freewatt®

Warm Air freewatt System, Model WAZ

POWERED by HONDA™

INSTALLATION, OPERATION & MAINTENANCE MANUAL

PATH
PARTNERSHIP FOR ADVANCING TECHNOLOGY IN HOUSING
PARTNER

An ISO 9001-2008 Certified Company
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ecr
innovative living™

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

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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.

NOTICE

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. Consult qualified installer, service agency or gas supplier for assistance or additional information.

CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

ENERGY STAR

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.

SP APPROVED

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

UL

The Honda MCHP is an Underwriter's Laboratory (UL) Listed, "Utility Interactive, Cogeneration, Stationary Engine-Generator Assembly, File Number FTSR.AU2004 (U.S.) and FTSR7.AU2004 (Canada)."

DESIGN CERTIFIED

1 – SAFETY INFORMATION

⚠ WARNING

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

⚠ WARNING

Furnace and engine exhaust from system contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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.

⚠ 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.

NOTICE

Appliance is equipped for residential installations. Commercial applications may have additional code requirements, adhere to all requirements of authority having jurisdiction for installation.

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

NOTICE

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

NOTICE

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

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 12, "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 12, "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 13, '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 Introduction

Appliance is 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. System consists of high efficiency (condensing) furnace, hybrid integration module and Honda MCHP unit.

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

Hybrid integration (HI) module consists of control module hydronic coolant loop and filter housing. Control module is custom-engineered micro-processor that monitors and controls operation of **freewatt** System. Hydronic coolant loop delivers heat from Honda MCHP to an air coil in HI module, transferring it into building's air stream. Filter housing includes 4" pleated high efficiency air filter and air coil heat exchanger. Module is CSA certified to be installed with furnace in **freewatt** System configuration.

Honda MCHP unit is manufactured by Honda Motor Company. Unit produces electrical power as by-product of providing heat on building's normal thermostatic demand. Unit is natural gas-fired and produces 240 VAC power delivered to the 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. The Honda MCHP uses a dedicated non-direct vent system, taking combustion air from the dwelling space around the unit and discharging exhaust to outdoors through a dedicated vent pipe.

2.2 Save These Instructions

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

2.3 Read All Documents

Use manual in conjunction with following manuals:

- Warm Air **freewatt** Installation, Operation and Maintenance Manual, and User's Information Manual
- **freewatt** Furnace Installation, Operation and Maintenance Manual, and User's Information Manual
- Honda MCHP Installation Manual and Owner's Manual
- HAI Thermostat Owner's Manual

3 – SYSTEM RATING AND SIZING

Table 3-1 System Rating And Sizing

Unit	Input (MBH)	Heating Capacity (MBH)	Overall Efficiency (%)	Nominal Power (kWe)	Weight (lbs)
Honda MCHP Unit (0-3,300 feet)	18.4	12.3	89%	1.2	180
Furnace (0-2,000 feet)	60 to 120	57 to 114	95%		120 – 160

Ratings are for sea level applications. Please consult furnace IOM for high altitude conversion and derating instructions. Honda MCHP, consult with ECR International Technical Support for high altitude conversion and derating instructions. System sizing follow instructions found in furnace Installation, Operation and Maintenance Manual. Sizing instructions require calculation of maximum hourly heat loss to properly size firing rate of furnace and review of ductwork to ensure proper air flow characteristics.

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

Figure 4-1 Typical MCHP Location Relative to Integrated Furnace/HI Module

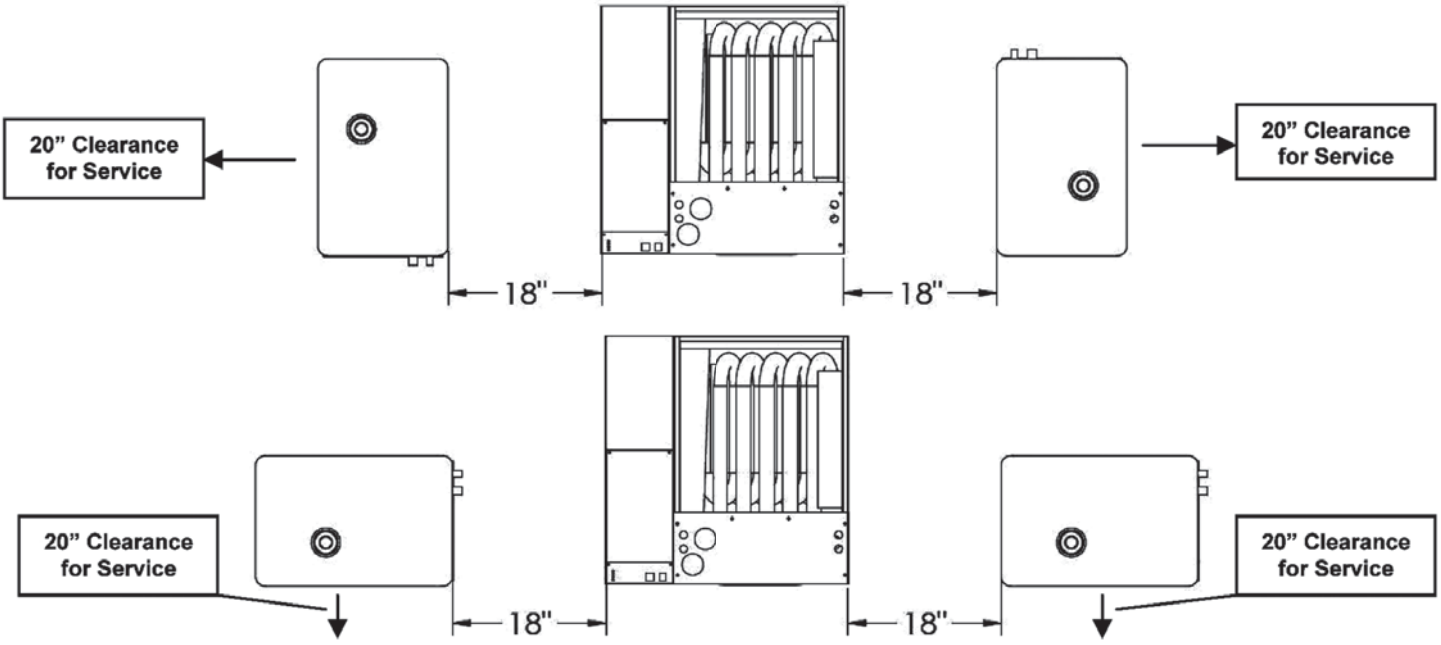
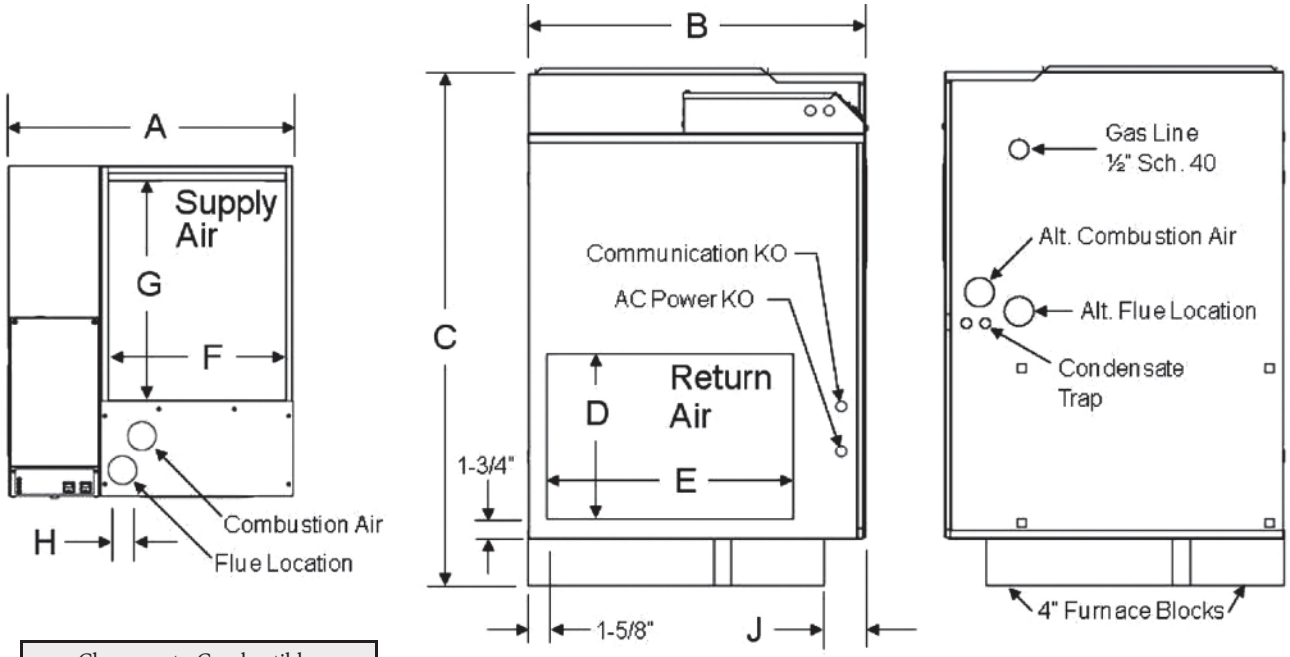


Figure 4-2 Integrated Furnace and HI Module Dimensions



Clearance to Combustibles	
Top	1 Inch
Front	2 Inches (24" + Service)
Sides	0 Inches
Rear	0 Inches
Bottom	Non-Combustible or Wood Floor
Return	Left or Right

Model	Width (A)	Depth (B)	Height (C)	Vents (H)	Supply Air (F x G)	Return Air (D x E)	Overhang (J)
60	25	29	44	2	15-7/8 x 20	14-1/4 x 21-1/4	3-1/2 to 5
80	26-1/2	29	44	2	17-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5
100	28-1/2	29	44	2	19-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5
120	31-1/2	29	44	2	22-1/2 x 20	14-1/4 x 21-1/4	3-1/2 to 5

Figure 4-3 Furnace Details

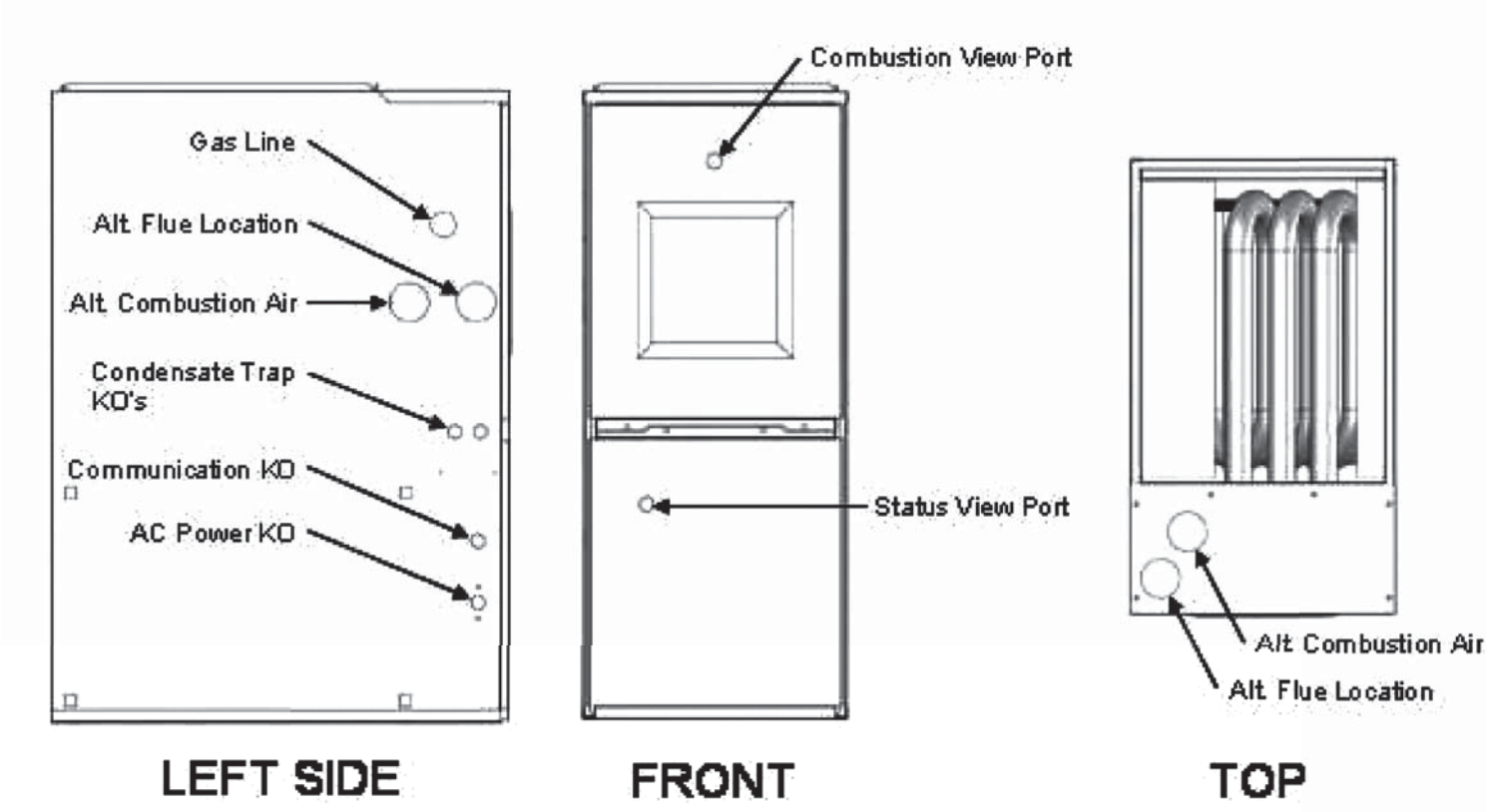


Figure 4-4 Hybrid Integration (HI) Module Details

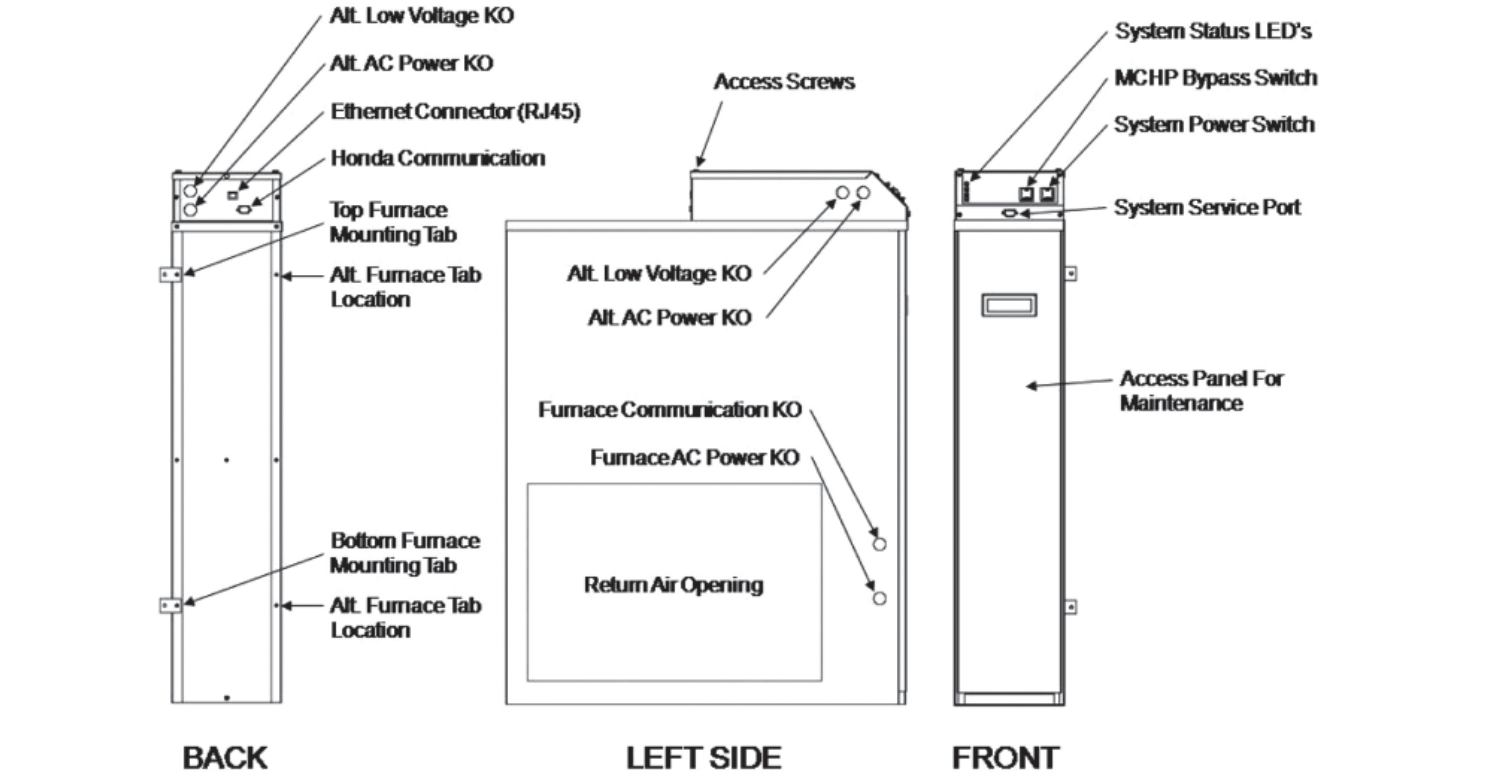
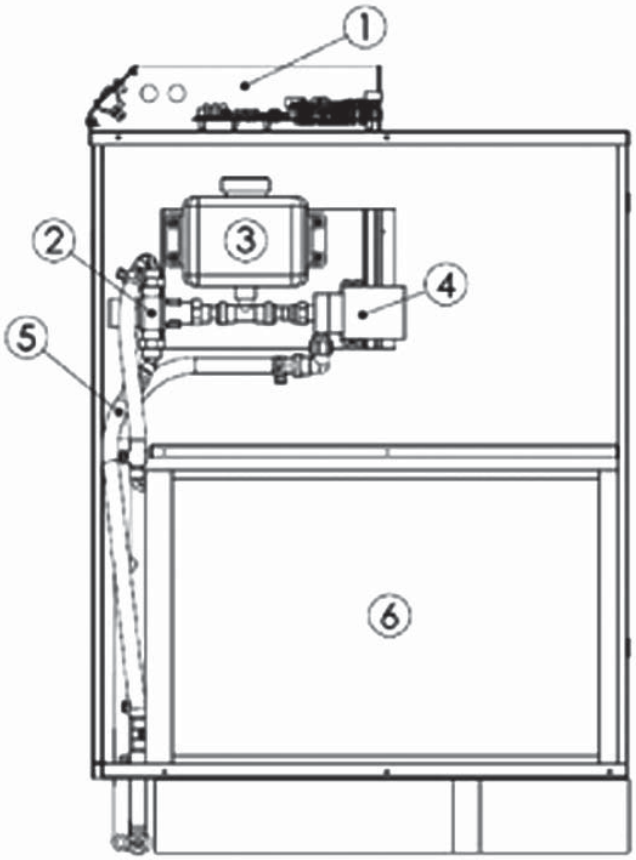


Figure 4-5 Cross Section View of HI Module Details



1 Electronics Enclosure/Control Module
2 Mixing Valve
3 Coolant Tank
4 Coolant Pump
5 Coolant Tubing
6 Air Coil Heat Exchanger

Figure 4-6 Electronics Box Details

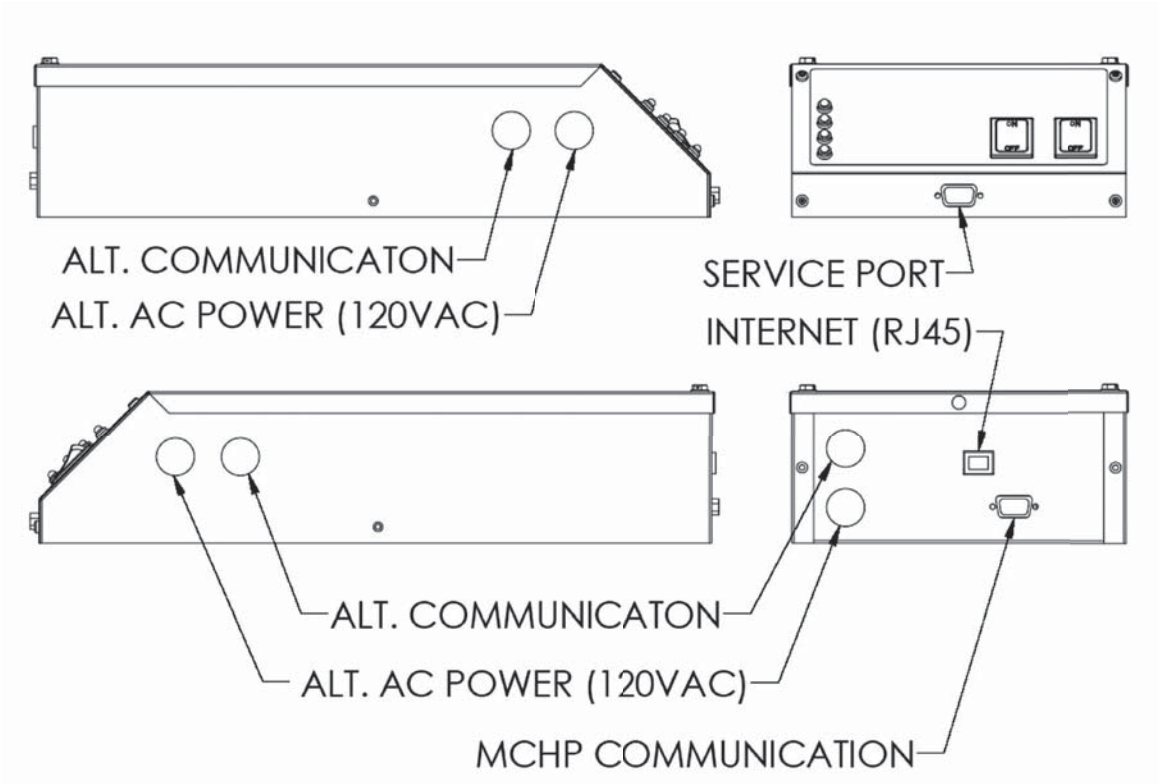
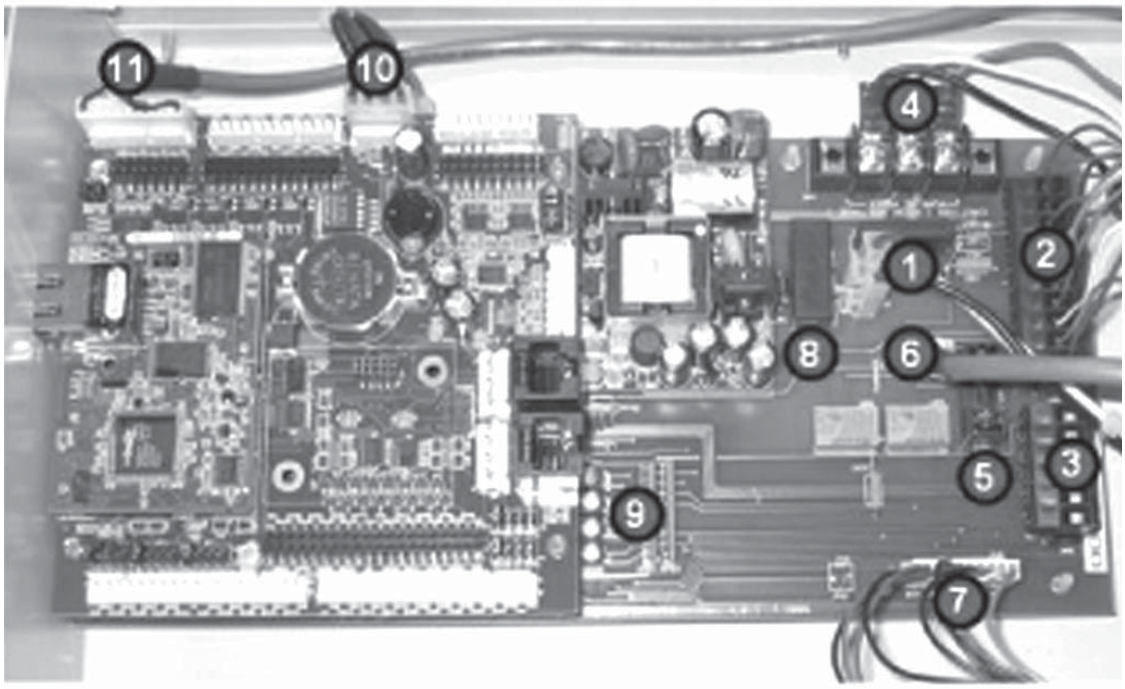


Figure 4-7 Electronics Box: Relay Board Details

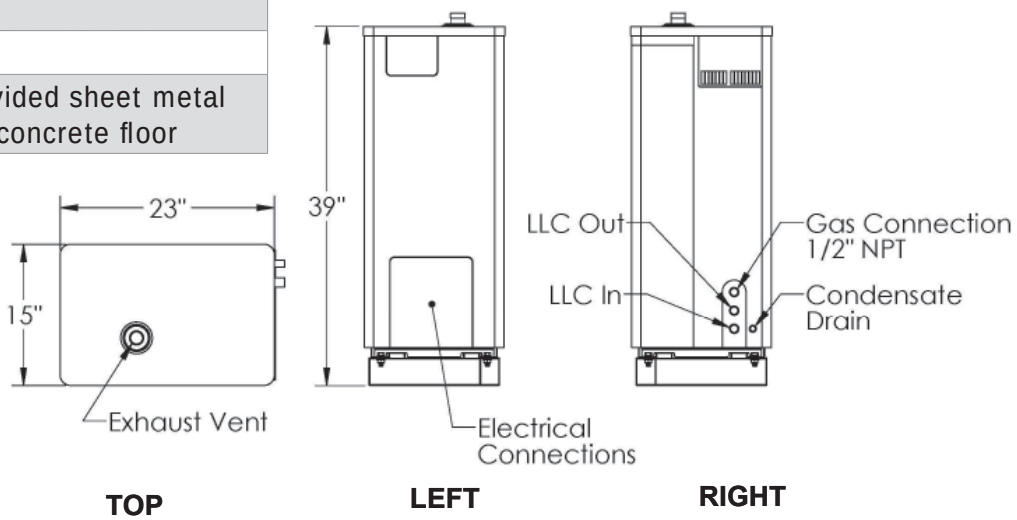


1	120 VAC System Power
2	Thermostat Connection
3	Pressure Switch & Outdoor Sensor
4	120 VAC - Coolant Pump
5	24 VAC Fuse
6	Furnace Communication
7	LED Cable Connections
8	120 VAC Fuses
9	Board LED's
10	CPU Power
11	Front Serial Connection

Figure 4-8 - Honda MCHP Dimensions

Table 4-2 MCHP — Clearance to Combustibles

Top:	14"
Front:	0.4" (20" for Service)
Sides:	0.4" (12" for Service)
Rear:	0.4" (2" for Service)
Bottom:	MCHP attached to provided sheet metal base and anchored to concrete floor



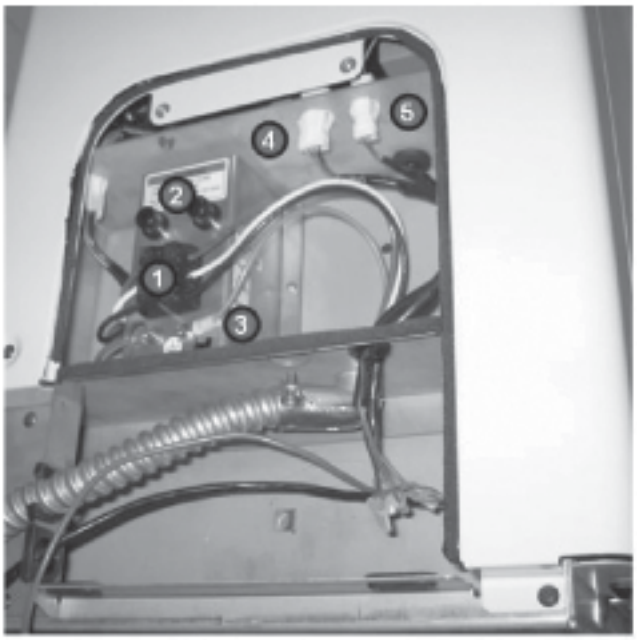
CONCRETE FLOOR REQUIREMENTS:

THICKNESS: 3" MINIMUM

FLATNESS: ½" IN 10 FEET CLASS CX

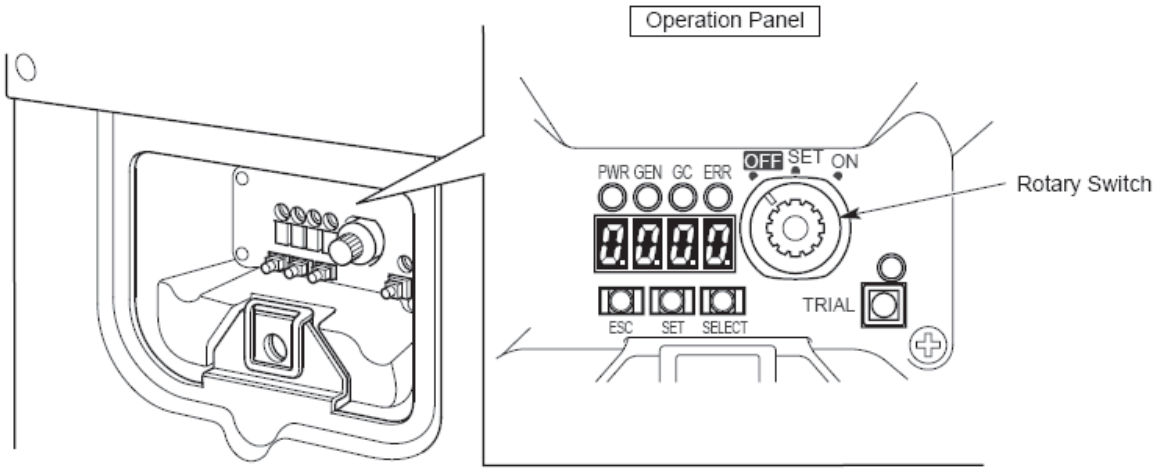
DROP-IN ANCHOR: 3/8" OD x 1.75" LONG (5/16"-18 THREAD) QUANTITY 4

Figure 4-9 Honda MCHP: Electrical Connection Details



1. 240 VAC Power Terminal
2. 240 VAC Fuses
3. Ground Screw
4. Signal Cable
5. Exhaust Gas Leak Sensor

Figure 4-10 Honda MCHP: Front Interface Details



5 – BEFORE PLACING THE SYSTEM

5.1 Codes

System incorporates gas-fired, condensing appliances and must be installed in accordance with all applicable federal, state and local building codes including, but not limited to 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 .2 installation codes.
- Electrical:

  United States: Installation shall conform to National Electrical Code (ANSI/NFPA-70).

  Canada: Installation shall be in accordance with CAN/CSA-C22.1 Canadian Electrical Code (Part 1).
- Condensate Disposal:

  Installation shall be in accordance authority having jurisdiction.
- Installers:

  Follow authority having jurisdiction with respect to installation of Carbon Monoxide Detectors. Follow maintenance recommendations outlined in this manual.
- Grid Interconnection:

  Follow local electric utility regulations with respect to interconnecting to the grid.

5.2 System Sizing

Verify system selected is proper capacity before continuing installation. Firing rate of system should be greater than or equal to calculated peak heating load (heat loss) for building or area(s) served by system. See Section 3 for system ratings.

Base heat loss calculations on approved industry methods.

5.3 System Location Considerations

Location of system and components considerations:

- Correct type of gas available.
- Suitable combustion air supply to provide correct amounts of fresh (outdoor) air for combustion.
- Suitable venting system to remove hazardous products of gas combustion.
- Suitable electrical supply for all system motors and controls.
- Connect to properly located thermostat or operating control (must be communicating thermostat).
- Place on level surface (must NOT be installed on carpeting).
- Condensate drain line must pitch 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).

5.4 Locating System

- Select level location, central to duct systems served and as close to vent and air intake terminals as possible.
- Use accessibility clearances for system installation, if more stringent (i.e. larger clearances) than required fire protection clearances.
- Accessibility clearances may be achieved with use of removable walls or partitions.
- Install system on solid, concrete floor with adequate make-up air available for 18,500 Btu/hr net input heating appliance. System shall NOT be installed on carpeting.
- Clearances shown in Figure 4-2 for integrated furnace and HI module indicate required clearances per CSA listing.
- Install equipment in location that facilitates operation of venting and combustion air intake piping systems described in this manual (Section 12).
- Advise system owner to 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 system such that system controller components are protected 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 therefore contributes no heat to space) are always at or above 32°F to prevent freezing of liquid condensate.

5.5 Combustion Air and Vent Pipe Requirements

- System requires dedicated vent systems for furnace and Honda MCHP to discharge all combustion products to outside atmosphere. Furnace requires a combustion air intake to complete the sealed combustion system and provide air from outdoors. Honda MCHP requires make-up air from space where installed.
- Combustion air and vent pipe connections shall terminate together in same atmospheric pressure zone, either through roof or sidewall (roof termination preferred). Consult furnace and Honda MCHP Installation Manuals for specific guidelines for required clearances and installation instructions.
- Refer to the furnace Installation Manual for specific guidelines for concentric vent termination installation

5.6 Condensate Drain Requirements

- Install condensate drain lines with pitch down to floor minimum ¼" per foot. External condensate pump (not furnished) may be used if floor drain is not available. Condensate pump must be designed for flue gas condensate application. Consult furnace and Honda MCHP Installation Manuals for specific guidelines for condensate drain installation.
- Recommend no additional electrical connections made within **freewatt** System for line power. If line power is required for condensate pump, separate junction box and receptacle should be field sourced.

5.7 Foundation Requirements

Place system on level concrete surface. DO NOT install on carpeting.

- System: A level System allows condensate drain lines to function properly. Use shims between boiler & floor and MCHP & base to make up for minor surface irregularities or tilt.
- Honda MCHP: Honda MCHP is supplied with base to raise unit above floor and secure it to concrete floor.

5.8 Removal of Existing Furnace from Common Vent System

When removing existing furnace from common venting system, existing common venting system is likely too large for proper venting of appliances remaining connected to it. Refer to proper decommissioning procedure outlined in furnace Installation, Operation and Maintenance Manual.

6 – PLACING THE SYSTEM

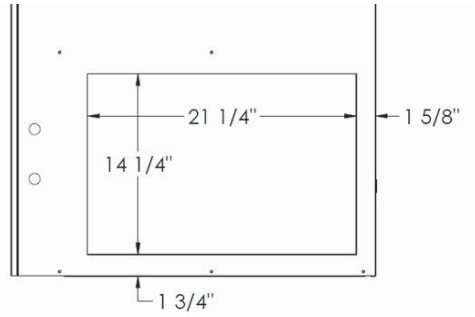
6.1 Placing the System

The system should be placed to provide the most direct connections to the combustion air/vent piping system, natural gas piping, return and supply duct-work, condensate removal system as well as considering the electrical connections for the system.

The following instructions outline the preparation and placement of the Warm Air **freewatt** System.

- Make sure to leave about a 4" gap in front of the 4" concrete block foundation for the integrated furnace/ HI module unit. The coolant piping from the MCHP unit will connect to the HI module through the bottom of the HI module and therefore needs an opening in front of the block foundation (J) to accommodate this piping. See Figure 4-2 for details.
- Place the 4" concrete block platform, consisting of a minimum of 4 – 4" x 8" x 16" blocks, in the optimum, level location for all utility connections and vent/air intake connections. See Figure 6-6.
- Place crated furnace and hybrid integration (HI) module as close to selected location as possible and uncrate units.
- Determine if the duct-work will enter the furnace/HI Module on the right side or left side and prepare the return air opening on the furnace per the instructions found in the furnace installation manual by cutting the opening to match the HI Module opening. See Figure 6-2.
- Inspect the return/supply air duct-work and modify duct-work to connect to the furnace and HI Module.
- Install supplied ¼" thick sealing foam around the peripheral edge of the furnace's return opening to seal this interface. Figure 6-3.
- For additional support, a self-tapping screw can be installed thru the top furnace compartment into the side of the HI module. Be careful not to penetrate the HI Module's Electrical Enclosure
- Connect the HI Module to the furnace with the 3 attachment plates as shown in Figures 6-3A & 6-3B. Start with front plate installation with the chase nipple (Figure 6-3B).
- Install the integration wiring between the HI Module and furnace before moving the integrated unit into position. Route the furnace power and furnace communication cables from the HI Module through the two knockouts in the furnace as shown in Figure 6-4. The communication cable will connect directly to the thermostat terminals and the power cable will connect to the power leads in the internal J-box.

Figure 6-1 Return Air Opening Dimensions



Right Side View

Figure 6-2 Sealing Foam

Figure 6-3A Rear Attachment Plates

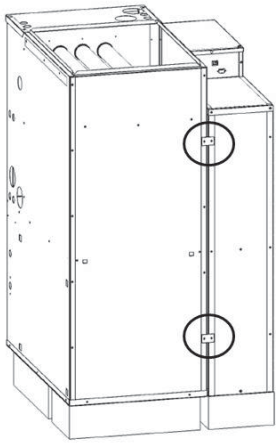


Figure 6-3B Front Attachment Plate

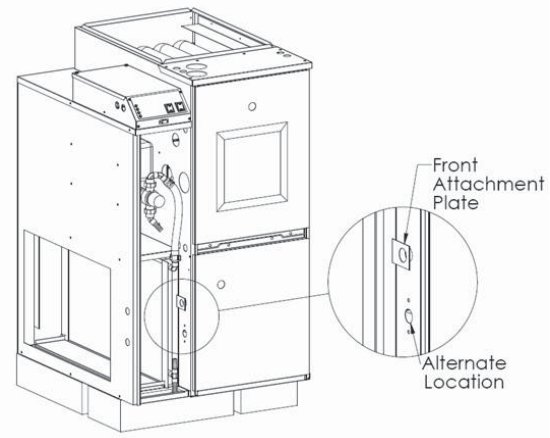
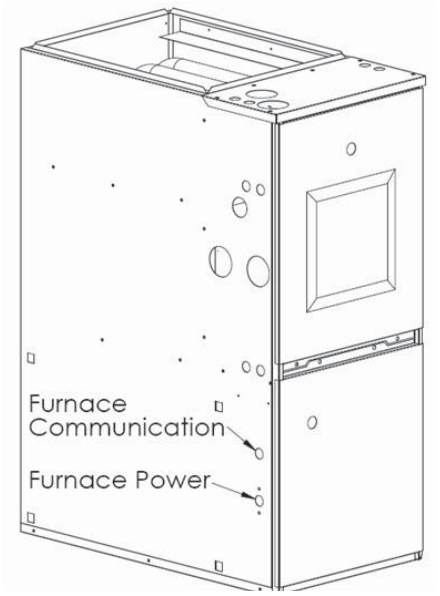


Figure 6-4 Furnace Knockouts

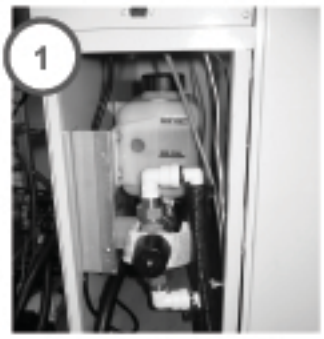


NOTICE

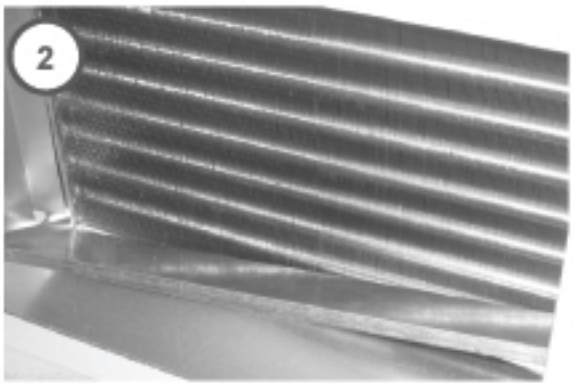
If system has Right-Hand Return, relocate the furnace's blower door safety switch to properly wire the HI Module.

- Place the integrated HI Module/Furnace unit onto the 4" block platform and align with the existing return and supply duct-work, see Figure 6-6.
- Locate the Honda MCHP unit's base adjacent to the integrated unit with the MCHP's service door facing forward as shown in Figure 6-7. Please review figures 4-1, 4-2 & 4-8 for system configuration requirements and clearances.
- Install the MCHP unit base as outlined in Figures 6-8 and 6-9.
  - A. Place the base on the concrete floor and check for levelness.
  - B. Mark the anchor bolt locations on the concrete floor.
  - C. Drill the proper hole diameters in the concrete for the anchor bolts per the manufacturer's installation instructions. If an obstruction is hit, move the base and redrill.
  - D. Attach the base to the anchor bolts with the supplied hardware.

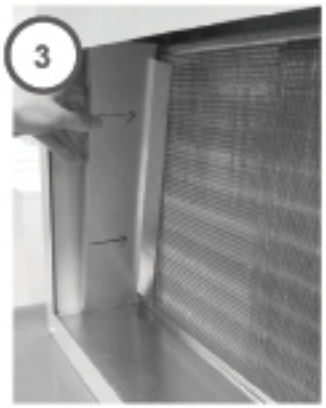
Figure 6-5 Instructions to Change Hybrid Integration Module From Left-Hand to Right Hand Return



Loosen and detach HOT and COLD connections of mixing valve.



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

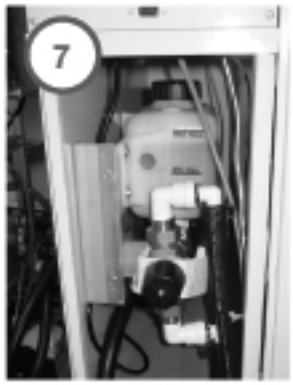


Mark air flow direction, remove 2 screws and pull air filter support plate forward and lift to remove.

Remove 2 lower rear screws, move air coil and re-insert 2 lower rear screws.

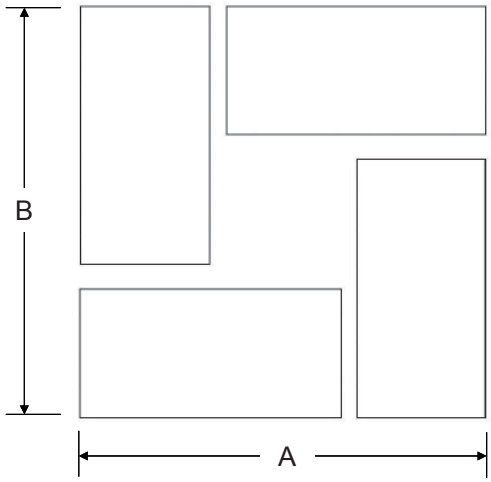
Reinstall air filter support plate with 2 screws, ensuring that the directional arrows point to air coil.

Reinstall base air filter plate with 2 screws.



Reconnect HOT and COLD connections of mixing valve

Figure 6-6 Typical Arrangement of Concrete Block Platform



Model	Width (A)	Depth (B)
60	25	25.5
80	26.5	25.5
100	28.5	25.5
120	30.5	25.5

Figure 6-7 Typical System Configuration

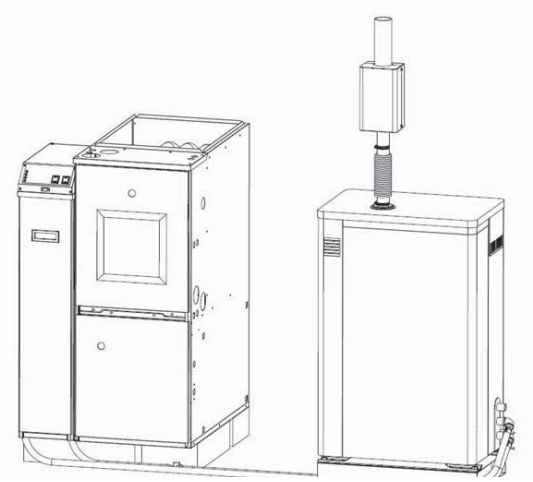


Figure 6-8 MCHP Base Installation

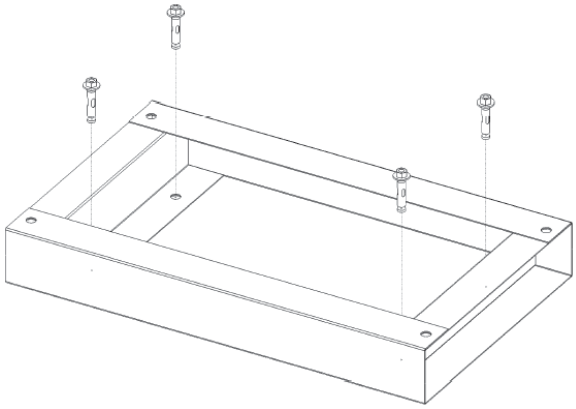
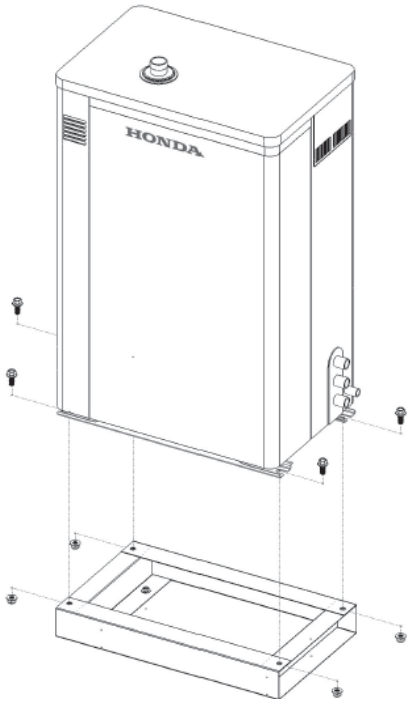


Figure 6-9 MCHP Installation



NOTICE

At least four - 4" Concrete blocks on a clean floor are required for the platform.

- After the base is installed, place the Honda MCHP on the base and secure the MCHP unit to the base with the supplied hardware. Figures 6-8 and 6-9 shows alignment and installation hardware.
- Level the integrated unit with shims between integrated unit and block platform.
- If unit needs to be shimmed level, washers should be located between the MCHP and base.
- Orientation of the bolt & nut is important! Bolt must be installed from the top with the nut on the bottom.

7 – BUILDING AIR DUCTWORK - RETURN AND SUPPLY

7.1 – Building Air Duct-work: Return and Supply

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

8 – NEAR SYSTEM PIPING

- After the system's three components are located and secure, the coolant piping should be connected to the MCHP unit and the HI module as shown in Figure 8-1.
- The following steps will be required to install the long life coolant (LLC) tubing between the HI module and the Honda MCHP. If these steps are not followed, the system will not operate properly and permanent damage to the HI Module or Honda MCHP may occur.

- HI Module coolant tubing:

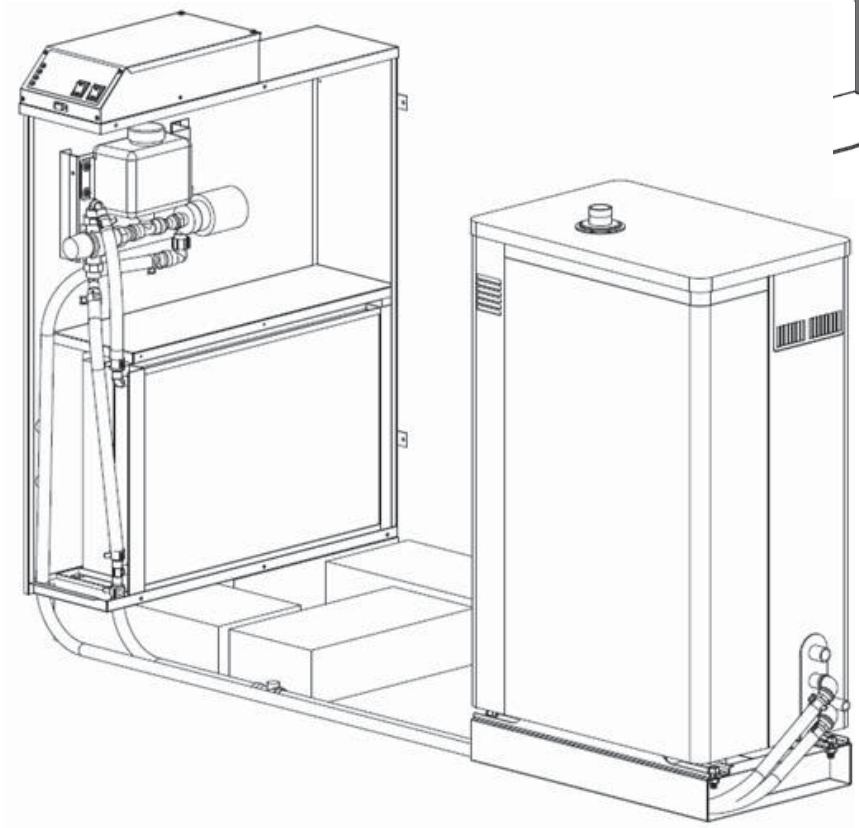
  A. The rear connections (LLC In and LLC Out) of the MCHP unit are ½" NPT and should be prepared with sealant

  B. Install ½" NPT brass street elbow onto the drain fitting before installing the ½" NPT street elbow and drain fitting assembly onto the MCHP unit's ½" MNPT LLC Out fitting. Install the other 1/2" NPT brass elbow onto MCHP unit's 1/2" MNPT LLC In fitting.

     IMPORTANT: Remember to use a wrench on the MCHP's fitting to ensure that this fitting is stable.

  C. Install the ½" NPT x ½" barb brass fittings into the drain fitting and ½" NPT elbow. The fittings should point downward at a 45 degree angle in the direction of the front of the HI Module. See Figures 8-1 & 8-1A.

Figure 8-1 MCHP Coolant Tubing



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.

Figure 8-2 MCHP Coolant Connector

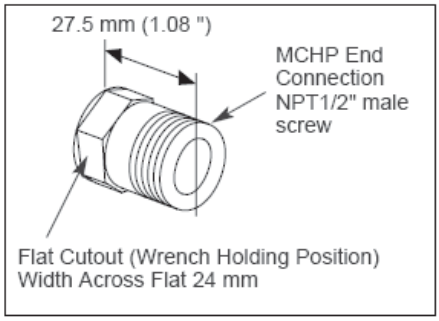
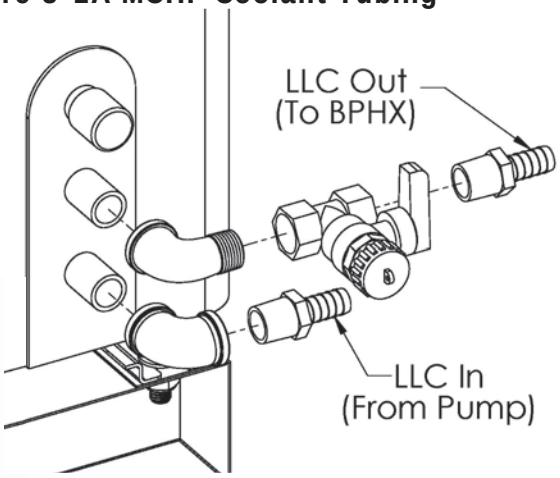


Figure 8-1A MCHP Coolant Tubing



D. Long Life Coolant Out (LLC Out) [MCHP to Air Coil. Figure 8-3]

- Install tubing onto HIGH air coil barb fitting with SelfTite clamp. Maximum Onix Tubing Length = 80”
- Route tubing from HI module, through open channel in front of MCHP base to rear of MCHP and cut to length.
- Slip a SelfTite clamp onto tubing and place about 3 inches from end.
- Install tubing onto the HIGH brass barb fitting with a SelfTite clamp.

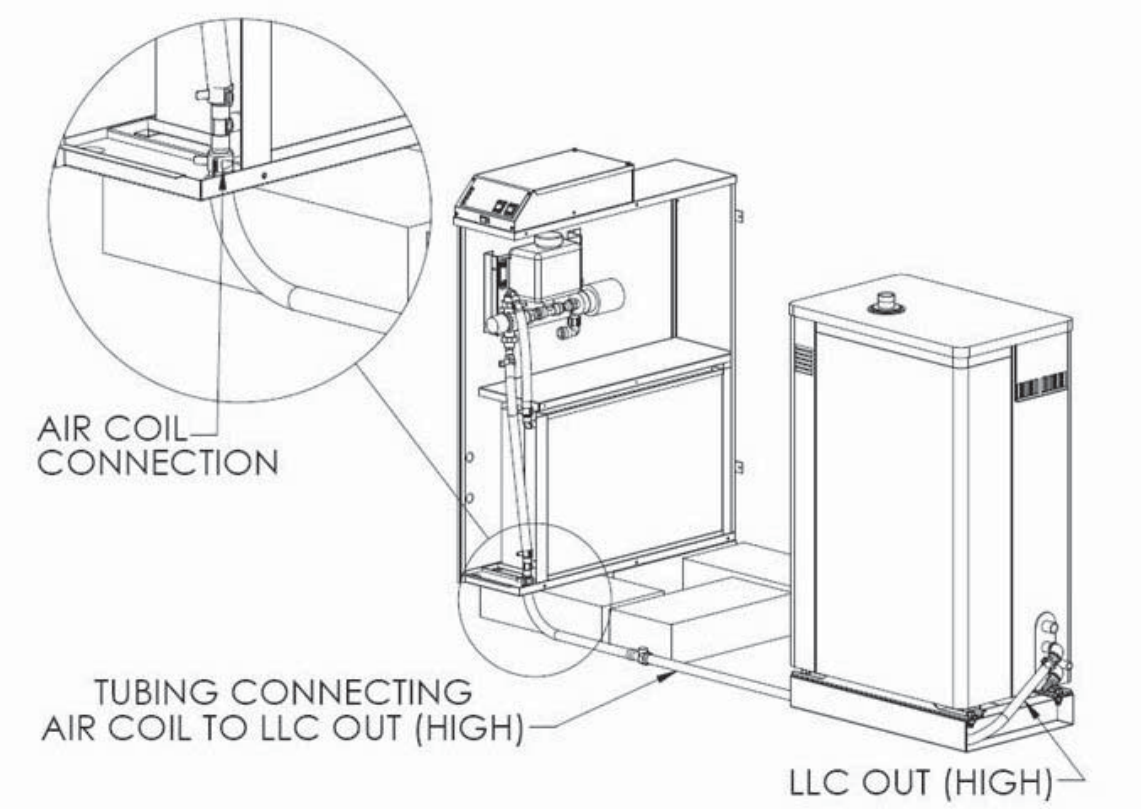
NOTICE

Install Onix tubing per manufacturer’s instructions. Maximum Onix Bending Radius is 4”.

NOTICE

Safety glasses must be worn when installing SelfTite Clamps. Install Onix tubing per manufacturer’s instructions.

Figure 8-3 LLC Out Connection to Air Coil and MCHP



E. Long Life Coolant In (LLC In) [Pump to MCHP. Figure 8-4]

- Use remaining length of Onix tubing to extend from coolant pump to MCHP's LLC In (LOW) connection.
- Install stackable hose barb fitting (Figures 8-4 and 8-5) into open tube end and secure with SelfTite clamp.
- Insert same stackable hose barb fitting into the female swivel elbow Figure 8-5, on the coolant pump & secure with a collet clip.
- Route the tubing through the open channel in the front of the MCHP base to the rear of the MCHP and cut to length.
- Slip a SelfTite clamp onto tubing (about 3 inches from the end) and install the tubing onto the bottom (LOW) brass hose barb fitting and secure with SelfTite clamp onto tubing.

Figure 8-5- Stackable Hose Barb and Female Swivel Elbow

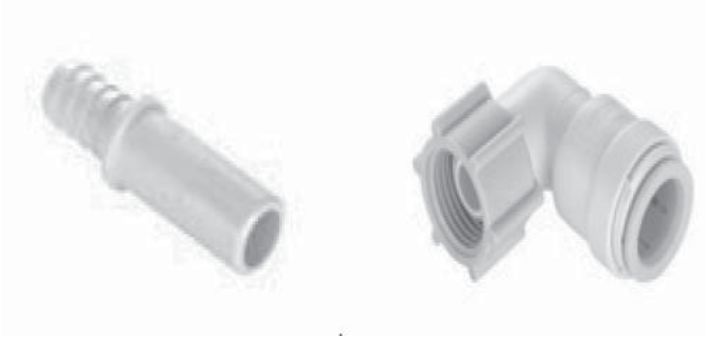
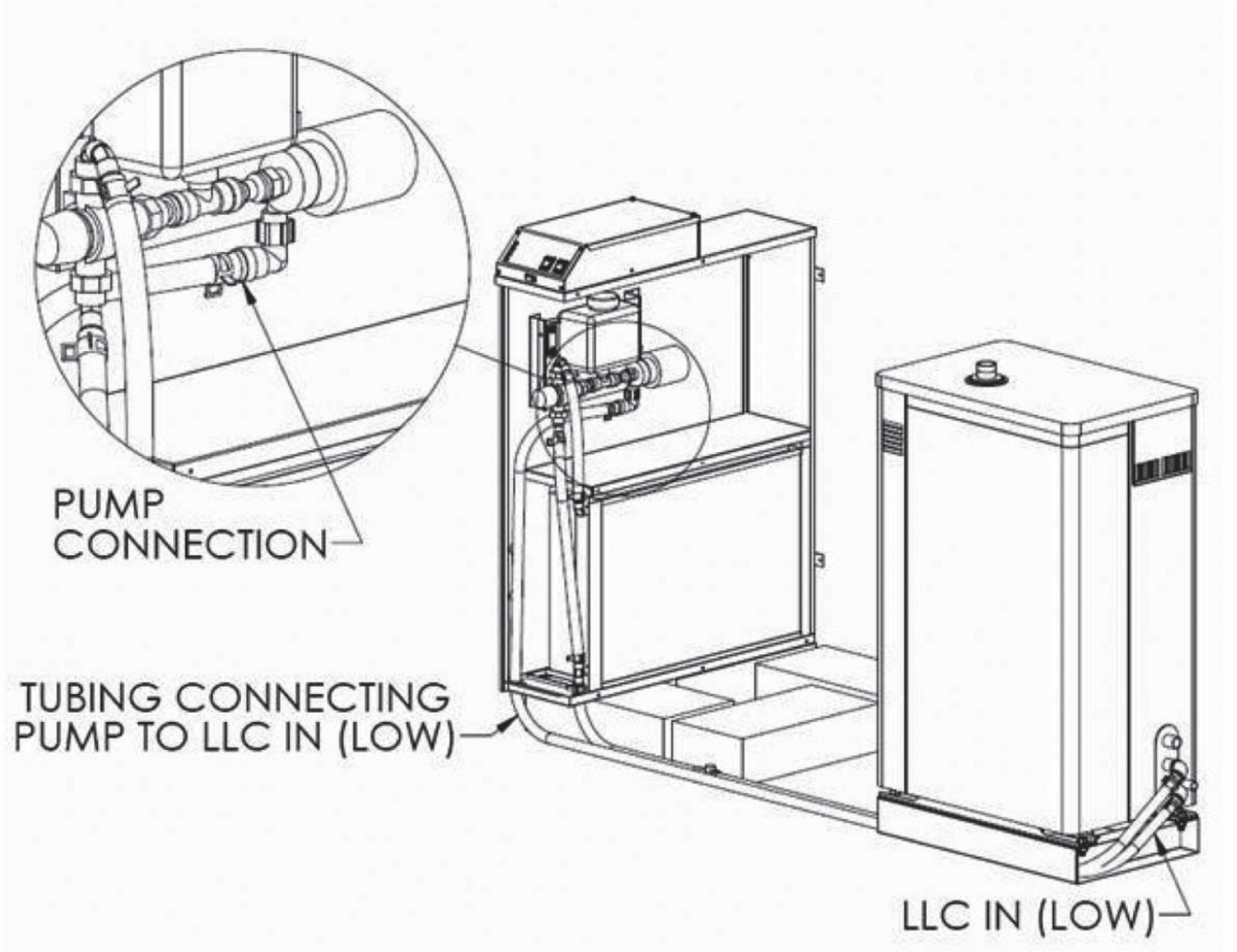


Figure 8-4 MCHP Connection to Pump



NOTICE

Do not use a screw gun or wrench to tighten Torque-Tite clamps. Safety glasses must be worn when installing SelfTite Clamps.

NOTICE

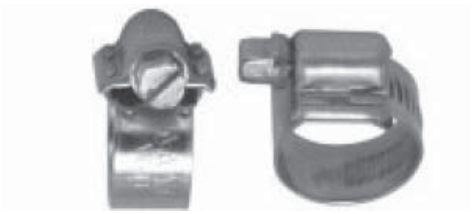
Safety glasses must be worn when installing SelfTite Clamps.

Onix Clamps

- Do not solder near, or overheat, any Onix connections. Extreme temperatures associated with soldering may seriously damage the Onix and will void warranty.
- All Onix and brass fitting surfaces must be clean and dry before making the connection.
- Whenever possible, avoid making connections or splices in inaccessible locations.
- Repairing Onix that has been in service requires special attention, particularly when glycol has been used. Any residual amounts of glycol or any other coating inside the Onix tube must be removed. Use an alcohol swab or pad to remove the residue(s), then allow the tube to dry prior to connection.
- It is recommended only to use Watts Radiant brass barb fittings with the Onix tubing. Off-the-shelf brass fittings are made to different dimensions and tolerances, which may result in leaks.

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".

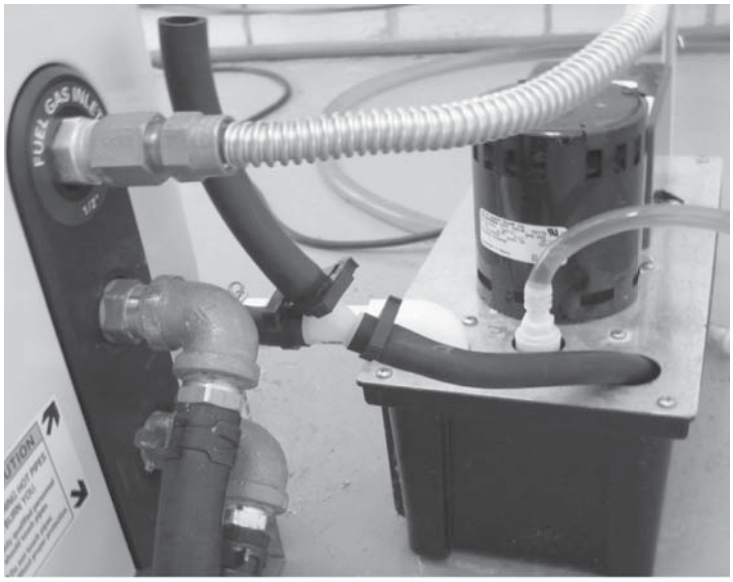
10. It is recommended to only use Watts Radiant brass barb fittings with Onix tubing. Off-the-shelf brass fittings are made to different dimensions and tolerances, which may result in leaks.

9 – CONDENSATE DRAIN PIPING

9.1 Condensate Drain Piping

- The system's furnace and MCHP unit will produce condensate at rates up to 2 ½ US quarts or more per hour. Provisions must be prepared to drain the condensate away from the appliances to ensure their proper operation. The furnace is supplied with a drain trap assembly that may be installed on either the left or right side furnace panel.
- The furnace's drain trap assembly must be filled with water before operating the furnace. A dry trap may cause the pressure switch to behave erratically, preventing the furnace from operating normally.
- It is recommended that no additional electrical connections be made within the **freewatt** System for 120 VAC power. If 120 VAC power is required for the condensate pump, a separate junction box and receptacle should be provided.
- When using a condensate pump, MCHP condensate line should be installed directly into the condensate pump, which should be located directly behind the MCHP unit. This condensate line should have a "Y connector", as shown in Figure 9-1, to ensure that the tubing is open to atmosphere, removing the chance for air lock in the line. The furnace's condensate line should be routed behind the MCHP unit and be installed directly into the condensate pump.
- Please review the condensate drain instructions in the respective furnace and Honda MCHP installation manuals to ensure proper system installation and operation.

Figure 9-1 MCHP Condensate Drain Tubing



10 – EXHAUST GAS SENSOR

⚠WARNING

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

NOTICE

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

Figure 10-1 Honda MCHP Connections

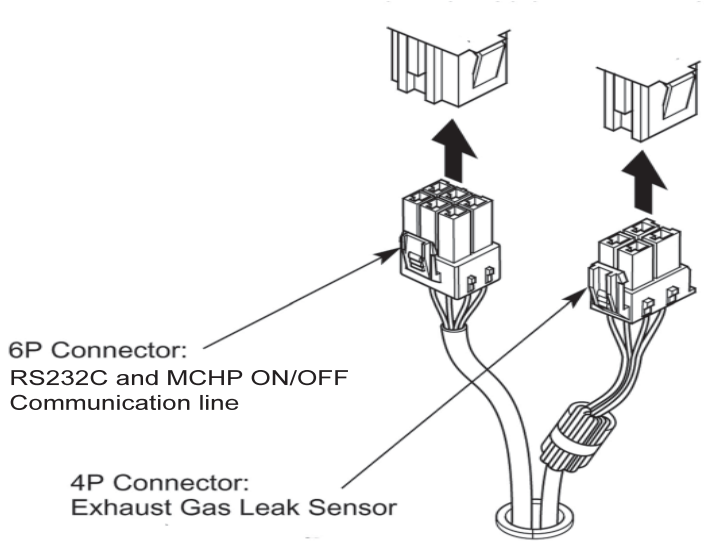
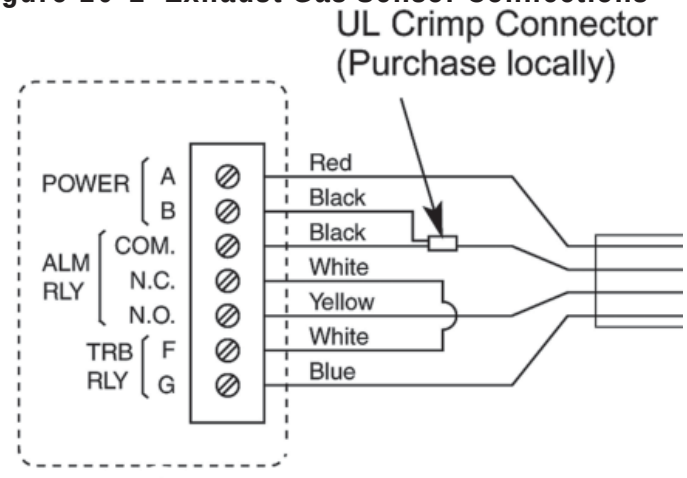


Figure 10-2 Exhaust Gas Sensor Connections



10.1 Exhaust Gas Sensor (EGS)

- The Exhaust Gas Sensor (EGS) monitors the integrity of the MCHP unit's combustion system and shuts down the MCHP unit if certain potentially unsafe conditions are detected. It does this by monitoring the carbon monoxide level in air space near the MCHP unit. The EGS is independent of, and separate from, the audible CO alarming system also installed with the **freewatt** System in compliance with best practices for all fuel-fired central heating equipment. The Exhaust Gas Sensor does not fulfill the State of Massachusetts's CO detector requirement.
- The Exhaust Gas Sensor is supplied with the Warm Air **freewatt** System and is intended for installation in close proximity of the Honda MCHP unit. Figure 10-1 shows the connections to the Honda MCHP and Figure 10-2 shows the connections to the Exhaust Gas Sensor.

10.2 Preparation

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

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

10.3 Installation

- Exhaust Gas Sensor is connected to Honda MCHP unit with field supplied four-wire stranded insulated cable (maximum allowable length 49 feet (15m)), and furnished 4 pin connector with noise filter and pigtail. Please follow installation instructions below:

10.4 Exhaust Gas Sensor

Exhaust Gas Sensor is Macurco CO Detector and is connected directly to Honda MCHP.

- Read Installation, Operation and Maintenance manual for **freewatt** supplied Exhaust Gas Sensor.
- Install Exhaust Gas Sensor per manufacturer's instructions in close proximity of Honda MCHP unit.
- Install four-wire cable from Honda MCHP to Exhaust Gas Senor per wiring schematic found in Figures 10-1, 10-2 & 10-3.
- Ensure the cable is properly secured (Max. Interval: every 3 ft.).

10 – EXHAUST GAS SENSOR

NOTICE

The Exhaust Gas Sensor's cable connections must be installed properly or the Warm Air freewatt System will not initialize and therefore not operate (ERROR – 14 or 15 Flashes).

10.5 Honda MCHP Connection

- The 4-pin cable connector to Honda MCHP for Exhaust Gas Sensor is factory-supplied and field installed. Figure 10-1 shows Honda MCHP connection details.
- Electrical schematic found in Figure 10-3 shows connections to the Honda MCHP for any servicing or troubleshooting.

10.6 Exhaust Gas Sensor Connections

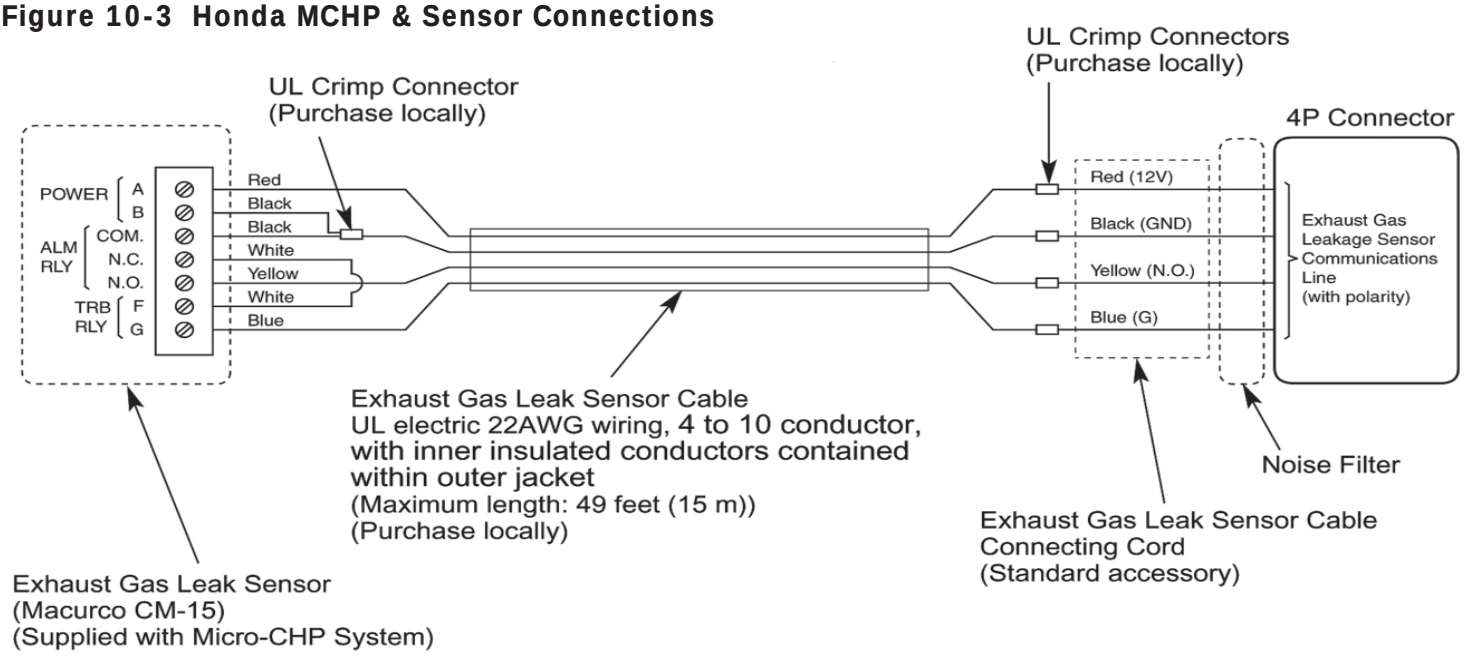
- Cable connection to Exhaust Gas Sensor will need to be field installed after installation of the sensor. Figure 10-2 shows these field connections. The 4-conductor shielded stranded cable is installer supplied.
- Electrical schematic found in Figure 10-3 shows connections to Honda MCHP for any servicing or troubleshooting.
- A white jumper wire will need to be installed in the field between second terminal (F) and fourth terminal (N.C.).

10.7 Test Procedure

Before commissioning the system, the Exhaust Gas Sensor should be tested to ensure proper operation. The Exhaust Gas Sensor has a test button that should be depressed. This should stop MCHP unit.

1. Disconnect **freewatt** System from the Internet. To do this, temporarily disconnect the LAN cable from the rear of the unit or disconnect the LAN cable where it plugs into the home's network.
2. Power is supplied to the exhaust gas sensor by the MCHP so the MCHP must be operating during testing of the exhaust gas sensor. If the MCHP is not operating turn up the thermostat until the MCHP operates.
3. The LED indicator on the Exhaust Gas Sensor must be solid green. If it is flashing red and green, the sensor is initializing. Please wait approximately 3 minutes until the LED is on solid green before proceeding.
4. When the LED is on solid green, press the button on the Exhaust Gas Sensor labeled "Push Here to Test or Reset" for at least 6 seconds. This action should cause a system error condition.
5. Confirm that the Honda MCHP unit has stopped operating, and that the red "Service Required" LED on the **freewatt** System's front panel is blinking error code "14", and the yellow "Bypass" LED is on. Contact technical support if any of these conditions do not occur.
6. Clear error condition. To do this, turn OFF **freewatt** System's "System Power" switch, and turn OFF power to Honda MCHP at MCHP service switch.
7. Reconnect LAN cable to **freewatt** System.
8. Turn power ON to Honda MCHP first, turn ON **freewatt** System's "System Power" switch to return system to normal operation.
9. Exhaust Gas Sensor must be replaced every 5 years and installed by qualified and properly trained service personnel.

Figure 10-3 Honda MCHP & Sensor Connections



10 – EXHAUST GAS SENSOR

⚠WARNING

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

Exhaust Gas Sensor System 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

11 – PRESSURE SWITCH SYSTEM

- The Pressure Switch System is designed to ensure that no blockage occurs in the Honda MCHP unit's exhaust vent. Pressure switch system is intended for installation at the beginning of exhaust vent piping system just above Honda MCHP unit. The major features of the pressure switch system are found in Figure 11-1.
- This system is factory-assembled and supplied with the Warm Air **freewatt** System for installation in the MCHP's exhaust vent with a cable that extends to the system controller.

11.1 Exhaust Vent Piping System

1. Attach Pressure Switch System PVC pipe section to the rubber exhaust adapter to the required depth (1") and install worm gear clamp.
2. Hold the Pressure Switch System PVC pipe section vertical above the Honda MCHP with the rubber exhaust adapter standing vertical and concentric with Honda MCHP exhaust port. The distance between the bottom PVC connection and the MCHP connection should be 8" (+/- 1"). DO NOT pull the pipe section too high and stretch the adapter. DO NOT hold the pipe section too low and allow the exhaust adapter to slump.
3. Measure the distance between the PVC coupling and the elbow of the exhaust vent piping system found directly above. MAKE SURE that the pipe is vertical and concentric with the Honda MCHP exhaust port.
4. Cut a section of PVC pipe of the proper diameter to fit the measured distance.
5. Dry fit the section of PVC pipe into the upper elbow and the Pressure Switch System and check:
   A. Level
   B. Location (Upper Pipe and MCHP exhaust port are concentric)
   C. Proper installation of the rubber exhaust adapter with 8" (+/- 1") between the bottom connection of the system and the MCHP connection. The rubber exhaust adapter should be:
      i. Level
      ii. NOT Pulled or Compressed
      iii. NOT Slumping or Installed at an Angle
6. Solvent cement the section of PVC pipe into the upper elbow of the exhaust piping system, making sure to have the pressure switch enclosure face forward for future servicing.
7. Solvent cement the section of PVC pipe into the open socket reducer fitting of the Pressure Switch System.

Figure 11-1 Pressure Switch

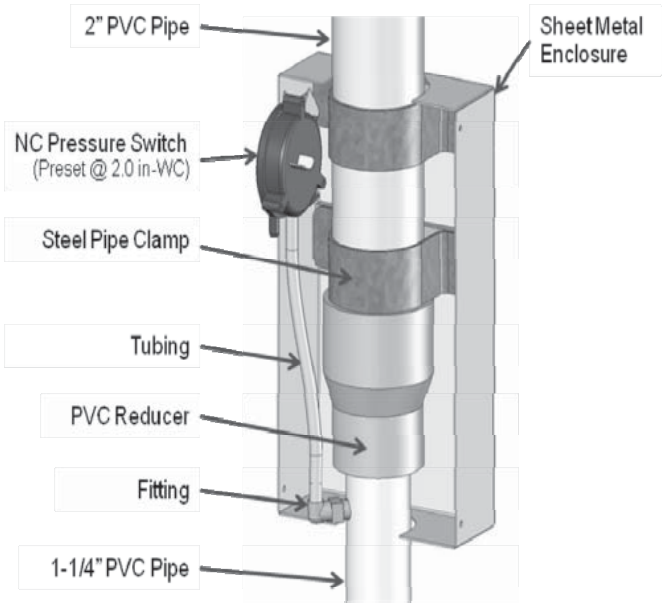


Figure 11-2 Pressure Switch Connection

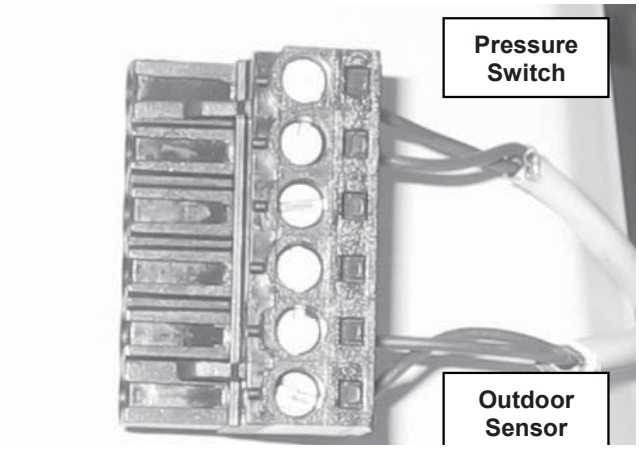
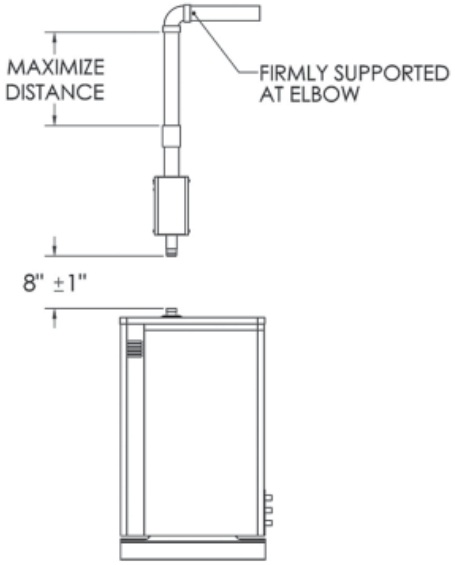


Figure 11-3 Honda MCHP Venting Installation



8. After placing the worm gear clamps over the rubber exhaust adapter ends, attach the rubber exhaust adapter to the MCHP and the contoured PVC pipe end of the Pressure Switch System.
9. Tighten the worm gear clamps.
10. Inspect the connections and clamps for proper welding and torque to ensure a tight exhaust system.
11. Ensure that the exhaust vent piping is supported in close proximity to the upper elbow to properly secure the Pressure Switch System and rubber exhaust adapter.

Figure 11-4 Incorrect Adapter Installation

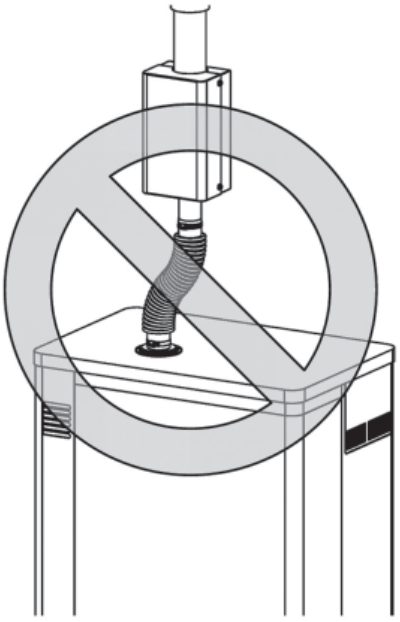
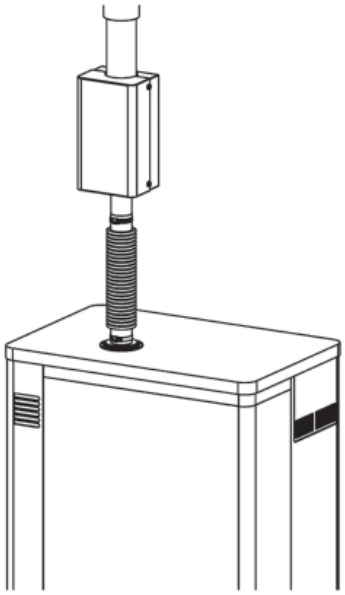


Figure 11-5 Correct Adapter Installation



11 – PRESSURE SWITCH SYSTEM

11.2 Pressure Switch Cable

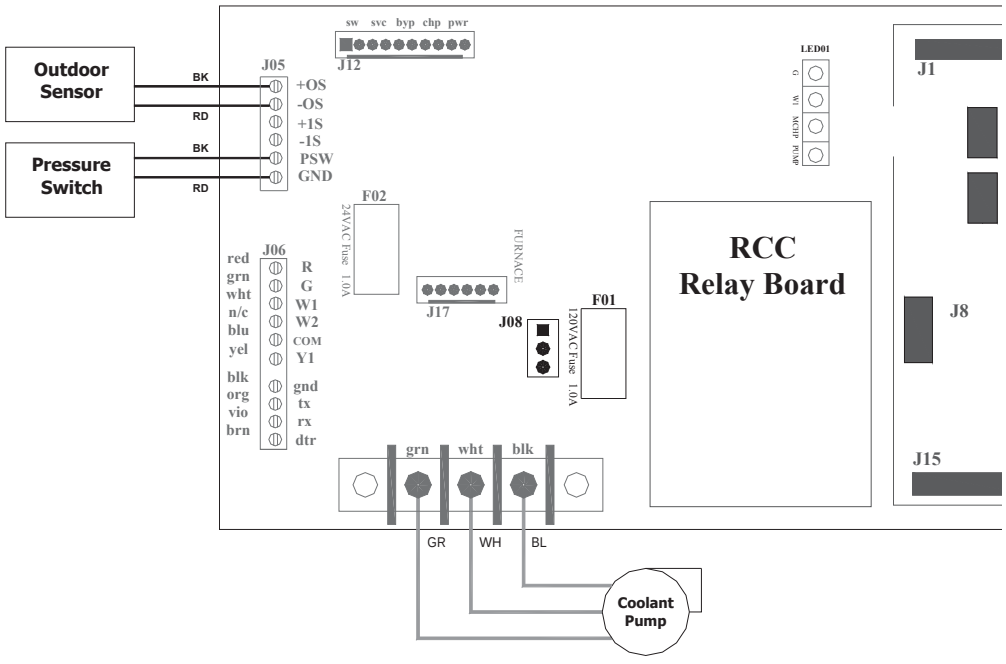
The pressure switch is connected to the control module with a two-wire cable. The cable is factory-installed to the pressure switch and is bundled outside the system enclosure. Please follow the installation instructions below:

1. Unbundle the cable and extend from the Pressure Switch System to the control module.
2. Install the two-wire cable end into the electronics enclosure of the Hybrid Integration (HI) Module and connect to the proper connection, as shown in Figure 11-2 & Figure 11-6.
3. Replace the removable Molex Connector into its connection port on the control module.
4. Secure the pressure switch cable to the Honda MCHP and the furnace with quick tie anchors.

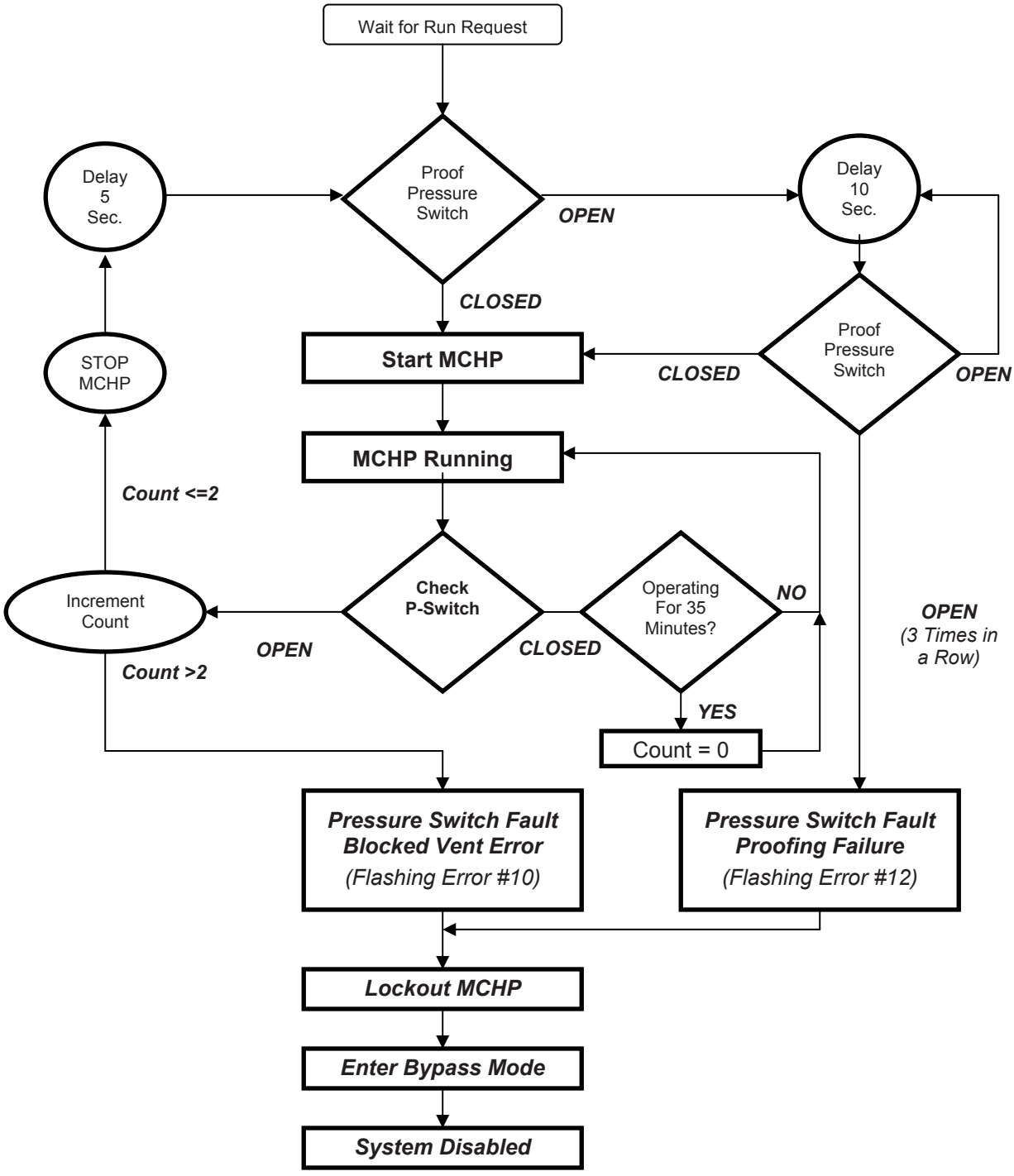
11.3 Pressure Switch Test

It is recommended to check all connections before commissioning the pressure switch system.

Figure 11-6 Pressure Switch Connection to Control Module



11.4 Pressure Switch: Sequence of Operation



11.5 Troubleshooting

⚠WARNING

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

IF	AND	CHECK or REPAIR
MCHP Will Not Start	Flashing Error #10	1. Check for Blocked Vent 2. Check for Broken or Loose Cable Connection 3. Replace Pressure Switch
Pressure Switch Loop Not Closed	Flashing Error #12	1. Check Cable & Connections 2. Blown In-Line fuse 3. Blockage in the Venting 4. Replace Pressure Switch
No Exhaust Past Pressure Switch System		1. PVC Reducer Clogged?
Pressure Switch Not Switching State		1. Check Cable for a Short 2. PVC Reducer Clogged? 3. Check Switch's Hi and Lo Tubes for cloggage 4. Replace Pressure Switch
Exhaust Products Leaking		1. Blockage in Vent 2. PVC Reducer Clogged? 3. Check PVC Connections for proper Solvent Weld 4. Check Pressure Switch Tube Connections

12 – COMBUSTION AIR AND VENT PIPE

⚠WARNING

Read, understand and follow all instructions in this section. Failure to properly vent or supply combustion air to this system can cause carbon monoxide poisoning, or an explosion or fire, resulting in property damage, personal injury or loss of life.

12.1 General Considerations

- If this system will be replacing a Category I type furnace connected to a chimney serving other appliances, the existing common venting system is likely to be too large for proper venting of appliances remaining connected to it. Please refer to the decommissioning procedure outlined in the furnace installation manual.
- For home heating appliances connected to gas vents or chimneys, vent installations shall be in accordance with Part 7, Venting of Equipment, of the National Fuel Code, ANSI Z223.1-latest revision, CSA-B149.1 and B149.2, and applicable provisions of the local building codes.
- Provisions for combustion and ventilation air must be in accordance with Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1-latest revision, CSA-B149.1 and B149.2, or applicable provisions of the local building code.

Warm Air **freewatt** System has two separate components that require combustion air and the discharge of combustion products. The furnace component requires a dedicated direct vent system. All air for the furnace's combustion is taken directly from outdoors through the combustion air intake pipe. All combustion products are discharged to the outdoors through the vent pipe. Honda MCHP component uses a dedicated non-direct vent system. Honda MCHP takes combustion air from the dwelling's open space and all combustion products are discharged to the outdoors through the vent pipe.

- See installation instructions in the furnace and Honda MCHP manuals for combustion air and vent pipe roof and sidewall termination (Roof termination is preferred). 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 a maximum 24 inches, minimum ¼" thickness.
- 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). 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.
- Combustion air and vent piping connections on the furnace and MCHP unit are 2" and 1 ½", respectively, although the 2" connection for the furnace must be upgraded to 3" for higher firing rates and lengthy intake/vent piping.
- The exhaust transition from 2" pipe to 3" pipe must be made in a vertical run. Transition pieces are not included. (See furnace installation manual for more details.)
- The use of periscopes on the air intake and venting is allowed, but if they extend over 24" in length the straight length should be insulated with proper weather-resistant pipe insulation.

12.2 Direct Vent Guidelines

- Venting may be vertical or horizontal.
- Minimum furnace vent length 25 total equivalent feet. See venting Table.
- Horizontal piping must slope back towards furnace at a minimum rate of ¼" to the foot, so condensate drains towards furnace.
- Horizontal runs must be supported at least every 3 feet. Horizontal sections must not dip or sag.
- All vent runs through unconditioned space where freezing might occur should be insulated with 1" thick, medium density, foil-faced Fiberglass insulation. An equivalent "arm-a-flex" or "rub-a-tex" may also be used as long as there is no het tape applied to the vent pipe. For horizontal runs where water may collect, wrap vent pipe with self regulating 3 or 5 watt heat tape. The heat tape must be CSA, UL, or ULC listed and installed per manufacturer's instructions.
- Do NOT common vent with any other appliance.
- If venting vertically, do not vent up a chimney serving another appliance or install in a chase with a metal or high temperature plastic pipe from another gas or fuel burning appliance unless the required clearance to combustibles can be maintained between the PVC pipe and other pipes.

12.3 Requirements for Commonwealth 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 the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

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

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

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

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

3. SIGNAGE:
A metal or plastic identification plate shall be permanently mounted to the 99exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The 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:
The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

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

6. INSTALLATION INSTRUCTIONS:
A 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 the appliance or equipment at the completion of the installation.

12.4 freewatt System Combustion Air and Venting

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

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

Figure 12-1- System Combustion Air and Venting Requirements *Sidewall Penetration*

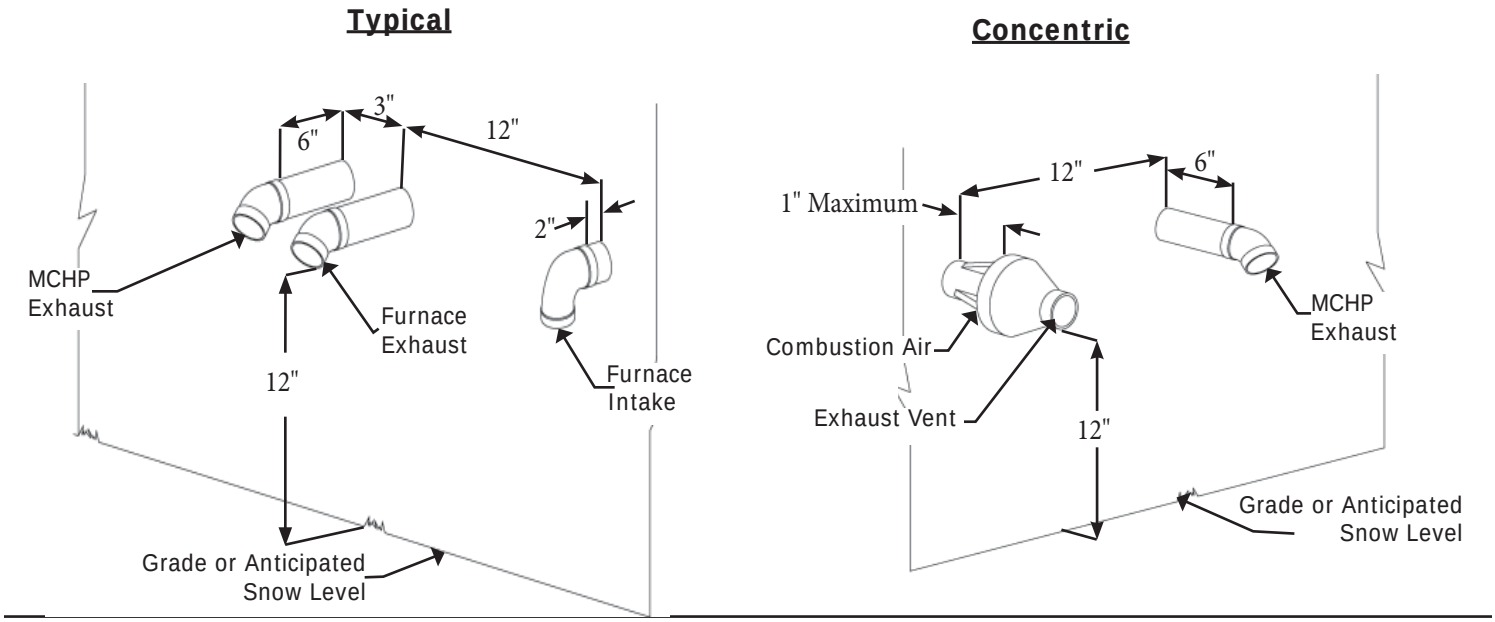
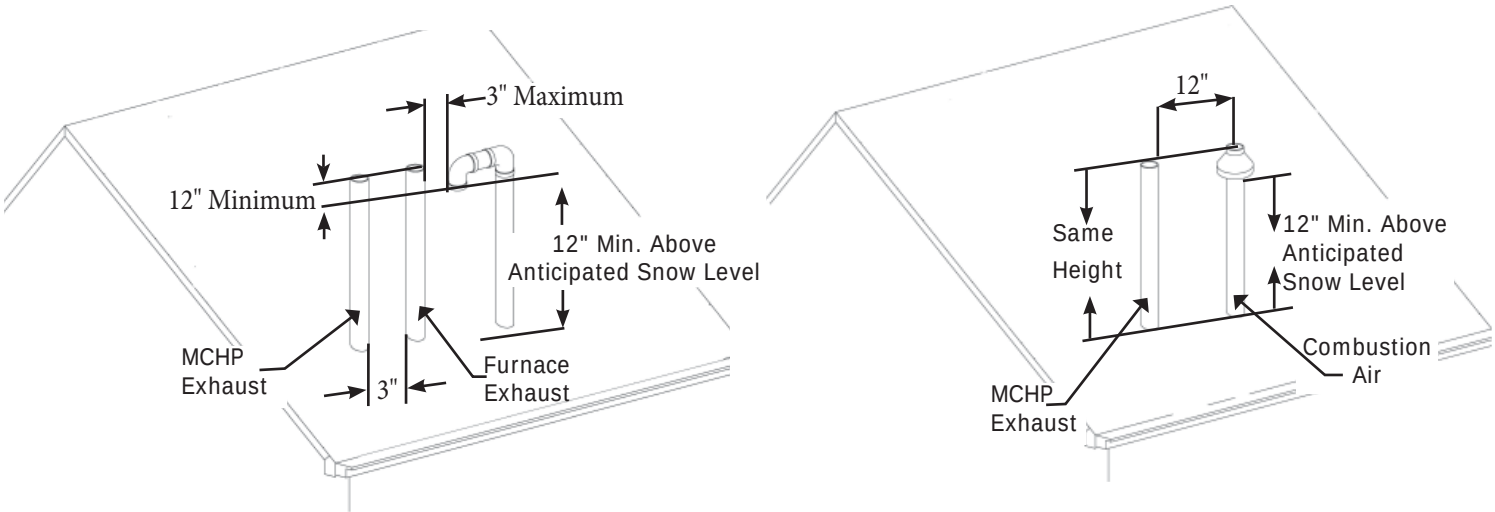


Figure 12-2- System Combustion Air and Venting Requirements *Vertical Penetration*



NOTICE

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.

In addition to general guidelines, direct vent exhaust for furnace shall be installed in accordance with requirements below.

12.5 United States *Direct* Vent System Requirements - Furnace

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

Direct vent intake and exhaust piping lengths for the furnace are found in Table 12-1.

TABLE 12-1 Maximum Direct Vent and Exhaust Piping Lengths - Furnace

Model	Pipe Size	Number of 90° Elbows							Notes
		0	1	2	3	4	5	6	
60	1½	25	20	15	10	5	-	-	• Count concentric vent fitting as straight pipe. • Use medium or long sweep elbows where possible. • One 90° elbow is equivalent to two 45° elbows. • For direct vent, listed lengths are allowed for each vent (intake and exhaust). • For non-direct vent, the listed lengths are allowed for exhaust. The intake should have a 1½" or 2" snorkel intake fitting. • 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 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 table.

In addition to the general guidelines non-direct vent exhaust for the MCHP shall be installed in accordance with the requirements below.

12.6 United States *Non-Direct* Vent System Requirements - Honda MCHP

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

Non-direct vent exhaust piping lengths for the MCHP are found in Table 12-2.

TABLE 12-2 Maximum Non-Direct Vent and Exhaust Piping Lengths Honda MCHP

Model	Pipe Size	Number of 90° Elbows						
		0	1	2	3	4	5	6
MCHP1.2U	1½"	90	85	80	75	70	65	60
	2"	110	105	100	95	80	85	80

- Count concentric vent fitting as straight pipe.
- Use medium or long sweep elbows where possible
- One 90° elbow is equivalent to two 45° elbows.
- For system with more than (6) six 90° elbows, subtract 5 feet from equivalent length.

13 – GAS SUPPLY

13.1 Check Gas Supply

- Connect the furnace and Honda MCHP units only to gas supplied by a 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 the furnace or Honda MCHP. These units cannot operate properly or safely using fuels outside normal commercial standards.
- The gas pipe to your furnace must be the correct size for the length of run and for the total BTU per hour input of all gas utilization equipment connected to the piping. See Tables in the furnace and Honda MCHP installation manuals for the proper size. Be sure the gas line complies with the local codes and gas company requirements.
- The system and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psig (3.5 kPa).
- The system must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures less than or equal to ½ psig (3.5 kPa).
- In order for proper operation of the system, it is recommended that the line pressure be within the minimum and maximum values in Table 13-1. Please see the furnace and MCHP manuals for specific appliance requirements.
- Please consult the furnace and Honda MCHP installation procedures for leak testing and purging gas lines.

13.2 Gas Piping

Please consult the furnace and Honda MCHP installation manuals for specific instructions regarding the gas piping for these two appliances.

NOTICE

Furnace and Honda MCHP units have been factory equipped to burn natural gas only. Honda MCHP can only run on natural gas. Do not attempt to operate Honda MCHP on propane gas.

Table 13-1 Natural Gas Supply Pressures (inches w.c.)

Component	Minimum	Nominal	Maximum
System	4”	7”	10”

14 – ELECTRICAL WIRING AND CONNECTIONS

⚠WARNING

For your safety, turn off electrical power supply at service panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

⚠WARNING

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

NOTICE

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

14.1 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 any local codes.
- 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 Electric Code ANSI/NFPA 70 – latest edition.
- Although the HI Module is supplied with System Power Switch on front of electrical enclosure (Figure 14-3), the Authority Having Jurisdiction [AHJ] may require additional switches to be installed for service or safety.
- 120 VAC dedicated circuit should conform to the NEC and use as a minimum 3-conductor, 14 Ga. Cable.

14.2 Line Voltage Connections

The system installation will include a 120 VAC dedicated circuit (15 amp) to the Hybrid Integration (HI) Module and a single phase three wire plus ground 240 VAC dedicated circuit (2 pole. 15 amp) to the Honda MCHP unit.

Figure 14-1 120 VAC Power (Side Connection)

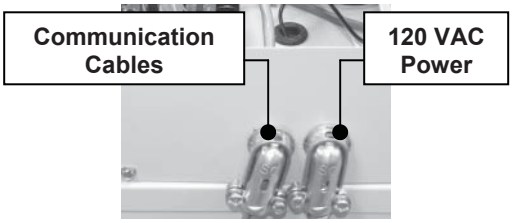
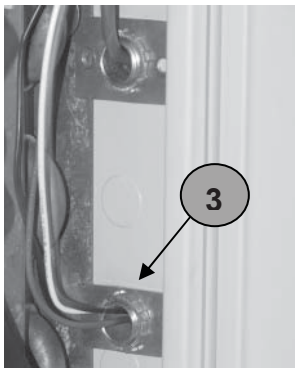


Figure 14-2 120 VAC Power (Inside Connections)

Figure 14-3 120 VAC System Power Switch

Figure 14-4 120 VAC HI Module Routing



HI Module:

- Route 120 VAC power wiring to electrical enclosure on top of HI Module. See Figure 14-1 for electrical knockout locations.
- Provide and install non-fused disconnect or service switch (15 amp recommended) as required by authority having jurisdiction.
- 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 Figures 14-4 & 14-5 for details.

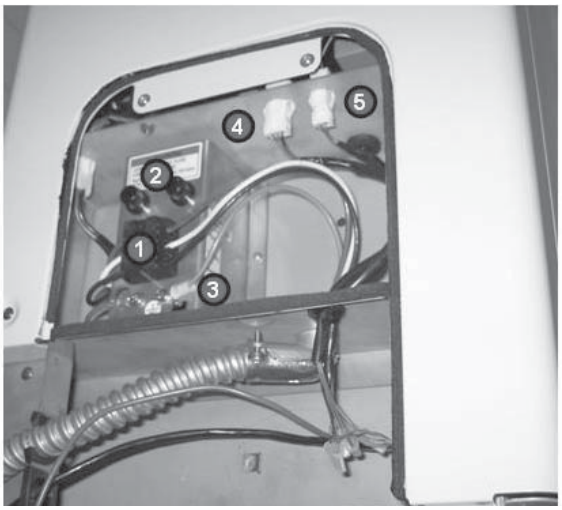
Figure 14-5 120 VAC Furnace Connections

Honda MCHP:

Please refer to Honda MCHP Installation Manual — Electrical Connections Section before performing installation instructions in this section. Power supply must be single phase three wire plus ground 240 VAC 60 Hertz per Honda MCHP Installation Manual.

1. Remove cover plate, install blanking plate and connect 240 VAC power cable to terminal block on Honda MCHP unit. See Figure 14-6 for details.
2. Provide and install 240-VAC disconnect switch and junction box onto side of furnace or adjacent wall. Do not attach any disconnect switch or junction box to Honda MCHP unit cabinet, make no penetrations in MCHP cabinet. Extend 4-wire flexible metal conduit to MCHP unit's electrical terminal block. Figure 14-7.
3. Recommended Breaker: 2-pole. 15 Amp breaker.
4. Flexible metal conduit is required to provide vibration isolation for Honda MCHP.
5. 240 VAC dedicated circuit should conform to NEC and be minimum 4-conductor, 14 AWG flexible metal conduit.

Figure 14-6 240 VAC MCHP Connections



1. 240 VAC Power Terminal
2. 240 VAC Fuses
3. Ground Screw
4. MCHP Communication Cable
5. Exhaust Leak Sensor Cable

14.3 Thermostat Connections

System includes a supplied communicating thermostat. This communicating thermostat must be installed correctly and properly commissioned to ensure optimum operation of system.

Thermostat installation requires field supplied 10 conductor thermostat cable. Use Honeywell Genesis Cable 22AWG 10/C STR CLM-CL2 or equivalent.

Refer to installation instructions supplied with thermostat for specific unit instructions. Thermostat cable will extend from thermostat to control module and will be routed through low voltage knockout on electronics box as shown in Figure 14-9. Thermostat cable shall be connected to thermostat via terminal block. The other end will route to control module.

1. Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, televisions, sun-rays, or fireplaces.
2. Route cable to control module. Cable will enter electronics enclosure through side or rear knockout opening. See Figure 4-6 or 14-9 and connect to control module plug-in connection. See Figure 14-11 and Section 22 Electrical Schematic.
3. Control module output to furnace includes furnace communication cable. Connection is factory-installed. Opposite end is found in lower compartment of HI module. This end will be installed through knock-out in HI module/furnace and connected to furnace's control board. See Figure 14-12.

14.4 Outdoor Temperature Sensor

Mount outdoor sensor on exterior wall per sensor manufacturer's instructions, shielded from direct sunlight or flow of heat or cooling from other sources.

Route sensor's wires through exterior wall into house and through opening on side of electronics box. Reference Figure 14-13 and Electrical Schematic for connection details.

14.5 Internet Connection

System Controller has RJ 45 network connection. Connection is found at rear of electronics enclosure on top of HI Module. See Figure 14-14. Connection point accepts CAT 5e cable. Commissioning instructions are found in Section 16.

Figure 14-7 240 VAC Junction Box and Disconnect Switch

Figure 14-8 Communicating Thermostat

Figure 14-9 Thermostat Knockout

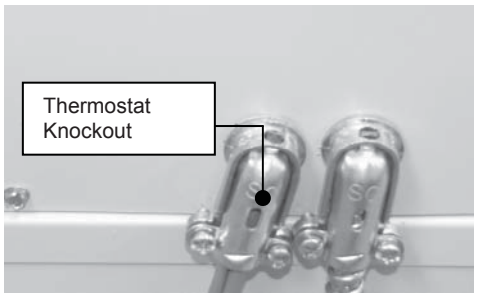


Figure 14-10 Thermostat Connection

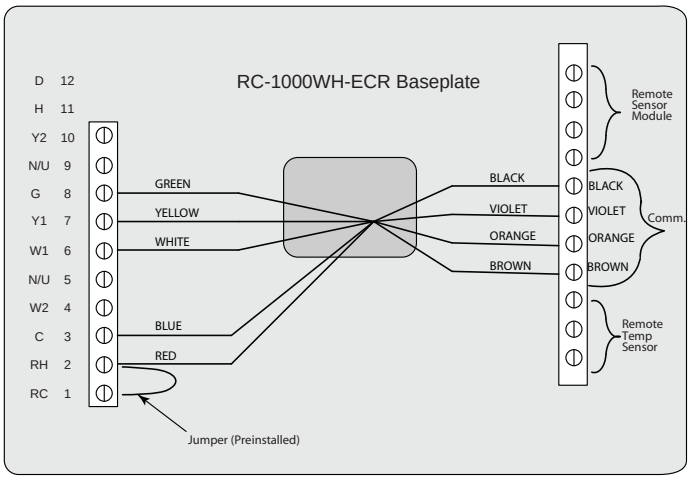


Figure 14-11 Thermostat Connections

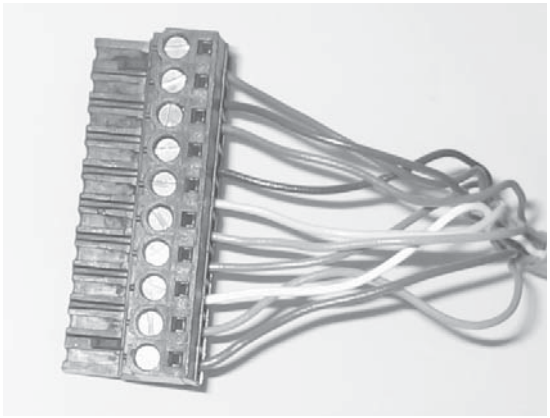


Figure 14-12 Thermostat/Furnace Connection

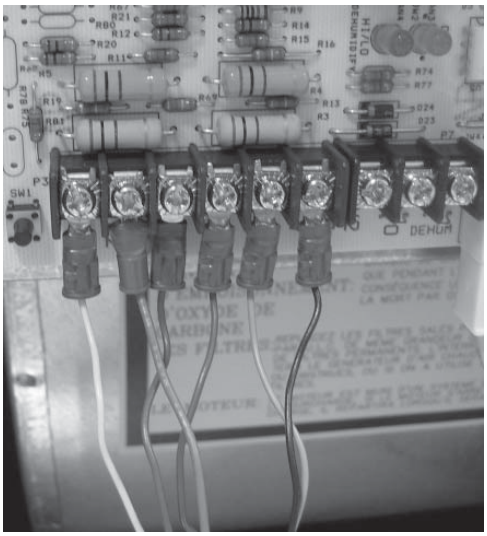


Figure 14-13 Outdoor Temperature Sensor & Pressure Switch

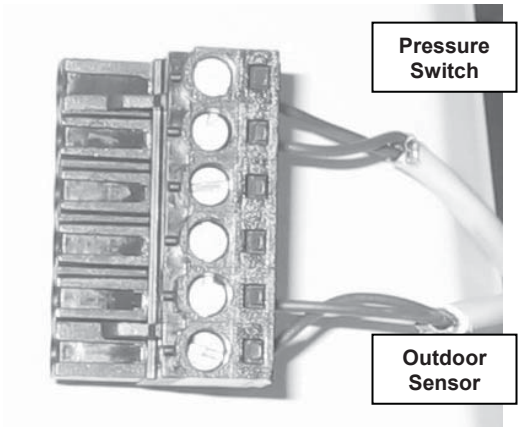
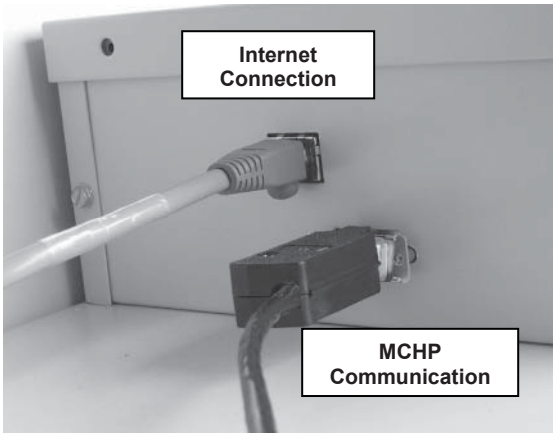


Figure 14-14 Internet & MCHP Communication



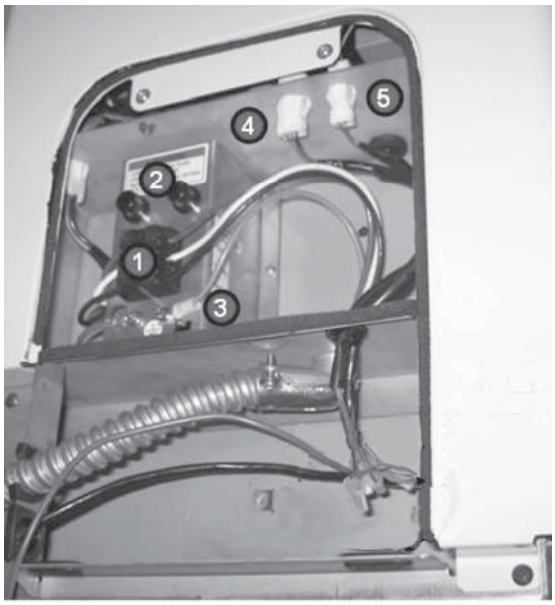
14.6 MCHP Communication Connection

- Connect Honda MCHP to HI Module with system-supplied RS 232 communication cable.
- Connect MCHP communication cable to HI Module at rear of electronics enclosure. See Figure 14-14.
- Route cable behind or above furnace to Honda MCHP wiring compartment (Figure 14-15).
- Connect Honda MCHP communication cable to Honda MCHP communication port (6 pin molex connector, item 4 in Figure 14-15).
- Install strain relief for MCHP communications cable and exhaust gas sensor cable just outside lower compartment as shown in Figure 14-6.
- Locate crimp connectors for exhaust gas sensor cable in lower compartment.

14.7 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 14-17.
- Route connection through furnace's sheet metal opposite HI Module/return opening. Care should be taken to leave service loop for future servicing of blower assembly.
- Do not install/connect A/C compressor contactor leads to **freewatt** System Controller as damage may occur to system controller. All connections should be made at furnace control board.

Figure 14-15 Low Voltage MCHP Connection



Refer to Electrical Schematic in Section 21.

1	240 VAC Power Terminal
2	240 VAC Fuses
3	Ground Screw
4	MCHP Communications Cable
5	Exhaust Gas Sensor Cable

Figure 14-16 MCHP Communication Cable & Exhaust Gas Sensor Cable

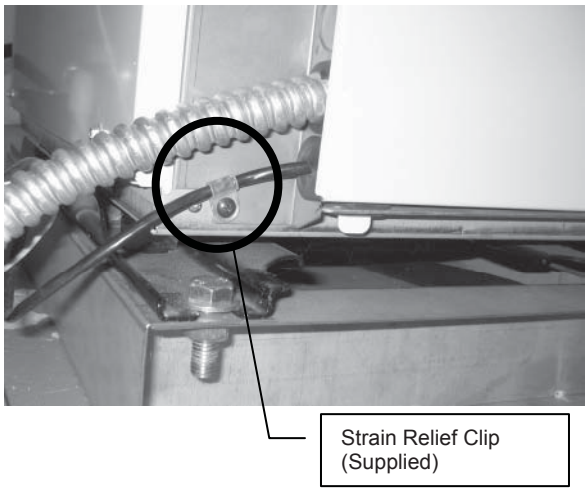


Figure 14-17 A/C Connection

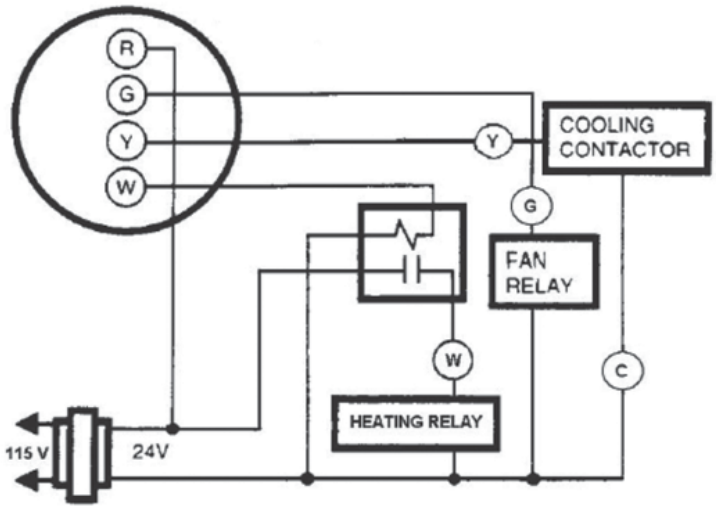
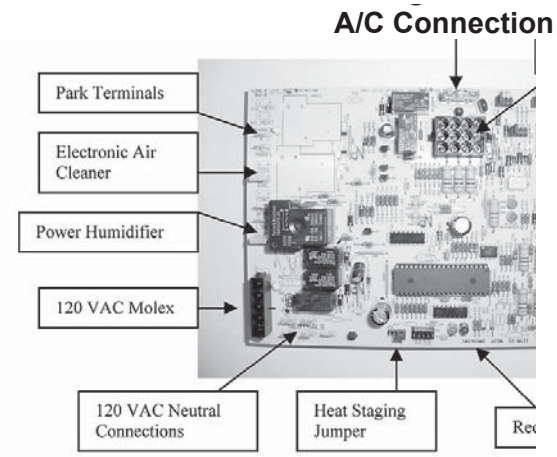


Figure 14-18 A/C Connection



Refer to Electrical Schematic in Furnace Manual

14.8 Humidifier & Electronic Air Cleaner Connection

Suggest use of Aprilaire 400 Humidifier for Warm Air **freewatt** System, its resource conservation design includes float valve and wicking media design to conserve water. Figure 14-18 shows the 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 14-18 and in furnace installation manual.

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

15 – CONTROLS AND ACCESSORIES

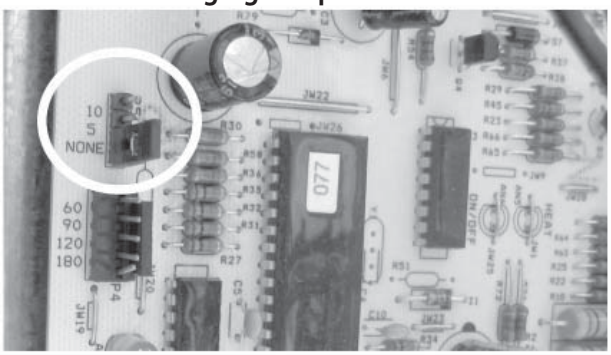
This section provides brief description of key controls and accessories found in this system.

15.1 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, Operation and Maintenance manual. Suggest 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 operations on integrated furnace control.
- Adjusting Continuous Fan Mode: Continuous fan mode is factory set at 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 requires HEAT Staging Jumper to be in 5 or 10 position to ensure proper 2nd stage operation of furnace. 5 or 10 position will enable HIGH HEAT mode after 5 or 10 minutes.

Figure 15-1 Heat Staging Jumper



15.2 Hybrid Integration (HI) Module

HI Module has three distinct areas within its jacket. Upper electrical cabinet, mid-level mechanical cabinet and lower return air cabinet.

- Upper electrical cabinet houses control module, LEDs and power switches.
- Mid-level mechanical cabinet holds mechanical sub-assembly that consists of mixing valve, coolant reservoir and pump. Mixing valve will be set during system's commissioning and delivers 152°F coolant to pump, which 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 high efficiency air filter and air coil heat exchanger. High efficiency air filter provides air filtration for dwellings air stream and is major component of ensuring proper indoor air quality and comfort while system is operating in **freewatt** mode through winter months. Air coil heat exchanger has been designed to transfer heat from coolant fluid into return air stream.

15.3 Honda MCHP Unit

Honda MCHP Unit is custom-engineered micro-combined heat and power module integrated into Warm Air **freewatt** 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 UL certified for grid interconnection and if your state allows, unit can deliver electrical power back into the grid.
- Unit also provides system controller with system operating data and diagnostic data.
- More details on MCHP unit can be found in attached Honda MCHP (MCHP1.2U (Type UCDJ) Installation Manual and Owner's Guide.

15.4 Communicating Thermostat

System-certified communicating thermostat has ability to communicate directly with control module.

- Feature allows control module to download settings and maximize system's electrical power generation, while also providing higher level of comfort to dwelling.

15.5 Outdoor Temperature Sensor

Warm Air **freewatt** 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, while also maximizing generation of electrical power.

15.6 Internet Connection

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

15.7 Website

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

15.8 External Condensate Pump (Sold separately)

External float activated condensate pump with integral sump is required for installation where no floor drain or other appropriate drainage receptacle is available to receive condensate from system (furnace and MCHP unit).

- Condensate pump can be piped to remote tie-in point to sanitary sewer system.
- 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.

15.9 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** System in compliance with best practices for all fuel-fired central heating equipment. System is required to commission Warm Air **freewatt** System.

15.10 Pressure Switch System

Pressure Switch System is intended to prove blockage of Honda MCHP unit's exhaust vent. System is required to commission Warm Air **freewatt** System. System is required to operate Honda MCHP unit.

15.11 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.

16 – CONTROL MODULE FEATURES

16.1 Control Module Design

Warm Air **freewatt** control module is designed for central heating with furnace and micro-combined heat and power (MCHP) unit.

- Control module integrates Honda MCHP unit with furnace replacing an existing furnace installation. Controller uses inputs from communicating thermostat and outdoor sensor to optimize operation of Honda MCHP unit.
- Control module operates in combination with display/ user interface (ie. laptop computer or PDA) for both information and operation purposes. Control module requires communicating thermostat and outdoor sensor to operate properly.
- Control module is located at top of HI Module and includes relay/interconnect board, DC power supply, and advanced single-board computer board that incorporates powerful microprocessor, RS-232/RS-485 serial ports, and 10/100Base-T Ethernet port.

16.2 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 control module 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.

16.3 Display/User Interface

Using a PC, homeowner can scroll through control settings and change operating settings to customize their **freewatt** System. See User's Manual for more information on using embedded **freewatt** webpage.

16.4 Internet Connection

Control Module connects to customer's home network in same way any computer or other network appliance does - by connecting via Ethernet connection available on most mass market routers. freewatt connection uses 10/100 Mbit/s wired Ethernet connection. Powerline network adapters may be used when direct wired connection isn't possible.

Control module is assigned static address outside of any DHCP range available from router. IP address, netmask, gateway and DNS addresses will need to be programmed into controller using freewatt Mint 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 or see www.portforward.com. Remote diagnostics requires port 4500 be directed to freewatt controller, customer webpage requires port 8082 be directed to freewatt controller.

Connect to Control Module using freewatt service tool to apply network settings to freewatt controller.

1. Select "Network Setup"
2. Default settings are DHCP – Check to see if an IP Address is acquired automatically in the "Router" text box. If so, proceed to the next step.
3. If IP address does not appear in "Router" text box, check wiring, and verify internet connection
4. Select "Use Manual"
5. In "IP Address" text box, change last three digits of this field to .200 (xxx.xxx.x.200) (if this address is available on the network.
6. Select "Use Open DNS".
7. Select "Update".
8. Follow prompt to reset system
9. Disconnect and restart freewatt service tool. After reconnecting to system, check Network Status in "Network Setup".
10. 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 freewatt status page should appear.
11. Change default user password for customer to something private.

DDNS service may be used to support dynamic IP addresses.

Turn on reporting from freewatt system to freewatt System telemetry server:

1. While connected to freewatt with 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 System.

Contact freewatt Technical Service for more details concerning connection.

Figure 17-1 Maximum Full Line

Figure 17-2 System Coolant Filling

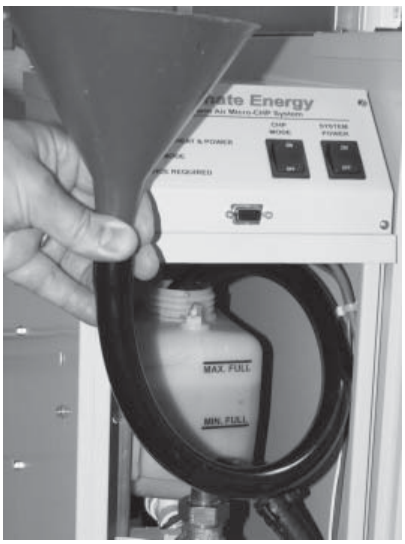
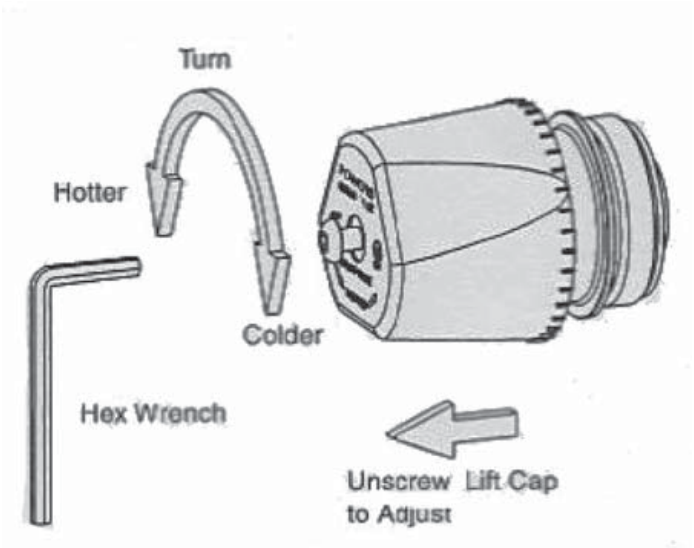


Figure 17-3 Final Mixing Valve Setting



NOTICE

Coolant Tank cap should be tightened to ensure no evaporation of coolant occurs.

Start-up procedure includes filling long life coolant loop and ensuring air is completely purged from loop.

Approximately 1.5 gallons of coolant will be needed for filling procedure.

17.1 System Coolant Filling

System coolant filling procedure assumes coolant tubing and HI Module connections have been completed and system is cold. If installation steps are not completed, please finish them before proceeding. Coolant filling procedure is found below:

1. Remove front panel from HI Module.
2. Remove cap from top of coolant tank.
3. Honda LLC (Long Life Coolant) is ready to use premixed ethylene glycol solution specifically formulated for use in Honda MCHP applications. 8 Liters (2.1 gallons) are provided with the system. Use only Honda LLC in this application.
4. Using funnel and some tubing, slowly fill reservoir with coolant through tank's top cap. See Figure 17-2.
5. Operate system for about 30 minutes to allow air to purge from coolant loop. Make sure to fill coolant tank to Max. Full Line. See Figure 17-1.
6. If necessary, adjust mixing valve to deliver coolant temperature (CWT2) of 176°F (+/- 2°) from outlet of MCHP (HI Connection). See Figure 17-3. Hex wrench is supplied with system.
7. System is now completely purged and ready for normal operation.
8. Remove tube and funnel, replace & retighten coolant cap before reinserting front panel.

NOTICE

Read instruction manual found on Mixing Valve.

NOTICE

Before modifying mixing valve's factory-setting, please check furnace is moving air, there are no coolant line blockages and coolant pump is operating properly.

17.2 Furnace Settings

- 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 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 5 or 10 position to ensure proper 2nd stage operation of furnace. Recommend use of 10 setting. 5 or 10 position will enable HIGH HEAT mode after 5 or 10 minutes.

17.3 Lighting Instructions

1. System does not have pilot. System is equipped with ignition device that automatically lights burner on furnace and spark plug that automatically lights within MCHP unit. Do NOT try to light furnace's burner by hand!

⚠ CAUTION

WHAT TO DO IF YOU SMELL GAS ...

Do not try to light appliance.

Do not touch any electrical switch. Do not use any phone in your building.

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

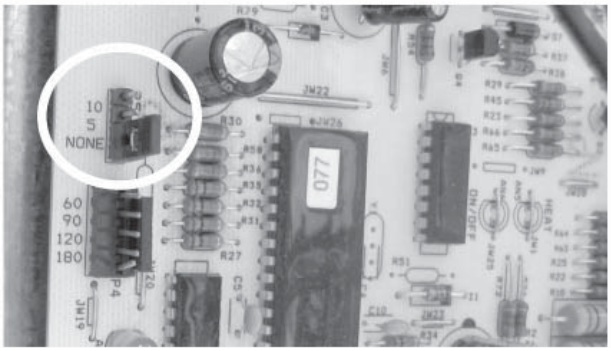
If you cannot reach your gas supplier, call the Fire Department

2. Before operating, smell all around system area for gas. Be sure to smell next to floor because some gas is heavier than air and will settle to floor.

3. Use only your hand to turn gas ball valve. Never use tools. If valve will not turn by hand, do not attempt to repair it, call qualified service technician. Force or attempted repair may cause fire or explosion.

4. Do not use this system if any part has been under water. Immediately call qualified service technician to inspect system and to replace any part of control system and any gas control that has been under water.

Figure 17-4 Heat Staging Jumper



17.4 System Operating Instructions

1. STOP! Read safety information on previous page before operating this appliance.

2. Thermostat operation:

A. When system power is enabled and lower furnace access panel is in place, communicating thermostat will be delivered power and its display should initialize after several seconds. Display is shown in Figure 17-5.

i. Mode button selects operating mode: Off, Heat, Cool, and Auto.

ii. Dial knob selects desired temperature.

B. Thermostat has been factory-set to off mode and temperature to °F. Set point is at 73°F.

3. Bypass Mode:

A. Bypass Mode disables **freewatt** System controls and components (Hybrid Integration Module and Honda MCHP). Mode will also connect thermostat directly to furnace and allow system to deliver heat to dwelling if, or when:

i. CHP MODE switch is set to OFF.

ii. Fault develops in **freewatt** subsystem (Hybrid Integration Module and Honda MCHP) or critical MCHP maintenance procedure has been ignored, resulting in condition with potential equipment damage.

iii. Use this feature when a **freewatt** furnace and HI Module have been initially installed and Honda MCHP installation and/or grid interconnection approval is pending.

Table 17-1 Bypass mode summary

Thermostat mode	Software Response	System State
OFF	Standby	AUTOMATIC
HEAT	Operate MCHP and furnace per heat demand.	AUTOMATIC
HEAT/AUTO	Operate MCHP and furnace per heat demand.	AUTOMATIC
FAN-ONLY	Turn on G signal to furnace to operate fan.	AUTOMATIC
COOL	Enter bypass mode.	BYPASS
COOL/AUTO	Enter bypass mode.	BYPASS

4. **freewatt** System Operating Instructions:

A. Honda MCHP

i. Supply natural gas.

ii. Set power to ON.

iii. Set twist knob on front panel to ON position.

B. HI Module/Furnace

i. Supply 120 VAC, power and natural gas.

ii. Set CHP MODE switch to ON position.

iii. Set SYSTEM POWER switch to ON position.

C. Set thermostat to Heat Mode by pressing Mode button once.

D. When call for heat, MCHP, coolant pump and furnace blower assembly will start.

5. Shutdown Procedure:

A. Preferred Method:
Set thermostat to OFF by pressing MODE button until display reads OFF. After shut down cycle of approximately three minutes is complete, turn SYSTEM POWER switch to OFF.

B. Emergency Method:
Turn SYSTEM POWER and BYPASS switch to OFF. Due to coolant pump turning off, MCHP may overheat and flash error message.

Figure 17-5 Thermostat Display

6. Draining Procedure:

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

During maintenance operations, it may be necessary to drain system. Please follow procedure found below:

A. Use shutdown procedure.

B. When coolant achieves safe working temperature, check coolant connections on MCHP and integral brass drain valve.

C. Place towel under drain valve.

D. After ensuring valve's position is OFF, slowly remove drain cap.

E. Connect short hose to drain valve and extend to clean coolant container or pan.

F. Open valve and evacuate coolant from system. Due to pressure in the system, coolant my initially flow at a high rate. Take precautions while collecting coolant. Coolant tank's cap may need to be removed to prevent vacuum formation as coolant drains.

⚠WARNING

Should overheating occur or gas burners or internal combustion engine fail to shut off, close manual gas valves for furnace and MCHP before shutting off electrical power to furnace. Failure to do so can cause an explosion or fire resulting in personal injury or loss of life. Before restarting furnace or MCHP, check all plastic vents, gas connectors and wiring for damage.

NOTICE

- If system has been operating, wait for coolant to cool down. Several hours may be necessary to cool coolant fluid to safe working temperature.
- Quick disconnect fitting has internal shut-off on both ends.
- Ensure 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, please reuse when refilling system.
- Recommend evacuate lines with aid of LOW pressure (under 5 psi) compressed air. Hand pump can be used.

17.5 Turn Off Gas to the System

freewatt System consists of two gas-fired units. Furnace and Honda MCHP unit. Each unit is installed with separate gas valve.

1. Use shutdown procedure.
2. If service is required, turn off all electrical power to system (furnace and MCHP unit) at external line switch.
3. Furnace
   A. Turn gas ball valve off, handle should be perpendicular to gas pipe.
4. MCHP Unit
   A. Follow flexible stainless steel gas connector extending from back of MCHP unit to its connection to gas piping.
   B. Turn gas ball valve off, handle should be perpendicular to gas pipe.

18 – CHECKOUT PROCEDURES AND ADJUSTMENTS

Furnace and Honda MCHP units have specific checkout procedures outlined in their Installation, Operation and Maintenance manuals provided with this manual. Please review these manuals before proceeding to system procedures found below.

18.1 Verify Sequence of Operation

Detailed sequence of operation containing potential faults can be found in Section 20, “Sequence of Operation.” Refer to this section and Section 21, “Service Hints,” for more information.

18.2 Verify Furnace Settings

Verify furnace has proper air flow settings. Refer to furnace IOM.

18.3 Inspect Venting and Air Intake

Operate system and verify all vent/air intake connections are gas-tight and watertight. Repair any leaks immediately. Complete furnace “Venting Checklist” found in furnace IOM.

18.4 Inspect Condensate Drain

Verify all connections are watertight, and condensate flows freely. Repair any leaks immediately.

If system is being checked out after long period of no use, verify condensate trap is adequately filled with water and no combustion products can freely vent from drain piping.

18.5 Inspect System Piping

Verify all connections are not leaking coolant. Repair leaks immediately.

18.6 Inspect Coolant Reservoir

Verify coolant reservoir is filled with Honda long life coolant. If necessary, fill tank with certified Honda LLC and repair leaks immediately.

18.7 Measure Furnace Natural Gas Input Rate

Measuring input rate of furnace is essential for proper and efficient operation. Please follow instructions found in furnace IOM.

18.8 Inspect Thermostat

Verify thermostat communicates with **freewatt** control module and properly communicates required modes of operation (Heat, Cool, Continuous Fan, Auto, etc.).

18.9 Inspect Internet Connection

Verify **freewatt** control module is properly connected to your Local Area Network and is communicating. This can be accomplished by bringing the webpage up on network computer to see if system is communicating to remote server.

18.10 Inspect Website

Verify **freewatt** website is operating properly. Perform steps outlined in User's Information Manual.

18.11 Inspect Exhaust Gas Sensor

Verify Exhaust Gas Sensor is operating properly. Follow instructions found in Section 10.

18.12 Inspect Pressure Switch System

Verify **freewatt** Pressure Switch System is operating properly. Follow instructions found in Section 11.

19 – MAINTENANCE AND CLEANING

⚠ CAUTION

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

Always verify proper operation after servicing.

⚠ 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.

Furnace and Honda MCHP unit have specific maintenance and cleaning procedures outlined in their Installation, Operation and Maintenance manuals provided. 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.

19.1 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. These 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. System Controller: Check system controller'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 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 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** service professional to maintain acceptable performance and ensure safe operation. These inspection/service procedures are outlined in unit's Owner's Manual. Typically, services are 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. Combustion Air Supply

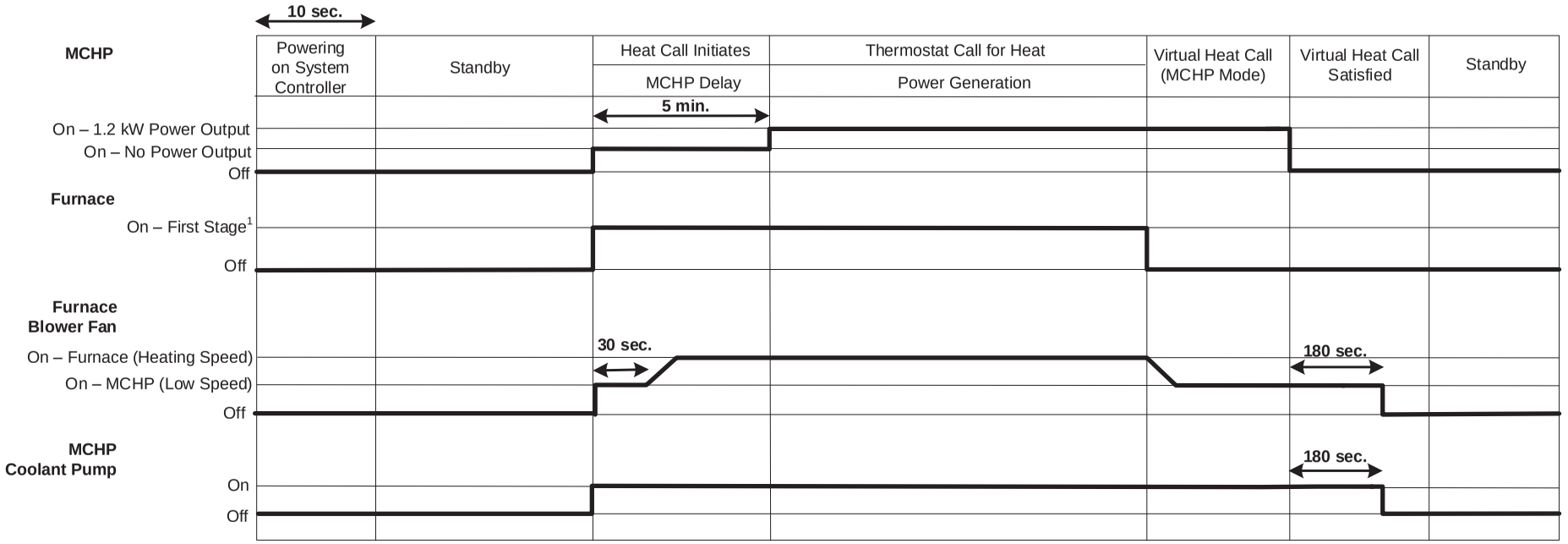
viii. Exhaust Piping

ix. Ventilation Air Inlet and Outlet

x. Coolant Tubing and Connections

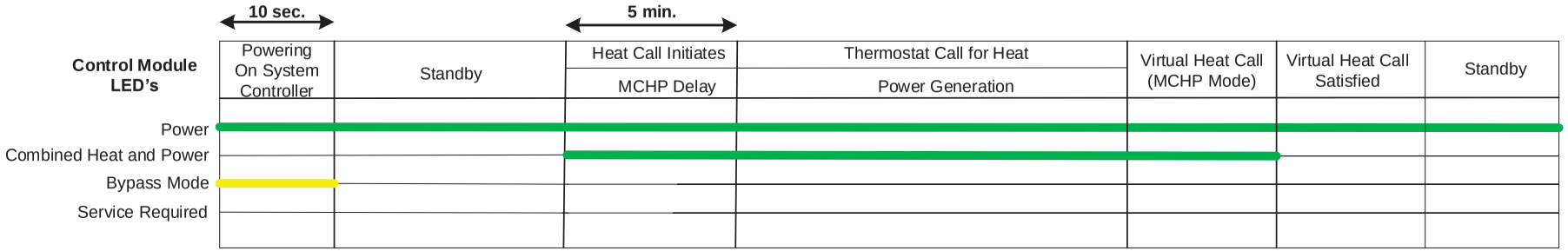
WARM AIR FREEWATT SYSTEM
Model WAZ
Sequence of Operation/Timeline

Mechanical Operations



[1]If the heat call lasts for longer than 10 minutes, the furnace will enter 2nd stage heating with a higher heat output and blower fan speed

LED Display



21 – SERVICE HINTS

⚠ WARNING

Do not attempt to modify the characteristics of this home heating appliance in any way!! Fire, explosion or risk of shock hazard may cause severe injury or death.

21.1 Troubleshooting Tools

Following tools should be available prior to troubleshooting system:

1. Voltmeter with settings to check: 240 VAC, 120 VAC, 24 VAC and 12 VDC;
2. Continuity Tester;
3. Contact Thermometer; (Non-Contact Infrared Thermometer.)
4. Manometer with range of 0 to 20" of water column with 0.01" scale in range 0 to 6".
5. Laptop Computer Loaded with MINT Software Tool, MINT Software Utility Supplement and RS-232 serial cable

21.2 Initial Service Checks

Prior to troubleshooting, the following tasks should be performed:

1. Verify appropriate 120 VAC and 240 VAC circuit breakers at main electrical panel are switched ON. Also, check outdoor disconnect switch, if present, is switched ON.
2. Verify 240 VAC and 120 VAC electric service switches are turned ON.
3. Verify 120 VAC (minimum 108 VAC to 132 VAC) to system;
4. Check for 240 VAC (minimum 216 VAC to 264 VAC) to HONDA MCHP;
5. Verify thermostat has been placed into Heat Mode;
6. Verify thermostat is calling for heat on system control. If not, inspect thermostat connections to ensure proper contact;
7. Verify all external safety controls are installed and working properly;
8. Verify natural gas supply valve is open at gas meter, at all appropriate manual shutoff valves and at gas control valve for system. Gas pressures should be maximum of 10" w.c. (natural gas) with no flow or with system operating and minimum of 5" w.c. with gas flowing at maximum firing rate of **freewatt** furnace (verify during system startup with furnace and HONDA MCHP operating simultaneously);
9. Check wire connectors at control module, furnace control and HONDA MCHP are securely plugged in or connected;

NOTICE

If any component does not function properly, verify it is correctly installed and wired before replacing it.

Static electricity discharge can damage control module and furnace control. Touch metal surface to discharge static electricity before touching either control.

Control module and furnace control cannot be repaired. If either or both controls malfunction, control unit must be replaced.

Only trained service technicians should service control systems. After troubleshooting, follow "Sequence of Operation" in Section 20 of this manual for normal light off sequence.

All controls are factory tested in the assembly process and defective control is generally least likely cause. If either control is suspected to be defective, please read through "troubleshooting" section (Section 23) of this manual before replacing control.

If two consecutive controls appear to be failing or defective, chances are control is not defective and another problem is causing control to appear defective or fail (for example, electrical short burning out transformer).

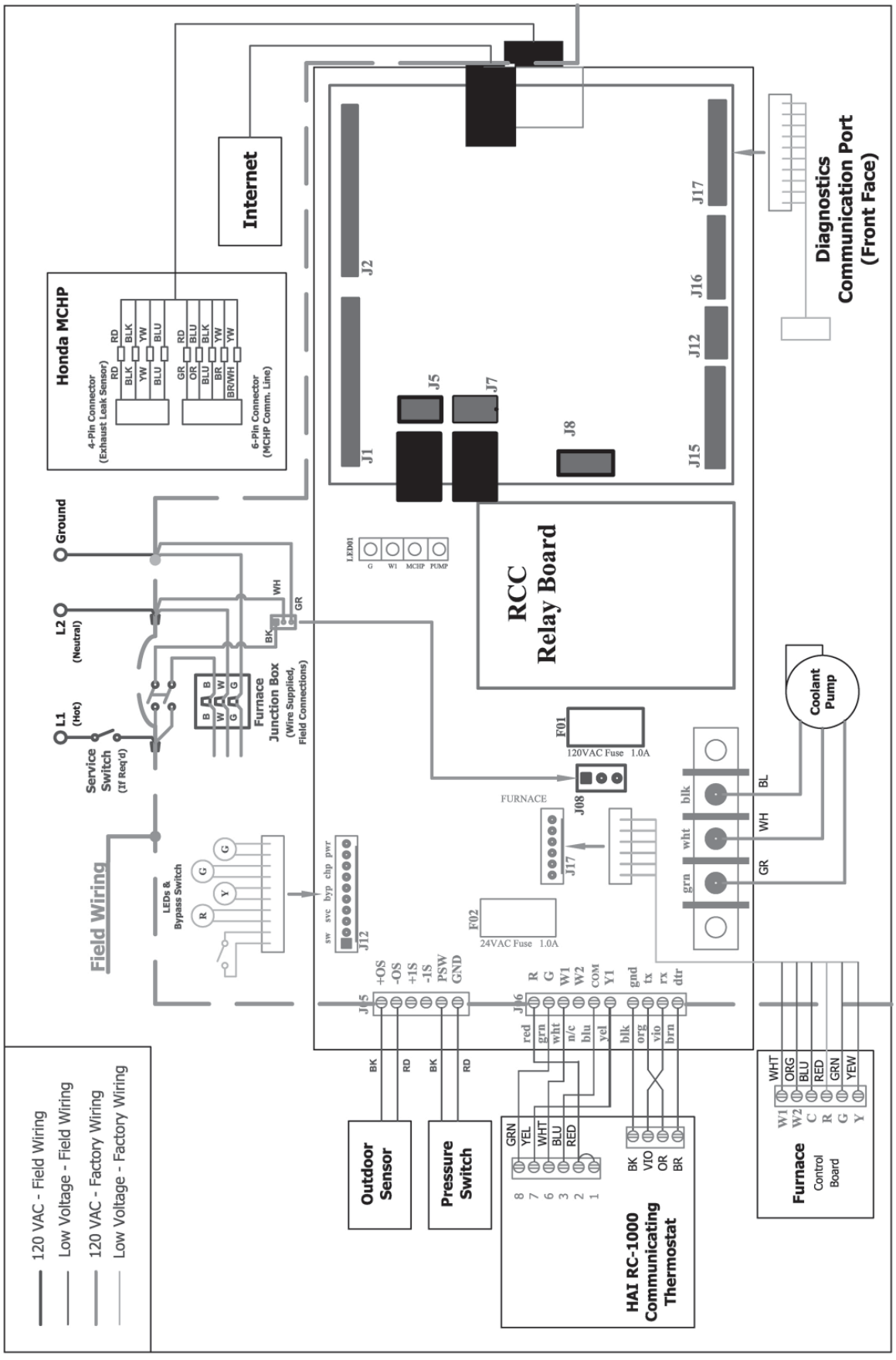
10. Check coolant tubing extending from HONDA MCHP to Hybrid Integration Module is securely connected and not plugged or damaged;
11. Check coolant operating temperature. Using MINT tool, confirm that coolant leaving MCHP unit is in range of 172° to 176° F (CWT2 in MINT).
12. Check coolant tank in Hybrid Integration Module. See that it is filled to at least above MIN level line.

21.3 Accessing freewatt System Operational Data and Codes

There are multiple means of accessing **freewatt** System operational data and error codes for purpose of trouble-shooting. These are:

1. Observing and counting number of flashes of red "Service Required" LED on front of **freewatt** Control Module. See following diagnostic table entitled "Alarm Codes for System Service LED on **freewatt** Control Module.
2. Observing status (lighted or not) of array of 4 LEDs directly on **freewatt** control board in **freewatt** Control Module. (Cover must be removed to observe.) See Table entitled " Interpretation of **freewatt** control board LEDs".
3. Reading furnace diagnostic code on **freewatt** integrated furnace control per **freewatt** furnace Installation, Operation and Maintenance Manual.
4. Using MINT software on portable computer connected to **freewatt** Control Module to display **freewatt** operating data and error codes for **freewatt** System and Honda MCHP unit per MINT software Manual.
5. Removing metal cover of control panel of MCHP (located on upper left hand side of unit) and reading error codes per Honda MCHP Installation and Operation Manual.
6. For freewatt systems operating with RC-1000 HAI thermostat, noting color of thermostat display (red for fault/alarm condition) and reading the error message displayed. Error messages and meaning are identical to those provide in table "Alarm Codes for System Service LED on freewatt Control Module".
7. If unit is supported with active Internet connection calling your ECR freewatt Technical Support representative.

22 – ELECTRICAL SCHEMATIC



23 – TROUBLESHOOTING

⚠ WARNING

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

If overheating occurs or gas supply fails to shut off, do not turn off or disconnect electrical supply to boiler or hydronic hybrid integration module. Instead shut off gas at location external to appliance.

Do not use system if any part of gas control system (furnace or MCHP unit) has been underwater. A 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 may result in fire or explosion.

WHAT TO DO IF YOU SMELL GAS

• Do not try to light or start any appliance.

• Do not touch any electric switch or use any phone in the building.

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

• If you can not contact your gas supplier, call the fire department.

Warm Air **freewatt** System consists of three major components: Furnace, Hybrid Integration (HI) Module and the HONDA MCHP. Furnace and Honda MCHP unit both have their own installation and service manual that outlines specific troubleshooting information regarding these units. **freewatt** system and Hybrid Integration Module troubleshooting information are outlined in this manual.

After making any corrective actions, be sure to turn off power and restart system to clear error conditions.

Use BYPASS MODE, (CHP MODE OFF) to sustain heating operation if needed while resolving freewatt Controller or MCHP unit errors or malfunctions.

23.1 General Troubleshooting

If	And	Check or repair
No Control module or HI Module operation		120 VAC electrical connections Blown fuse on **freewatt** Control Module circuit board
No furnace operation		Thermostat settings Check furnace per **freewatt** furnace installation manual.
HONDA MCHP overheats		•Coolant Pump functioning Properly •Air in Coolant Line •Coolant Line Blocked •Coolant lines piped correctly into the HONDA MCHP •Mixing valve setting
No power to thermostat	Display is blank	Check Control Module Connection Fuse in the thermostat 24VAC fuse in **freewatt** Control Module or Faulty wire connection
No HONDA MCHP operation		See MCHP Manual

23 – TROUBLESHOOTING

Alarm Codes for "System Service" LED on freewatt Control Module WAZ Models		
RED LED STATUS	INDICATES	CHECK OR REPAIR ACTION
1 Flash	No or incomplete Communication To Thermostat, system in Bypass Mode	Check furnace blower access panel is installed and blower door safety switch is depressed. Check cable and connections between Thermostat and HI Module. Check 24 volt power supply to thermostat. If cables and voltage are okay, check data registers in thermostat.
2 Flashes	Outdoor Temperature Sensor Error: Outdoor Temp Sensor may be missing, broken, have loose connection, incorrectly wired, or might have some source of electrical interference impairing sensor's correct operation. System in Bypass Mode.	Check Outdoor Sensor and Connections
3 Flashes	No or incomplete communication With HONDA MCHP. MCHP unit not operating, System in Bypass Mode	Reset System Power to verify error. Check 240VAC and MCHP on/off switch power to MCHP. Cables and connections between HONDA MCHP and HI Module. Check outdoor disconnect switch if present.
4 Flashes	HONDA MCHP Device Error, System in Bypass Mode	Check HONDA MCHP diagnostics.
5 Flashes	Control Board Error	Replace **freewatt** control board
6 Flashes	Flash Data Integrity Error. Flash memory on **freewatt** Controller is not properly initialized, and has lost its factory settings. This could be result of tampering or damage to **freewatt** Controller. System in Bypass Mode.	Replace **freewatt** control board
7 Flashes	Reserved For Future Use	
8 Flashes	Reserved For Future Use	
9 Flashes	Reserved For Future Use	
10 Flashes	Blocked MCHP Exhaust detected, system in By-pass Mode.	Inspect Exhaust Piping for Blockage, clear blockage if present, reset System Power to clear error.
11 Flashes	Reserved for future use.	
12 Flashes	MCHP Pressure Switch Failed Proving, system in Bypass Mode	Inspect MCHP Pressure Switch & Connections
13 Flashes	Software Watchdog Time-out, system in Bypass Mode	Replace **freewatt** control board
14 Flashes	Exhaust Gas Leak Sensor failure or error. MCHP has shut down. System in Bypass Mode.	Check Exhaust Gas Leak Sensor (Macurco CO Detector), Cables and connections between the controller & alarm
15 Flashes	Exhaust Gas Leak Sensor has no power, MCHP unit has shutdown, system in Bypass Mode.	Check Power and Cables and connections between controller and Exhaust Gas Leak Sensor
16 Flashes	Exhaust Gas and Carbon Monoxide Detected by Exhaust Gas Leak Sensor or Exhaust Gas Sensor "Test Button" pushed, MCHP has shut down, system in Bypass Mode , possible unsafe carbon monoxide level.	IF THERE IS AN AUDIBLE ALARM FROM ANY CARBON MONOXIDE DETECTOR: LEAVE BUILDING AND CONTACT YOUR LOCAL HEALTH, SAFETY, OR FIRE OFFICIALS TO ASSIST IN DETERMINING CAUSE FOR ALARM. Audible alarm indicates high and potentially dangerous level of CO may be present in building. If no audible alarm is sounding, check function of audible alarm of separately installed CO detector(s) in building by pushing test button on all such units. If not functioning, high CO level may still be present: LEAVE BUILDING AND CONTACT LOCAL OFFICIALS FOR ASSISTANCE. If results of pushing test button on separately installed CO monitor(s) indicates correct function, reset **freewatt** System by opening 120VAC and 240VAC service switches on **freewatt** System and then closing switches to re-power and reset **freewatt** System controller. If system restarts without 16 flash error code indication, likely cause was activation of **freewatt** Exhaust Gas Leak Sensor test button. If this 16 flash error code persists (but without audible alarm for separately-installed CO leak detector) contact your local health, safety or fire officials to assist in determining if high CO level is actually present and is the cause for this error code. If no high CO levels are found, replace Exhaust Gas Leak Sensor.
Continuous Flash	Watchdog Reset, system in Bypass Mode	Replace **freewatt** control board

23 – TROUBLESHOOTING

23.2 Control Board LED Interpretation

By removing cover of **freewatt** Control Module, status (lighted or not) of array of 4 green LEDS can be observed. Controller Board LEDs are valid only in Combined Heat and Power Mode (CHP Mode switch "ON"). They are not used when system is in Bypass Mode (CHP Mode switch "OFF"). Do not use Controller Board LEDs as indicator of system status when in Bypass Mode.

Controller Board LEDs, as labelled on Controller Board, indicate following:

	LED ON	LED OFF
G	Furnace blower is energized	Furnace blower is not energized
W1	Call for heat	No call for heat
PUMP	Hi module coolant pump is energized	HI module coolant pump is not energized
MCHP	MCHP enabled *	MCHP disabled

* NOTE: MCHP enabled LED does not necessarily mean MCHP is running. This LED means MCHP is enabled and communicating with **freewatt** Control Module.

23.3 Control Module Fuses

⚠ WARNING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Always disconnect power to system before servicing. 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 the following pages of this manual. Severe personal injury, death or substantial property damage can result.

⚠ 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 the system control module or any major components (pump, motor, etc.). If one of these fuses is blown, it can prevent the system control module or other components from operating.

1. Turn off power to system at external line switch.
2. Remove top panel from control module jacket on top of HI module.
3. Remove top cover of control module fuse and replace with new 5mmx20mm, 250 Volt, 1 amp fuse.
4. Install control module top panel after fuse inspection.
5. Restore power to system at external line switch and verify system operation after completing system service.

Fuse List

Location	QTY	Amp	Voltage	Spares	Shape	Size
Hi-Module (Control board, F02)	1	1	250	0	Cylinder	5mm X 20mm
MCHP (Power Wire Harness, In-line, Left of inverter)	1	1	650	0	Cylinder	6.25mm x 32mm
MCHP (Bottom Half of Inverter)	2	15	250	0	Cylinder	6.25mm x 32mm
MCHP (Below Inverter, Sealed by Fuse Cap Holders)	2	5	Non-Serviceable		Rectangle	6mm x 10mm
Furnace (Control Board, F1, Right Side)	1	5	12-32	0	Blade	Standard Blade

23 – TROUBLESHOOTING

Exhaust Gas Sensor System 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

Pressure Switch System Troubleshooting		
IF	AND	CHECK or REPAIR
MCHP Will Not Start	System Service LED Flashing Error #10	Check for Blocked Vent Check for Broken or Loose Cable Connection Replace Pressure Switch
Pressure Switch Loop Not Closed	System Service LED Flashing Error #12	Check Cable & Connections Blown In-Line fuse Blockage in the Venting Replace Pressure Switch
No Exhaust Past Pressure Switch System		PVC Reducer Clogged?
Pressure Switch Not Switching State		Check Cable for a Short PVC Reducer Clogged? Check Switch's Hi and Lo Tubes for clog Replace Pressure Switch
Exhaust Products Leaking		Blockage in Vent PVC Reducer Clogged? Check PVC Connections for proper Solvent Weld Check Pressure Switch Tube Connections

24 – INSTALLATION CHECKLIST

Placing The System

- ❒ Ductwork Inspected
- ❒ Blocks Positioned
- ❒ MCHP Stand Installed

Attaching The HI Module/Furnace

- ❒ ¼" Sealing Foam Installed
- ❒ Front & Back Attachment Brackets
- ❒ Install 120VAC & Communication Cables
- ❒ Place unit on 4 Concrete Blocks
- ❒ 4" Gap at Front of Blocks

Connections

- ❒ Attach/Seal Return/Supply Ductwork
- ❒ Coolant Piping (Maximum Length = 20 ft.)
- ❒ Proper Condensate Drain Piping ("Y")
- ❒ Furnace Trap Filled with Water

Combustion Air and Vent Pipe

- ❒ Installed per Furnace Instructions
- ❒ Installed per Honda MCHP Instructions
- ❒ Installed per AHJ's Requirements

Thermostat Wiring & Connections

- ❒ Thermostat (10-cond) Wire Installed
- ❒ Properly Connected at Both Ends
- ❒ Verify Thermostat Operation
- ❒ Outdoor Temperature Sensor Installed

Internet Connection

- ❒ Cat 5 Cable Connected
- ❒ Newwork Setup Through MINT
- ❒ Port Forwarding on Router
- ❒ Check Embedded freewatt Webpage

Safety Systems

- ❒ Pressure Switch System
- ❒ Test Exhaust Gas Sencor System
- ❒ Operation Check (Furnace & MCHP)

Start-Up Procedures

- ❒ Fill MCHP Condensate Trap
- ❒ Coolant Level Acceptable
- ❒ Coolant Outlet Temperature (CWT2) 176°F +/-2°

Grid Interconnect

- ❒ Permit Information
- ❒ Certificate of Competion
- ❒ Electrical Inspector Signature
- ❒ Forward Completed Certificate to Utility

Commissiong Checkout

- ❒ Confirm Furnace Jumper Settings
- ❒ Verify Sequence of Operation
- ❒ Inspect Venting and Air Intake
- ❒ Inspect Condensate Drain
- ❒ Inspect System Piping & Connections
- ❒ Inspect Coolant Reservoir
- ❒ Measure Furnace Gas Input Rate
- ❒ Check Furnace Airflow Temperature Rise
- ❒ Confirm Internet Connected
- ❒ Confirm Accessory Systems are Properly Connected *(AC, Humidifier)*

Documentation

- ❒ IOM & Users Information Manuals left at jobsite
- ❒ Record System Serial Number
- ❒ Service Contact Information Provided to Homeowner
- ❒ Register freewatt Warranty on ECR Website
- ❒ Register Extended Warranty with CornerStone

Honda MCHP

- ❒ Strain Relief
- ❒ Y in Condensate Drain Tube

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