freewatt®

Warm Air freewatt Plus System, Models WAJ & WDJ

POWERED by HONDA™

PRODUCT SPECIFICATIONS AND PERFORMANCE GUIDE

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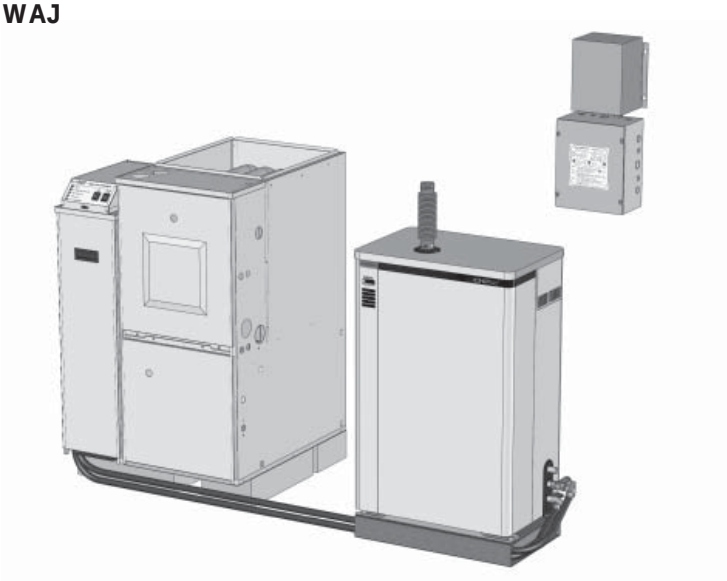
PRODUCT SPECIFICATIONS AND PERFORMANCE GUIDE

This guide will present the end-user, designer and installer with a better understanding of the Warm Air **freewatt®** PLUS System and its product data. A properly designed warm air heating system should provide comfort, efficiency and optimize equipment durability.
The Warm Air **freewatt®** PLUS system has been developed to replace an existing warm air heating system and provide home energy features and benefits to enhance home comfort and security.

Figure 1 - Warm Air freewatt® PLUS System, Model WAJ



WHAT IS freewatt®?

freewatt® is Micro-CHP. CHP is short for Combined Heat and Power. CHP has been widely practiced on an industrial scale for many years. The term Micro-CHP is an industry term used to categorize smaller CHP systems, which are typically smaller than 10 kilowatts electric power output. The **freewatt®** system is a new integrated approach to small-scale combined heat and power for an individual home.

WHAT IS freewatt® PLUS?

freewatt® PLUS brings Micro-CHP to next level. Micro-CHP offers many features and benefits to the homeowner, one major feature not often included is back-up power. Our newest generation of **freewatt®** PLUS offers the homeowner comfort and security at higher level by providing green back-up power in a quiet and small package.

Figure 2 -APC Universal Transfer Switch & Main Service Panel

WHAT IS ADAPTIVE LOAD MANAGEMENT (ALM™)?

freewatt® PLUS uses the latest generation of load management to ensure highest energy conservation and reduced environmental impact, while providing back-up power. ALM intelligently monitors power usage and automatically sheds and reconnects loads to prevent generator overload, while maximizing generator operating efficiency.

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FEATURES/BENEFITS

GREEN POWER GENERATION

- **Honda MCHP power generation technology** provides reliable, quiet heat and power for the home. This technology integrates an engine control unit to ensure proper operating characteristics.
- **UL 1741 grid-tied inverter** is factory-installed within the electronic cabinet and is pre-wired for easy installation of 240 VAC dedicated circuit.
- **Engine control unit** monitors and controls the engine to optimize its efficiency and ensure proper operating conditions.
- **3-way catalytic converter** significantly reduces the unit's emission levels by reduction or oxidation of the engine's exhaust product (CO2, NOx and unburned hydrocarbons).
- **Oxygen sensor feedback** operates the engine at near Stoichiometric conditions to ensure near complete reduction of emission pollutants.
- **freewatt® PLUS offers the best value for green back-up power** by integrating the power into your home energy system. Green Back-Up Power by **freewatt®**.

ADVANCED COMFORT

- **freewatt® PLUS heating algorithm** maximizes heat and power delivered by Honda MCHP unit. Our proprietary heating algorithm is specially engineered for **freewatt®** PLUS System.
- **Low-level heat delivery** removes stratification of heat in rooms and provides more comfortable experience for building occupants. Benefits of continuous fan are increased by adding low level of heat.
- **MERV 8 air filtration** is standard for **freewatt®** PLUS System, effective at removal of allergens, dust mites and hair spray. MERV 14 air filtration is available and effective at removing all bacteria, most smoke, cooking oil, allergens, dust mites and hair spray.

HIGH EFFICIENCY

- **Honda MCHP Unit** delivers steady-state efficiency of nearly 90% while producing heat and power, significantly reducing primary energy required to produce your home's electric power.
- **freewatt®** PLUS furnace delivers 95% AFUE efficiency with two-stage condensing operation. Furnace is also Energy Star appliance.
- **Domestic water heating** is integrated into WDJ model to ensure off-heating season operation of Honda MCHP. Independent testing forecasted over 1,000 additional annual operating hours for Honda MCHP.
- **Electronically Commutated Motor (ECM)** in furnace's blower assembly reduces electric power consumption by 20% over conventional blower motors in high heat mode and 80% in low heat mode.
- **PVC Venting** is only permitted for condensing appliances Honda MCHP and furnace use this material for venting.

ADVANCED POWER TECHNOLOGY

- **freewatt® Transfer Switch** ensures safe grid-connected and back-up power operation. Custom integrated component is UL 1008 Listed and provides 120 VAC power to APC UTS back-up panel.
- **APC Universal Transfer Switch (UTS) Back-up Panel** provides configurable platform to maximize **freewatt®** PLUS System's power generation.
- **Adaptive Load Management (ALM™) technology** maximizes power generated by Honda MCHP, allowing 1.8 kW to power six critical loads, including your heating system, security system, refrigerator/freezer, sump pump and still have some power left for convenience outlet: Security & Comfort.
- **Uninterruptible Power Supplies (UPSs)** can also be integrated into UTS to provide uninterrupted power to critical loads such as computers or radios.

COMMUNICATION

- **freewatt®** PLUS **Thermostat** has new LCD display that displays inside temperature, heating/cooling setpoint and outdoor temperatures. LCD display shows MCHP operating hours and alerts homeowner to system faults or errors.
- **Embedded freewatt®** PLUS **webpage** offers networked homeowners ability to see status of **freewatt®** PLUS System and change thermostat settings remotely. Depending on your local network settings, homeowners can check on their **freewatt®** PLUS system at any time and any place.
- **freewatt®** PLUS remote monitoring is available for customers who wish to have their systems data captured and evaluated by professional **freewatt®** PLUS technical support team. Please consult your **freewatt®** PLUS specialist about this exciting new product feature.

MODEL NUMBER DECODING

WAJ 060 N 00A

Model

WAJ - Warm Air **freewatt®** PLUS

WDJ - Warm Air **freewatt®** PLUS w/ Domestic Water Heating

Furnace Firing Rate (MBH)

060, 080, 100, 120

Fuel Gas

N - Natural Gas, L - LP Gas (Propane Gas)

Revision

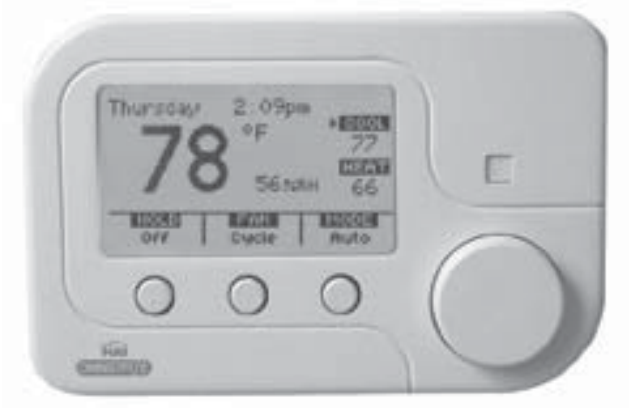
Revision Number and Letter

- **WAJ** Series models provide space heating and electric power.
- **WDJ** Series models provide space heating and electric power and include an additional heat exchanger to provide supplemental domestic water heating when connected to an appropriate existing water heater. See typical configuration on page 20.

SUPPLIED ACCESSORIES

- **freewatt® PLUS Thermostat** – The **freewatt®** PLUS Thermostat is programmable, communicating thermostat allows **freewatt®** control module to communicate with it. Provides system control module with thermostat's room temperature, set points and remote LCD screen to provide MCHP operation to homeowner.
- **Outdoor Temperature Sensor** – **freewatt®** PLUS System includes installation of outdoor temperature sensor. Sensor provides system control module with information to allow for anticipatory heating of dwelling by Honda MCHP unit. Maximizing power production of system.
- **Air Filters** - MERV 8 air filtration is standard for **freewatt®** PLUS System and MERV 14 air filtration is available.
- **APC UTS Hardwire Kit** – APC UTS requires Hardwire Kit to permanently connect Back-Up Power Output from **freewatt®** Transfer Switch to APC UTS. Supplied with **freewatt®** PLUS system.

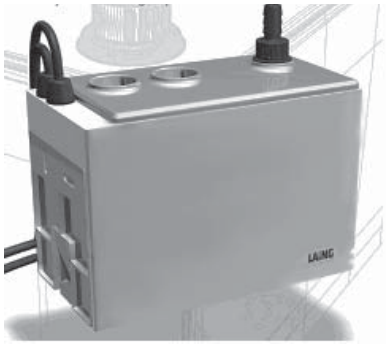
Figure 3 - RC 1000 Communicating Thermostat



OPTIONAL ACCESSORIES

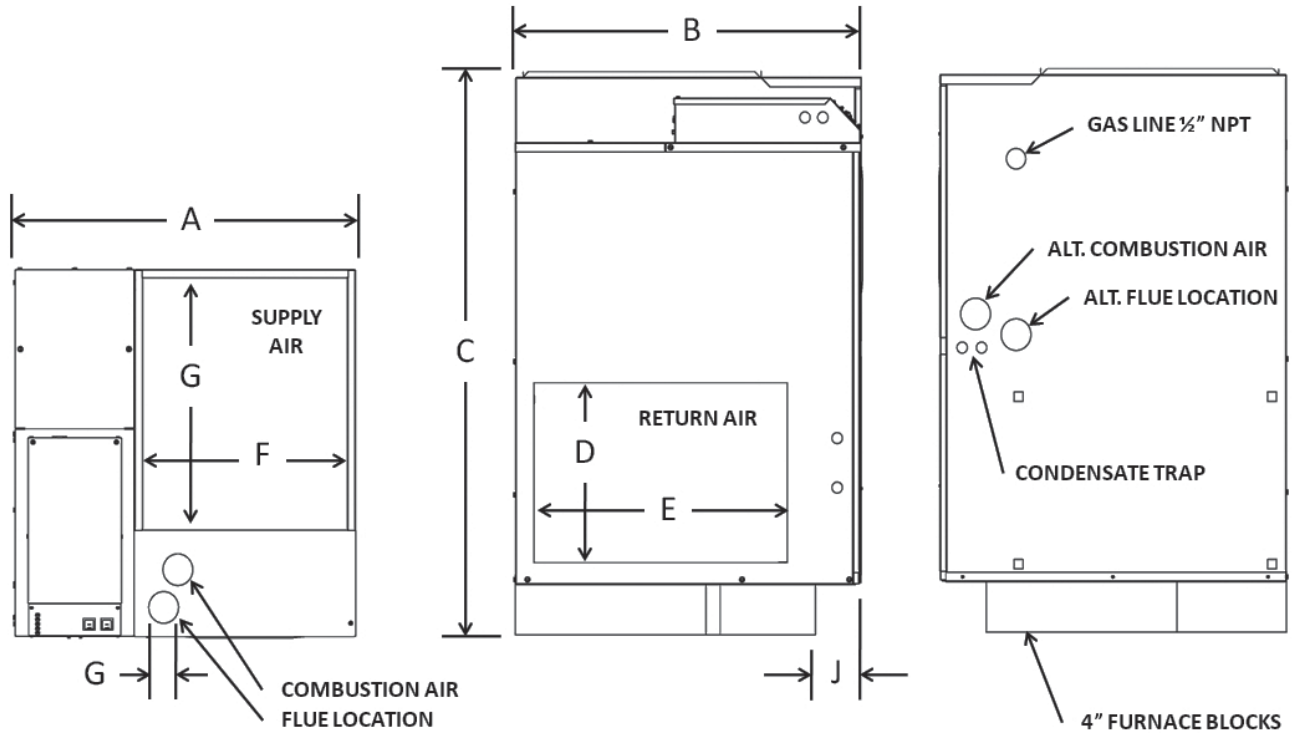
- **TP1 Condensate Pump** – Suggest TP1 condensate pump for **freewatt®** PLUS installations because of its low power consumption and small footprint.

Figure 4 - freewatt® PLUS TP1 Condensate Pump



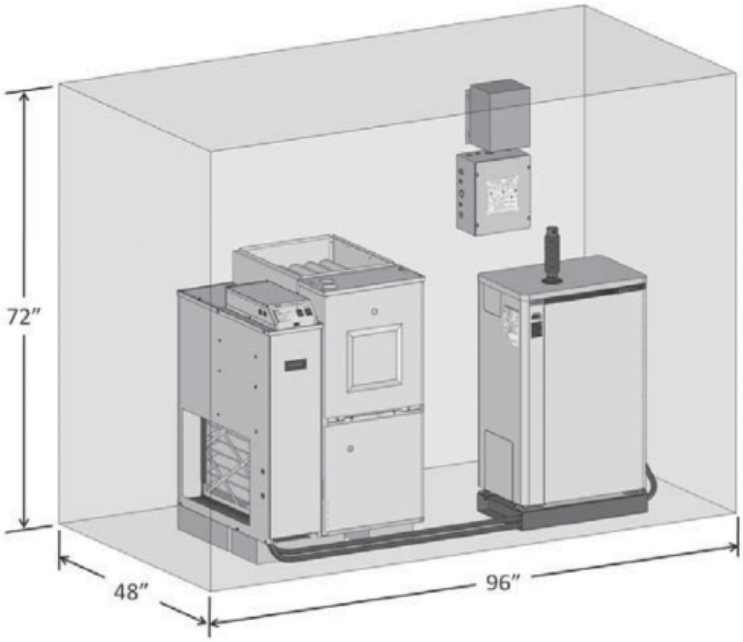
PRODUCT DESCRIPTION - MODEL WAJ/WDJ

Figure 5 - freewatt® PLUS Furnace and HI Module



MODEL	WIDTH A	DEPTH B	HEIGHT C	VENT H	SUPPLY AIR F x G	RETURN AIR D x G	OVERHANG J
60	27	29	44	2	15-7/8 x 20	14- /4 x 21-1/4	3-1/2 to 5
80	28-1/2	29	44	2	17-1/2 x 20	14- /4 x 21-1/4	3-1/2 to 5
100	30-1/2	29	44	2	19-1/2 x 20	14- /4 x 21-1/4	3-1/2 to 5
120	33-1/2	29	44	2	22-1/2 x 20	14- /4 x 21-1/4	3-1/2 to 5

Model WAJ/WDJ
Typical Warm Air freewatt Plus System Footprint



Model WAJ/WDJ
Major Connections

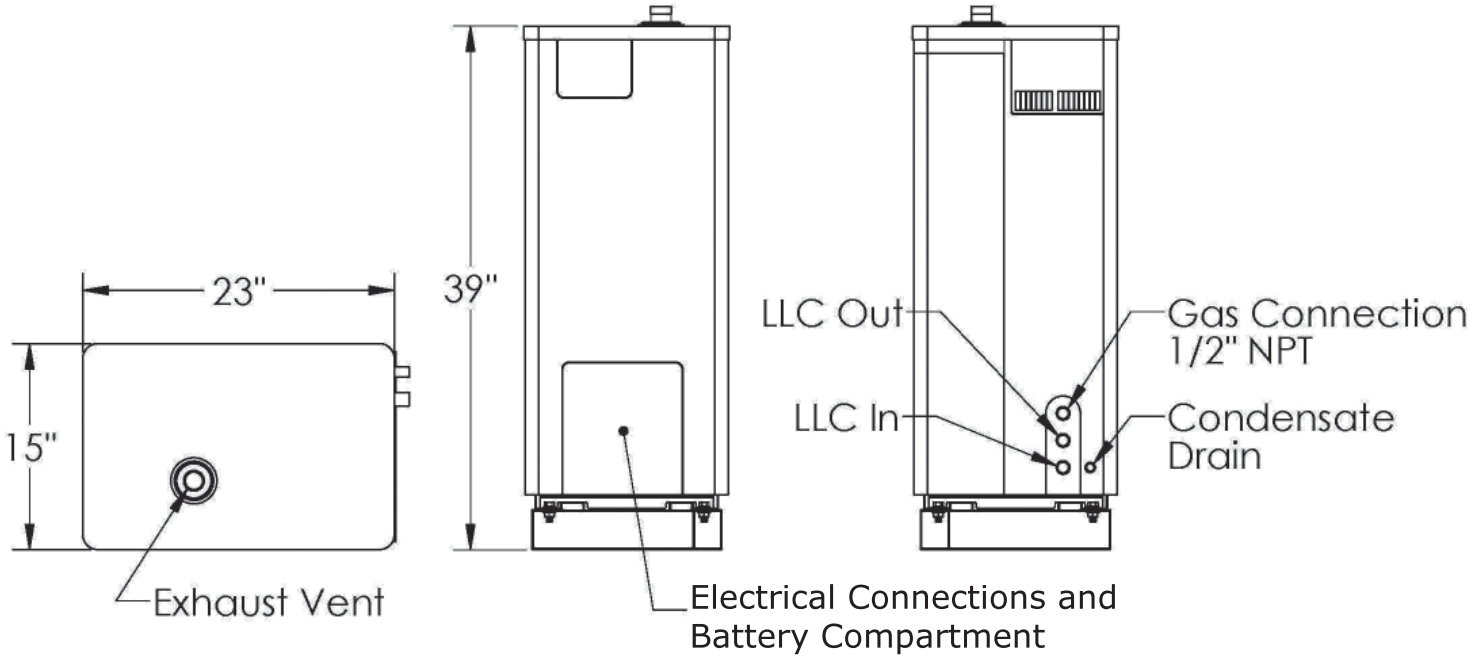
Furnace/HI Module
Electrical: 120 VAC, 60 Hz, 1 phase, < 14 amps
Air Intake/Vent: 2"/3" Sch 40 PVC
Natural Gas: ½" NPT
Condensate Drain: ½" PVC
Internet Connection: RJ45

Honda MCHP
Electrical: 240 VAC, 60 Hz, 1 phase, < 8 amps
Vent: 2" Sch 40 PVC
Natural Gas: ½" NPT w/flexible connector
Condensate Drain: ½" Tube

freewatt Transfer Switch/APC UTS6H
Electrical: 240 VAC, 60 Hz, 1 phase, < 8 amps
120 VAC, 50 Hz, 1 phase, < 14 amps

Consult Installation Manuals for more details.

Figure 6 - Honda MCHP, Model MCHP1.2D(P), Type UCFJ



Concrete Floor Requirements:

- Thickness: 3" Minimum
- Flatness: 1/2" In 10 Feet Class Cx
- Drop-In Anchor: 3/8" Od X 1.75" Long (5/16"-18 Thread) Quantity 4

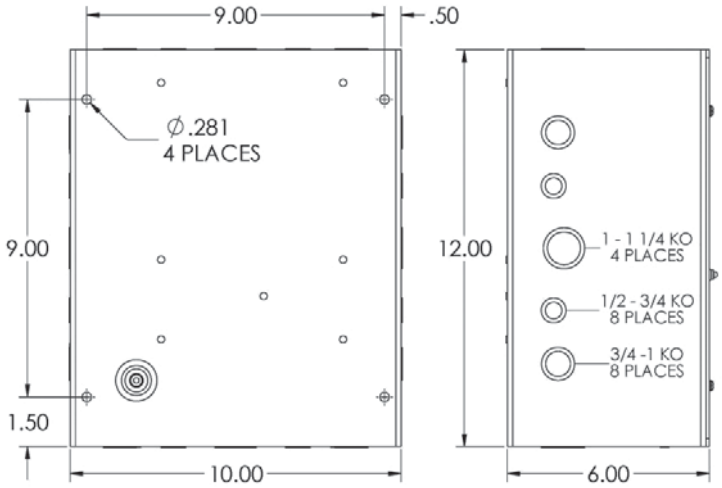
Honda MCHP Battery

Honda MCHP1.2D(P) requires battery to provide power to start the engine in backup power mode. Battery is provided for each **freewatt®** PLUS System, however to insure proper battery storage conditions and charge level, it is not packaged with the system. The battery must be ordered at the time of installation from ECR Customer Service by the certified **freewatt®** dealer performing the installation. Original battery provided for each **freewatt®** PLUS system will be shipped to installing dealer at no cost.

NOTICE
Honda MCHP will not operate without a battery. Use only a battery specifically designed for use in the Honda MCHP.

PRODUCT DESCRIPTION - MODEL WAJ/WDJ

Figure 7 - freewatt® Transfer Switch



Notes:

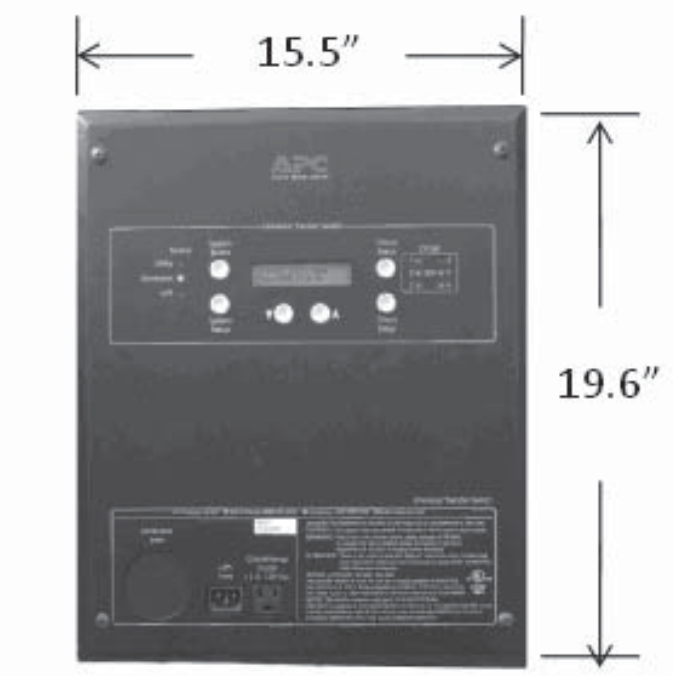
- Weight approximately 19 Lbs.
- Specifications subject to change without notice.

Model WAJ/WDJ

Load Balancing Transformer

Manufacturer	Dimensions
Square D (2S1F)	
Length	9.56"
Width	8.68"
Depth	6.56"
Weight	39.1 Lbs.
ACME Electric Corp. (T-2-53012-S)	
Length	12.52"
Width	5.40"
Depth	5.13"
Weight	38.0 Lbs.
Jefferson Electric (411-0091-000)	
Length	12.50"
Width	6.69"
Depth	5.34"
Weight	41 Lbs.
Note: Specifications are subject to change without notice.	

Figure 8 - Universal Transfer Switch (UTS6H)



Notes:

- Weight approximately 25 Lbs.
- Pigtail factory installed to APC UTS6H.
- Hardwire kit furnished for attaching backup power cable.
- Specifications subject to change without notice.

Figure 9 - freewatt® PLUS Thermostat (Model RC-1000WH - ECR)

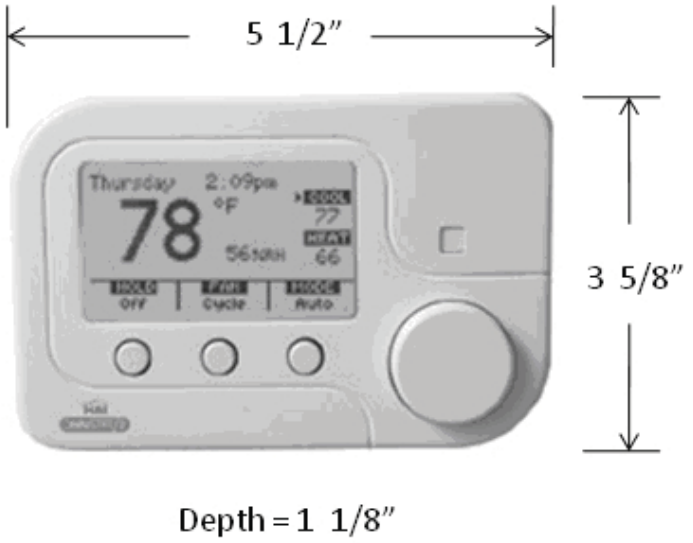


Figure 10 - Outdoor Temperature Sensor, Model 070

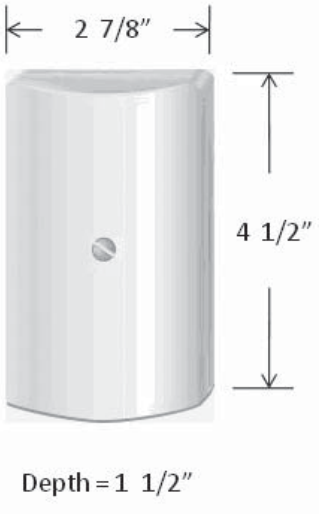
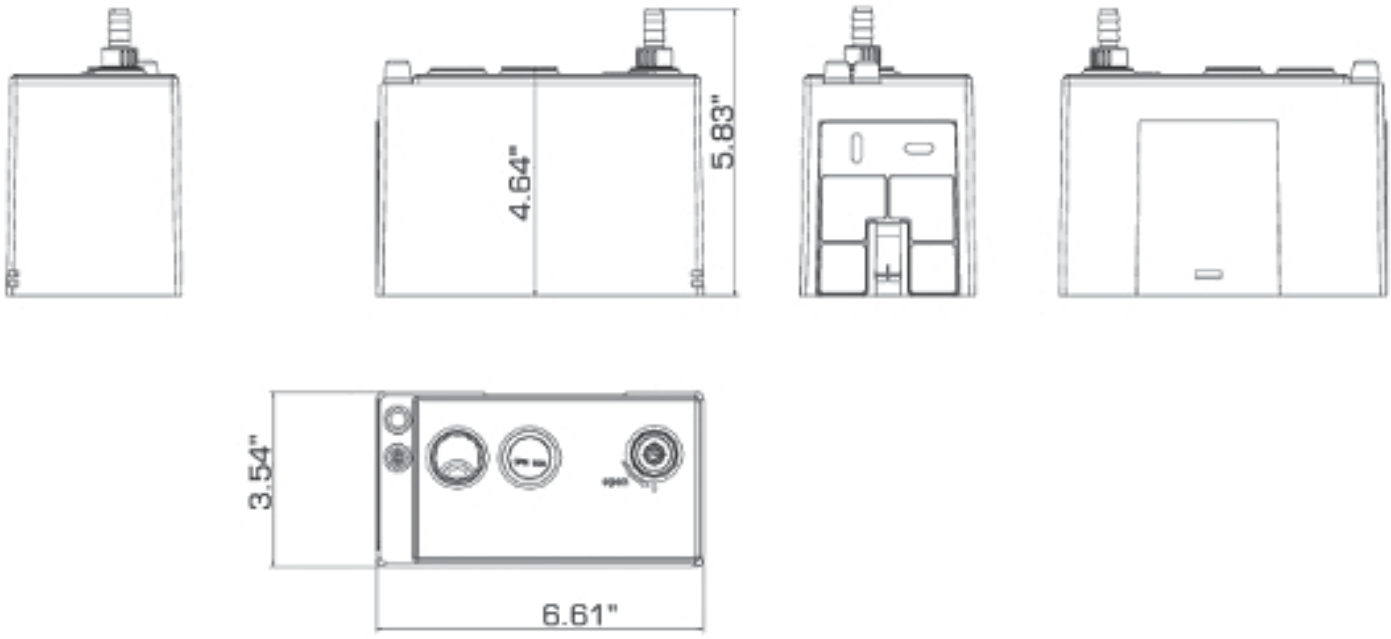


Figure 11 - Optional - TP1 Condensate Pump



SYSTEM DESIGN

Warm Air **freewatt®** PLUS System requires evaluation of many site specific conditions, including

- Heat Loss Calculation
- Fuel Type & Existing Piping
- Existing Gas Appliances
- Footprint Available
- AC Power & Panel
- Existing Heating Appliance
  - A. Asbestos
  - B. Chimney Liner
- Existing A/C
- Existing Humidifier
- Existing Electronic Air Cleaner
- Dampers
- Ductwork Sizing
- System Venting
- Concentric Vent
- Make-up Air
- Condensate Pump
- Condensate Drain
- Internet Connection
- Mounting Location for the APC UTS 6H
- Water Cooled or Air Cooled Heat Rejection System (Refer to Selection Example, Section 6)

- Select proper firing rate of Warm Air **freewatt®** PLUS System (natural gas and propane) after performing heat loss calculation.
- Furnace component of system is available in following firing rates: 60, 80, 100 and 120 btu/hr.
- Size furnace to deliver air required for air conditioning coil (tons of cooling) if cooling is required.

Not Supplied with System

Miscellaneous HVAC Components

Ductwork

- Supply Manifold: Connection to furnace's supply opening
- Return Manifold: Connection to furnace's return opening

Gas Piping & fittings

- Furnace gas piping and gas stop valve
- MCHP gas piping and gas stop valve

Air intake/Exhaust Vent

- Furnace - 2" or 3" PVC piping & supports
- MCHP - 2" PVC vent piping & supports
- Outside Signage, if required

Electrical Components

- 15 AMP 120 VAC Dedicated Circuit w/breaker connected to furnace w/service switch
- 15 or 20 AMP 240 VAC Dedicated Circuit to **freewatt®** Transfer Switch
- 240 VAC DPST Service Switch at **freewatt®** Transfer Switch
- Ethernet Cable for internet connection
- 10 conductor Tstat Cable [Honeywell Genesis (22AWG 10/C STR CM-CL2)]
- 2 Conductor Cable for Outdoor Temperature Sensor
- Audible CO Detector and Wiring per local Codes
- External Service Switch (it required)

DHW Heating Circuit Components (WDJ models only)

- Water Heater
- 1/2 " Piping and Fittings (approved for potable water use)
- Hot Water Recirulation circulator (Grundfos UP-10 or Taco 003 recommended)
- Mixing Valve for Water Heater's HOT output to ensure anti-scald protection
- 120 VAC Wiring from HI Module to Circulator

Condensate Pump & Tubing

Heat Rejection Piping and Fittings

SYSTEM DESIGN

Installation Considerations

- Installation of APC UTS6H:
  - 120 VAC wiring from **freewatt®** Transfer Switch to APC unit must be 12 gauge if run is longer than 12ft (US-NEC)
  - Pigtail for connection to Main Service Panel is factory installed, mount UTS6H in close proximity to Service Panel. Plywood backing and mounting screws are not provided.
  - Hardwire kit supplied, care should be taken to install per instructions for Model UTS6H.
- Installation of **freewatt®** Transfer Switch and Transformer:
  - Plywood backing and mounting screws are not provided.
- Installation of DHW Heating Circuit: (WDJ Models only)
  - 120 VAC wiring must be run from HI-Module to power circulation pump.
- Installation of Heat Rejection System:
  - Condensate pump is not suitable drain for heat rejection.
  - Heat rejection assembly supplied with 1/2" NPT Inlet, and 1/2" Seatech fitting outlet (easy connection for 1/2" copper tubing (Plain End) or PEX (PE)).
- General Installation:
  - Macurco CM-15 is Exhaust Gas Leak Sensor; it is not audible CO Detector. Required to install audible CO detector must be field supplied.
  - GFCI Outlet may be required for condensate pump outlet depending on local codes.

PERFORMANCE DATA

Warm Air freewatt® PLUS System

freewatt® PLUS HEATING CAPACITIES - NATURAL GAS & PROPANE					
Model	Natural Gas	WAJ060N00A	WAJ080N00A	WAJ100N00A	WAJ120N00A
		WDJ060N00A	WDJ080N00A	WDJ100N00A	WDJ120N00A
	Propane	WAJ060L00A	WAJ080L00A	WAJ100L00A	WAJ120L00A
		WDJ060L00A	WDJ080L00A	WDJ100L00A	WDJ120L00A
Honda MCHP - *MCHP Mode*	Input (Btu/hr) 0-3,300'	18,420	18,420	18,420	18,420
	Output (Btu/hr) 0-3,300'	12,300	12,300	12,300	12,300
Honda MCHP - *Back-Up or Grid Boost*	Input (Btu/hr) 0-3,300'	26,000	26,000	26,000	26,000
	Output (Btu/hr) 0-3,300'	17,000	17,000	17,000	17,000
Furnace	Input (Btu/hr) 0-2,000'	60,000/36,000	80,000/48,000	100,000/60,000	120,000/72,000
	Output (Btu/hr) 0-2,000'	57,000/34,200	76,000/45,600	95,000/57,000	114,000/68,400
	Furnace Efficiency (AFUE)	95%	95%	95%	95%
HYBRID INTEGRATION MODULE					
Pump Power (watts)		65	65	65	65
Pump Voltage (VDC)		12/24	12/24	12/24	12/24
MAXIMUM VENTING LENGTHS (EACH ELBOW EQUALS FIVE FEET)					
Venting Length (ft.) – Furnace (3")		100 ft.	100 ft.	100 ft.	100 ft.
Venting Length (ft.) – Honda MCHP (2")		110 ft.	110 ft	110 ft.	110 ft.

Furnace

freewatt® PLUS FURNACE CAPACITIES - NATURAL GAS & PROPANE					
Model	Natural Gas	WAJ060N00A	WAJ080N00A	WAJ100N00A	WAJ120N00A
		WDJ060N00A	WDJ080N00A	WDJ100N00A	WDJ120N00A
	Propane	WAJ060L00A	WAJ080L00A	WAJ100L00A	WAJ120L00A
		WDJ060L00A	WDJ080L00A	WDJ100L00A	WDJ120L00A
Furnace	Input (Btu/hr) 0-2,000'	60,000/36,000	80,000/48,000	100,000/60,000	120,000/72,000
	Output (Btu/hr) 0-2,000'	57,000/34,200	76,000/45,600	95,000/57,000	114,000/68,400
	Furnace Efficiency (AFUE)	95%	95%	95%	95%
HEATING AIRFLOW					
Airflow Range of Low Fire (CFM)		790-1050	1050-1400	1575-2100	1310-1750
Airflow Range of High Fire (CFM)		1050-1300	1405-1750	2110-2200	1755-2100
Motor – ECM Direct Drive		½ hp	¾ hp	1 hp	1 hp
CONTINUOUS FAN AIRFLOW					
Airflow (CFM)		600	750	875	875
COOLING CAPACITY AND AIRFLOW					
Cooling Capacity (tons)		1.5, 2, 2.5, 3	2, 2.5, 3, 4	2, 3, 4, 5	2, 3, 4, 5
CFM Range @ 0.50" WC		600 - 1200	800 - 1600	800 - 2000	800 - 2000
DUCTWORK CONNECTION DIMENSIONS					
Supply Air (F x G)		16 x 20	17.5 x 20	19.5 x 20	22.5 x 20
Return Air (D x E)		14 x 22	14 x 22	14 x 22	14 x 22
MAXIMUM VENTING LENGTHS (EACH ELBOW EQUALS FIVE FEET)					
Venting Length (ft.) – Furnace (3")		100 ft.	100 ft.	100 ft.	100 ft.

PERFORMANCE DATA

Honda MCHP, Model MCHP1.2D(P), Type UCFJ

Honda MCHP (UCFJ) Heating Capacities – Natural Gas & Propane		
Model	Natural Gas	Model 1.2D
	Propane	Model 1.2DP
Honda MCHP - *MCHP Mode*	Input (Btu/hr) 0-3,300'	18,420
	Thermal Output (Btu/hr) 0-3,300'	12,300
	Power Output (kW)	1.2
	Voltage (V)	240
	Current (A)	5
	Noise Level - dB(A) 1m	47
	MCHP Steady State Efficiency	89%
Honda MCHP - *Back-Up Mode*	Input (Btu/hr) 0-3,300'	18,500-26,000
	Thermal Output (Btu/hr) 0-3,300'	12,000-17,000
	Electrical Output (kW)	0 - 1.8*
	Voltage (V)	120
	Current (A)	0-15
	Noise Level - dB(A) 1m	47
	MCHP Steady State Efficiency	89%
Honda MCHP (UCFJ) - *Grid Boost Mode*	Input (Btu/hr) 0-3,300'	26,000
	Thermal Output (Btu/hr) 0-3,300'	17,000
	Electrical Output (kW)	1.8
	Voltage (V)	240
	Current (A)	7.5
	Noise Level - dB(A) 1m	47
	MCHP Steady State Efficiency	89%
Maximum Venting Lengths Reduce Vent length 5 feet for each 90° elbow		
Venting Length (ft.) – Honda MCHP (2")		110 ft.
* Maximum power available to connected loads is 1,700 Watts due to 100 Watt power consumption of load balancing transformer.		

freewatt® Transfer Switch (Model FTS-1.8)

freewatt® Transfer Switch Electrical Specification	
Manufacturer	ECR Int'l
Model No.	FTS-1.8
Max. Watts	1,800
Max. Single-Pole Circuits	4
Max. Double-Pole Circuits	0
Max. current@ 120VAC	15A
Max. current@240VAC	7.5A
Minimum Wire Gauge	14AWG
Conduit Trade-Size (diameter)	½"

PERFORMANCE DATA

Load Balancing Transformer

240/120 VAC BALANCING TRANSFORMER ELECTRICAL SPECIFICATION			
Manufacturer	Schneider Electric	Acme Electric Corporation	Jefferson Electric
Brand	Square D	Acme Electric	Jefferson Electric
Catalog No.	2S1F	T-2-53012-S	411-0091-000
Power Rating	2 KVA	2 KVA	2 KVA
Phase	1	1	1
Primary Voltage Rating	480/240 VAC	480/240 VAC	480/240 VAC
Secondary Voltage Rating	240/120 VAC	240/120 VAC	240/120 VAC
Minimum Wire Gauge	14 AWG	14 AWG	14 AWG
Conduit Trade-Size (diameter)	½"	½"	½"

freewatt® Thermostat (RC-1000WH-ECR)

freewatt® THERMOSTAT Model RC-1000 WH-ECR	
Manufacturer	HAI
Model No.	RC-1000WH-ECR
Voltage	24Vac
Current	2 Amps
Maximum Current (any circuit/total)	2/3 Amps
Frequency	50/60 Hz
Cable Specification	Honeywell Genesis (22AWG 10/C STR CM-CL2)

freewatt® Air Filters

FILTER EFFICIENCY & APPLICATION GUIDELINES		
MERV8 Filter	Typical Applications:	Better Residential
	Typical Contaminants:	Allergens, Dust Mites, Hair Spray
	Arrestance:	> 90%
	Dust Spot Efficiency:	30 – 35%
MERV14 Filter	Typical Applications:	Hospital Grade, Superior Residential- Sustainable Component for a LEED/Green Building Initiative.
	Typical Contaminants:	All Bacteria, Most Smoke, Cooking Oil, Allergens, Dust Mites, Hair Spray
	Arrestance:	> 98%
	Dust Spot Efficiency:	90 – 95%
Source: ASHRAE Standard 52.2 - 1999		

PERFORMANCE DATA

APC Universal Transfer Switch (UTS6H w/ Hardwire Kit)

APC UNIVERSAL TRANSFER SWITCH Model UTS6H		
Manufacturer		American Power Conversion
Model No.		UTS6H
INPUT - UTILITY	Voltage Range	84 to 142Vac
	Nominal Voltage	120 Vac Single Phase
	Allowable Frequency	47 Hz to 63 Hz
	Rated Current	20 A per circuit
INPUT – Backup1 (MCHP GENERATOR)	Input Line	Hardwire Kit
	Nominal Voltage	120 Vac/Single Phase
	Rated Voltage	120 Vac
	Allowable Frequency	47 Hz to 63 Hz
	Rated Current	30 A per circuit
	Maximum Voltage	84 to 142 Vrms
INPUT – Backup2 (UPS)	Input Line	IEC 320 Male
	Nominal Voltage	120 Vac Single Phase
	Rated Voltage	120 Vac
	Allowable Frequency	47 Hz to 63 Hz
	Rated Current	15 A per circuit
	Maximum Voltage	84 to 142 Vrms
OUTPUT	Nominal Voltage	120 Vac (Six Total)
	Current Per Circuit	20 A Maximum
	Current for Circuits Combined	60 A Maximum
	Convenience Outlet Type	NEMA 5-15 Female (120V 15A)
	Protection	UL-Listed Class CC Branch rated fuses
	Recommended 15 Amp Fuses	Ferraz-Shawmut ATMR15
		Littlefuse KLKR015
		Bussman LP-CC-15

SELECTION EXAMPLE

1. Determine cooling and heating requirements at design conditions:

Site Data:

Required Heating Capacity 68,000 Btu/hr

(Based on Design temperature = 0°F)

Required Cooling Capacity 36,000 Btu/hr

(Based on existing 3-Ton system design)

2. Select system based on required heating capacity:

See table for proper system size and select WAJ080-N00A with Heating Capacity of 76,000 Btu/hr.

3. Site Evaluation

Evaluate following system components after selecting firing rate for system:

- Ductwork: Properly sized for new airflow & distribution at MCHP Mode & furnace Heat Mode
- Smart Zone Thermostat Location: Locate Smart Zone in large zone in close proximity of **freewatt®** PLUS System. Will facilitate installation of 10 conductor cable from thermostat to system.
- Make-Up Air Calculation: Ensure Honda MCHP has adequate make-up air for its 27,000 Btu/hr firing rate.
- Electrical Requirements: Ensure main electrical panel has two open breaker slots for 240 VAC MCHP breaker.
- Utility Requirements: Grid interconnection, net metering and disconnect switch requirements differ from utility to utility. Review your utility's requirements and how they impact installation.
- Condensate Removal: Furnace and Honda MCHP create condensate drain for this fluid is required. Follow local codes for condensate removal.
- Internet Connection: **freewatt®** System control module is internet-ready and has embedded web-page. Remote monitoring of system can be performed by ECR International.
- Heat Rejection System: Evaluate whether water cooled or air cooled heat rejection system (HRS) is applicable for site and logistics involved with their installation. The air cooled HRS is located outdoors and the water cooled HRS is located indoors. Refer to section 6 for additional details.

4. Load Selection

Select up to six (6) loads to be placed on APC UTS6H back-up panel. Loads need to be 120 VAC and each load should be less than 15 amps. Sheets on following pages outline circuit plan for back-up panel.

Ensure each load be on dedicated circuit, and total load of each circuit is known to be less than 15 amps.

Required loads for this panel include:

- Furnace (Hot Air) [**freewatt®** PLUS System]

Suggested additional loads for this panel include:

- Lighting Circuit
- Garage Door Opener (Low Power)
- Freezer
- Air Conditioner [Low Power, Dedicated 120 VAC circuit]
- None (If less than 6 loads required)
- Other (Computer/TV/Radio)
- Sump Pump (Low Power)
- Sprinkler System
- Security System
- Refrigerator [NAECA 2001 Compliant recommended]
- Well Pump [Low Power, 120 VAC]
- Microwave Oven (Low Power)

5. Backup Power Source

Next level of selection is backup power source, the Honda MCHP. Honda MCHP provides 1,800 watts of power in backup power mode, however only 1,700 watts is available to serve connected loads due to the 100 Watt power consumption of the load balancing transformer. The Honda MCHP should be placed in BACKUP1 Power Source Configuration.

freewatt® PLUS System has approximately 90 second delay before power is supplied to back up loads.

Homeowner has option to connect Uninterruptible Power Supply (UPS) to APC UTS6H and allow selected loads to have power throughout power outage. If UPS is included in system design, recommend computer,

TV and radio circuits be configured to use proper-sized and installed UPS. Please follow instructions in UTS6H manual for UPS's sizing and installation.

6. Heat Rejection System

Heat rejection kit (sold separately) is required for backup mode operation during times when no space heating or water heating is required.

- A water cooled heat rejection system is available for installations where there is uninterrupted supply of water during power outage (city water). Kit ties into main water supply line and discharges water to appropriate drain. Drain must be suitable for 0.35 GPM at 180° F. Kit contains ball valve, pressure reducer, electronic ball valve, and flow reducer. Installer must supply piping to tie into main water line, and deliver water to appropriate drain.

- Installations without uninterrupted supply of water during power outage (most houses with well pumps) air cooled heat rejection system is available. Contains vertically arranged side discharge fan-coil unit installed outside, and is connected to HI Module through closed coolant loop. Dimensions of unit are 24" Length, 15" Width, and 36" Height.

- Air cooled heat rejection system installer must supply secure mounting pad or foundation, power wiring, low voltage wiring (18 AWG minimum), and closed Propylene Glycol coolant loop from HI Module to unit (3/4" piping, circulator, air separator, pressure relief valve, expansion tank, flow check, and purge valve). See FWHRJ Air cooled heat rejection system Installation, Operation, Maintenance manual for specific installation instructions.

UTS WIRING PLAN

UTS Wiring Plan

Load Description	Load Voltage 120V/204V	Breaker Number	Load Power Watts or Amps	UTS Circuits		NOTES
				Even	Odd	

Even Circuits Total:		
Odd Circuits Total:		
Total Power:		

Backup Power Sources Configuration

	Type	Power	Make/ Model	Overload Delay 1	Start Relay 2	Stop Relay 2	Start Delay 2	Stop Delay 2
	UPS/Gen/ Other	Watts	-	Seconds	Normally open/closed		Seconds or Minutes	
BACKUP1								
BACKUP2								

Note 1: Refer to the system Configuration and Setup section in the Operation Manual.
Note 2: These entries apply only to auto start generators.

CIRCUIT ASSIGNMENTS

Circuit Assignments

Tables on this page and previous page are intended to be filled in and taped to inside cover of building circuit breaker panel enclosure.

UTS6 / UTS6H

Circuit No.	Load Description
1	
2	
3	
4	
5	
6	

Circuit 1

Circuit 1 includes load attached to Circuit 1 connection plus convenience outlet on front of UTS6H, together must consume less than 15 amps. Recommended to use Circuit 1 to power **freewatt®** System's low power condensate pump.

Circuits 5 & 6

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

Uninterruptible Power Supply (UPS)

If using UPS to power "uninterruptible" loads, plug UPS's AC power cord into convenience outlet to charge UPS batteries when MCHP backup power is available. Note: UPS batteries will be charged from convenience outlet when grid power is available.

Follow UPS and UTS6H instructions for sizing UPS for loads configured to be powered in backup mode. Low power circuits, such as computers or security systems, are typically configured for use with UPS.

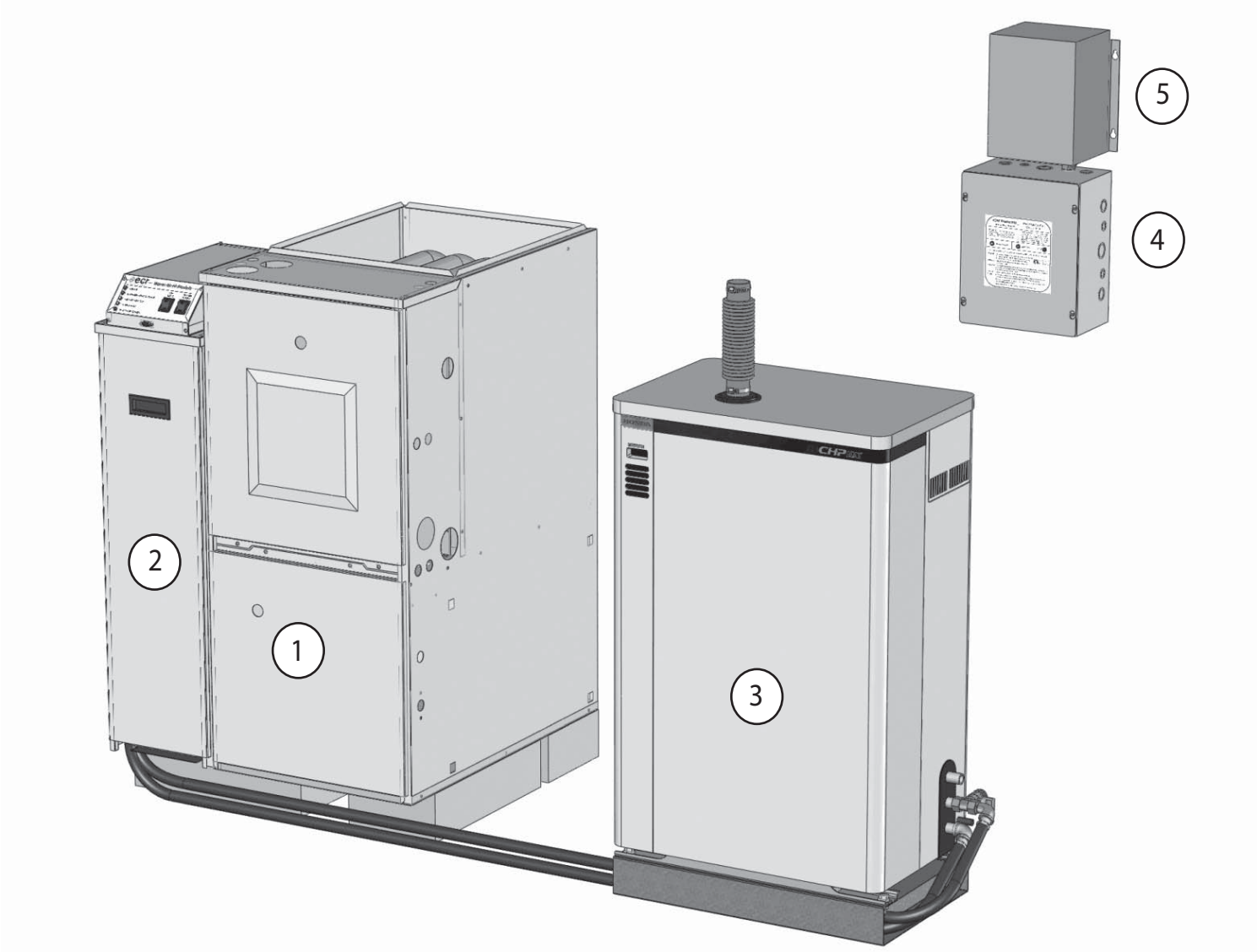
Non-Delayable & Delayable Circuits

Circuit assigned to **freewatt®** furnace must be configured as "Delayable-NO" to ensure **freewatt®** system always has power when in backup mode, otherwise system may not operate correctly.

All other circuits must be configured as "Delayable- Yes" except in case where UPS is used and circuit source is configured as "UPS".

TYPICAL CONFIGURATION

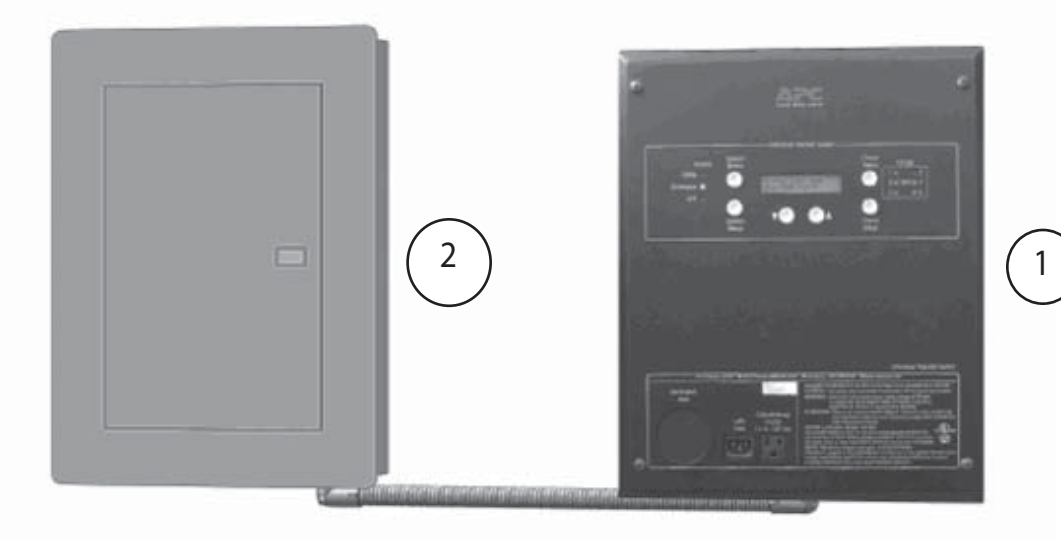
Warm Air freewatt® PLUS System



1. **freewatt®** PLUS Furnace
2. HI Module
3. Honda MCHP Unit
4. **freewatt®** Transfer Switch
5. Load Balancing Transformer

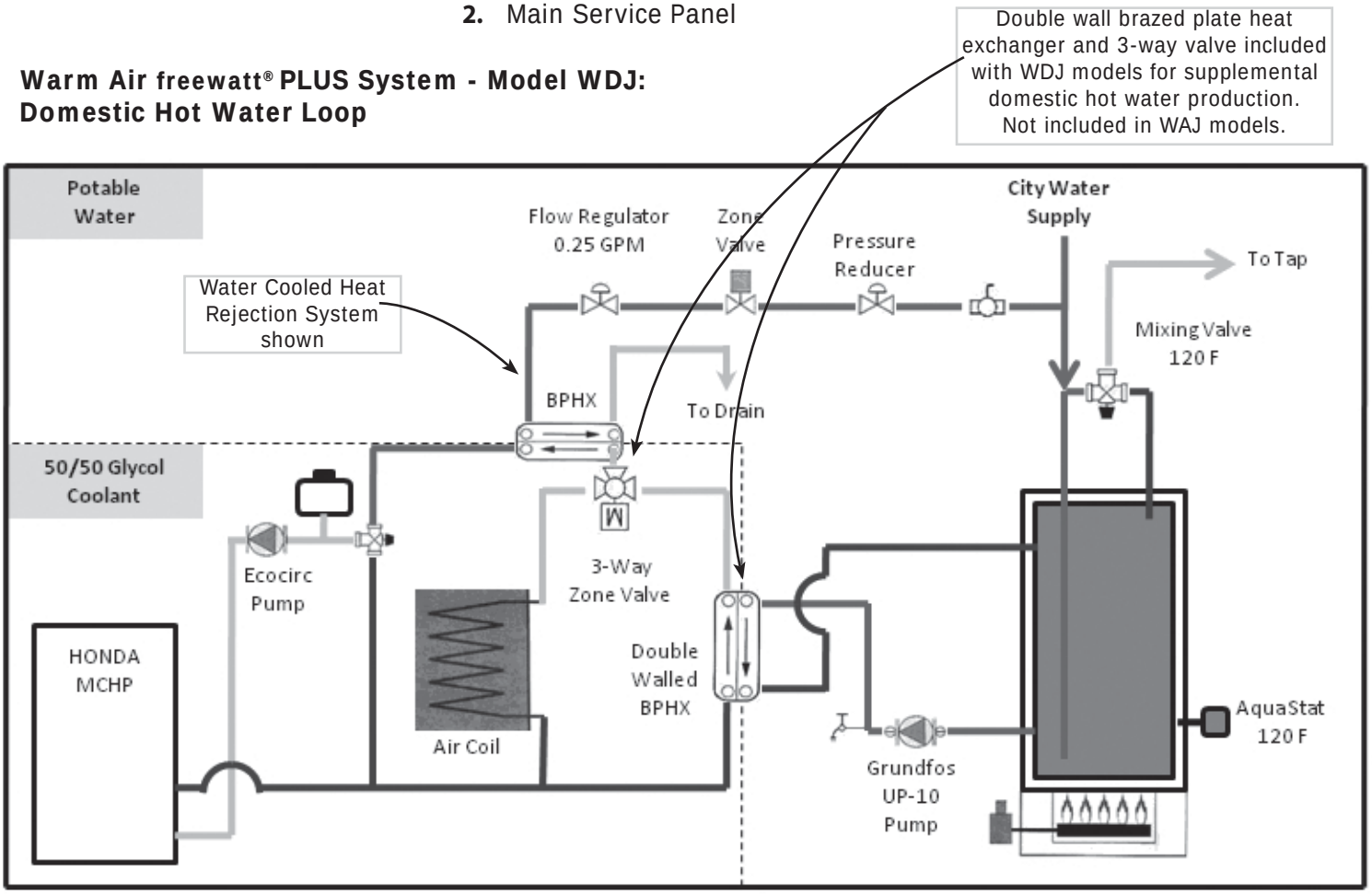
TYPICAL CONFIGURATION

Warm Air freewatt® PLUS System - Main Panel Configuration



1. APC Universal Transfer Switch
2. Main Service Panel

Warm Air freewatt® PLUS System - Model WDJ: Domestic Hot Water Loop



Potable water connections are for two separate and distinct purposes.

Heat Rejection System connection is to single wall brazed plated heat exchanger downstream of 3-way mixing valve. Water is used to cool Honda MCHP's coolant during Grid Boost or Back-Up mode. In DHW Boost mode, Honda MCHP's heat is transferred into potable water. Direct-fired water heater is connected to double-walled brazed plate heat exchanger with ½" piping and includes Hot Water Recirculation Circulator (Grundfos UP-10 or Taco 003 recommended). If equivalent length of recirculation piping system is over 100 feet, it is recommended use ¾" piping system.

COMPATIBLE WATER HEATER TABLE

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

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

APPLICATION DATA

Configuration

Warm Air **freewatt®** PLUS System can be installed in several different configurations as long as installer adheres to appliance clearances. Typical configuration is explained below:

Furnace, HI Module and Honda MCHP: Typical system configuration has Honda MCHP next to furnace, MCHP can be located on other side of return ductwork or behind furnace, if required. In some cases, MCHP has been installed on other side of a wall.

freewatt® Transfer Switch and Load Balancing Transformer: **freewatt®** transfer switch (FTS) and load balancing transformer are typically located on wall behind or next to Honda MCHP unit. Location allows for short connections between FTS and Honda MCHP and system controller.

APC Universal Transfer Switch (UTS6H): APC UTS6H supplied with factory-supplied pig-tail easing unit's installation next to Main Electrical Service panel. Pig-tail connects directly to Main Service Panel and includes supply and return leads.

Thermostat: Install thermostat in large zone on first floor. Facilitates installation of 10-conductor cable to system controller.

Heat Rejection System: Water-cooled heat rejection system (HRS) can be installed on wall besides Warm Air **freewatt®** PLUS System with potable water supply piped through punch-outs in back of HI module. Cooling water discharge tubing, which should be capable of delivering 180° F water, should discharge into appropriate drain. Air-Cooled heat rejection system must be installed outside within 100' of **freewatt®** PLUS System with coolant loop piped through punch-outs on back of HI Module.

Controls

Warm Air **freewatt®** PLUS System has its own system control module that monitors and controls operation of system. Unit is factory-installed on top of HI module and connects directly to furnace, Honda MCHP, **freewatt®** Transfer Switch, heat rejection system, thermostat, outdoor temperature sensor and internet.

Operation

Outline of Warm Air **freewatt®** PLUS System's modes of operation:

Normal Mode

In Normal Mode, system operates on "Call for Heat" as typical heating system would operate. "Call for Heat" is initiated by thermostat and sends signal to Honda MCHP and furnace to provide heat to conditioned space. When thermostat signals system control module "Call for Heat" is satisfied, furnace is signaled to power OFF and Honda MCHP continues to operate. Control module continues to monitor room temperature and allows Honda MCHP to produce power, while delivering low level of heat to room.

While utility power is present, **freewatt®** transfer switch remains closed, allowing power to flow through **freewatt®** transfer switch from MCHP unit to main electrical panel. MCHP unit, when operating, will generate fixed 1200 watts of power. Power will flow back through **freewatt®** transfer switch to main utility panel and back to utility if surplus power is being generated. Balancing transformer is not used in this mode.

Virtual Heat Mode

Virtual Heat Mode operates system to provide heat to conditioned space in anticipation of heat requirement. **freewatt®** heating algorithm in system control module firmware monitors room temperature and outdoor temperature to optimize Honda MCHP's operation. Allowing MCHP's low level of heat to act as first stage and furnace's higher levels of heat to act as second and third stage.

Bypass Mode

Bypass Mode is utilized when Honda MCHP is not installed or operational. Mode directly connects thermostat to furnace and only supplies furnace's heat to conditioned space. Mode is normally initiated by installer or homeowner when MCHP is not installed or operational and home still needs heat. System control module automatically switches to this mode when Honda MCHP has fault or error condition, switching "Call for Heat" to furnace.

Since MCHP will not be operating, no power is generated and system is high efficiency home heating appliance in this mode.

Domestic Hot Water (DHW) Boost Mode (WDJ Only)

DHW Boost Mode activates Honda MCHP unit to heat water at same time as water heater burner, if **freewatt®** PLUS System is not already operating in space-heating mode.

DHW Auto Heat Mode (WDJ Only)

If Honda MCHP unit is not satisfying any normal calls for heat, **freewatt®** PLUS System will activate DHW Auto Heat Mode. Mode activates Honda MCHP unit to heat water before water heater would activate, maximizing use of fuel through Honda MCHP unit. Smaller use of water and water heater standby losses do not lower tank temperature enough to activate water heater's burner.

Post-Run Mode

If Honda MCHP has been started in Back-Up Power or Grid Boost Modes and has not operated for minimum of 30 minutes, **freewatt®** PLUS System will restart MCHP unit in normal operation and operate unit until it reaches 30 minutes of runtime.

Grid Boost Mode

If Owner and Electric Utility have signed agreement, Electric Utility can send remote command to initiate **freewatt®** PLUS System to operate Grid Boost Mode and generate power in distributed generation mode. Power will flow same way as Normal Mode, except Boost Mode temporarily increases power output from fixed 1200 watts to fixed 1800 watts. Higher power output optimizes benefit of **freewatt®** PLUS System and is useful for utility demand/response energy programs. Balancing transformer is not used in this mode.

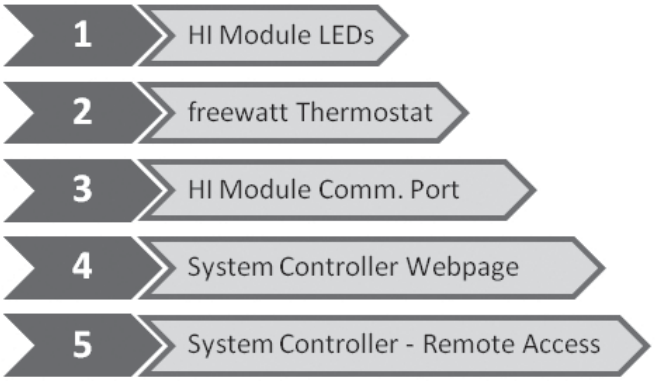
Back-Up Mode

When utility power is not present, **freewatt®**Transfer Switch will automatically open and deliver MCHP unit's 240 VAC power into load balancing transformer to create 120 VAC. 120 VAC power will be delivered to APC Universal Transfer Switch (UTS6H) and unit will load manage back-up loads. **freewatt®** Transfer Switch, **freewatt®** control module, MCHP unit and APC UTS will monitor state of utility grid, while initiating backup power sequence.

MCHP unit starts up in backup power mode and delivers 240VAC variable output power, up to maximum of 1800 watts to **freewatt®** Transfer Switch. **freewatt®** Transfer Switch will divert 240 VAC power to load balancing transformer to convert MCHP unit's 240VAC power to 120 VAC power compatible with loads on APC UTS.

MCHP unit will continue to operate in Back-up Mode until **freewatt®** Transfer Switch senses return of utility power. **freewatt®** control module will safely command **freewatt®** Transfer Switch to re-close to utility power after MCHP unit ceases backup mode operation, and system will subsequently return to Normal Mode.

Communications



Warm Air **freewatt®** PLUS System uses several levels of communication to allow homeowner, service technician and dealer to monitor and control system's operation. Several levels of communication allow system to be properly commissioned, operated, monitored and serviced to ensure proper operation.

First level is LED lights found on front of HI module. Signal homeowner or service technician status of operation and error mode.

Second level is **freewatt®** PLUS thermostat. Thermostat is latest generation of programmable communicating thermostat combines advanced digital technology with new easy user interface. Scroll wheel allows homeowner multiple levels of programming and menus to display operating information. Thermostat displays MCHP runtime and outdoor temperature on scrolling line at top as well as system error messages.

Third level available for service technician involves laptop computer connected to system control module for diagnostic troubleshooting. **freewatt®** PLUS MINT tool, proprietary software program, queries system control module for status information, operating characteristics and error codes as well as allowing manual control of system for troubleshooting activities.

Fourth level is embedded webpage on system control module. When Warm Air **freewatt®** PLUS System is installed, connect system control module to local area network. Allowing homeowner to access webpage on system control module, monitor system operation and modify thermostat settings.

APPLICATION DATA

Fifth level involves configuring your system control module for remote access. Level allows your **freewatt®** PLUS dealer to remotely monitor, troubleshoot and diagnose your system's operation. Homeowner benefits from level of communication because **freewatt®** PLUS dealer will be remotely signaled about maintenance requirements, abnormal operating conditions and any system errors before homeowner notices these conditions. Homeowner benefits because **freewatt®** PLUS dealer will know error and system's operating characteristics and what service is required and required parts/tools for site visit.

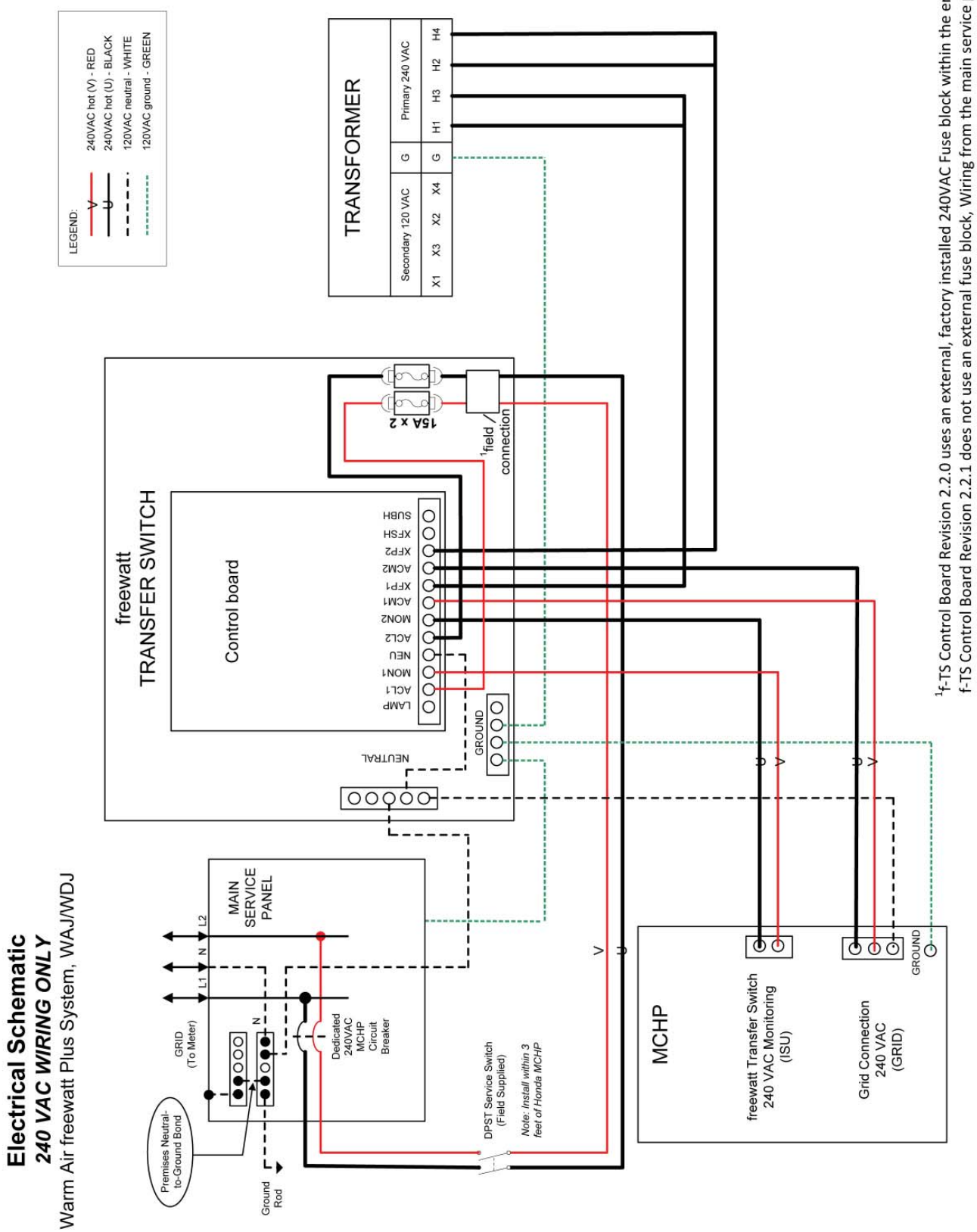
LEED Information

The following table outlines potential LEED points for the Warm Air **freewatt®** PLUS System.

Section	Number	Credit	Description	Max. Points
Indoor Environmental Quality	EQ1	2	Combustion Venting	Mandatory Measure
	EQ1	6.2	Return Air Flow/Room by Room Controls/Thermal Comfort	2
	EQ1	7	Supply Air Filtering	2
Energy and Atmosphere	EA	1	Energy Star Labeled Home	16
	EA	6	Space Heating and Cooling	2
	EA	7	Water Heating	2
	EA	10	Renewable Energy	6

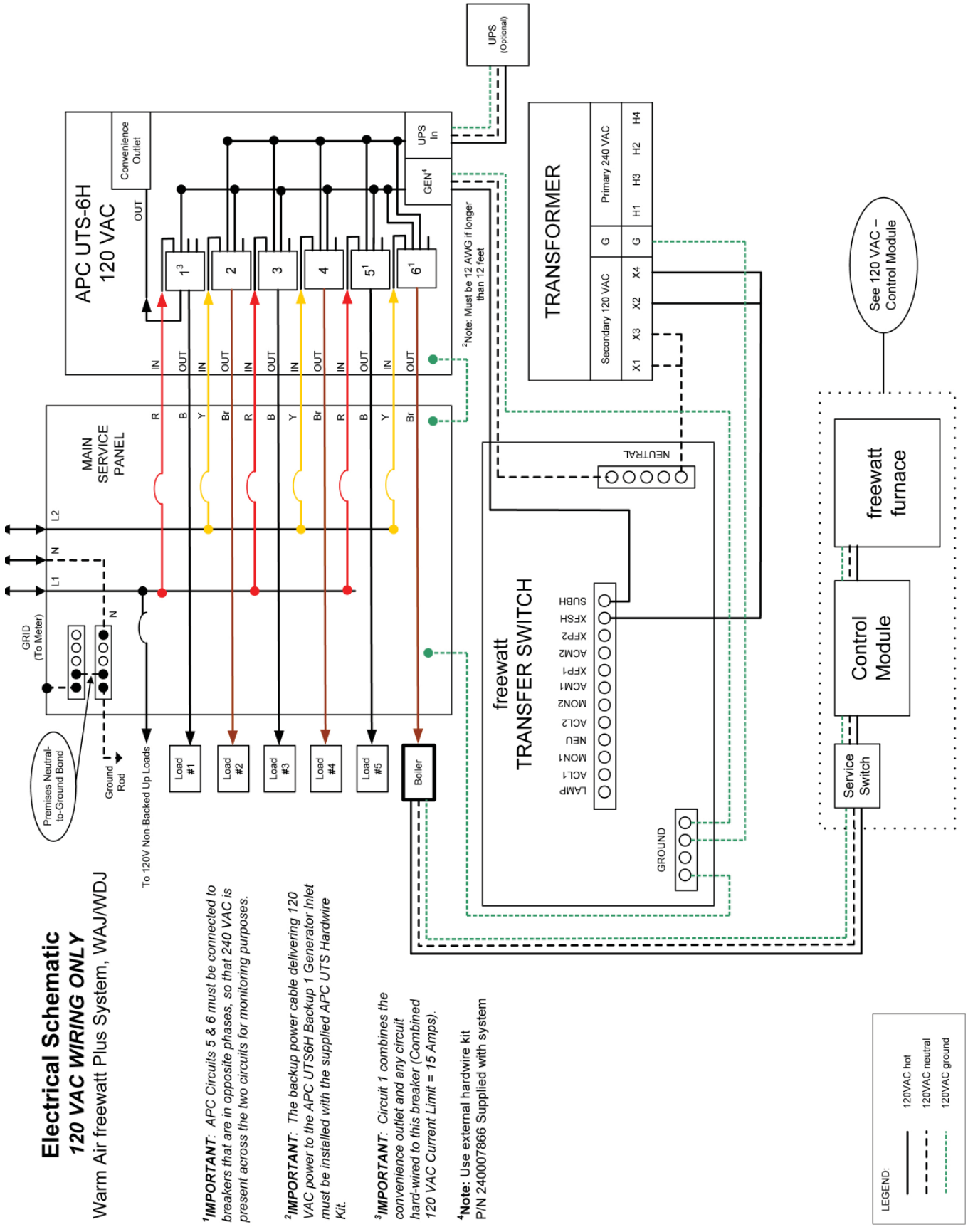
TYPICAL ELECTRICAL SCHEMATICS

240 VAC Warm Air freewatt® PLUS System, WAJ/WDJ



TYPICAL ELECTRICAL SCHEMATICS

120 VAC Warm Air freewatt® PLUS System, WAJ/WDJ



[1]**IMPORTANT**: *APC Circuits 5 & 6 must be connected to breakers that are in opposite phases, so that 240 VAC is present across the two circuits for monitoring purposes.*

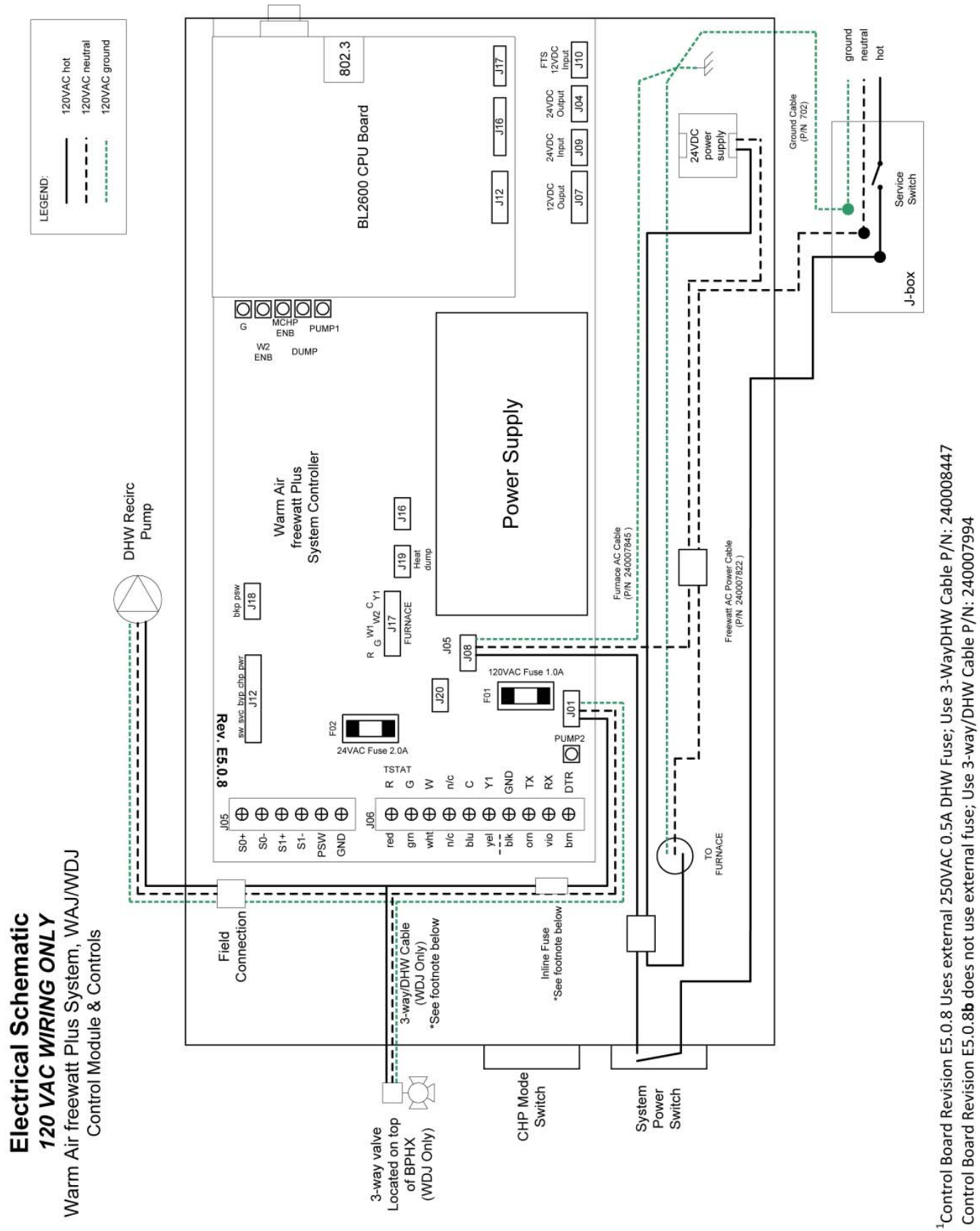
[2]**IMPORTANT**: *The backup power cable delivering 120 VAC power to the APC UTS6H Backup 1 Generator Inlet must be installed with the supplied APC UTS Hardwire Kit.*

[3]**IMPORTANT**: *Circuit 1 combines the convenience outlet and any circuit hard-wired to this breaker (Combined 120 VAC Current Limit = 15 Amps).*

[4]**Note:** Use external hardwire kit P/N 240007866 Supplied with system

TYPICAL ELECTRICAL SCHEMATICS

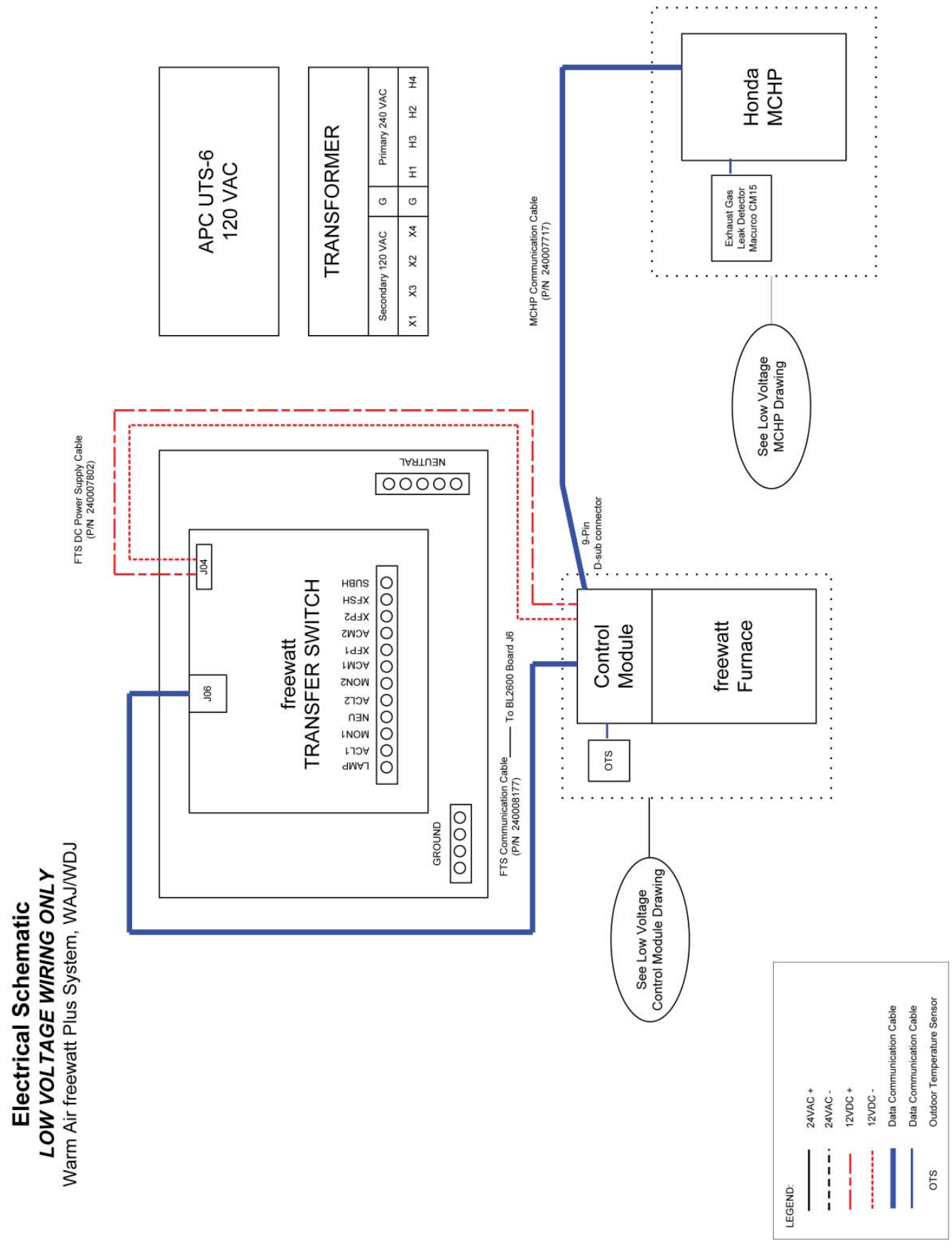
120 VAC Wiring, Warm Air freewatt® PLUS System, WAJ/WDJ, - Control Module & Controls



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

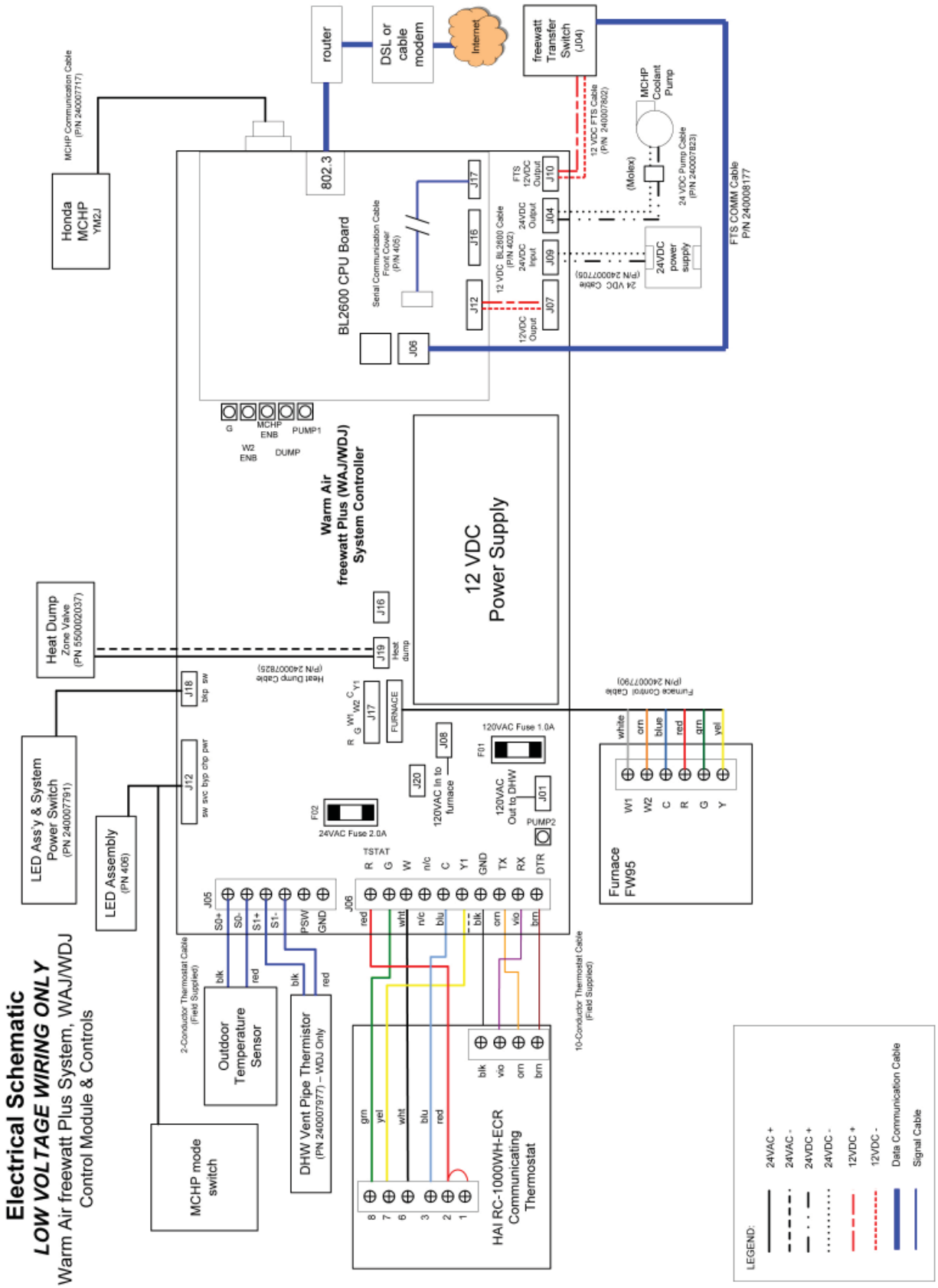
TYPICAL ELECTRICAL SCHEMATICS

Low Voltage Wiring, Warm Air freewatt® PLUS System, WAJ/WDJ



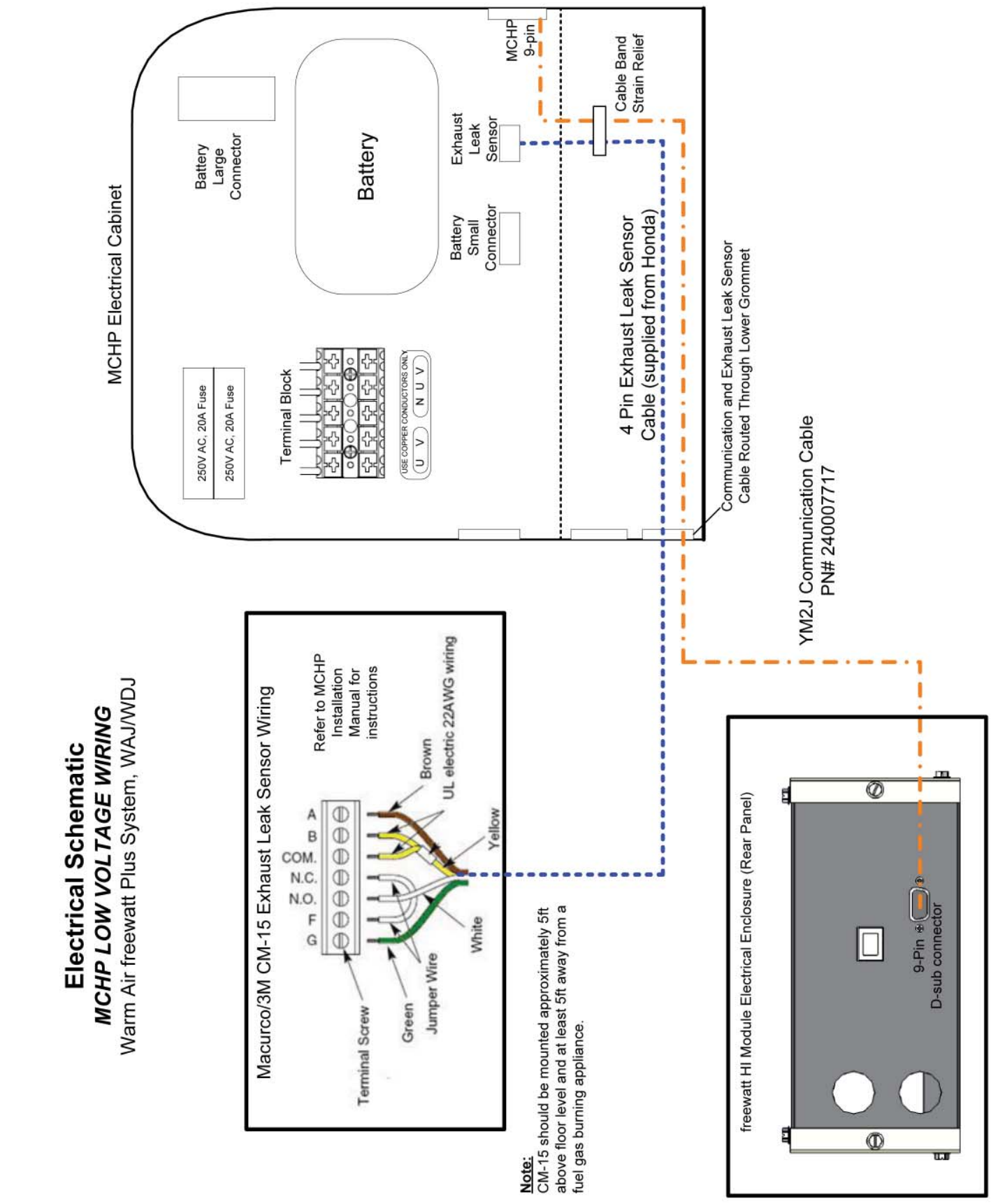
TYPICAL ELECTRICAL SCHEMATICS

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



TYPICAL ELECTRICAL SCHEMATICS

Low Voltage Wiring, Warm Air freewatt® PLUS System, WAJ/WDJ, MCHP Unit



GUIDE SPECIFICATION

Guide Specification – WAJ Model

ECR International
2201 Dwyer Avenue
Utica, NY 13501
Phone: (315) 797-1310
Fax: (315) 797-3762

Website: www.freewatt.com

Section 23 54 35
Warm Air Micro-CHP System
with Back-Up Power & Grid
Boost Capability

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Warm Air Micro-CHP System using fuel gas (natural gas or liquid propane) to heat indoor spaces and generate power, while also providing on-demand power for grid boost or back-up power conditions. System can also integrate conventional air conditioning equipment for summer time cooling operation.

B. Related Sections:

a. Other Division 23 HVAC Sections

1.E.1 1.02 REFERENCES

A. ANSI:

a. ANSI Z21.47-/CSA2.3 latest Revision: American National Standard/CSA Standard for Gas-Fired Central Furnaces

b. 10 CFR Part 430 Method of Testing for Annual Fuel Utilization Efficiency or Residential Central Furnaces and Boilers

B. UL:

a. UL 2200 Standard for Stationary Engine Generator Assemblies

b. UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distribute Energy Resources

C. NFPA:

a. NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines (2002 Edition or Latest Revision)

b. NFPA 54-2006 National Fuel Gas Code

c. NFPA 70-2005 National Electric Code

1.E.2 1.03 SYSTEM DESCRIPTION

A. Performance Requirements:

a. Furnace

i. Firing Rates: 60, 80, 100 or 120 Btu/hr

ii. Annual Fuel Utilization Efficiency: 95%

iii. Stages of Combustion and Air Flow: Two (2)

iv. ECM Blower Motor Efficiency: 70% or higher

v. Cooling: 1 - 5 Tons (Capability if outfitted with Air Conditioning Equipment)

b. MCHP Unit

i. Steady State Efficiency: 89% or higher

ii. Power Output:

1. MCHP Mode = 1.2 kW
2. Grid Boost Mode = 1.8 kW
3. Back-up Mode = 0.2 – 1.8 kW

iii. Noise: Under 50 dBA at 3 feet

iv. Emissions: Under 400 ppm CO and NOx

v. Grid Interconnection: Provide an MCHP unit that meets or exceeds the performance requirements outlined in UL 1741

c. Power Management

i. System shall optimize power output with power management equipment.

ii. Configuration of power management equipment shall allow for pre-selected loads to have delayable, non-delayable, interruptible and non-interruptible settings.

1.E.3 1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of Contract and Section [01 33 00 – Submittal Procedures]

B. Product Data: Submit product data, including manufacturer's technical specification sheets and User Guides.

C. Load Calculation: Submit a residential load calculation performed by ACCA's Manual J7.

D. Shop Drawings: Submit installation manuals for system components.

1.E.4 1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

a. Furnace: Certified to ANSI Z21.47/CSA 2.3 latest Revision: American National Standard/CSA Standard for Gas-Fired Central Furnaces

d. MCHP Unit: Certified to UL 2200 Standard for Stationary Engine Generator Assemblies and UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

b. All system components must be approved for installation in the State of Massachusetts by the State Plumbing Board.

B. Manufacturer Qualifications:

a. Minimum of 5 years experience in design and manufacture of micro-combined heat and power systems.

1.E.5 1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 01 Product Requirements Section

B. Delivery: Deliver equipment in manufacturer's original, unopened, undamaged containers with identification labels and installation/owner manuals intact.

C. Storage and Protection: Store equipment protected from exposure to harmful environmental conditions.

1.E.6 1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit in accordance with Section [01 78 36 – Warranties] for Owner's acceptance manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

a. Warranty Period:

i. System: 24 months from the date of installation or 27 months from the date of shipment, whichever comes first.

PART 2 – PRODUCTS

2.01 WARM AIR MICRO-CHP SYSTEM

A. Manufacturer: ECR International

a. Contact: 2201 Dwyer Avenue, Utica, NY 13501; phone (315) 797-1310; fax (315) 797-3762; Website: www.ecrinternational.com

B. Warm Air **freewatt®** PLUS System:

a. Models:

i. Natural Gas: WAJ060N00A, WAJ080N00A, WAJ100N00A, WAJ120N00A

ii. Propane: WAJ060L00A, WAJ080L00A, WAJ100L00A, WAJ120L00A

b. System shall include:

i. High-efficiency, gas furnace (ANSI Z21.47/CSA 2.3):

1. Triple-pass tubular primary heat exchanger
2. Stainless steel heat recovery coil
3. Silicone nitride hot surface igniter
4. Self diagnostic two stage integrated furnace control
5. Electronically commutated motor (ECM)
6. Energy Star Compliant

ii. Hybrid Integration Module
1. Coolant system
2. Air coil heat exchanger
3. High efficiency MERV 8 air filtration
4. Integrated heat rejection capability

iii. Micro-combined heat & power (MCHP) unit (UL 2200 & UL 1741):
1. 4-cycle, single-cylinder OHV natural-gas fired engine
   a. Rated Speed: 1,950 rpm
   b. Long-life liquid cooling system
2. Power Generation
   a. Permanent magnet generator
   b. Power output: 1.2 kW
   c. Voltage: 240 Volts AC
   d. Current: 5 Amps
   e. Power Factor: 1
   f. Frequency: 60 Hz
3. Inverter
   a. Self-exciting voltage-type current control
   b. Voltage regulation system: Pulse width modulation system
   c. Insulation system: Non-isolated transformer-less
   d. Electrical system: Single phase 3-wire
   e. Power control system: Voltage-type current control system
   f. Meets UL 1741 standard for construction and performance
4. Air intake/Exhaust
   a. Air cleaner
   b. Three-way catalytic converter for emissions control
   c. Muffler system for low noise

iv. System controller
1. Micro-processor based with heating algorithm
2. Internet connector (RJ 45 compatible)
3. Outdoor temperature sensor (10 ohm) with outdoor mounting box

v. Thermostat
1. 24 Volt AC
2. Programmable, communicating-type w/ LCD Screen
3. Non-volatile program and setting memory: no batteries required for long-term operation
4. Energy Star compliant

2.02 ACCESSORIES

A. Condensate Removal: Supply approved means to remove condensate for the furnace and MCHP.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation drawings and instructions.

B. Coordination: Coordinate electrical or mechanical requirements for these connections.

3.02 EXAMINATION

A. Site Verification or Conditions: Verify that floor conditions are acceptable for product installation in accordance with manufacturer's instructions.

B. Footprint: Verify that floor space is acceptable for product installation in accordance with manufacturer's instructions.

C. Intake/Vent Pipe Routing: Verify that air intake and vent pipe chases and termination locations are acceptable for product installation in accordance with manufacturer's instructions.

D. Condensate Removal: Verify that condensate removal locations are acceptable for product installation in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Certification: Verify that installers have valid certification from the manufacturer to install and service the Warm Air Micro-CHP System.

B. Warm Air Micro-CHP System: Install in accordance with manufacturer's installation instructions.

C. Accessories: Install in accordance with manufacturer's installation instructions.

END OF SECTION

GUIDE SPECIFICATION

Guide Specification – WDJ Model

ECR International
2201 Dwyer Avenue
Utica, NY 13501
Phone: (315) 797-1310
Fax: (315) 797-3762

Website: www.**freewatt**.com

Section 23 54 36
Warm Air Micro-CHP System
with Back-Up Power & Grid Boost Capability &
Domestic Water Heating

PART 1 – GENERAL

1.01 SUMMARY

C. Section Includes: Fully-integrated Warm Air Micro-CHP System using fuel gas (natural gas or liquid propane) to heat indoor spaces/domestic water and generate power, while also providing on-demand power for grid boost or back-up power conditions. System can also integrate conventional air conditioning equipment for summer time cooling operation.

D. Related Sections:

a. Other Division 23 HVAC Sections

1.E.7 1.02 REFERENCES

D. ANSI:

a. ANSI Z21.47/CSA 2.3 latest Revision: American National Standard/CSA Standard for Gas-Fired Central Furnaces

b. 10 CFR Part 430 Method of Testing for Annual Fuel Utilization Efficiency or Residential Central Furnaces and Boilers

E. UL:

a. UL 2200 Standard for Stationary Engine Generator Assemblies

b. UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

F. NFPA:

a. NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines (2002 Edition or Latest Revision)

b. NFPA 54-2006 National Fuel Gas Code

c. NFPA 70-2005 National Electric Code

1.E.8 1.03 SYSTEM DESCRIPTION

B. Performance Requirements:

a. Furnace

i. Firing Rates: 60, 80, 100 or 120 Btu/hr

ii. Annual Fuel Utilization Efficiency: 95%

iii. Stages of Combustion and Air Flow: Two (2)

iv. ECM Blower Motor Efficiency: 70% or higher

v. Cooling: 1 - 5 Tons (Capability if outfitted with Air Conditioning Equipment)

b. MCHP Unit

i. Steady State Efficiency: 89% or higher

ii. Power Output:

1. MCHP Mode = 1.2 kW
2. DHW Mode = 1.2kW
3. Grid Boost Mode = 1.8 kW
4. Back-up Mode = 0.2 – 1.8 kW

iii. Noise: Under 50 dBA at 3 feet

iv. Emissions: Under 400 ppm CO and NOx

v. Grid Interconnection: Provide an MCHP unit that meets or exceeds the performance requirements outlined in UL 1741.

c. Power Management

i. System shall optimize power output with power management equipment.

ii. Configuration of power management equipment shall allow for pre-selected loads to have delayable, non-delayable, interruptible and non-interruptible settings.

1.E.9 1.04 SUBMITTALS

E. General: Submit listed submittals in accordance with Conditions of the Contract and Section [01 33 00 – Submittal Procedures]

F. Product Data: Submit product data, including manufacturer's technical specification sheets and User Guides.

G. Load Calculation: Submit a residential load calculation performed by ACCA's Manual J7.

H. Shop Drawings: Submit installation manuals for system components.

1.E.10 1.05 QUALITY ASSURANCE

C. Regulatory Requirements:

a. Furnace: Certified to ANSI Z21.47/CSA 2.3 latest Revision: American National Standard/CSA Standard for Gas-Fired Central Furnaces

d. MCHP Unit: Certified to UL 2200 Standard for Stationary Engine Generator Assemblies and UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources

b. All system components must be approved for installation in the State of Massachusetts by the State Plumbing Board.

D. Manufacturer Qualifications:

a. Minimum of 5 years experience in the design and manufacture of fully integrated micro-combined heat and power systems.

1.E.11 1.06 DELIVERY, STORAGE & HANDLING

D. General: Comply with Division 01 Product Requirements Section

E. Delivery: Deliver equipment in manufacturer's original, unopened, undamaged containers with identification labels and installation/owner manuals intact.

F. Storage and Protection: Store equipment protected from exposure to harmful environmental conditions.

1.E.12 1.07 WARRANTY

C. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

D. Manufacturer's Warranty: Submit in accordance with Section [01 78 36 – Warranties] for Owner's acceptance manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

PART 2 – PRODUCTS

2.01 WARM AIR MICRO-CHP SYSTEM

C. Manufacturer: ECR International

a. Contact: 2201 Dwyer Avenue, Utica, NY 13501; phone (315) 797-1310; fax (315) 797-3762; Website: www.ecrinternational.com

D. Warm Air **freewatt®** PLUS System:

a. Models:

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b. System shall include:

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4. Self diagnostic two stage integrated furnace control
5. Electronically commutated motor (ECM)
6. Energy Star Compliant

ii. Hybrid Integration Module

1. Coolant system
2. Air coil heat exchanger
3. High efficiency MERV 8 air filtration
4. Integrated heat rejection capability
5. Integrated domestic water heating capability

iii. Micro-combined heat & power (MCHP) unit (UL 2200 & UL 1741-Certified):

1. 4-cycle, single-cylinder OHV natural-gas fired engine
    a. Rated Speed: 1,950 rpm
    b. Long-life liquid cooling system
2. Power Generation
    a. Permanent magnet generator
    b. Power output: 1.2 kW
    c. Voltage: 240 Volts AC
    d. Current: 5 Amps
    e. Power Factor: 1
    f. Frequency: 60 Hz
3. Inverter
    a. Self-exciting voltage-type current control
    b. Voltage regulation system: Pulse width modulation system
    c. Insulation system: Non-isolated transformer-less
    d. Electrical system: Single phase 3-wire
    e. Power control system: Voltage-type current control system
    f. Meets UL 1741 standard for construction and performance
4. Air intake/Exhaust
    a. Air cleaner
    b. Three-way catalytic converter for emissions control
    c. Muffler system for low noise

iv. System controller
    1. Micro-processor based with heating algorithm
    2. Internet connector (RJ 45 compatible)
    3. Outdoor temperature sensor (10 ohm) with outdoor mounting box

v. Thermostat
    1. 24 Volt AC
    2. Programmable, communicating-type w/ LCD screen
    3. Non-volatile program and setting memory: no batteries required for long-term operation
    4. Energy Star compliant

2.02 ACCESSORIES

B. Condensate Removal: Supply approved means to remove condensate for the furnace and MCHP.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

C. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation drawings and instructions.

D. Coordination: Coordinate any electrical or mechanical requirements for these connections.

3.02 EXAMINATION

E. Site Verification or Conditions: Verify that floor conditions are acceptable for product installation in accordance with manufacturer's instructions.

F. Footprint: Verify that floor space is acceptable for product installation in accordance with manufacturer's instructions.

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H. Condensate Removal: Verify that condensate removal locations are acceptable for product installation in accordance with manufacturer's instructions.

3.04 INSTALLATION

D. Certification: Verify that installers have valid certification from the manufacturer to install and service the Warm Air Micro-CHP System.

E. Warm Air Micro-CHP System: Install in accordance with manufacturer's installation instructions.

F. Accessories: Install in accordance with manufacturer's installation instructions.

END OF SECTION

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

MEMBER: *The Hydronics Institute*