SunTherm™ HEATING PRODUCTS

INSTALLATION MANUAL

MODULAR AIR HANDLER WITH HOT WATER HEATING
MODELS: MM SERIES

LIST OF SECTIONS

LIST OF FIGURES

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SECTION I: GENERAL

The following list includes important facts and information regarding the electric furnace and its inclusions.

1. Air handler is rated at either 120 volts AC or 240 volts AC at 60 Hertz
2. Air handler size varies by model
3. Four-wire thermostat operation for heating and cooling
4. Seven wire thermostat for heat pump operation.
5. Air Handlers equipped with blower for A/C or Heat Pump operation
6. This air handler is designed for multi position, upflow and horizontal application
7. This air handler must not be operated without the door installed

NOTE: This air handler and its components listed on the A/C and Heat Pump equipment sticker were listed in combination as a system by ETL for the United States and Canada.

SAVE THIS MANUAL FOR FUTURE REFERENCE

SECTION II: SAFETY

This is a safety alert symbol. When you see this symbol on labels or in manuals; be alert to the potential for personal injury.
Understand and pay particular attention to the signal words **DANGER, WARNING,** or **CAUTION.**

DANGER: indicates an **imminently** hazardous situation, which if not avoided, **will result in death or serious injury.**

WARNING: indicates a **potentially** hazardous situation, which if not avoided, **could result in death or serious injury.**

CAUTION: indicated a **potentially** hazardous situation, which if not avoided, **may result in minor or moderate injury.** It is also used to alert against unsafe practices and hazards involving property damage.

⚠WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance; or for additional information consult a qualified contractor, installer, or service agency.

⚠WARNING

FIRE OR ELECTRICAL HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death, or property damage.
A fire or electrical hazard may result causing property damage, personal injury or loss of life.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state, and national codes including, but not limited to; building, electrical, and mechanical codes.

IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HFC's) as of July 1, 1992. Approved methods of reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance

Safety Requirements

This appliance should be installed in accordance with all national and local building/safety codes and requirements, local plumbing or waste water codes, and other applicable codes. In the absence of local codes, install in accordance with the following codes.

- Standard for the Installation of Air Conditioning and Ventilating Systems (NFPA 90A)
- Standard for the Installation of Warm Air heating and Air Conditioning Systems (NFPA 90B)
- National Electrical Code (NFPA 70)
- Canadian Electrical Code, Part I (CSA C22.2) or ANSI/NFPA No. 70
- All local codes (State, City, and Township)

NOTE: All applicable codes take precedence over any recommendation made in these instructions.
SunTherm assumes no responsibility for units installed in violation of any code or regulation.

1. Refer to the unit rating plate for the air handler model number, and then see the dimensions page of this instruction for return air plenum dimensions in Figure 1. The plenum must be installed according to the above listed codes or the instructions in this manual.
2. Refer to the dimensions page of this instruction for the duct connector and combustible floor base dimensions shown in Figure 6. The duct connector and combustible floor base must be installed according to the instructions in this manual.
3. These models **ARE NOT** ETL listed or approved for installation into a **Manufactured (Mobile) Home**.
4. Provide clearances from combustible materials as listed under **Clearances to Combustibles.**
5. Provide clearances for servicing ensuring service access is allowed for the control box, electric elements, hot water coil and the blower.

⚠WARNING

Hot water from a boiler used to satisfy heating requirements can be heated to temperatures of 180°F. Parts containing water this hot can scald very quickly. Use extreme caution when servicing or performing maintenance on any parts containing hot water.

6. Check the rating plate and the power supply to be sure the electrical characteristics match.
7. Failure to carefully read and follow all instructions in this manual can result in malfunction of the air handler, death, personal injury, and/or property damage.
8. Electric air handler shall be installed so the electrical components are protected from water.
9. Installing and servicing heating/cooling equipment can be hazardous due to electrical components.
10. Only trained and qualified personnel should install repair or service heating/cooling equipment. Untrained service personnel can perform basic maintenance functions such as cleaning of exterior surfaces and replacing the air filters. Observe all precautions in the manuals and on the attached labels when working on this appliance.

11. These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances these instructions exceed certain local codes and ordinances, especially those who have not kept up with changing home and/ or HUD construction practices. These instructions are to be followed and are the minimum requirement for a safe installation.
12. The size of the unit should be based on an acceptable heat loss calculation for the structure. ACCA, Manual J or other approved methods may be used.
13. Check the rating plate and power supply to be sure that the electrical characteristics match. The 115 VAC models use nominal 115 VAC, 1 Phase, 60-Hertz power supply. DO NOT CONNECT THIS APPLIANCE TO A 50 HZ POWER SUPPLY OR A VOLTAGE ABOVE 130 VOLTS.
14. The 240 VAC models use nominal 240 VAC, 1 Phase, 60-Hertz power supply. DO NOT CONNECT THIS APPLIANCE TO A 50 HZ POWER SUPPLY OR A VOLTAGE ABOVE 250 VOLTS.
15. Ground connections MUST BE securely fastened to the control box and ground wires MUST BE secured to the ground lugs control box with terminals.

⚠WARNING

ALWAYS SHUT OFF ELECTRICITY AT THE DISCONNECT SWITCH OR TURN OFF THE CIRCUIT BREAKERS IN THE MAIN ELECTRICAL ENTRANCE BEFORE PREFORMING ANY SERVICE ON THE APPLIANCE.

GENERAL INFORMATION

This single piece air handler provides the flexibility for installation in any upflow, downflow, or horizontal application. The versatile models may be used with or without electric heat or hot water heat. The direct drive variable speed ECM motor, optional (3) speed PSC motor, or the (5) five speed X-13 motors provide a selection of air volume to match any application.

The unit can be positioned for bottom air return in the upflow position, top air return in the downflow position, or air return through the end of the unit in the horizontal position.

NOTE: Refer to the instructions in this manual for the proper downflow conversion kit and instructions on the proper conversion to downflow.

Inspection

As soon as the furnace is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. Before installing the air handler you should check the cabinet for screws or bolts which may have loosened in transit. There are no shipping or spacer brackets which need to be removed before startup.

See local Distributor for more information. Mortex Products, Inc assumes no liability for freight damage.

Also check to be sure all accessories such as heater kits, and coils are available. Installation of these accessories should be accomplished before the air handler is set in place or the connecting of the wiring, electric heat, ducts or piping.

Hydronic Heat			
Models	MM**OS	MM**OM	MM**OL
Hot Water Coil (Rows)	2, 3, 4	2, 3, 4	2, 3, 4
Blower Size (D x W)	10 x 7	10 x 7	12 x 9
Unit Voltage	115 VAC, 60 HZ, 1 PH		
Max. External S.P. (Duct) inwc	0.50		
Thermostat Circuit	24 VAC, 60 HZ, 40VA		

Table 1 Air Handler Model Specifications

Available Blower Motors

1. Standard Blower Motor - – VAR SPD ECM MOTOR
2. Optional Blower Motor - 3 SPD PSC MOTOR
3. Optional Blower Motor – 5 SPD X-13 MOTOR

DIMENSIONAL DATA MODULAR HYDRONIC HEAT

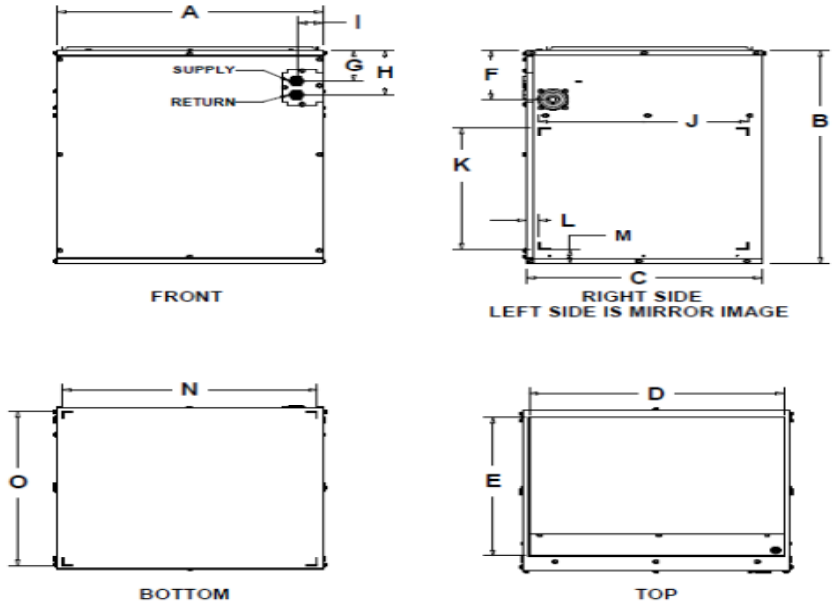


Figure 1: DIMENSIONAL DATA MODULAR HYDRONIC HEAT

Model	A	B	C	D	E	F	G	H	I
MM**OS	17.50	29.00	21.00	16.00	18.00	6.75	3.875	5.75	2.50
MM**OM	21.00	29.00	21.00	18.875	18.00	6.75	3.875	5.75	2.50
MM**OL	24.50	29.00	21.75	23.50	18.75	6.75	4.25	6.00	2.50

Model	J	K	L	M	N	O
MM**OS	19.25	16.50	1.125	1.9375	16.50	20.00
MM**OM	19.25	16.50	1.125	1.9375	20.00	20.00
MM**OL	19.25	16.50	1.125	1.9375	23.50	20.9375

Table 2: DIMENSIONAL DATA MODULAR HYDRONIC HEAT

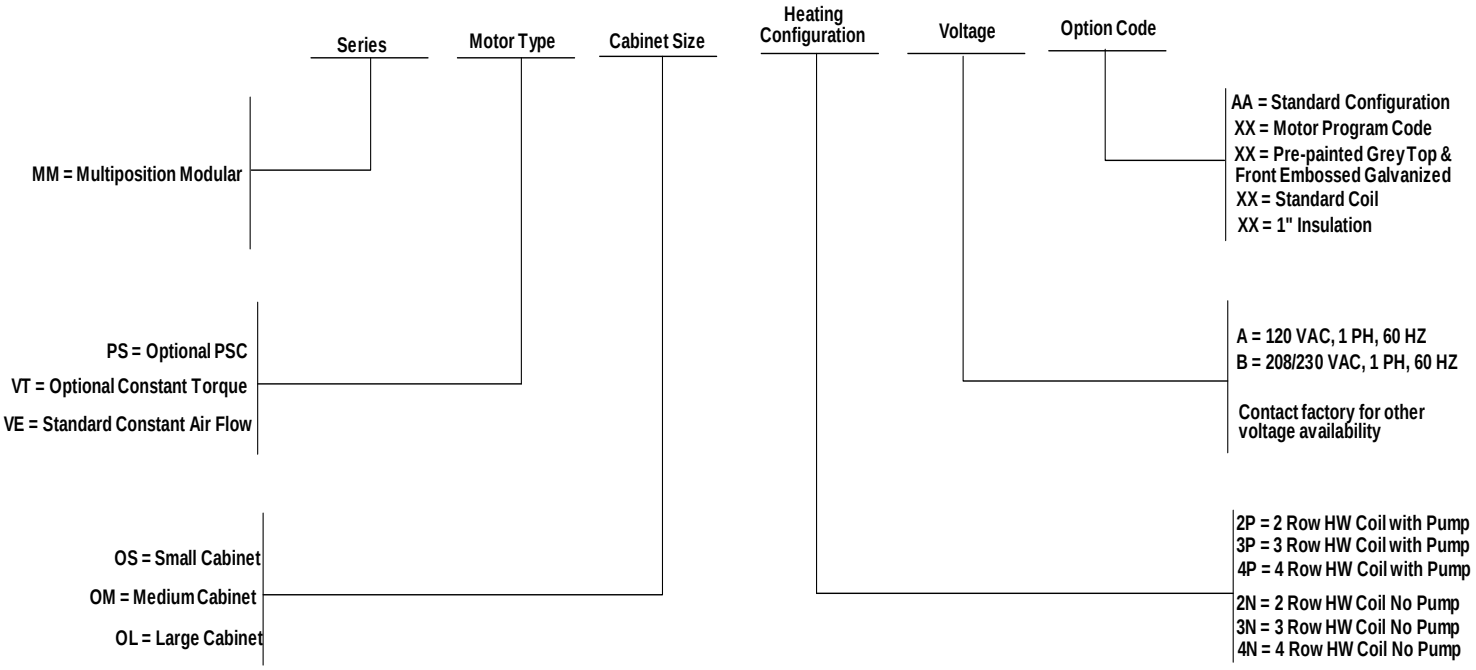


Table 3: Air Handler Model Nomenclature

NOTE: MM = Multiposition Modular "Heating Only".

FILTER BASE ASSEMBLY KIT – FIELD INSTALLED
86ET0002 – 16"X 20" X 2" Small Cabinet, **86ET0001** – 20" X 20" X 2" Medium Cabinet, **86ET0003** – 20" X 24" X 2" Large Cabinet

SECTION III: CLEARANCE AND RETURN AIR REQUIREMENTS

LOCATION

Access for servicing is an important factor in the location of any air handler. Provide a minimum of 30 inches in front of the appliance for access to the control box, heating elements, water pump, blower and air filters. This access may be provided by a closet door or by locating the appliance so that a wall or partition is not less than 30 inches from the front access Panel Location is usually predetermined. Check with owner's or dealer's installation plans. If location has not been decided, consider the following in choosing a suitable location.

1. Select a location with adequate structural support, space for service access, clearance for return and supply duct connections.
2. Normal operating sound levels may be objectionable if the air handler is placed directly over or under some rooms such as bedrooms, study, etc.
3. Caution should be taken to locate the unit so that supply and return air ducts are about the same length causing even air distribution of supply and return air to and from the living spaces.
4. Locate appliance where electrical supply wiring can be easily routed to main electrical panel and where electrical wiring will not be damaged.
5. Locate appliance where thermostat wiring can be easily routed to the thermostat and where the wiring will not be damaged.
6. Some states, cities and counties require additional insulation to be installed on the exterior casing of the air handler to prevent sweating. Refer to the state, city, county or local code for insulation requirement to be sure the installation is in compliance.
   It is recommended that air handlers installed in non-conditioned spaces be insulated on the exterior of the entire cabinet, including the front access panel with one (1) inch thick fiberglass with the vapor barrier on the outside.

Appliance Clearances

This appliance is approved for zero (0) inches clearance to combustible material on any part of the air handler exterior casing and the inlet or outlet ducts providing NO electric heater is being used. There is a one (1) inch clearance on the supply plenum and supply air duct when an electric heater is installed in the appliance. Refer to Table 4 for clearance to combustibles information.

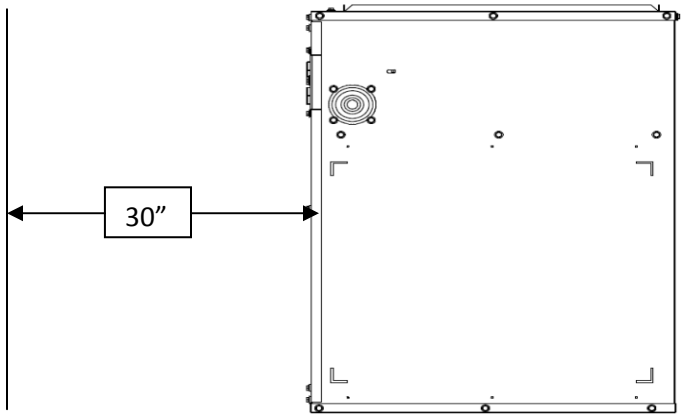


Figure 2: Clearance – Access for Service

MODEL	TOP (in)	BACK (in)	SIDES (in)	FRONT OF FURNACE		DUCT (in)
				ALCOVE (in)	CLOSET (in)	
Hydronic	0	0	0	30	6	0
Electric	0	0	0	30	6	1

Table 4: Clearances to Combustibles

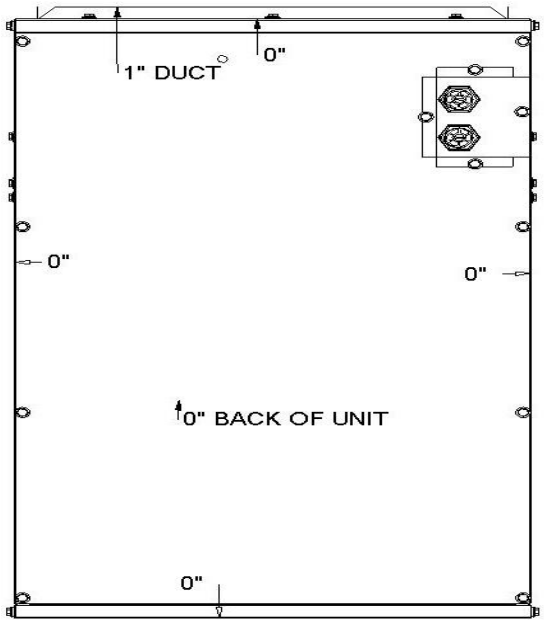


Figure 3: Closet Clearances

In order for the air handler to work properly, a closet or alcove must have a certain total free area opening for the return air.

For Air Handlers with a 1/3 HP Blower Motor On (MMVE, MMVT, MMPS OS models)

- Minimum 200 in² free area opening
- Use Return Grille or Coil Cabinet

For Air Handlers with a 1/2 HP Blower Motors On (MMVE, MMVT, MMPS OM models)

- Minimum 250 in² free area opening
- Use Return Grille, A/C Coil Cabinet, or any return grille with a minimum 250 in² free area opening

For Air Handlers with Hydronic Heat that use a 1.0 HP Blower Motor On (MMVE OL models)

- Minimum 390 in² free area opening
- Use Return Grille, or A/C Coil Cabinet, or any return grille with a minimum 390 in² free area opening

Return Air

Bottom Return Only – Recommended Grille Size
800 CFM – 20 X 20 Grille – 324 in²
1000 CFM – 20 X 25 Grille - 414 in²
1200 CFM – 25 X 25 Grille - 414 in²
1400 CFM – 25 X 30 Grille - 644 in²
1600 CFM – 25 X 30 Grille - 644 in²
1800 CFM – 30 X 30 Grille - 784 in²
2000 CFM – 30 X 35 Grille - 924 in²
2400 CFM – 30 X 40 Grille - 1064 in²

The return air opening can be located in in the floor, on a closet front door or in a side wall above the furnace casing. If opening for the return air is located in the floor, side walls, or closet door anywhere below the appliance casing, a 6 inch minimum clearance between the appliance and the wall or door must be provided on the side where the return is located to provide for proper air flow. The 6 inch minimum clearance is not required if there is a return grille installed above the appliance casing, providing the grille has a sufficient return air opening.

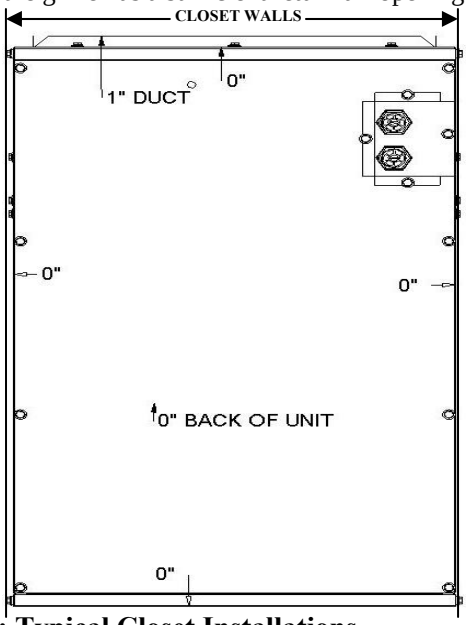


Figure 4: Typical Closet Installations

Provisions shall be made to permit the air in the rooms and the living spaces to return to the furnace. Failure to comply may cause a reduction in the amount of return air available to the blower, causing reduced air flow resulting in improper heating of the living space. The reduced air flow may cause the furnace to cycle on the limit causing premature heating element failure.

Upflow Accessory Filter Box Kit

Accessory filter box kit can be used on the return air end of the air handler when configured in the upflow position. The filter kit is placed over the return plenum in the floor and sealed to the plenum using sealant or caulking material and/or tape. The Air Handler is placed on top of the return filter box and the return opening sealed to prevent leaks.

Accessory filter box kit can be used on the return air end of the air handler when configured in the downflow position in place of a wall, door or ceiling mounted return filter grille.

NOTE: Make sure the flow arrow on the air filter is pointing towards the coil.

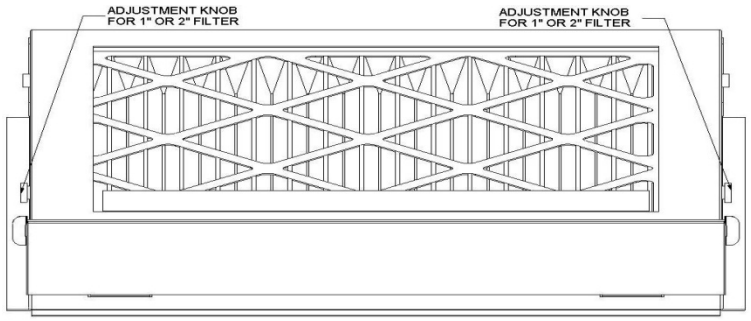


Figure 5: Accessory Air Filter Box for 1” or 2” Air Filters. Filter Size Adjustment knob is on both sides

SECTION IV: FURNACE & SUPPLY AIR DUCT INSTALLATION

AIRFLOW CONFIGURATION:

Unit is shipped from the factory arranged to be installed in an upflow or horizontal right to left air flow position. Horizontal right to left means, when facing the front of the unit, when the unit is laid on its side, the supply air opening is to the left and the return opening is to the right. These models are field convertible to a horizontal left to right air flow position

UPFLOW APPLICATION:

In an upflow installation the discharge outlet is at the top. Normal upflow installation will be in a closet or basement. If installed in a closet, the closet should have a platform framed in, that with an opening at the top of the platform centered in the closet that measure at least 12 inches in height. A filter frame and filter can be used that covers the opening and is sealed to prevent air by-passing the filter. A filter grille can be used that is located as described in RETURN AIR REQUIREMENTS. The minimum filter size is shown in the table below.

Standard Throw away Air Filter @ 300 ft/min or less
800 CFM = 20 x 20 x 1
1000 CFM = 20 x 25 x 1
1200 CFM = 20 x 30 x 1
1400 CFM = 25 x 30 x 1
1600 CFM = 25 x 30 x 1
1800 CFM = 30 x 30 x 1
2000 CFM = 30 x 40 x 1 or two 30 x 20 x 1
2400 CFM = 30 x 40 x 1 or two 30 x 20 x 1

Pleated Air Filter @ 500 ft/min or less
800 CFM = 16 x 16 x 1
1000 CFM = 18 x 20 x 1
1200 CFM = 20 x 20 x 1
1400 CFM = 20 x 20 x 1
1600 CFM = 20 x 25 x 1
1800 CFM = 20 x 30 x 1 or two 20 x 15 x 1
2000 CFM = 20 x 30 x 1 or two 20 x 15 x 1
2400 CFM = 25 x 30 x 1 or two 14 x 30 x 1

Pleated filters are not recommended for use with PSC Motors. The other option is to use the SunTherm Filter Base Accessory Kit. This filter base is placed on the closet floor and secured with screws. The unit is placed on top of the filter base and secured to the base with screws. Use seal strip, tape or calking to seal between the unit and the base.

Connect the supply air outlet to a plenum to the top of the unit and secure it with screws. Use a Non-tape sealant such as mastic or an aerosol sealant to seal duct leakage.
If installed in a basement, run supply and return duct work in accordance with local codes. Use a Non-tape sealant such as mastic or an aerosol sealant to seal duct leakage.

HORIZONTAL APPLICATION
Horizontal applications will normally be used in an attic or crawl space. This type of installation requires supply air plenum or duct to be connected to the supply collar and a return air plenum or duct be attached to the unit inlet collar. The supply ducts will be connected to the supply air plenum and routed thru the attic to a register in each room. Use a Non-tape sealant such as mastic or an aerosol sealant to prevent leaks in the ducts and the plenum.

The opposite end of the return air duct is attached to a return filter grille housing. The filter grille is usually located in a wall, just below the ceiling or the ceiling in a hallway. Use a Non-tape sealant such as mastic or an aerosol sealant to prevent leaks in the ducts and the plenum.

The unit is shipped to be installed without modification in a right to left configuration. See AIRFLOW CONFIGURATION for details.

DOWNFLOW APPLICATION:
The unit is designed for downflow configuration.
Flip the unit so the top is now the bottom of the unit.

INSTALLATION ON COMBUSTIBLE FLOORING

⚠WARNING

Combustible Floor Base MUST BE USED when the unit is being installed on combustible flooring. The unit cannot be installed on carpeting.
Failure to use the combustible floor base combustible flooring or installing the unit on carpeting could result in a fire causing personnel injury, property damage or loss of life.

Before installing the combustible floor base make sure that there is a minimum of R-12 insulation between the sheet metal and any wood or combustible flooring. Refer to Figure 6 for typical combustible floor base installation.

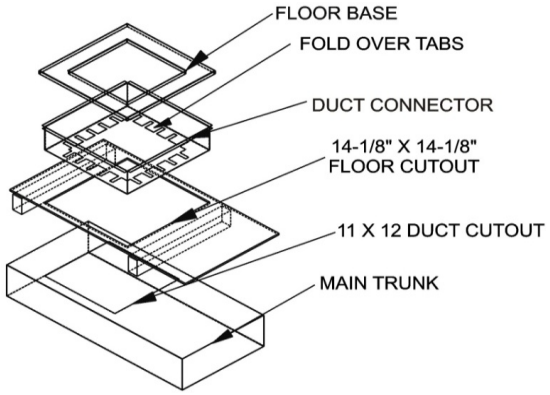


Figure 6: Combustible Floor Base Installation
Hot Water Piping:

SECTION V: FURNACE INSTALLATION

Installing the Air Handler

Closet Installation

Prior to installing the furnace make sure the holes are cut into the floor for the refrigerant tubing, the drain line, the electrical wiring, the thermostat wiring and the condenser control wiring.

1. Remove the top shipping cover and corner posts.
2. Remove the bottom shipping cover.
3. Remove the blower and control box access panel (door).
4. Place the unit into position using one of the following choices:

A. If the Combustible Floor Base is used you slide the unit on to the combustible floor base until the unit is touching the flanges on the back of the floor base.
B. If the Combustible Floor Base is not used you slide the unit over the duct opening until the opening in the unit lines up with the duct opening in the floor.

5. Secure the unit by one of the two choices:

A. If the Combustible Floor Base is used you secure the furnace to the floor by drilling two holes through the furnace base and the floor base at the right and left front inside corners of the cabinet. Use two screws to secure the furnace to the floor.
B. If the Combustible Floor Base is not used you secure the unit to the floor by drilling two holes through the furnace base at the left and right front inside corners of the cabinet. Use two screws to secure the unit to the floor.

6. Use calking, sealers, and/or tape to seal between the combustible floor base and the opening on the unit or between the opening on the unit and the duct in the floor.
7. Connect the electrical supply wires and the thermostat control wires in the control box.
8. Re-install the blower and control box access panel (door) and secure with the screws that were removed in step 2
9. Turn the power on to the unit by following the procedure in the Users Information Manual.
10. Set the thermostat to the desired temperature.

SECTION VI: HYDRONIC HEATING

Water Piping

All piping must be supported independent of coils to prevent vibration and stress on coil headers. Swing joints or flexible fittings must be provided to absorb expansion and contraction strains. Rigid piping reduces the effectiveness of vibration isolators. Coil water pipes must be adequately vented in order to prevent air binding. Units are provided with manual air vents mounted through the manifold panel.

"Massachusetts requires an electronically controlled pump timer that activates the pump every 6 hours for 60 seconds and limits the distance between the water heater and the air handler to 50 feet max."

If a residential water heater is used for space heating water, do not exceed a distance of 70' between the air handler and the water heater. The water heater should be the quick recovery type. Air handler and water heater must be located indoors and not subject to freezing temperatures.

MODEL	CFM	GPM	BTUH	LAT °F	LWT °F	APD IWC	WPD FT	ROWS	FPI
MM**OS2N	500	2.7	26,290	116.5	160	0.07	1.2	2	10
	600	3.0	29,630	113.5		0.09	1.5		
	700	3.4	32,690	111.1		0.12	1.8		
MM**OS3N	500	4.0	39,000	137.0		0.10	1.2	3	
	600	4.6	44,500	133.4		0.14	1.5		
	700	5.1	49,600	130.3		0.18	1.8		
MM**OS4N	500	4.9	47,500	152.6		0.13	2.1	4	
	600	5.6	54,740	149.1		0.18	2.7		
	700	6.3	61,510	146.0		0.23	3.3		
MM**OS2N	600	3.0	29,630	113.5		0.09	1.5	2	
	800	3.6	35,510	108.9		0.15	2.1		
	900	3.9	38,140	107.1		0.19	2.4		
MM**OS3N	600	4.6	44,500	133.4		0.14	1.5	3	
	800	5.6	54,300	127.6		0.23	2.2		
	900	6.0	58,700	125.7		0.28	2.5		
MM**OS4N	600	5.6	54,740	149.1		0.18	2.7	4	
	800	7.0	67,890	143.3		0.29	4.0		
	900	7.6	73,928	140.7		0.35	4.6		

Table 5: Hot Water Capacity-Boiler Loop 65°F EAT 180°F EWT 20°F Δt (No Pump) Small Cabinet OS Models

MODEL	CFM	GPM	BTUH	LAT °F	LWT °F	APD IWC	WPD FT	ROWS	FPI
MM**OM2N	900	4.4	42,780	111.8	160	0.14	1.2	2	10
	1000	4.7	45,680	110.1		0.16	1.4		
	1200	5.2	51,010	107.2		0.23	1.7		
MM**OM3N	900	6.2	60,500	130.0		0.21	2.5	3	
	1000	6.7	65,020	128.0		0.25	2.9		
	1200	7.5	73,410	124.4		0.34	3.7		
MM**OM4N	900	7.5	73,140	139.9		0.29	4.9	4	
	1000	8.1	78,830	137.7		0.34	5.2		
	1200	9.2	89,455	133.7		0.46	5.7		
MM**OM2N	1000	4.7	45,680	110.1		0.16	1.4	2	
	1200	5.2	51,010	107.2		0.23	1.7		
	1400	5.7	55,830	104.8		0.29	2.1		
MM**OM3N	1000	6.7	65,020	128.0		0.25	2.9	3	
	1200	7.5	73,410	124.4		0.34	3.7		
	1400	8.3	81,080	121.4		0.44	1.4		
MM**OM4N	1000	8.1	78,830	137.7		0.34	5.2	4	
	1200	9.2	89,455	133.7		0.46	5.7		
	1400	10.2	99,230	130.4		0.60	6.6		

Table 6: Hot Water Capacity-Boiler Loop 65°F EAT 180°F EWT 20°F Δt (No Pump) Med Cabinet OM Models

MODEL	CFM	GPM	BTUH	LAT °F	LWT °F	APD IWC	WPD FT	ROWS	FPI
MM**OL2N	1200	6.1	59,100	113.4		0.12	2.0	2	
	1400	6.7	65,130	110.9		0.15	2.4		
	1600	7.3	70,690	108.7		0.19	2.8		
MM**OL3N	1200	8.5	83,040	131.8		0.18	1.1	3	
	1400	9.5	92,390	128.9		0.23	1.4		
	1600	10.4	101,100	126.3		0.29	1.6		
MM**OL4N	1200	10.1	98,890	144.0		0.23	1.7	4	
	1400	11.4	111,020	141.1		0.31	2.1		
	1600	12.6	122,430	138.6		0.39	2.5		
MM**OL2N	1400	6.7	65,130	110.9		0.15	2.4	2	
	1600	7.3	70,690	108.7		0.19	2.8		
	1800	7.8	75,860	106.9		0.24	3.2		
MM**OL3N	1400	9.5	92,390	128.9		0.23	1.4	3	
	1600	10.4	101,100	126.3	160	0.29	1.6		10
	1800	11.2	109,250	124.0		0.36	1.9		
MM**OL4N	1400	11.4	111,020	141.1		0.31	2.1	4	
	1600	12.6	122,430	138.6		0.39	2.5		
	1800	13.7	133,200	136.2		0.47	3.0		
MM**OL2N	1800	7.8	75,860	106.9		0.24	3.4	2	
	2000	8.3	80,690	105.2		0.28	3.9		
	2100	8.5	83,000	104.4		0.31	4.2		
MM**OL3N	1800	9.5	92,390	128.9		0.36	5.2	3	
	2000	12.0	116,930	121.9		0.43	8.4		
	2100	12.4	120,600	120.0		0.46	8.9		
MM**OL4N	1800	13.7	133,200	136.2		0.47	11.0	4	
	2000	14.7	143,400	134.1		0.57	12.7		
	2100	15.4	147,245	132.0		0.46	13.9		

Table 7: Hot Water Cap-Boiler Loop 65°F EAT 180°F EWT 20°F Δt (No Pump) Large Cabinet OL Models

HOT WATER CAPACITY-WITH FACTORY PUMP 65°F EAT @ STATED EWT										
MODEL	CFM	GPM	BTUH 120°F	BTUH 130°F	BTUH 140°F	BTUH 150°F	BTUH 160°F	APD IWC	ROWS	FPI
MM**OS2P	500	4	13,600	16,200	18,840	21,510	24,200	0.07	2	10
	600		14,890	17,760	20,660	23,600	26,570	0.09		
	700		15,990	19,090	22,230	25,410	28,620	0.12		
MM**OS3P	500		18,160	21,580	25,000	28,500	32,000	0.10	3	
	600		20,170	24,000	27,840	31,700	35,600	0.14		
	700		21,900	26,000	30,280	34,500	38,800	0.18		
MM**OS4P	500		21,870	25,930	30,015	34,110	38,225	0.13	4	
	600		24,620	29,215	33,820	38,460	43,115	0.18		
	700		27,050	32,108	37,195	42,305	47,440	0.23		
MM**OS2P	600		14,890	17,760	20,660	23,600	26,570	0.09	2	
	800		16,960	20,250	23,600	26,990	30,420	0.15		
	900		17,810	21,280	24,810	28,390	32,010	0.19		
MM**OS3P	600		20,170	24,000	27,840	31,700	35,600	0.14	3	
	800		23,400	27,900	34,300	34,160	41,600	0.23		
	900		24,800	29,500	34,300	39,160	44,000	0.28		
MM**OS4P	600		24,620	29,215	33,820	38,460	43,115	0.18	4	
	800		29,210	34,680	40,190	45,725	51,295	0.29		
	900		31,140	36,990	42,845	48,800	54,755	0.35		

Table 8: Hot Water Capacity- -with Factory Pump 65°F EAT @ Stated EWT - Small Cabinet OS Models

MODEL	CFM	GPM	BTUH 120°F	BTUH 130°F	BTUH 140°F	BTUH 150°F	BTUH 160°F	APD IWC	ROWS	FPI
MM**OM2P	900	4	19,620	23,420	27,270	31,170	35,110	0.13	2	10
	1000		20,510	24,500	28,540	32,630	36,770	0.16		
	1200		22,050	26,350	30,720	35,150	39,630	0.22		
MM**OM3P	900		25,940	30,920	35,960	41,060	46,210	0.20	3	
	1000		27,230	32,470	37,780	43,160	48,580	0.24		
	1200		29,440	35,140	40,910	46,760	52,670	0.33		
MM**OM4P	900		31,895	37,790	43,710	49,645	55,595	0.29	4	
	1000		33,836	40,100	46,385	52,685	59,010	0.34		
	1200		37,260	44,165	51,104	58,065	65,045	0.46		
MM**OM2P	1000		20,510	24,500	28,540	32,630	36,770	0.16	2	
	1200		22,050	26,350	30,720	35,150	39,630	0.22		
	1400		23,340	27,910	32,550	37,260	42,040	0.29		
MM**OM3P	1000		27,230	32,470	37,780	43,160	48,580	0.24	3	
	1200		29,440	35,140	40,910	46,760	52,670	0.33		
	1400		31,270	37,350	43,510	49,750	56,070	0.43		
MM**OM4P	1000		33,836	40,100	46,385	52,685	59,010	0.34	4	
	1200		37,260	44,165	51,104	58,065	65,045	0.46		
	1400		40,195	47,660	55,150	62,670	70,220	0.60		

Table 9: Hot Water Capacity- -with Factory Pump 65°F EAT @ Stated EWT - Medium Cabinet OM Models

MODEL	CFM	GPM	BTUH 120°F	BTUH 130°F	BTUH 140°F	BTUH 150°F	BTUH 160°F	APD IWC	ROWS	FPI
MM**OL2P	1200	7	28,770	34,300	39,900	45,550	51,260	0.12	2	10
	1400		30,880	36,840	42,880	48,980	55,140	0.15		
	1600		32,720	39,050	45,470	51,970	58,540	0.19		
MM**OL3P	1200		37,800	45,010	52,290	59,640	67,050	0.18	3	
	1400		40,860	48,690	56,600	64,590	72,660	0.23		
	1600		43,530	51,890	60,360	68,910	77,550	0.29		
MM**OL4P	1200		44,170	52,530	60,960	69,460	78,020	0.23	4	
	1400		48,080	57,220	66,440	75,750	85,130	0.31		
	1600		51,490	61,310	71,230	81,250	91,340	0.39		
MM**OL2P	1400		30,880	36,840	42,880	48,980	55,140	0.15	2	
	1600		32,720	39,050	45,470	51,970	58,540	0.19		
	1800		34,340	41,010	47,770	54,620	61,550	0.24		
MM**OL3.P	1400		40,860	48,690	56,600	64,590	72,660	0.23	3	
	1600		43,530	51,890	60,360	68,910	77,550	0.29		
	1800		45,870	54,710	63,670	72,720	81,870	0.36		
MM**OL4P	1400		48,080	57,220	66,440	75,750	85,130	0.31	4	
	1600		51,490	61,310	71,230	81,250	91,340	0.39		
	1800		54,490	64,910	75,450	86,090	96,820	0.47		
MM**OL2P	1800		34,340	41,010	47,770	54,620	61,550	0.24	2	
	2000		35,780	42,750	49,820	56,990	64,240	0.28		
	2100		36,450	43,550	50,770	58,080	65,480	0.31		
MM**OL3P	1800		45,870	54,710	63,670	72,720	81,870	0.36	3	
	2000		47,960	57,220	66,610	76,110	85,710	0.43		
	2100		48,920	58,380	67,970	77,670	87,480	0.46		
MM**OL4P	1800		54,490	64,910	75,450	86,090	96,820	0.47	4	
	2000		57,160	68,120	79,200	90,400	101,710	0.57		
	2100		58,380	69,590	80,930	92,390	103,750	0.62		

Table 10: Hot Water Capacity-with Factory Pump 65°F EAT @ Stated EWT - Large Cabinet OL Models

⚠WARNING

Air handler must be located so that if any connections should leak, water will not cause damage to the adjacent area. When such locations can't be avoided, a suitable drain pan should be installed under the air handler, not over 1-1/2" deep, with minimum length and width at least 2" greater than the air handler dimensions and connected to an adequate drain. Under no circumstances is the manufacturer to be held libel for any water damage in connection with this air handler.

Total hot water piping should not exceed 140 feet. All hot water piping to the coil should be 3/4 inch ID (7/8 inch OD) copper. CPVC piping may be used in applications where the water temperature does not exceed 150°F. It is recommended a water isolation valve and a union be placed in the water lines to and from the coil, near the coil, for serviceability, repair or replacement of the coil.

A thermal expansion tank is recommended on any closed loop system to relieve thermal expansion due to pressure increase.

⚠WARNING

Toxic chemicals used for treatment of boilers or non-potable water heating appliances shall never be introduced into a potable water space heating system.

After piping has been installed, allow the system to fill with water and check connections for leaks. To insure complete filling of the system, follow start-up procedure.

⚠WARNING

When system requires water at temperatures higher than required for other uses, a means such as a mixing valve shall be installed to temper the water for those uses in order to reduce the scald hazard potential.

SECTION VII: LINE VOLTAGE WIRING

Power Supply Wiring

The unit internal wiring is complete except for the power supply and the thermostat wires. See wiring diagram and/or Tables 11 and 12 for wire size, fuse/circuit breaker size, and ground wire sizes. The use of cable connectors on incoming power supply wires to relieve any strain on wiring is recommended. Follow the steps below to connect the power supply wires.

Single Circuit Line Wiring Connections

1. Remove the blower and control box access panel (door).
2. Remove the control box cover.
3. Install the cable connectors on the 7/8" dia holes on the right side of the control box.
4. Strip ½" of the insulation on the end of each wire.
5. Insert the wires through the holes in the casing and through the cable connectors.
6. Insert the black wire into the L1 screw terminal on the power terminal block and tighten the set screw to clamp down on the wire.
7. Insert the white or red wire into the L2 screw terminal on the power terminal block and tighten the set screw to clamp down on the wire.
8. Insert the green wire into the ground lug and tighten the set screw.

NOTE: The furnaces are equipped with either one power terminal block. There are no circuit breakers to protect the wiring inside of the furnace in the event of a short circuit. There is a 3 amp fuse located on the 24 VAC circuit to protect the components in case of a short circuit

Circuit breakers in the main entrance are used to protect the branch circuit wiring between the furnace and the home's breaker panel. A fused switch should be installed at the air handler to protect the air handler wiring in case of a short circuit. General wire and breaker sizes are shown in Tables 11 and 12. If sheathed cable is used, refer to NEC National Electrical Code (NFPA 70) or the Canadian Electrical Code, Part I (CSA C22.1) and local codes for additional requirements concerning supply circuit wiring.

IMPORTANT - All installation on field wiring must be rated at 60ºC or higher. Please refer to the wiring diagrams on the furnace or the tables this manual for more information.

IMPORTANT - Refer to the NEC National Electrical Code (NFPA 70) or the Canadian Electrical Code, Part I (CSA C22.1) and local codes for wiring material requirements.

	AIR HANDLER MODELS					
	MMVEOS	MMVTOS	MMPSOS	MMVEOM	MMVTOM	MMPSOM
Indoor Blower Type	ECM	Constant Torque	PSC	ECM	Constant Torque	PSC
Indoor Blower Amps	1.80	2.72	4.40	2.31	2.72	7.70
Circuit Load - FLA - 120 VAC	2.00	2.92	4.60	2.51	2.92	7.90
Min. Wire Sizw (90°C)	#14	#14	#14	#14	#14	#14
Min. Wire Sizw (75°C)	#14	#14	#14	#14	#14	#14
Min. Wire Sizw (60°C)	#14	#14	#14	#14	#14	#14
Ground Wire Size	*	*	*	*	*	*
Max Fuse / Circuit Breaker Size	15	15	15	15	15	15

Table 11: Wiring Requirements – 120 VAC Hydronic Small and Medium Cabinet Models

+ Refer to the National Electrical Code Table 250-95 for Non-Sheathed Conductor Ground Wire.

* Ground conductor **must be the same size and temperature rating** as the other conductors listed in Table 11.

** = Model Series – MM

	AIR HANDLER MODELS		
	MMVEOL	MMVTOL	MMPSOL
Indoor Blower Type	ECM	Constant Torque	PSC
Indoor Blower Amps	8.48	8.48	11.00
Circuit Load - FLA - 120 VAC	8.70	8.70	11.20
Min. Wire Sizw (90°C)	#14	#14	#14
Min. Wire Sizw (75°C)	#14	#14	#14
Min. Wire Sizw (60°C)	#14	#14	#14
Ground Wire Size	*	*	*
Max Fuse / Circuit Breaker Size	15	15	15

Table 12: Wiring Requirements – 120 VAC Hydronic Large Cabinet Models

+ Refer to the National Electrical Code Table 250-95 for Non-Sheathed Conductor Ground Wire.

* Ground conductor **must be the same size and temperature rating** as the other conductors listed in Table 12.

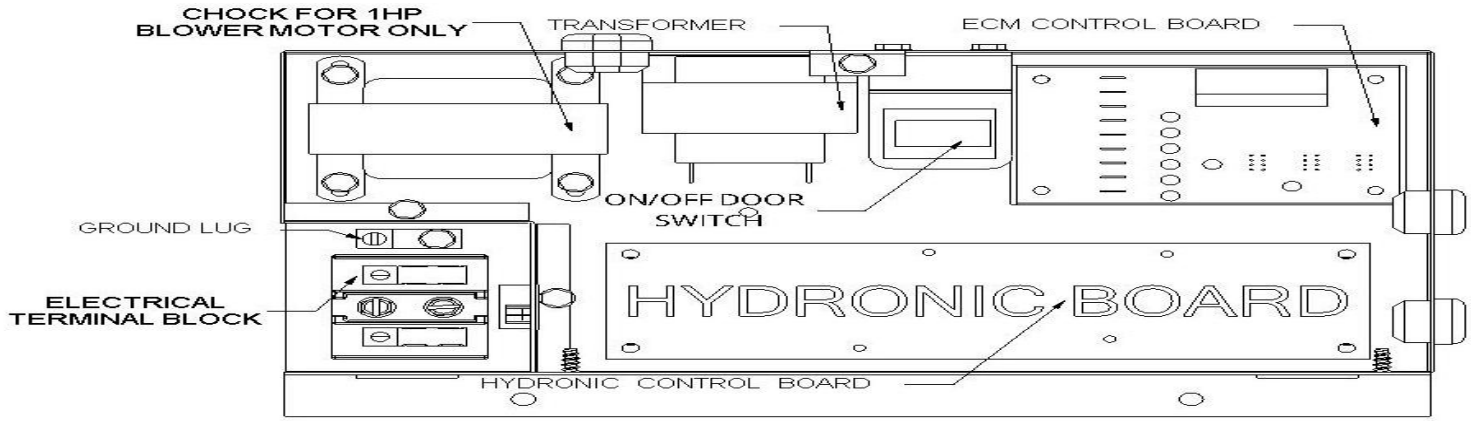


Figure 7: Component Locations – Hydronic Heat Control Box No Pump

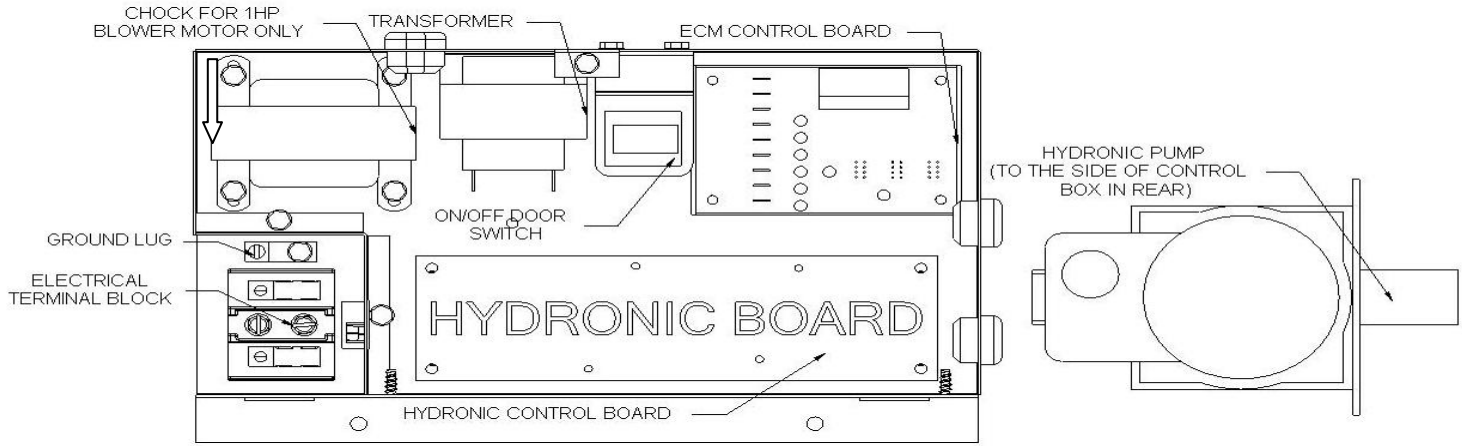


Figure 8: Component Locations – Hydronic Heat Control Box with Pump

⚠WARNING

For personal safety be sure to turn the electrical power "OFF" at the main entrance (Home Circuit Breaker Box) and at the unit control box circuit breakers before attempting any service or maintenance operations. Homeowners should never attempt to perform any maintenance which requires opening the air handler control box door.

POWER SUPPLY CONNECTIONS

If the air handler has been installed prior to installing the electric heaters or if an older unit is being replaced, the supply power wires must be checked to make sure the wires are the proper sizes to handle the current load for the heaters Refer to Tables 11 and 12 for correct wire size. If the supply power wire size is incorrect, new wires will need to be installed. Follow the instructions "Power Supply Wiring" on page 10 of these instructions for proper installation.

LOW VOLTAGE CONNECTIONS

If the air handler was previously installed, nothing will need to change on the low voltage wiring. If this is a new installation refer to figures on page 14 and 15 of these instructions.

SECTION VIII: THERMOSTAT WIRING AND CONNECTIONS

Thermostat Wiring

Thermostat wires connect through side of furnace and should be no smaller than 22 gauge. Refer to Table 13 for recommended wire gauge, lengths and maximum current for each wire gauge.

Max. Thermostat Wire Length	Thermostat Wire Gauge	Thermostat Wire Maximum Current	Transformer Maximum Current
0 - 100 Feet	22	4.0 Amps	1.6667 Amps
0 - 125 Feet	20	7.0 Amps	1.6667 Amps
0 - 250 Feet	18	10.0 Amps	1.6667 Amps

Table 13: Low Voltage Wire Gauge and Max Lengths

Thermostat wires can enter through the side or top of the unit. When bringing wiring through the top or side of the furnace, cable connectors must be installed to hold wiring in place and to relieve any strain on the wiring.

The use of a five-conductor cable from the thermostat to the furnace is recommended for typical heating or heating/cooling installations with a two or three-conductor cable from the furnace to the condenser. The typical heating/cooling connections are listed in Tables 14, 15 and 16.

A seven-conductor cable from the thermostat to the furnace is recommended for a typical heat pump installation with a five-conductor cable from the furnace to the condenser.

The thermostat wire colors and the typical heat pump heating/cooling connections are listed in Figures 10, 11, 12, 13, 14, 15 and 16. Thermostat wire color code can be found in Tables 14, 15 and 16.

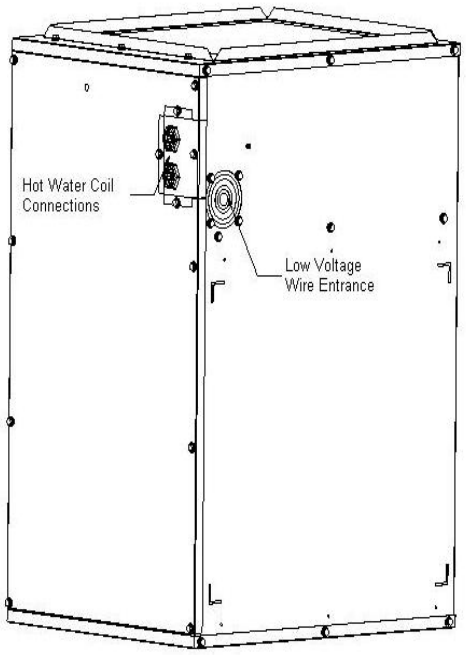


Figure 9: Hydronic Control Box Wiring Connection Locations

Thermostat Installation

The thermostat heat anticipator must be-set at 0.4 Amps if the thermostat has a manual heat anticipator adjustment. This setting should be checked at the time of installation.

The thermostat may be a “self-setting" type in which case no heat anticipator setting will be found on the thermostat, eliminating the need for any field adjustment.

Thermostat should be located on an inside wall in an open area to more closely regulate average room air, preferably, where there is air movement back to furnace. Locating height of thermostat is important. Thermostat should be located preferably in a hall way upstream from the furnace return airflow, not within three feet of from any windows and 52 to 66 inches above the floor.

DO NOT place the thermostat within three feet of any of the furnace supply air registers
DO NOT place the thermostat within three feet of any of the air conditioner supply air registers

Maintenance, operating and/or programming instructions are in the envelope accompanying the thermostat. Give the envelope to the home owner.

⚠ CAUTION

Do not locate thermostat within three feet of any of the following items:

1 Furnace supply air registers
2 Cooling unit supply air registers
3 Lights or heat lamps
4 Aquariums
5 Televisions, stereo, amplifiers, surround sound systems
6 Stoves or any cooking appliance
7 Refrigerator
8 Washer and/or dryer
9 Hot water tank
10 Sink or near any hot water
11 Within 15 feet of any electric space heater
12 Within two feet of any sunlight

Separate Heating and Cooling System; Same Thermostat

If the furnace and the cooling unit have separate transformers be sure to use a thermostat with isolated heating and cooling contacts “RC” and “RH” to prevent interconnection of Class II 24 Volt Systems Refer to Figures 10 thru 16. Cycle furnace and the air conditioner separately to make sure it will operate correctly.

Most new thermostats have separate heating and cooling contacts for use with homes that have a air handler and air conditioner that are completely separate and each have a 24 VAC transformer for system control. These thermostats have a “RC” terminal for cooling and a “RH” terminal for heating. Connect the cooling unit red wire from the “R” terminal on the outdoor unit to the “RC” terminal on the thermostat and the RED air handler pigtail wire to the “RH” terminal on the thermostat. Refer to Figures 10 thru 16 for typical low voltage wire connections.

If you have separate furnace and air conditioner with separate transformers and your thermostat does not have the “RC” and “RH” terminals it is recommended that you purchase a new thermostat. If the furnace and air conditioner are both connected to the thermostat “R” terminal it can cause transformer burnout or it can cause either the furnace or air conditioner control system to go into lockout.

Separate Heating and Cooling Units, Separate Thermostats

If the heating/cooling system in your house is a central heating and cooling system but, the furnace and the cooling unit are controlled by separate thermostats, then the use of a thermostat interlock switch is required in order to prevent the furnace and the air conditioner from operating at the same time.

⚠ CAUTION

When using separate thermostats a thermostat interlock system must be provided to prevent simultaneous operation of the furnace and air conditioner. Simultaneous operation can result in equipment overheating, equipment damage, and wasted energy.

Do Not connect the Yellow wire to the thermostat unless an outdoor unit is installed.

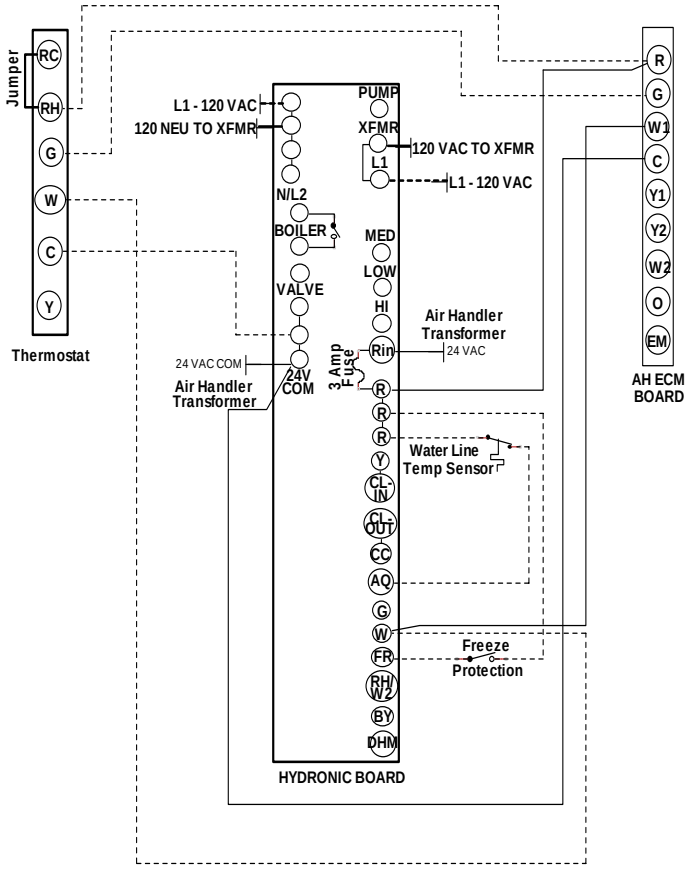


Figure 10 Typical Hydronic Heat Wiring Diagram with Freeze Protection (FP) and Aquastat (AQ)

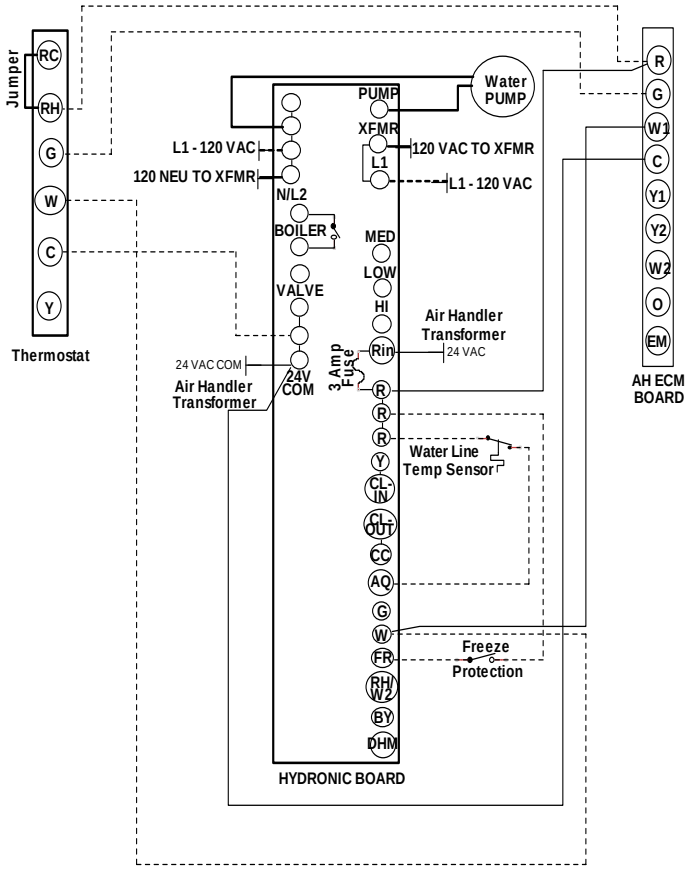


Figure 11: Typical Hydronic Heat Wiring Diagram with Freeze Protection (FP) Aquastat (AQ) and Pump

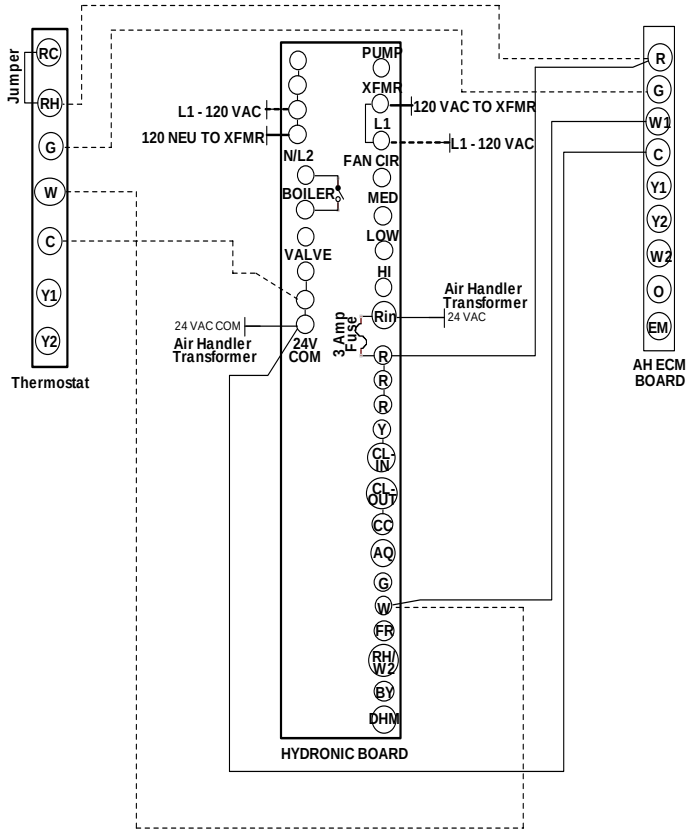


Figure 12: Typical Hydronic Heat Wiring Diagram

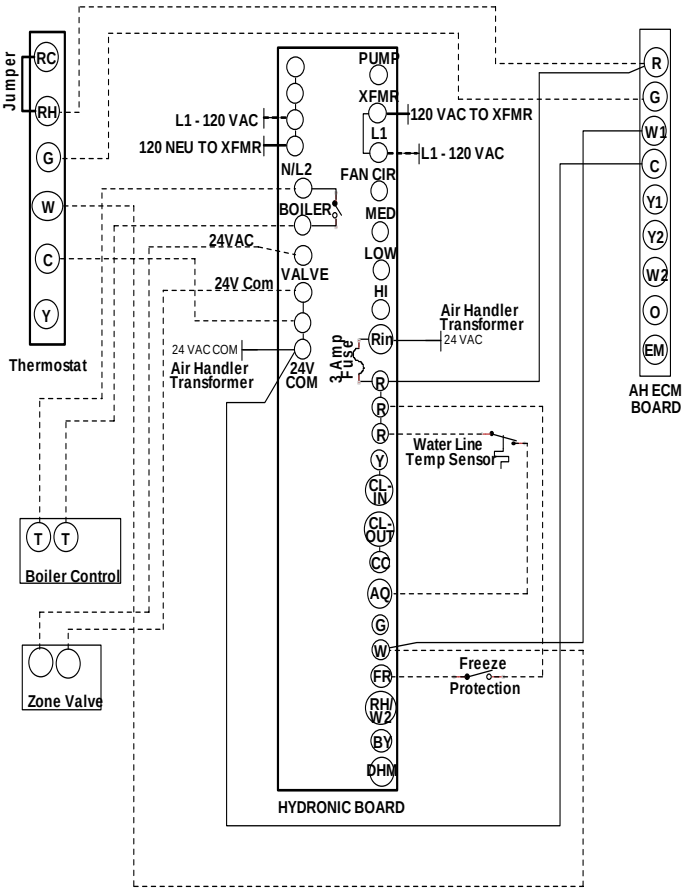


Figure 13: Typical Hydronic Heat Wiring Diagram with FP, AQ, Boiler Loop and Zone Valve

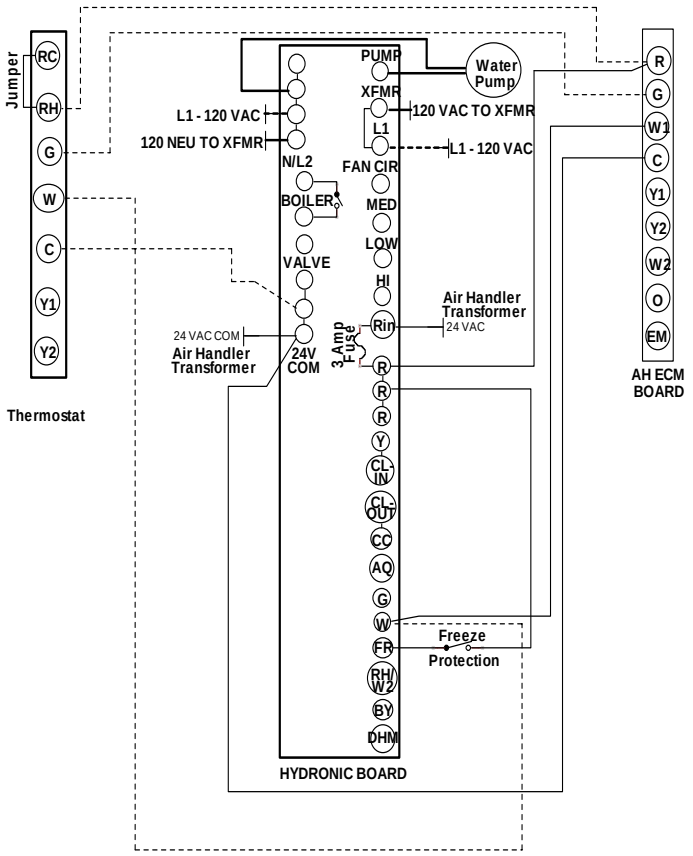


Figure 14: Typical Hydronic Heat Wiring Diagram with Freeze Protection (FP) and Pump

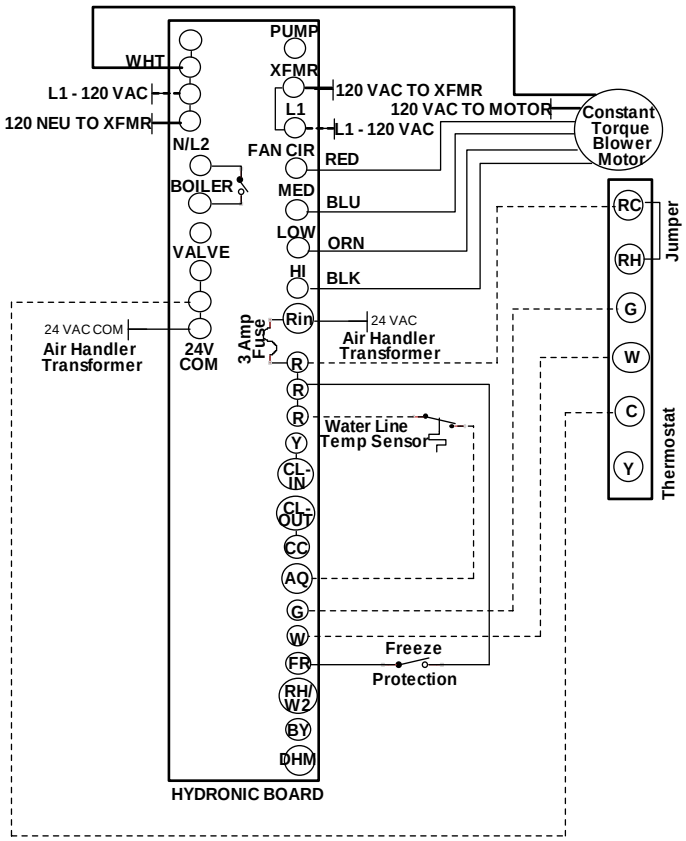


Figure 16: Typical Hydronic Heat Wiring Diagram with Freeze protection (FP) and Aquastat (AQ)

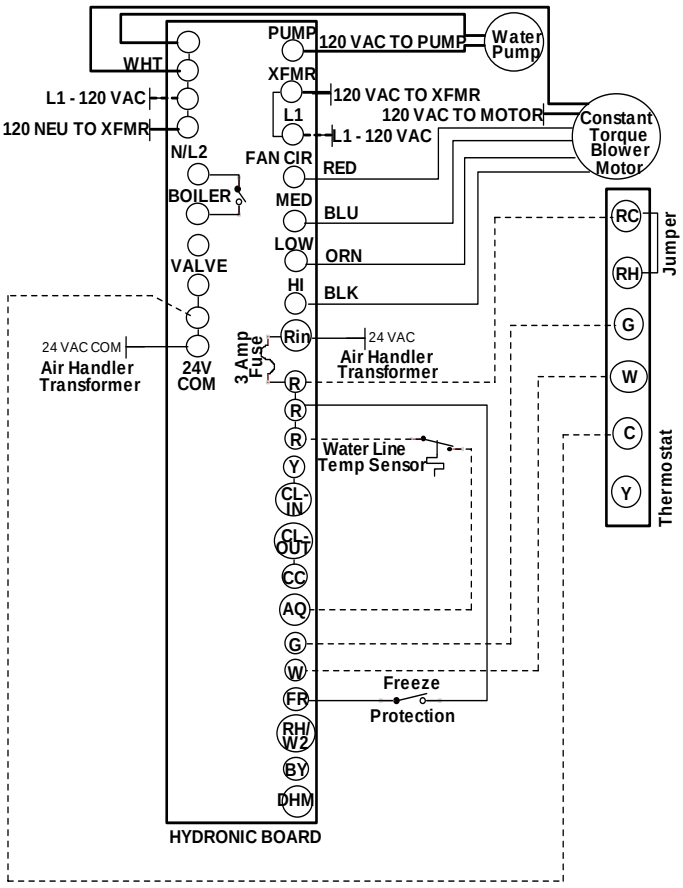


Figure 15: Typical Hydronic Heat Wiring Diagram with C.T. Motor, FP, AQ and Pump

Wire Color	Description	Letter Code	Thermostat Connection
RED	24 VAC	R	R
WHITE	Heat (1st Stage Heat)	W	W or W1
GREEN	Indoor Fan	G	G
YELLOW	24 VAC Common	C	C

Table 14: Recommended Heating Thermostat Wire Connections.

Wire Color	Description	Letter Code	Thermostat Connection
RED	24 VAC	R	R
WHITE	Heating Stage 1	W	W or W1
BLACK	Heating Stage 2	BL	W2
GREEN	Indoor Fan	G	G
YELLOW	Cooling - Stage 1	Y	Y or Y1
BLUE	Cooling - Stage 2	Y2	Y2
BROWN	24 VAC Common	C	C

Table 15: Recommended Heating / Cooling Thermostat Connections.

Wire Color	Description	Letter Code	Thermostat Connection
RED	24 VAC	R	R
WHITE	Heating Stage 1	W	E or W1
BLACK	Heating Stage 2	BL	W2
GREEN	Indoor Fan	G	G
YELLOW	Cooling - Stage 1	Y	Y or Y1
BLUE	Cooling - Stage 2	Y2	Y2
ORANGE	Heat Pump Reversing Valve	ORN	O
BROWN	24 VAC Common	C	C

Table 16: Recommended Heating / Cooling / Heat Pump Thermostat Wire Connections.

Note: Transformer secondary wire color is yellow. Place the yellow transformer secondary wire on the piggyback terminal with the green wire located on the COM terminal on the AY1014 (PSC Motors) or AY1015 (ECM or C.T. Motors) Hydronic Control Board.

Typical Heating/Cooling Thermostat Wiring Connections

1. Remove blower / control box access door.
2. Remove the control box cover.
3. Install a grommet or strain relief in the 9/16" hole on the top and the right side of the air handler casing to protect the thermostat wire cable.
4. Strip ½" of the insulation on the end of each wire.
5. Insert the wire cable from the thermostat thru the 9/16" hole into the control box and place the thermostat wire cable next to the low voltage pigtails. Secure the thermostat wire cable with a strain relief to prevent wire connections from being pulled apart.
6. Connect the Red (24 VAC) supply thermostat wire to the Red low voltage pigtail wire and secure with a wire nut.
7. Connect the White (First stage heating) thermostat wire to the White low voltage pigtail wire and secure with a wire nut.
8. Connect the Green (Indoor fan) thermostat wire to the Green low voltage pigtail wire and secure with a wire nut.
9. Connect the Yellow (Air conditioning) wire from the thermostat with the Yellow low voltage pigtail wire on the air handler and with the Red wire from the compressor contactor on the condenser unit. Fasten the three wires together securely with a wire nut.
10. Connect the Grey (24 VAC Common) wire from the thermostat with the Grey low voltage pigtail wire on the air handler and with the Grey (Common) wire from the compressor contactor on the outdoor unit. Fasten the three wires together securely with a wire nut.
11. Connect the Brown (2nd stage heating) thermostat wire to the brown low voltage pigtail wire and secure with a wire nut.
12. If a two stage outdoor unit is used then connect the "W2" wire from the outdoor unit to the brown wires discussed in step 11 and secure with a wire nut.

NOTE: If single stage thermostat is used on a two stage air handler connect the black and the white air handler pigtail wires and the white thermostat wire together; then, secure all three wires with a wire nut.

Typical Heat Pump - Heating/Cooling Thermostat Wiring Connections

1. Remove the blower / control box access panel.
2. Remove the control box cover.
3. Install a grommet or a strain relief in the 9/16" diameter hole on the top and the right side of the air handler casing to protect the thermostat wire cable.
4. Strip ½" of the insulation on the end of each wire.
5. Insert the wire cable from the thermostat thru the 9/16" hole into the control box and place the thermostat wire cable next to the low voltage pigtails. Secure the thermostat wire cable with a strain relief to prevent wire connections from being pulled apart.
6. Connect the Red (24 VAC) supply wire from the thermostat to the Red low voltage pigtail wire on the air handler and with the Red wire from the "R" terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
7. Connect the White (first stage heating) wire from the thermostat to the White low voltage pigtail wire on the air handler and the White wire from the "E" terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
8. Connect the Green (indoor fan) wire from the thermostat to the Green low voltage pigtail wire on the air handler and securely fasten the two wires together with a wire nut.
9. Connect the Red wire from the "Y" terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
10. Connect the Grey (24 VAC Common) wire from the thermostat with the Grey low voltage pigtail wire on the air handler and with the Grey (Common) wire from the "C" terminal on the outdoor unit. Fasten the three wires together securely with a wire nut.
11. Connect the Orange (Reversing Valve Solenoid) wire from the thermostat with the Orange wire from the "O" terminal on the condenser unit. Fasten the two wires together securely with a wire nut.

12. Connect the Brown (2nd stage heating) thermostat wire to the brown low voltage pigtail wire and secure with a wire nut.
13. If a two stage outdoor unit is used then connect the "W2" wire from the outdoor unit to the brown wires discussed in step 12 and secure with a wire nut.

NOTE: If single stage thermostat is used on a two stage air handler connect the brown and the white air handler pigtail wires and the white thermostat wire together; then, secure all three wires with a wire nut.

SECTION IX: MOTOR, BLOWER AND FURNACE STARTUP SECTION

⚠WARNING

To avoid personal injury or property damage, make certain that the motor leads cannot come into contact with non-insulated metal components of the unit.

Selecting the X-13 Blower Speed

This furnace uses the new X-13 high efficiency motor. This motor operates on 240 VAC. The motor speed tap are 24 VAC, 0.03 amps, 60 Hz, 1 PH. The speed taps can be changed by removing the black wire from the isolation relay terminal #4 or the red wire from the isolation relay terminal #6 and connecting either the blue, orange, or purple wire to the terminal. Table 17 shows the X-13 motor lead connection labeling and the connection definitions.

Terminal	Connection
C	Speed Tap Common - 24 VAC Common
L	Supply Voltage - 240 Vac Line 1
G	Ground Connection
N/L2	Supply Voltage - 240 Vac Line 2
1	Low Speed Tap - 24 VAC Input
2	Medium-Low Speed Tap - 24 VAC Input
3	Medium Speed Tap - 24 VAC Input
4	Medium-High Speed Tap - 24 VAC Input
5	High Speed Tap - 24 VAC Input

Table 17: X-13 Motor Terminal Connections

Total 24 VAC circuit amps are 0.14 amps.

Change Motor Speeds - X-13 Motor

1. Turn off **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
2. Remove the blower door and switch furnace circuit breaker(s) to "OFF".
3. Disconnect the wire from the isolation relay terminal and reconnect the desired wire to the terminal. Here is the X-13 motor speed tap wire color code.
   Black wire is High Speed, Orange wire is Medium High Speed, Blue wire is Medium Speed, Purple wire is Medium Low Speed, and Red wire is Low Speed.
4. Turn the circuit breakers on and reinstall air handler blower door.
5. Turn on **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
6. Set the thermostat to the desired temperature.

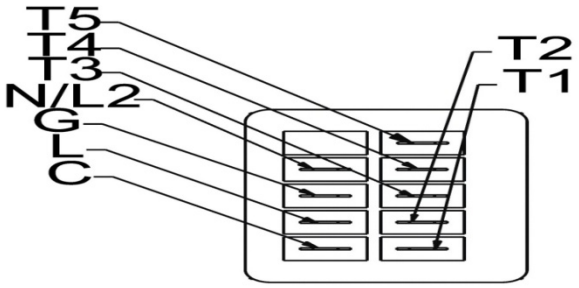


Figure 17: X-13 Motor Terminals

Replacing the X-13, ECM, 3/4 HP PSC and 1 HP PSC Blower Motor

1. Turn off all electrical supply circuits to the air handler at the main service panel.
2. Remove air handler blower door and switch the air handler circuit breaker(s) to "OFF"
3. Disconnect the power cable and the speed tap cable that connect to the blower motor.
4. Remove the two screws on the right side and the two screws on the left side of the blower mounting plate. Refer to Figure 19 for screw locations.

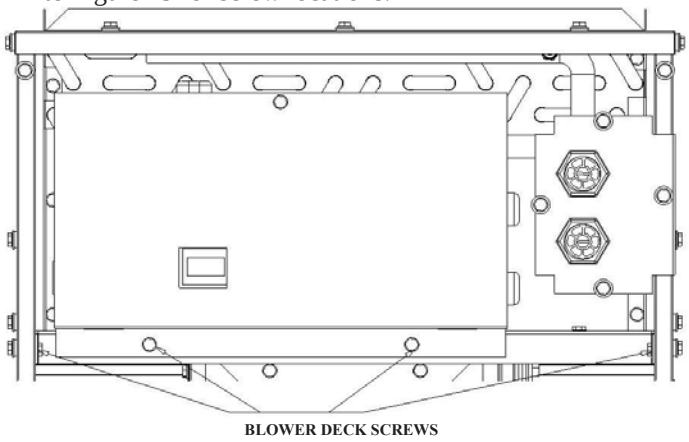


Figure 18: Blower Mounting Plate Screw Locations

5. Slide the blower out of the blower compartment and set on the floor.
6. Loosen the wheel set screw by placing on wrench on the screw head and turning counter clockwise. Loosen the wheel set screw until the shaft can spin freely 360° while inside the wheel hub. The wheel set screw is located on the wheel hub on the opposite side of the motor.
7. Remove the blower motor from the blower housing by removing the screws on the sides of the housing that secure the blower to the housing
8. Remove the blower motor mount assembly by loosening the belly band bolt and nut, then, remove the belly bans and mount legs.
9. Insert the new blower motor into the blower mounting bracket making sure the mounting legs are properly placed into the belly band and the legs are straight. Tighten the belly band screw and nut until belly bans is securely fastened to the motor.
10. Place the motor into the housing so the mount leg holes line up with the rivet nuts in the housing. Place the screw into the mount leg holes and tighten until the mount legs are securely fastened to the housing.

11. Center the blower wheel in the housing, turn the motor shaft so the wheel set screw is located on the center of the flat spot of the shaft and tighten the set screw.
12. Connect the same two cables that were removed in step 3.
13. Slide the blower assembly into the blower deck and insert the screws on the right and left sides of the mounting bracket.
14. Switch the circuit breakers to ON and replace air handler blower door.
15. Turn on all electrical supply circuits to the furnace at the main service (House Circuit Breaker) panel.
16. Set the thermostat to the desired temperature.

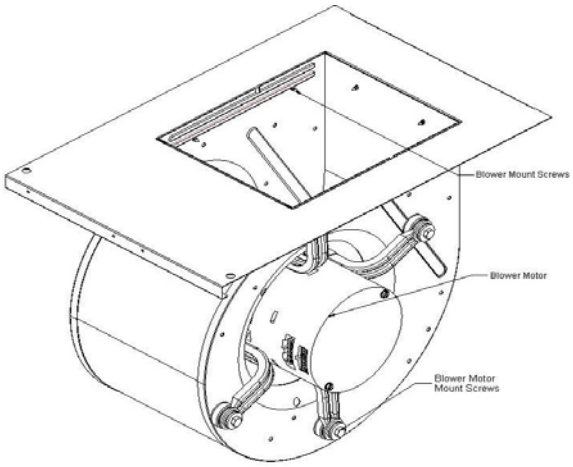


Figure 19: Blower Assembly and Blower Deck

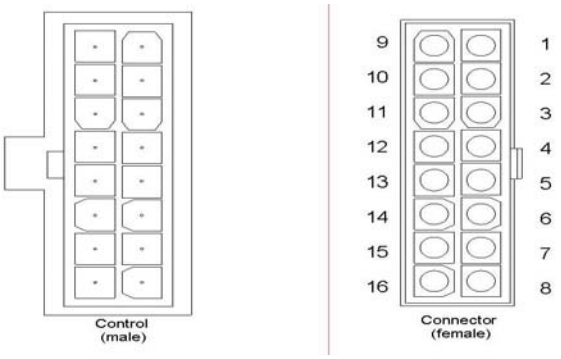


Figure 20: ECM Motor Control Pin out

Pin Number	
1	Common C1
2	W/W1
3	Common C2
4	Delay Tap Select
5	Cool Tap Select
6	Y1
7	Adjust Tap Select
8	Output –
9	Reversing Valve (Heat Pump Only)
10	Humidistat (BK)
11	Heat Tap Select
12	24 VAC (R)
13	2nd Stage Heat (EM/W2)
14	2nd Stage Cool (Y/Y2)
15	Fan (G)
16	Output +

Table 18: ECM Motor Control Connector Terminal Descriptions

Change Motor Speeds - ECM Motor

1. Turn off **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
2. Remove the blower door and switch furnace circuit breaker(s) to "OFF".
3. Motor speed can be changed for both heating and cooling modes. Heating blower motor speed change is done by moving the jumper on the **"HEAT"** jumper pins to a different setting. Pin out is shown below:
   A = High Speed, B = Medium High Speed, C = Medium Speed, and D = Low Speed.
   The blower motor speed can also be changed for cooling by moving the jumper on the **"COOL"** jumper pins to a different setting. Pin out is shown below:
   A = High Speed, B = Medium High Speed, C = Medium Speed, and D = Low Speed.
   The **ADJUST** pin is used to increase or decrease the blower motor speed by 10% to 12% from the **HEAT** or **COOL** setting. Placing the jumper in normal will allow no increase or decrease in the motor speed. The **+** setting will increase the motor speed by 10% to 12% above the **HEAT** or **COOL** setting. The **–** setting will decrease the motor speed by 10% to 12% below the **HEAT** or **COOL** setting.

⚠WARNING

The **test** setting on the ADJUST jumper pins must not be used except for trouble shooting to determine if the blower operates. The **test** setting allows the motor to run only at 70% of normal operation and bypasses any delays.

The **PROFILES** jumper pins are used for blower motor on and off delays. See Climate Profiles in the back of the **SERVICE AND MAINTENANCE MANUAL** of these instructions to determine the proper setting for the climate in your area.

4. Turn the circuit breakers on and reinstall air handler blower door.
5. Turn on **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
6. Set the thermostat to the desired temperature.

Change Motor Speeds - PSC Motor

1. Turn off **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
2. Remove the blower door and switch furnace circuit breaker(s) to "OFF".
3. Disconnect the wire from the isolation relay terminal and reconnect the desired wire to the terminal. Here is the PSC motor speed tap wire color code.
   Black wire is High Speed, Blue wire is Medium Speed, and Red wire is Low Speed. Brown wires for capacitor.
4. Turn the circuit breakers on and reinstall air handler blower door.
5. Turn on **all** electrical supply circuits to the air handler at the main service (House Circuit Breaker) panel.
6. Set the thermostat to the desired temperature.

Replacing the 1/3 HP PSC and 1/2 HP PSC Blower Motor

1 Turn off all electrical supply circuits to the air handler at the main service panel.
2 Remove air handler blower door and switch the air handler circuit breaker(s) to “OFF”.
3 Disconnect the power cable and the speed tap cable that connect to the blower motor.
4 Remove the two screws on the right side and the two screws on the left side of the blower mounting plate. Refer to Figure 19 for screw locations.
5 Slide the blower out of the blower compartment and set on the floor.
6 Loosen the wheel set screw by placing on wrench on the screw head and turning counter clockwise. Loosen the wheel set screw until the shaft can spin freely 360° while inside the wheel hub. The wheel set screw is located on the wheel hub on the opposite side of the motor.
7 Remove the blower motor from the blower housing by removing the three (3) screws on the sides of the housing that secure the blower to the housing
8 Place the motor into the housing so the mount leg holes line up with the rivet nuts in the housing. Place the three (3) screws into the mount leg holes and tighten until the mount legs are securely fastened to the housing.
9 Center the blower wheel in the housing, turn the motor shaft so the wheel set screw is located on the center of the flat spot of the shaft and tighten the set screw.
10 Connect the same two wires that were removed in step 3.
11 Slide the blower assembly into the blower deck and insert the screws on the right and left sides of the mounting bracket.
12 Switch the circuit breakers to ON and replace air handler blower door.
13 Turn on all electrical supply circuits to the furnace at the main service (House Circuit Breaker) panel.
14 Set the thermostat to the desired temperature.

SECTION X: FINAL SYSTEM CHECKOUT

1. Refer to appropriate wiring diagram and recheck all wiring connections. Ensure that all wiring connections are tight.
2. Check blower motor connectors to make sure they are not damaged or loose.
3. If the control box cover was removed; reinstall control box cover.
4. Switch circuit breaker(s) to “ON” position.
5. Switch the furnace circuit breakers in the main service (House Circuit Breaker) panel to the ON position.
6. Set the blower selector switch to the ON position and check all of the duct connections for air leaks. Seal any air leaks found.
7. Set the blower selector switch to the AUTO position.
8. Set the thermostat above the room temperature to check for proper operation of the electric heaters.
9. Set the thermostat to the desired temperature.

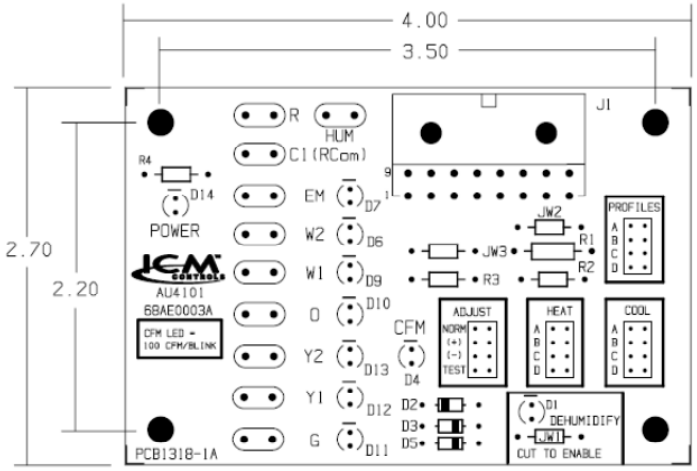


Figure 21: ECM Control Board Diagrams

DEHUMIDIFY – The ECM board has a 0 ohm resistor or a jumper pin that provides 24 VAC to the HUM terminal keeping the motor from initiating the dehumidify program. Once the o ohm resistor is cut, a 24 VAC signal must be present from the thermostat or humidistat when the humidity is below the set point. **The humidistat contacts must open when humidity is above the set point**.

The jumper pin configuration can be changed by moving the jumper from the OFF position to the ON position. Once the jumper pin has been changed to the ON position the humidistat will turn the dehumidify program in the motor on and off. The LED on the board will be lit when the motor is running the “dehumidify” programmed speed.

If the ECM motor dehumidify program is no longer desired by the home owner, simply move the jumper pin back to the OFF position to disable the motor program.

Control Board Flash Code

The ECM control board has a CFM flash code when the air handler is operation to indicate the current CFM.

- Typically flashes once per 100 CFM.
- To determine the selected CFM, count the number of flashes between pause flashes and multiply by 100.
- The sequence is followed by a 10 second OFF period signifying the end of the flash code, then the flash code starts over

Note: Since static will be low due to the removed panel, RPM will be lower to maintain the selected CFM

Example of the flash code:

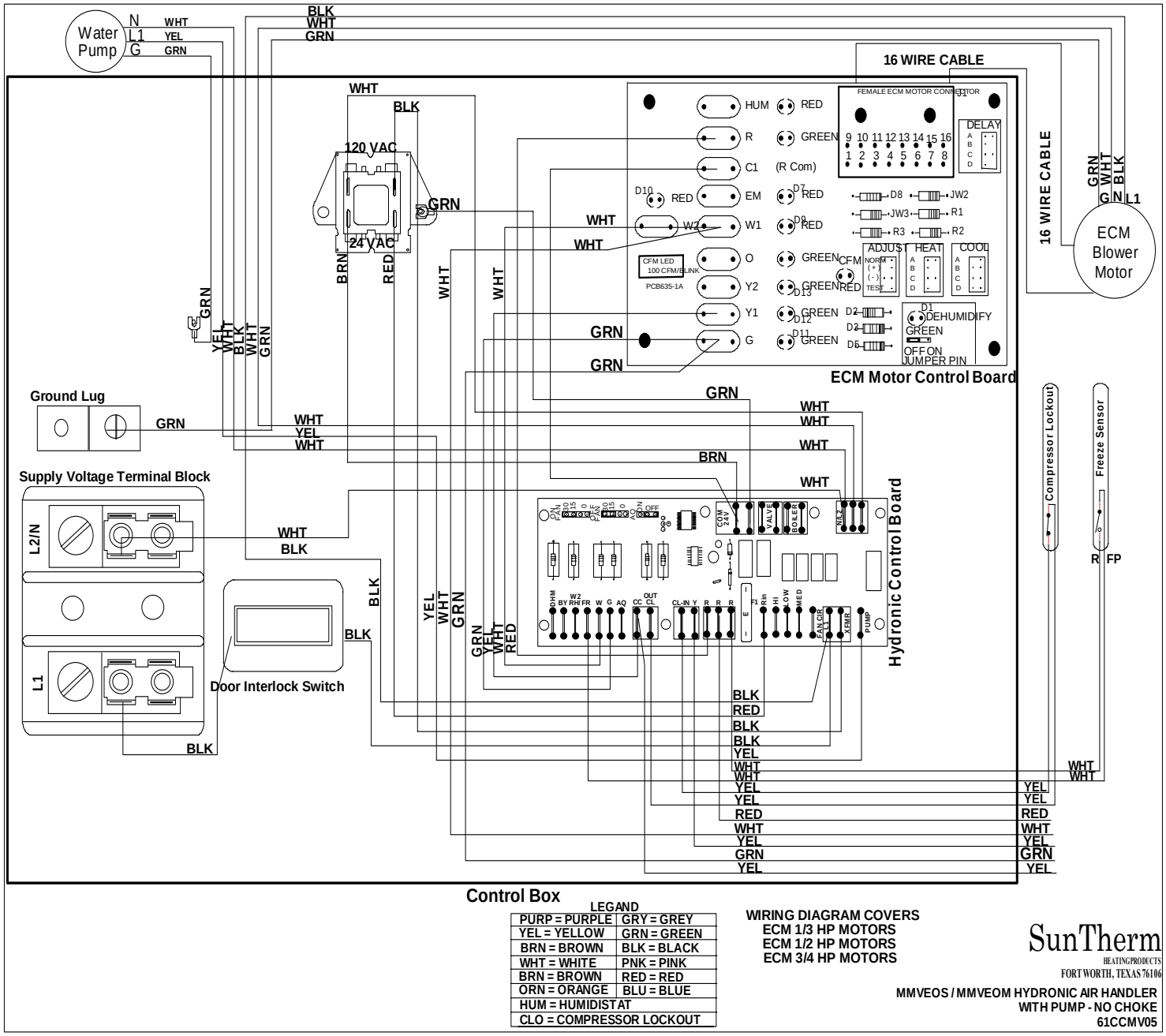
The air handler is operating at 1400 CFM. The flash code will be 1 second flashes with pulse flashes, 0.1 seconds apart, 14 times, followed by a 10 second off, then the flash code starts over.

Thermostat Heat Anticipator

Some thermostats have a heat anticipator setting that must be set to the settings shown below in order to function correctly. If the heat anticipator setting is too low the furnace will short cycle. If the heat anticipator setting is too high the furnace will run long cycles thus causing the temperature to overrun the temperature setting. This will cause the home owner to feel hot by the time the blower completes its cycle; then cold, by the time the furnace cycles on again.

The heat anticipator should be set to the following settings.
For 5kW, 10kW, 15kW and 20 kW Models Set at 0.4

SECTION XII: WIRING DIAGRAMS



LEGAND

PURP = PURPLE	GRY = GREY
YEL = YELLOW	GRN = GREEN
BRN = BROWN	BLK = BLACK
WHT = WHITE	PNK = PINK
BRN = BROWN	RED = RED
ORN = ORANGE	BLU = BLUE
HUM = HUMIDISTAT	
CLO = COMPRESSOR LOCKOUT	

WIRING DIAGRAM COVERS
ECM 1/3 HP MOTORS
ECM 1/2 HP MOTORS
ECM 3/4 HP MOTORS

SunTherm
HEATING PRODUCTS
FORT WORTH, TEXAS 76106

MMVEOS / MMVEOM HYDRONIC AIR HANDLER
WITH PUMP - NO CHOKE
61CCMV05

Figure 22: MMVEOS and MMVEOM – ECM Hydronic Heat with Pump – No Choke.

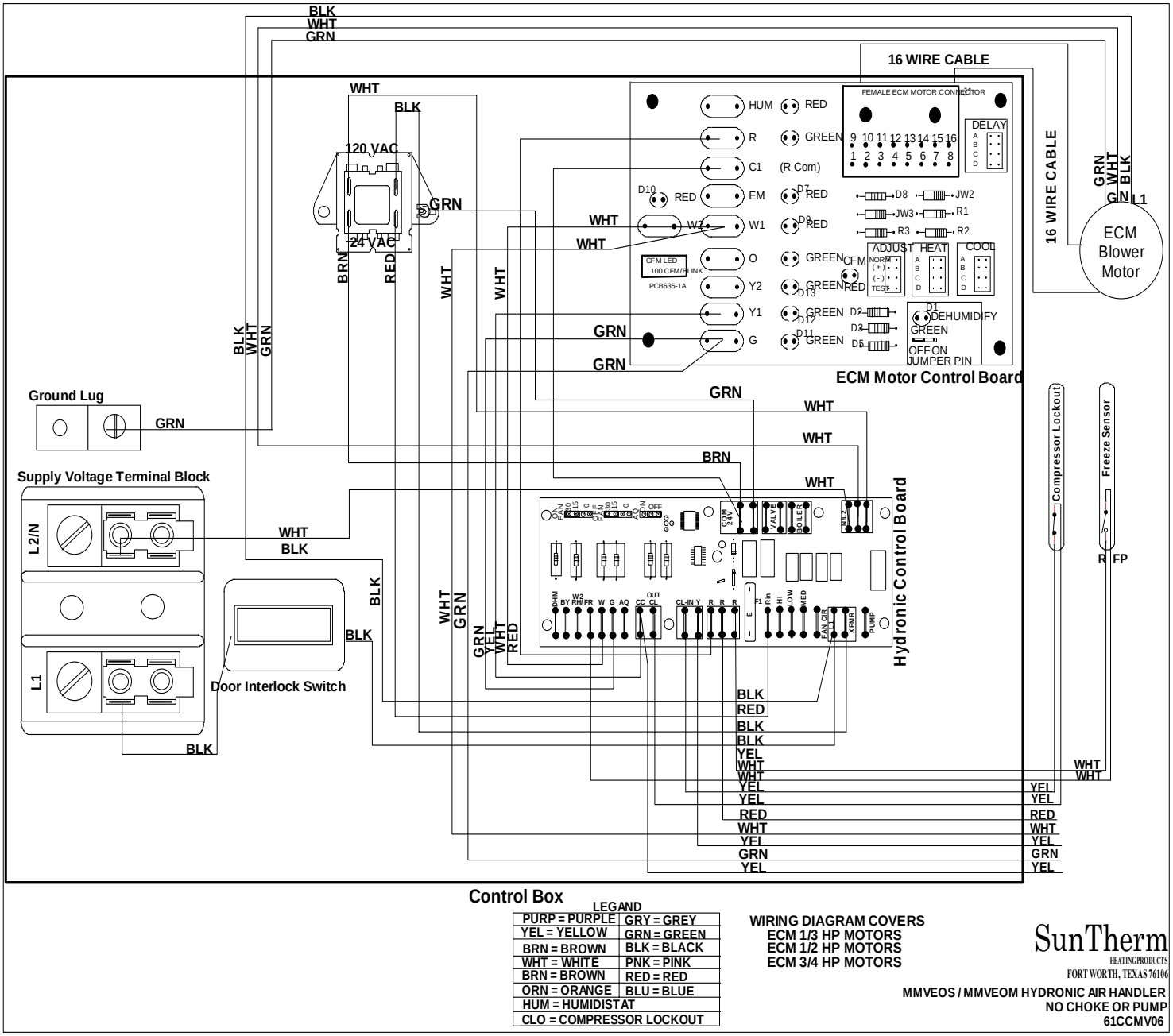
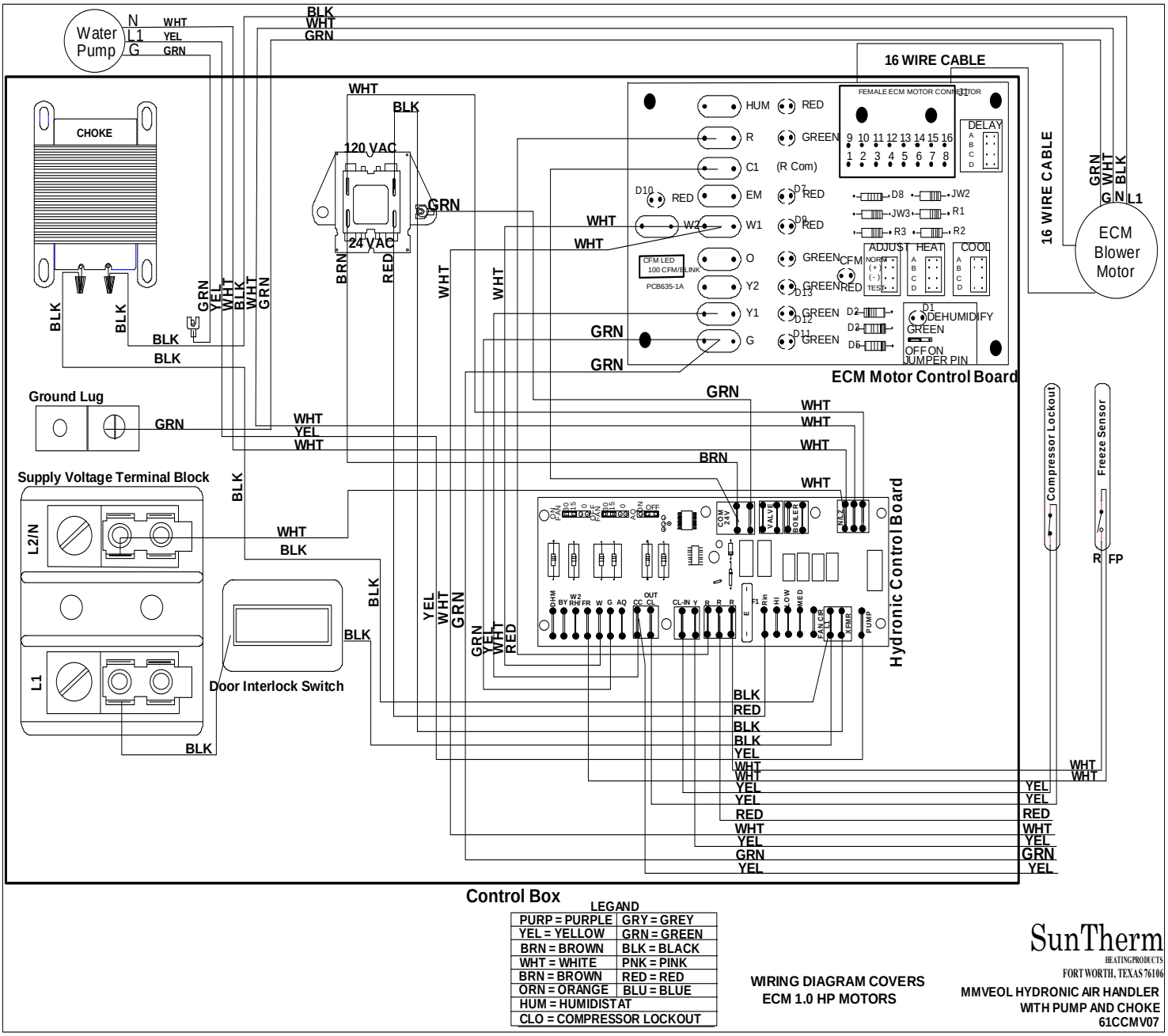


Figure 23: MMVEOS and MMVEOM – ECM Hydronic Heat No Pump or Choke.



LEGAND	
PURP = PURPLE	GRY = GREY
YEL = YELLOW	GRN = GREEN
BRN = BROWN	BLK = BLACK
WHT = WHITE	PNK = PINK
BRN = BROWN	RED = RED
ORN = ORANGE	BLU = BLUE
HUM = HUMIDISTAT	
CLO = COMPRESSOR LOCKOUT	

WIRING DIAGRAM COVERS
ECM 1.0 HP MOTORS

SunTherm
HEATING PRODUCTS
FORT WORTH, TEXAS 76106

MMVEOL HYDRONIC AIR HANDLER
WITH PUMP AND CHOKE
61CCMV07

Figure 24 MMVEOL – ECM Hydronic Heat with Pump and Choke.

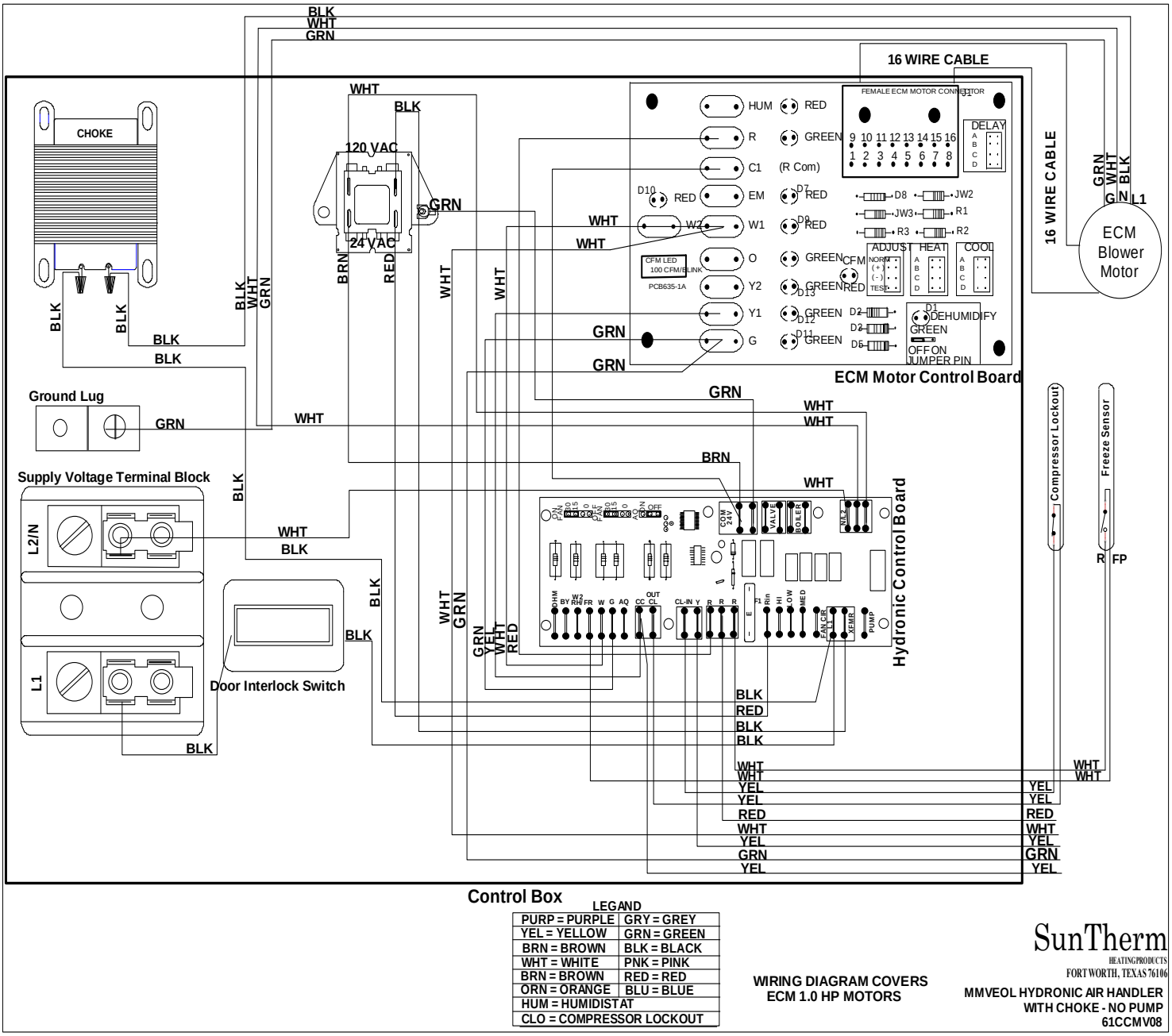


Figure 25 MMVEOL – ECM Hydronic Heat – with Choke - No Pump.