SunTherm™ HEATING PRODUCTS

INSTALLATION MANUAL

Intertek

Multi-Position DX and Chilled Water-Cooling with Electric Heating
MODELS: MSVT Series With Single-Stage Cooling/Heat Pump Air-Flow
MSVE Series With Single or Two-Stage Cooling/Heat Pump Air-Flow

LIST OF SECTIONS

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SECTION 1: GENERAL

The following list includes important facts and information regarding the air handler models covered in this manual.

1. Air handler is rated for 208/240 VAC at 60 Hertz.
2. Air handler size varies by model.
3. Air handler is designed for A/C or heat pump operation.
4. Air handler is designed for upflow, downflow and horizontal applications.
5. Air handler must not be operated with the access panels removed.
6. Air handler is listed by ETL in the United States and Canada.

SAVE THIS MANUAL FOR FUTURE REFERENCE

MS Series Multi-Position Air Handler

This is a safety alert symbol. When this symbol is seen 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: Indicates 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 Figures 1 and 2. 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 and the duct connector and combustible floor base dimensions shown in Figure 9 for the proper duct connector or combustible floor base for downflow applications. 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.
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. This air handler must be connected to a nominal 208/240 VAC, 1 Phase, 60-Hertz power supply. **DO NOT CONNECT THIS AIR HANDLER TO A 50 HZ POWER SUPPLY OR A VOLTAGE ABOVE 250 VOLTS.**
14. Ground connections must be securely fastened to the control box and ground wires must be secure.

⚠ WARNING

Always shut off electricity at the disconnect switch or turn off the circuit breakers in the main electrical panel before performing any service on this air handler.

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 and 5-speed constant torque motors provide a selection of air-flow volume to match any application. The air handler 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 air handler 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 air handler 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.

Models	**MS**18,24**	**MS**25,30,36**	**MS**37,42,48,60**	**MS**72**
Available Electric Heat kW	5,10	5,10,15	5,10,15,20	5,10,15,20
Blower Size (D x W)	9 x 6 (MSVE) 10 x 7 (MSVT)	10 x 7 (MSVE) 10 x 8 (MSVT)	12 x 9 (MSVE & MSVT)	12 x 10 (MSVE & MSVT)
Unit Voltage	208/240V, 60 HZ, 1 PH			
Max. External SP (Duct), In. W.C.	0.50			
Thermostat Circuit	24 VAC,60 Hz, 40VA			

Table 1: Air Handler Model Specifications

Available Blower Motors

1. 5 SPD CONSTANT TORQUE MOTOR
2. VARIABLE SPEED ECM MOTOR

MODEL NUMBER NOMENCLATURE						
MS	**VT**	**36**	**15**	**B**	**862T**	**AA**
I	**II**	**III**	**IV**	**V**	**VI**	**VII**
I	**Series** MS = Multi-Position Single-Piece					
II	**Motor Type** VT = Variable Constant Torque VE = Variable Speed ECM					
III	**Unit Size (Capacity in MBTUH)** 12 through 24 - Small Cabinet 25 through 36 - Medium Cabinet 37 through 72 - Large Cabinet OS = No Cooling Small Cabinet OM = No Cooling Medium Cabinet OL = No Cooling Large Cabinet					
IV	**Heating Configuration** 00 = Cooling Only 05 = 5 kW Electric Heating Capacity 10 = 10 kW Electric Heating Capacity 15 = 15 kW Electric Heating Capacity 20 = 20 kW Electric Heating Capacity					
V	**Air Handler Voltage** B = 208/240					
VI	**SUMMIT Evaporator Coil Configuration** 862T = DX Coil Geometry And Metering Device 8K2N = CW Coil Geometry, No Metering Device					
VII	**Option Code** AA = Standard Factory Options					

Table 2: Electric Heat Air Handler Model Number Nomenclature

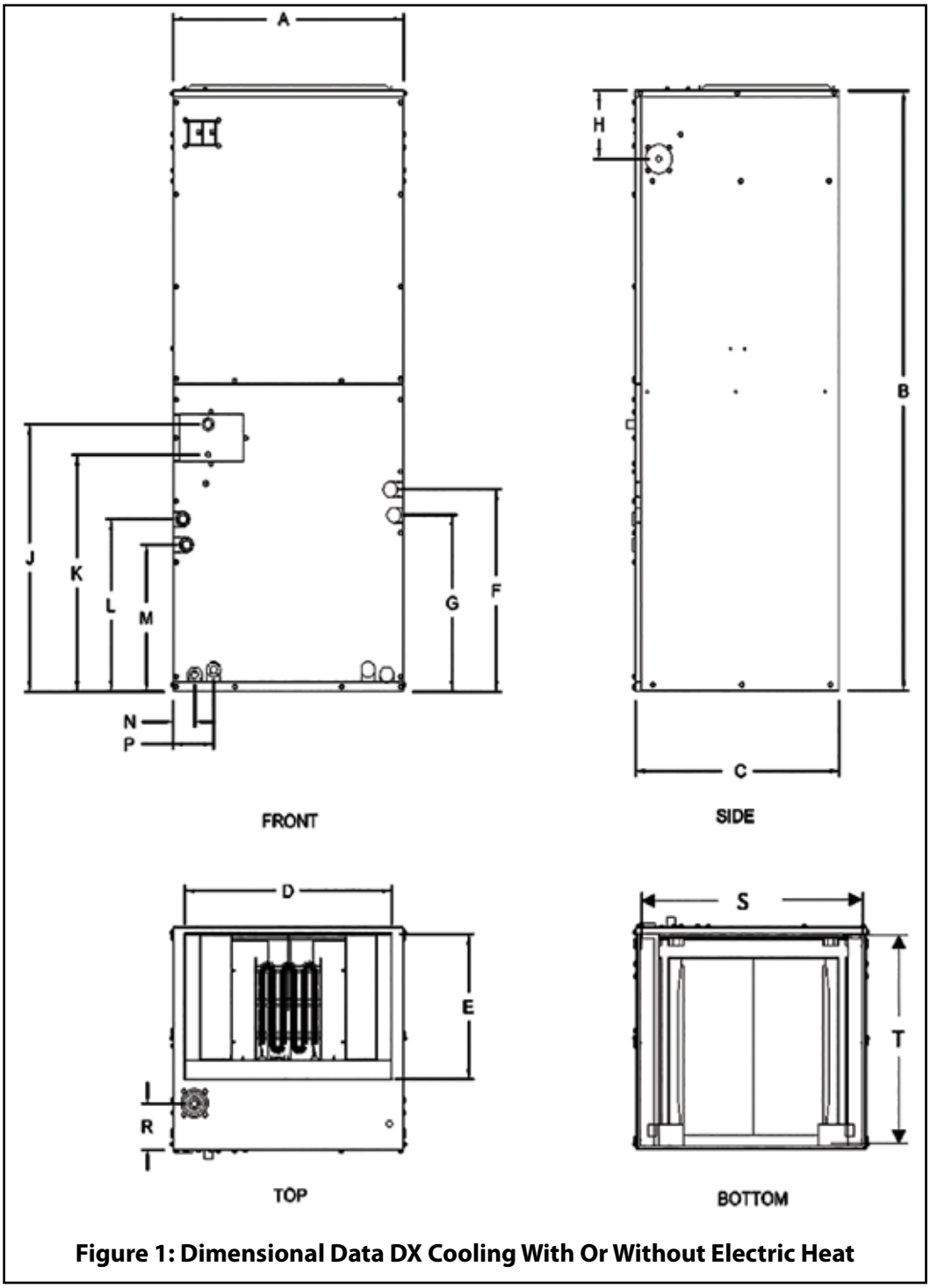


Figure 1: Dimensional Data DX Cooling With Or Without Electric Heat

DIMENSIONAL DATA MULTI-POSITION AIR HANDLER COOL ONLY OR ELECTRIC HEAT																	
Model	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**	**T**
MS**18, 24	17.50	43.00	21.00	15.63	12.50	13.50	11.00	6.75	16.75	14.00	11.00	10.75	2.00	1.50	5.00	16.10	20.20
MS**25, 30, 36, 38, 46	21.00	48.00	21.00	19.00	12.50	14.50	13.00	6.75	20.00	17.00	12.75	10.30	2.30	4.35	5.00	19.90	20.80
MS**37, 42, 48, 60, 72	24.50	58.88	21.75	22.25	14.25	19.75	17.25	6.75	26.00	23.00	16.75	14.35	2.30	4.35	4.50	23.50	20.70

Table 3: Dimension Data - DX Cooling With & Without Electric Heat

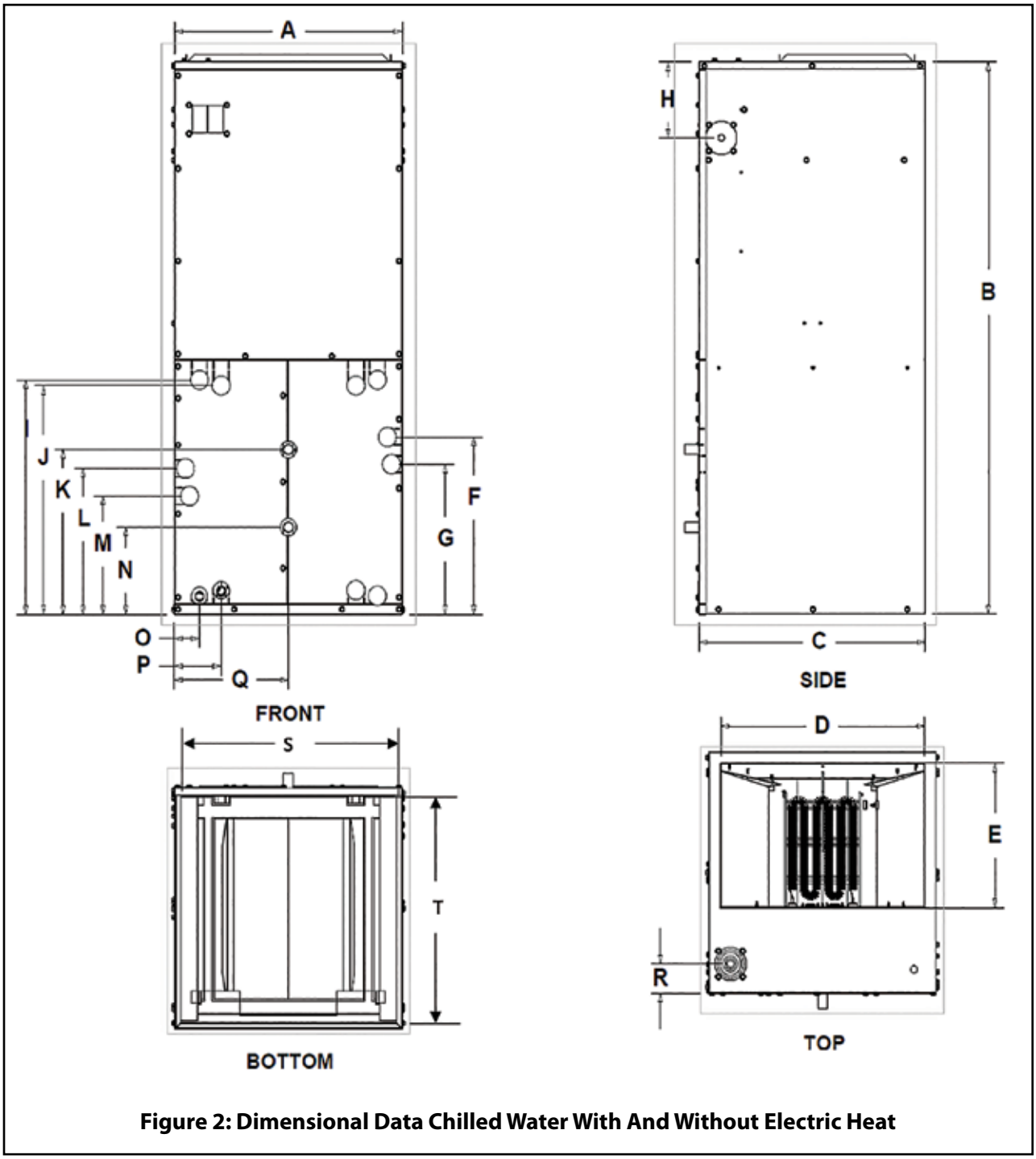


Figure 2: Dimensional Data Chilled Water With And Without Electric Heat

DIMENSIONAL DATA MULTI-POSITION AIR HANDLER COOL ONLY OR ELECTRIC HEAT																	
Model	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**	**K**	**L**	**M**	**N**	**P**	**R**	**S**	**T**
MS**18, 24	17.50	43.00	21.00	15.63	12.50	13.50	11.00	6.75	16.75	14.00	11.00	10.75	2.00	1.50	5.00	16.10	20.20
MS**25, 30, 36, 38, 46	21.00	48.00	21.00	19.00	12.50	14.50	13.00	6.75	20.00	17.00	12.75	10.30	2.30	4.35	5.00	19.90	20.80
MS**37, 42, 48, 60, 72	24.50	58.88	21.75	22.25	14.25	19.75	17.25	6.75	26.00	23.00	16.75	14.35	2.30	4.35	4.50	23.50	20.70

Table 4: Dimensional Data - Chilled Water With And Without Electric Heat

SECTION 3: LOCATION, CLEARANCES 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. As the 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. It is best to locate the air handler so that supply air ducts are about the same length and the return air ducts are about the same length to provide 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. Locate appliance where refrigerant lines can be easily routed from the indoor coil to the outdoor unit.
7. Locate the appliance where condensate lines can be easily routed to an available drain or outside. Be sure to route condensate drain piping so as not to obstruct access to the air filter.
8. When the coil is installed in a draw-through configuration as in this air handler, a negative pressure is created in the condensate drain system. To assure proper condensate drainage and to prevent condensate from being drawn into the blower, it is recommended that a trap be installed in the primary (main) and secondary (overflow) drain lines. Refer to the CONDENSATE DRAIN PIPING section and Figure 13 in this manual. If the secondary drain is not used, it must be capped.
9. The draw-through design can also cause exterior surface of cabinet to sweat when air handler is installed in a non conditioned space such as an attic or garage. The installer must provide protection such as full-size auxiliary drain pan under all air handlers installed in a non-conditioned space to prevent damage from condensation runoff. 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. In the absence of a local code, 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 that has a vapor barrier on the outside.

CLEARANCES

This air handler is approved for zero (0) inches clearance to combustible material on any part of the air handler exterior casing. Refer to Table 5 and Figures 3 and 4 for clearance to combustibles and for service access clearances.

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

Table 5: Clearances to Combustibles

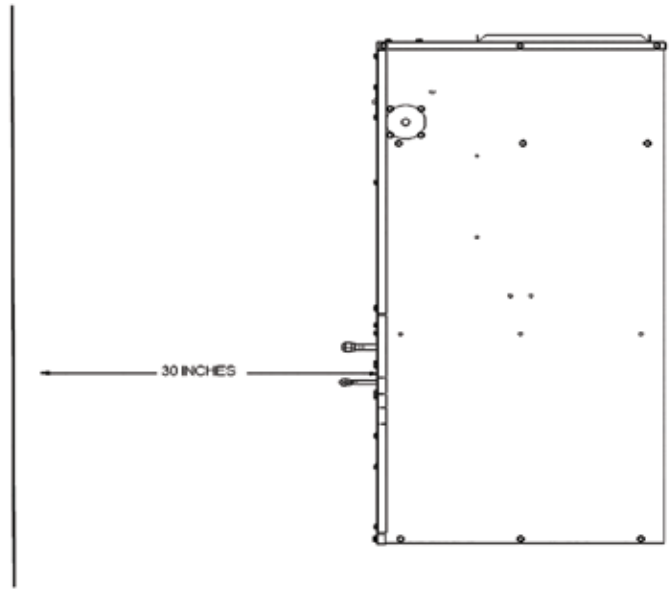


Figure 3: Clearance – Access for Service

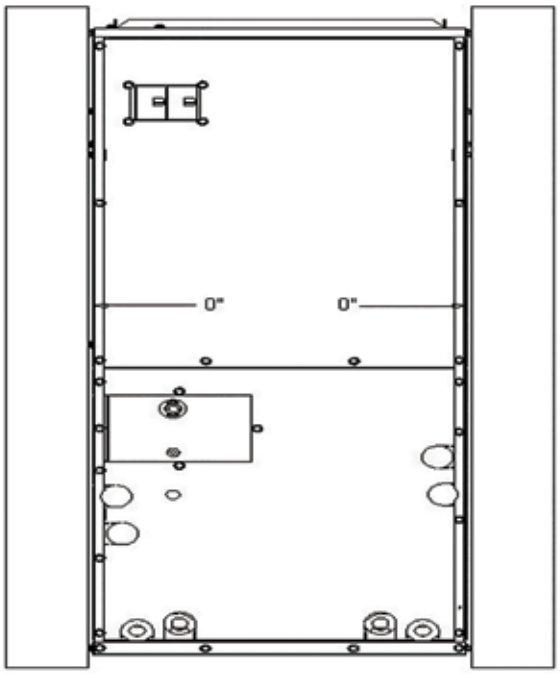


Figure 4: Closet Clearances

RETURN AIR REQUIREMENTS

Provisions shall be made to permit the air in all rooms in the living space to return to the air handler. 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 air handler to cycle on the electric heater's over-temperature limit causing premature heating element failure.

The return air opening can be located in the floor, on a closet front door, or in a side wall above the air handler cabinet. If the opening for the return air is located in the floor, side walls, or closet door anywhere below the appliance cabinet, a 6-inch minimum clearance between the air handler 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 air handler casing providing the grille has a sufficient return air opening.

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

For A/C and HP Air Handlers 1/3 HP Blower Motor On (MSVE, MSVT18 & 24)
- Minimum 200 in free area opening
- Use Return Grille or Coil Cabinet

For A/C and HP Air Handlers 1/2 HP Blower Motors On (MSVE, MSVT25, 30, & 36)
- Minimum 250 in^2 free area opening
- Use Return Grille, A/C Coil Cabinet, or any return grille with a minimum 250 in^2 free area opening.

For A/C and HP Air Handlers with Electric Heat use 3/4 HP Blower Motor On (MSVE, MSVT 37, 42, 48, & 60)
- Minimum 390 in^2 free area opening
- Use Return Grille, or A/C Coil Cabinet, or any return grille with a minimum 390 in^2 free area opening.

For A/C and HP Air Handlers use 1.0 HP Blower Motor On (MSVE, MSVT72)
- Minimum 430 in^2 free area opening
- Use Return Grille, or A/C Coil Cabinet, or any return grille with a minimum 430 in^2 free area opening.

SECTION 4: AIR HANDLER ORIENTATION, SUPPLY AIR DUCT, AND RETURN AIR FILTERS

The air handler is shipped from the factory configured 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 air handler and when it is laid on its side, the supply air opening is on the left and the return opening is on the right. This air handler is field convertible to a horizontal left-to-right air-flow position.

UPFLOW APPLICATIONS

In an upflow installation the discharge outlet is at the top. Care should be taken to ensure air handler is level to permit proper condensate drainage. Normal upflow installation will be in a closet or basement. If installed in a closet, the closet should have a platform framed in that measures at least 12 inches in height with an opening cut in the top of the platform for the return air to enter the bottom of the air handler. 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 as follows:
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
1400 CFM = 20 x 20 x 1
1200 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

Another option is to use a SunTherm Air Filter Base Accessory Kit which can be used on the return air end of the air handler when configured in the upflow position (See Figure 5). The filter base 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 base and the return opening sealed to prevent leaks.

FILTER BASE ASSEMBLY KIT – FIELD INSTALLED

86ET0002 – 16"X 20" X 2" Small Cabinet 86ET0001 and 20" X 20" X 2" Medium Cabinet
86ET0003 – 20" X 24" X 2" Large Cabinet

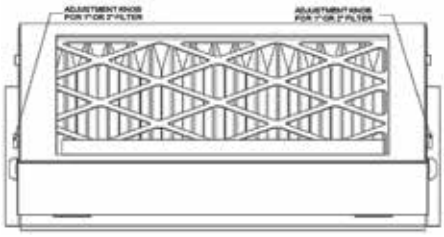


Figure 5: Air Filter Base Accessory for 1" or 2" Air Filters.

Notes for Air Filter Base Accessory
- The filter size adjustment knobs are located on both sides of the base.
- Make sure the flow arrow on the air filter is pointing towards the coil.
- The Air Filter Base Accessory can also 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.

After the air handler has been secured to the return platform, connect the supply air outlet to a plenum to the top of the air handler and secure it with screws. Use a non-tape sealant such as mastic or an aerosol sealant to seal duct leakage. If the air handler is installed in a basement, run the 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 air handler inlet collar. The supply ducts will be connected to the supply air plenum and routed through 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.

NOTE: The same return air filtration requirements apply to horizontal applications as upflow applications. Refer to the upflow orientation section for return air filter requirements on this page. 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 air handler is shipped to be installed without modification in a right-to-left configuration.

To convert the air handler for left-to-right applications:

1. Remove the air handler access panels.
2. Remove the cooling coil.
3. Move the condensate drain pan to the right side.
4. Reinstall the cooling coil.
5. Connect the condensate drains and refrigerant lines.
6. Reinstall air handler access panels.

DOWNFLOW APPLICATIONS

This air handler may be converted to a downflow configuration using a required downflow conversion kit by following the instructions below (See Figures 6 and 7).

NOTE: The same return air filtration requirements apply to downflow applications as upflow applications. Refer to the upflow orientation section on page 8 of this manual for return air filter requirements.

1. Remove the blower and control box access panel.
2. Remove indoor coil access panel and discard it. The indoor coil access panel will not be re-used.
3. Remove indoor coil assembly with drain pan by sliding out the front of the air handler as shown in the Figure
4. Remove 6 screws (3 on each side of air handler), securing indoor coil support rails. Refer to Figure 6.
5. Flip the air handler so the discharge is on the bottom.
6. Re-install the indoor coil support rails in the holes provided in the air handler casing as shown in Figure 7. Use the six (6) screws that were removed in step 4 to secure the indoor coil support rails to the air handler casing.
7. Re-install the cooling coil in the upright position as shown in Figure 7.
8. Remove the new indoor coil access panel from the conversion kit and install over the indoor coil section as shown in Figure 7.
9. Re-install the blower and control box access panel in the upside-down position and secure with the screws that were removed in step 1.

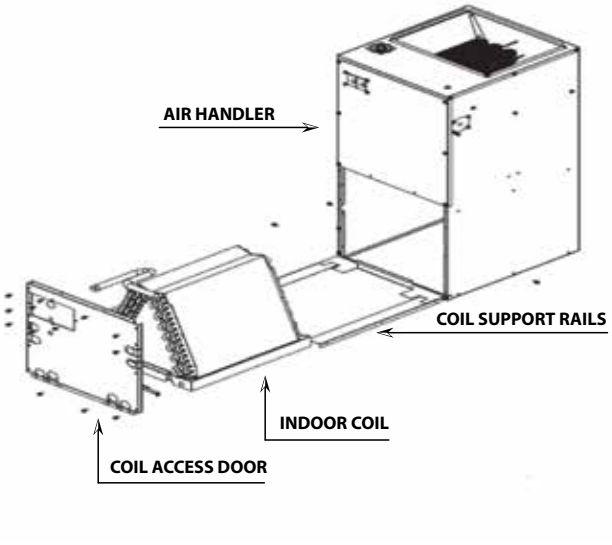


Figure 6: Indoor Coil Disassembly When Converting to Downflow

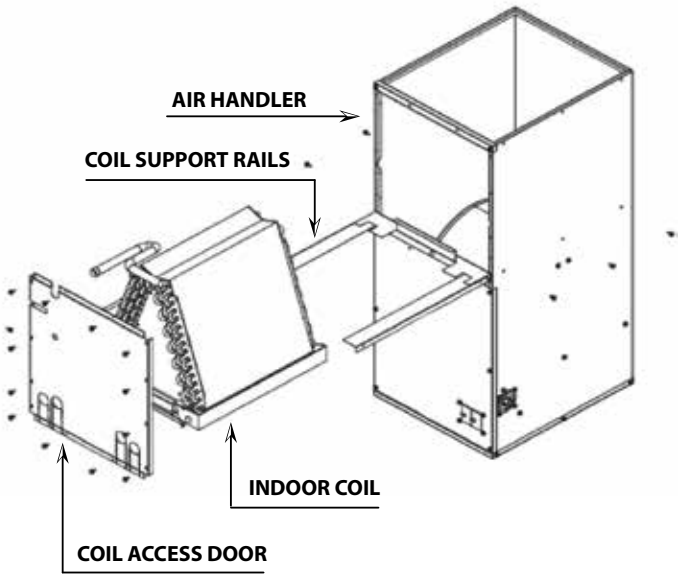


Figure 7: Indoor Coil Assembly When Converting to Downflow Operation.

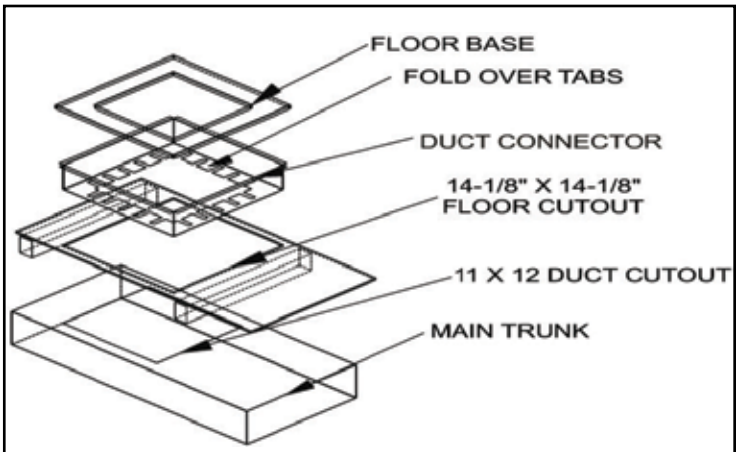


Figure 8: Combustible Floor Base Installation

SECTION 5: INSTALLING THE AIR HANDLER

Prior to installing the air handler, make sure the holes are cut into the floor for the refrigerant tubing, the drain line, the electrical wiring, the thermostat wiring and the outdoor unit 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.
4. Remove the coil compartment access panel.
5. Place the air handler into position using one of the following choices:
   (a) If the Combustible Floor Base is used, slide the air handler onto the combustible floor base until the air handler touching the flanges on the back of the floor base.
   (b) If the Combustible Floor Base is not used, slide the air handler over the duct opening until the opening in the air handler lines up with the duct opening in the floor.
6. Secure the air handler by one of the two choices:
   (a) If the Combustible Floor Base is used, secure the air handler to the floor by drilling two holes through the air handler base and the floor base at the right and left front inside corners of the cabinet. Use two screws to secure the air handler to the floor.
   (b) If the Combustible Floor Base is not used, secure the air handler to the floor by drilling two holes through the air handler base at the left and right front inside corners of the cabinet. Use two screws to secure the air handler to the floor.
7. Use calking, sealers, and/or tape to seal between the combustible floor base and the opening on the air handler or between the opening on the air handler and the duct in the floor.
8. Connect the electrical supply wires and the thermostat control wires in the control box.
9. Connect the refrigerant lines to the coil.
10. Re-install the coil compartment access panel and secure with the screws that were removed in step 3.
11. Re-install the blower and control box access panel and secure with the screws that were removed in step 2.
12. Turn the power on to the air handler by following the procedure in the Users Information Manual.
13. Set the thermostat to the desired temperature.

SECTION 6: REFRIGERANT PIPING, TXV, AND CONDENSATE PIPING

DX Refrigerant Piping:

Air handlers with DX type indoor coils require liquid and suction piping sized in accordance with outdoor unit manufacturer's instructions. Indoor coils have sweat copper connections. Refrigerant lines should be soldered with silver solder or high temperature brazing alloy. Suction line must be insulated to avoid condensate from forming and dropping off. Armaflex pipe insulation (or equivalent) with 3/8" (1 cm) minimum wall thickness is recommended. In severe conditions such as hot or high humidity areas require 1/2" (1.3 cm) minimum wall thickness may be required. If outdoor unit is installed above indoor coil, then oil traps are required at equal intervals along suction line (see Figure 9). Horizontal suction lines should slope downward 1 inch for every 20 feet toward outdoor unit. The manufacturer recommends that dry nitrogen be flowed through refrigerant lines during soldering operation.

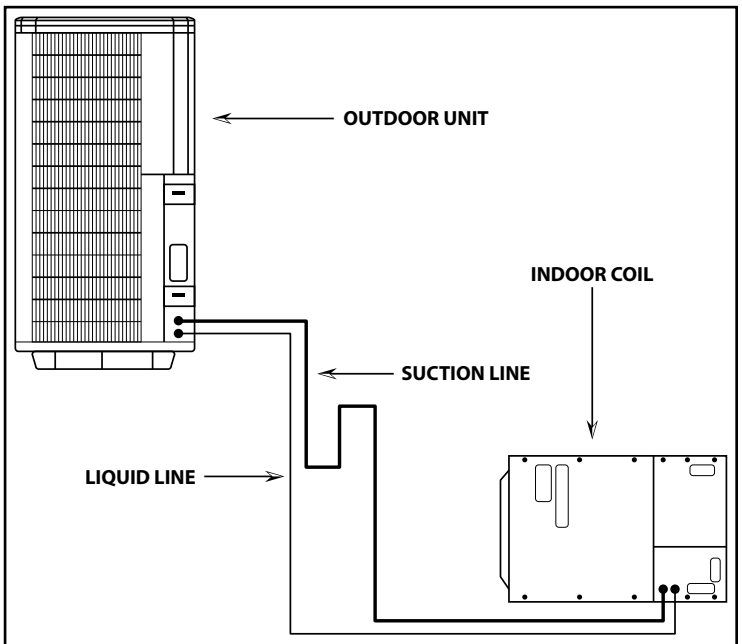


Figure 10: Indoor Coil Below Outdoor Unit Piping

- Install 1 oil trap for a height difference of 15 ft to 25 ft (4.6 m to 7.6 m) between indoor and outdoor units.
- Install 2 oil traps for a height difference of 26 ft to 50 ft (7.9 m to 15.2 m) between indoor and outdoor units.
- Install 3 oil traps for a height difference of 51 ft to 100 ft (15.5 m to 30.5 m) between indoor and outdoor units.
- Install 4 oil traps for a height difference of 101 ft to 150 ft (30.8 m to 45.7 m) between indoor and outdoor units.

Thermal Expansion Valves (TXV)

SunTherm air handlers can have a factory installed thermal expansion valve (TXV) or a TXV may be field installed. The factory and field installed TXV's for this air handler have an internal check valve making them compatible for both cooling only and heat pump applications. The TXV has an external pressure equalizer, non-adjustable superheat, and a 15% bleed rate. A hard start capacitor on the outdoor unit is normally not required when a 15% bleed TXV is used, but may be necessary if compressor starting issues are encountered.

Field Installed TXV Kit Information

R72DB0053HX: R-410A, 1.5 – 2.5 Ton, 15% Bleed, Inlet: Male Rotolock, Outlet: Female Swivel Nut

R72DB0054HX: R-410A, 3.0 – 5.0 Ton, 15% Bleed, Inlet: Male Rotolock, Outlet: Female Swivel Nut

⚠ WARNING

Coil is pressurized with nitrogen from the factory. Relieve pressure before installing TXV by depressing the Shrader valve on the coil manifold.

FIELD INSTALLED TXV INSTALLATION

The TXV assembly is to be installed between the flowrator distributor and the existing liquid line attached to the flowrator distributor as shown in Figure 10.

1. After the coil pressure has been relieved, turn the female swivel nut counter-clockwise to remove.
2. Remove the piston from the flowrator distributor fitting using a small diameter wire or paper clip. **ALWAYS REMOVE PISTON FROM DISTRIBUTOR BODY WHEN TXV IS INSTALLED).**
3. Attach the TXV by connecting the female swivel nut on TXV outlet to the flowrator distributor (aligning Teflon seal first) and torque swivel nut to 10-30 ft. lbs.
4. Attach liquid line with female swivel nut to male rotolock fitting on TXV inlet (Aligning Teflon seal first) and torque swivel nut to 10-30 ft. lbs.
5. Remove the cap from the male Schrader valve port on the coil manifold. Attach equalizer tube with 1/4" female flare nut.

FIELD INSTALLED AND FACTORY INSTALLED TXV INSTRUCTIONS – SENSING BULB, LEAK CHECK, EVACUATION

1. Install the TXV bulb on the suction line just outside the air handler cabinet using the two bulb clamps furnished with kit as shown in Figure 11.
2. The bulb should be installed on the upper portion of a horizontal section of the suction line between 10:00 o'clock and 2:00 o'clock as shown in Figure 12.
3. If the bulb must be installed on a vertical run, the bulb should be located at least 6 inches from any bend, and on the tubing side opposite the plane of the bend. On vertical bulb installations, the bulb should be positioned with the bulb capillary tube at the top.
4. The bulb must be insulated using thermal insulation to protect it from the effect of the surrounding ambient temperature.
5. After completing the installation of the TXV (including equalizer tube), leak check the coil and evacuate the coil through the liquid and suction line valves on the outdoor unit.

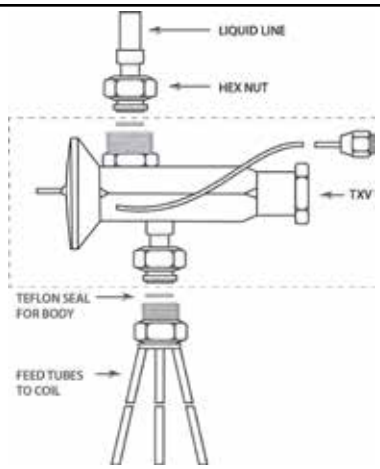


Figure 10: Typical TXV Connections

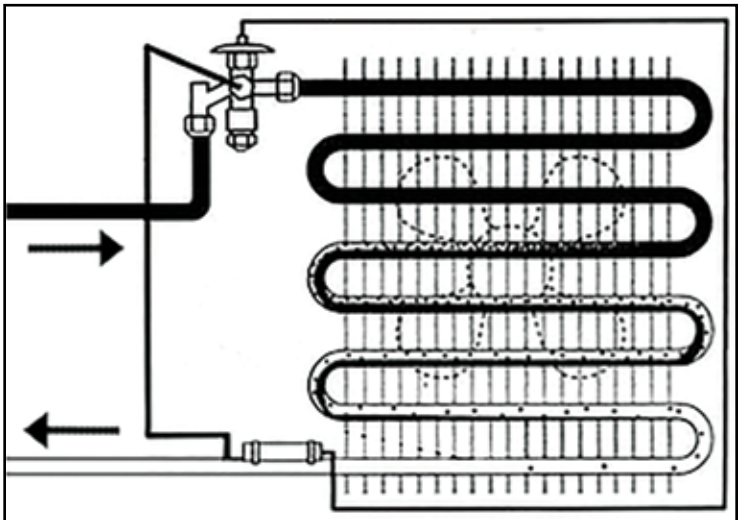
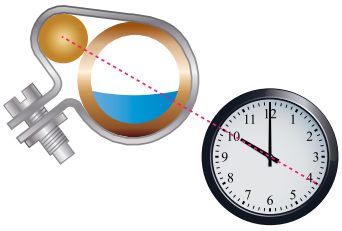


Figure 11: TXV Sensing Bulb Location



BULB PLACEMENT ANYWHERE FROM 10—2 O'CLOCK POSITION

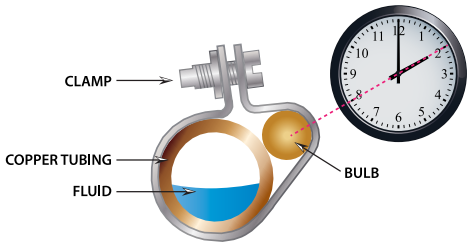


Figure12: TXV Bulb Placement

CONDENSATE DRAIN PIPING:

The air handler "A" coil drain pan has two ¾" NPT female primary and two secondary connections (left or right hand). Piping from each fitting used is to have 2" minimum trap (See Figure 13) and each run in such a manner as to provide enough slope for adequate drainage to a visible area. Do not pipe these two fittings together into a common drain. if a secondary drain is not installed, the secondary drain connection must be capped.

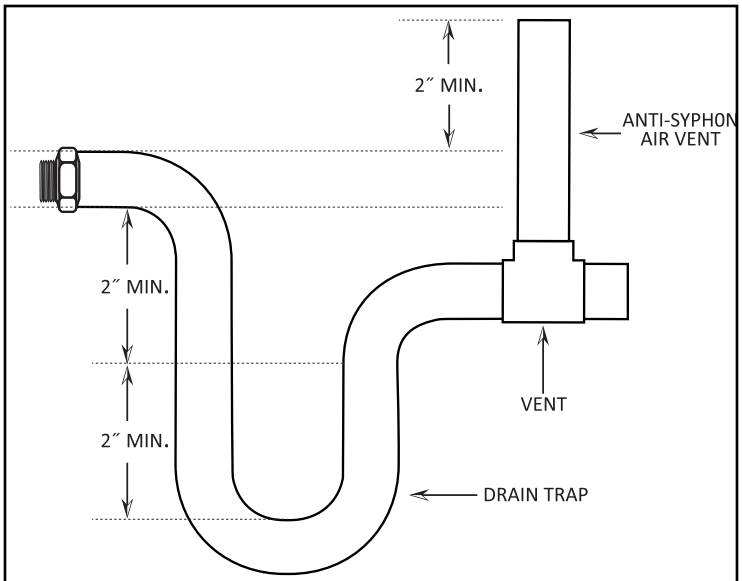


Figure 13: Typical Condensate Trap

⚠ 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 ½" 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 liable for any water damage in connection with this air handler.

SECTION 7: LINE VOLTAGE WIRING

The unit internal wiring is complete except for the power supply and the thermostat wires. See wiring diagram and/or Tables 6 - 9 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 Voltage Wiring Connections

1. Remove the blower and control box access panel.
2. Remove the control box cover.
3. Install the cable connectors on the 7/8" diameter holes on the right side of the control box.
4. Strip 1/2" of the insulation on the end of each wire.
5. Insert the wires through the holes in the air handler casing and through the cable connectors.
6. Insert the BLACK wire into the L1 screw terminal on the first circuit breaker from the top 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 first circuit breaker down from the top and tighten the set screw to clamp down on the wire.
8. If a single circuit is being used for a 5 kW, 10kW, 15kW or 20kW model, install a BLACK jumper wire from the L1 terminal on circuit breaker #1 to the L1 terminal on circuit breaker #2 and a WHITE or RED jumper wire from the L2 terminal on circuit breaker #1 to the L2 terminal on circuit breaker #2. Refer to Figures 14, 16, and 17 for circuit breaker locations.
9. Insert the GREEN wire into the ground lug and tighten the set screw.

NOTE: The 100 amp 4-Pole Jumper Bar Assembly part number 68BAE001 can be used in place of the jumper wires.

Dual Circuit Line Voltage Wiring Connections: 15kW or 20kW Models

1. Insert the BLACK wire from the second power supply into the L1 screw terminal on the second circuit breaker down from the top and tighten the set screw to clamp down on the wire.
2. Insert the WHITE or RED wire from the second power supply into the L2 screw terminal on the second circuit breaker down from the top and tighten the set screw to clamp down on the wire Insert both GREEN wires into the ground lug and tighten the set screw.
3. Tighten the screws on the cable connectors until the power supply wires are securely fastened to the connector.

NOTE: The air handler is equipped with either one or two circuit breakers. These circuit breakers protect the wiring inside of the air handler in the event of a short circuit. Additionally, these breakers provide a means of disconnecting the power to the air handler. The circuit breakers in the air handler are not meant to protect the branch circuit wiring between the air handler and the home's breaker panel. General wire and breaker sizes are shown in Tables 6 - 9. 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. Electrical data can be found in Tables 6-9.

IMPORTANT - All installation on field wiring must be rated at 60ºC or higher. Please refer to the wiring diagrams on the air handler or the tables this manual for more information. The 15kW and 20kW models may be connected to a single or dual branch circuit.

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 requirement.

The field installed electric heat accessories are used on cooling or heat pump models that were not purchased with electric heat from the factory. Each air handler model is approved for use with the field installed accessory electric heat kit.

AIR HANDLER MODELS														
	MSVE 18, 24			MSVT 18, 24			MSVE 25, 30, 36				MSVT 25, 30, 36			
5 kw Heater Amps - 208/240 VAC	18.0/20.8			18.0/20.8			18.0/20.8				18.0/20.8			
10 kW Heater Amps - 208/240 VAC	36.1/41.7			36.1/41.7			36.1/41.7				36.1/41.7			
15 kW Heater Amps - 208/240 VAC	N/A			N/A			54.1/62.5				54.1/62.5			
Indoor Blower Motor Type	ECM			CONSTANT TORQUE			ECM				CONSTANT TORQUE			
Indoor Blower Amps – 208/240 VAC	0.90/0.78			0.83/0.72			2.33/2.03				1.91/1.66			
Heater - kW	0	5	10	0	5	10	0	5	10	15	0	5	10	15
Minimum Circuit Ampacity	1.1	27.0	53.1	1.0	26.9	53.0	2.9	28.6	54.6	80.7	2.4	28.1	54.2	80.2
Min. Wire Size (90°C)	#14	#12	#8	#14	#12	#8	#14	#12	#8	#4	#14	#12	#8	#4
Minimum Wire Size (75°C)	#14	#10	#6	#14	#10	#6	#14	#10	#6	#4	#14	#10	#6	#4
Minimum Wire Size (60°C)	#14	#10	#6	#14	#10	#6	#14	#10	#6	#3	#14	#10	#6	#3
Ground Wire Size	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Maximum Overcurrent Protection Amps	15	30	60	15	30	60	15	30	60	90	15	30	60	90

Table 6: Electrical Data: 18-36 kBTU Models - Single Branch Circuit

15kW and 20 kW models may have a dual or single power supply. Single power supply requires a jumper bar or a jumper wire.
+ 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 6.

AIR HANDLER MODELS																				
	MSVE 37, 42, 48, 60					MSVT 37, 42, 48, 60					MSVE 72					MSVT 72				
5 kw Heater Amps - 208/240 VAC	18.0/20.8					18.0/20.8					18.0/20.8					18.0/20.8				
10 kW Heater Amps - 208/240 VAC	36.1/41.7					36.1/41.7					36.1/41.7					36.1/41.7				
15 kW Heater Amps - 208/240 VAC	54.1/62.5					54.1/62.5					54.1/62.5					54.1/62.5				
20 kW Heater Amps - 208/240 VAC	72.2/83.4					72.2/83.4					72.2/83.4					72.2/83.4				
Indoor Blower Motor Type	ECM					CONSTANT TORQUE					ECM					CONSTANT TORQUE				
Indoor Blower Amps – 208/240 VAC	2.88/2.50					2.40/2.09					4.31/3.75					6.58/5.72				
Heater - kW	0	5	10	15	20	0	5	10	15	20	0	5	10	15	20	0	5	10	15	20
Minimum Circuit Ampacity	3.6	29.2	55.2	81.2	107.4	3.0	28.7	54.7	80.7	106.8	5.4	30.7	56.8	82.8	108.9	8.2	33.2	59.2	85.3	111.4
Min. Wire Size (90°C)	#14	#12	#6	#4	#3	#14	#12	#8	#4	#3	#14	#10	#6	#4	#3	#14	#10	#6	#4	#2
Minimum Wire Size (75°C)	#14	#10	#6	#4	#2	#14	#10	#6	#4	#2	#14	#10	#6	#4	#2	#14	#10	#6	#3	#2
Minimum Wire Size (60°C)	#14	#10	#4	#3	#1	#14	#10	#6	#3	#1	#14	#8	#4	#3	#1	#14	#8	#4	#2	#1
Ground Wire Size	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Maximum Overcurrent Protection Amps	15	30	60	90	110	15	30	60	90	110	15	35	60	90	110	15	35	60	90	125

Table 7: Electrical Data: 37-72 kBTU Models - Single Branch Circuit

15kW and 20kW models may have a dual or single power supply. Single power supply requires a jumper bar or a jumper wire.
+ 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 7.

AIR HANDLER MODELS				
	MSVE 25, 30, 36		MSVT 25, 30, 36	
Circuit Number	1	2	1	2
15 kW Heater Amps - 208/240 VAC	18.0/20.8	38.1/41.7	18.0/20.8	38.1/41.7
Indoor Blower Motor Type	ECM		CONSTANT TORQUE	
Indoor Blower Amps	2.33/2.03		1.91/1.66	
Heater - kW	15		15	
Circuit Number	1	2	1	2
Minimum Circuit Ampacity	28.6	52.1	28.1	52.1
Minimum Wire Size (90°C)	#12	#8	#12	#8
Minimum Wire Size (75°C)	#10	#6	#10	#6
Minimum Wire Size (60°C)	#10	#6	#10	#6
Ground Wire Size	*	*	*	*
Maximum Overcurrent Protection Amps	30	60	30	60

Table 8: Electrical Data: 25-36 kBTU Models – Dual Branch Circuit

+ 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 8.

AIR HANDLER MODELS																
	MSVE 37, 42, 48, 60				MSVT 37, 42, 48, 60				MSVE 72				MSVT 72			
Circuit Number	1		2		1		2		1		2		1		2	
15 kW Heater Amps - 208/240 VAC	18.0/20.8		38.1/41.7		18.0/20.8		38.1/41.7		18.0/20.8		38.1/41.7		18.0/20.8		38.1/41.7	
20 kW Heater Amps - 208/240 VAC	36.1/41.7		36.1/41.7		36.1/41.7		36.1/41.7		36.1/41.7		36.1/41.7		36.1/41.7		36.1/41.7	
Indoor Blower Motor Type	ECM				CONSTANT TORQUE				ECM				CONSTANT TORQUE			
Indoor Blower Amps	2.88/2.50				2.40/2.09				4.31/3.75				6.58/5.72			
Heater - kW	15		20		15		20		15		20		15		20	
Circuit Number	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Minimum Circuit Ampacity	29.1	52.1	55.3	52.1	28.6	52.1	54.7	52.1	30.7	52.1	56.8	52.1	33.2	52.1	59.3	52.1
Minimum Wire Size (90°C)	#12	#8	#6	#8	#12	#8	#8	#8	#10	#8	#6	#8	#10	#8	#6	#8
Minimum Wire Size (75°C)	#10	#6	#6	#6	#10	#6	#6	#6	#10	#6	#6	#6	#10	#6	#6	#6
Minimum Wire Size (60°C)	#10	#6	#4	#6	#10	#6	#6	#6	#8	#6	#4	#6	#8	#6	#4	#6
Ground Wire Size	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Maximum Overcurrent Protection Amps	30	60	60	60	30	60	60	60	35	60	60	60	35	60	60	60

Table 9: Electrical Data: 37-72 kBTU Models – Dual Branch Circuit

+ 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 9.

	ELECTRIC HEATER HEATING CAPACITIES						
		5 kW	10 kW	15kW		20kW	
	BRANCH CIRCUIT	1	1	1	2	1	2
240 VAC	BTU/HR	17,033	34,067	34,067	17,033	34,067	34,067
	kW	4.99	10.00	10.00	4.99	10.00	10.00
230 VAC	BTU/HR	15,876	33,686	33,686	15,876	33,686	33,686
	kW	4.65	9.78	9.78	4.65	9.78	9.78
220 VAC	BTU/HR	14,736	30,222	30,222	14,736	30,222	30,222
	kW	4.32	8.86	8.86	4.32	8.86	8.86
TOTAL HEATING CAPACITY @ 240 VAC	BTU/HR	17,033	34,067	51,149		68,134	
	kW	4.99	10.00	14.99		20.00	

Table 10: Electric Heater Heating Capacities

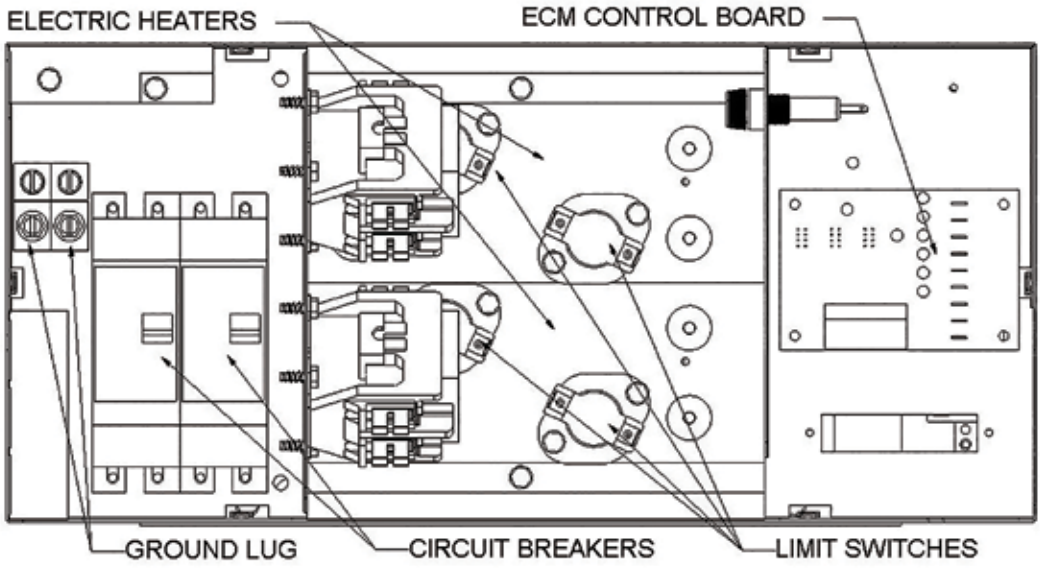


Figure 14: Component Locations – Electric Heat Control Box

NOTE: Casing or cabinet must be permanently grounded in accordance with the National Electrical Code or other applicable codes.

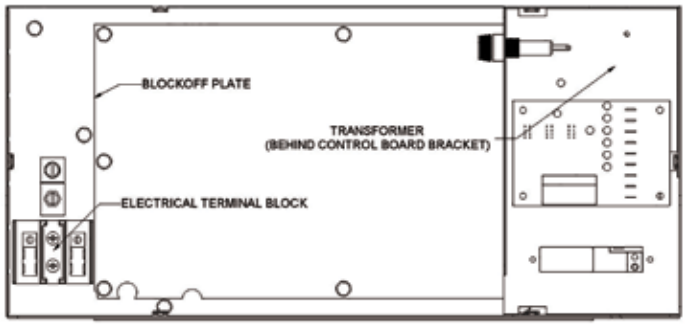


Figure 15: Component Locations – No Heat Control Box

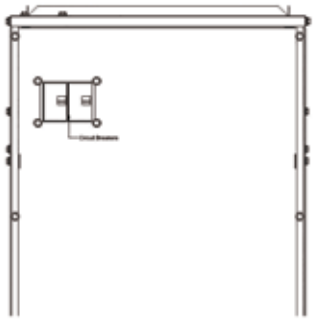


Figure 16: Circuit Breaker Location on Front Panel

⚠ WARNING

For personal safety be sure to turn the electrical power "OFF" at the main electrical panel and at the air handler 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 cover. Refer to Figures 18 and 19.

⚠ WARNING

This air handler is not equipped with a shield that covers the line voltage electrical supply wires and the circuit breaker connections. Take precautions to prevent accidental electrical shock. Be sure to turn the electrical power "OFF" at the main electrical panel and at the air handler control box circuit breakers before removing the front panel. Refer to Figure 16 for the circuit breaker location on the front panel.

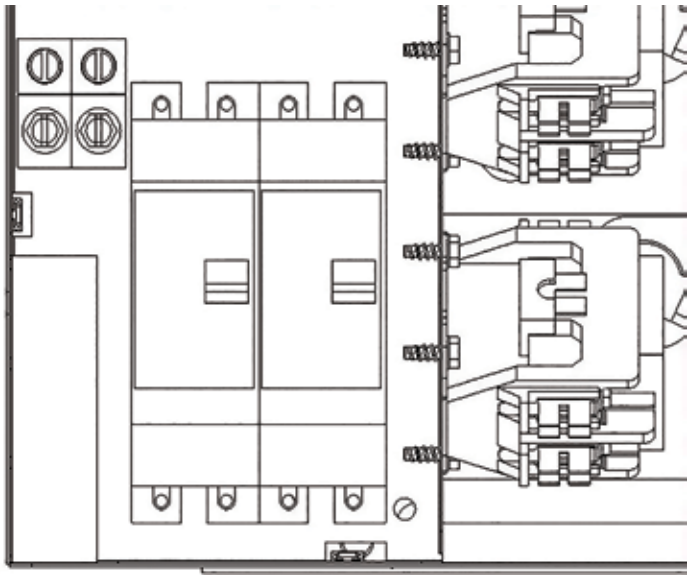


Figure 17: Control Box Circuit Breaker Location.

SECTION 8: FIELD INSTALLED ELECTRIC HEATER KITS

The field installed electric heat accessories are used on cooling or heat pump models that were not purchased with electric heat from the factory. Each air handler model is approved for use with the field installed accessory electric heat kit.

INSTALLING THE HEATERS

1. Follow the instructions in the USERS INFORMATION MANUAL to properly shut down the air handler.
2. Remove the block off plate shown in Figure 15 and discard. Retain the screws, they will be used to secure the electric heater mount plate.
3. Insert electric heat kit into the opening where the block off plate was removed. Secure the mounting plate with the screws that were removed from the block off plate.
4. Connect the six-pin male plug on the electric heater assembly to the six-pin female plug mounted on the side of the low voltage control box divider panel.
5. Remove the wiring diagram from the kit, remove the paper that covers the adhesive back and place the electric heat wiring diagram over the wiring diagram located on the blower housing.
6. Follow the instructions in the USERS INFORMATION MANUAL to properly start up the air handler.

Models Equipped With Circuit Breakers						
Model No	**Cabinet Size**	**Voltage**	**Phase**	**Hertz**	**Heater kW**	**Motor**
BSXHK05B	Small	208/240	1	60	5	C.T.
BSXHK10B	Small	208/240	1	60	10	C.T.
BMXHK05B	Medium	208/240	1	60	5	C.T.
BMXHK10B	Medium	208/240	1	60	10	C.T.
BMXHK15B	Medium	208/240	1	60	15	C.T.
BLXHK05B	Large	208/240	1	60	5	C.T.
BLXHK10B	Large	208/240	1	60	10	C.T.
BLXHK15B	Large	208/240	1	60	15	C.T.
BLXHK20B	Large	208/240	1	60	20	C.T.
BSEHK05B	Small	208/240	1	60	5	ECM
BSEHK10B	Small	208/240	1	60	10	ECM
BMEHK05B	Medium	208/240	1	60	5	ECM
BMEHK10B	Medium	208/240	1	60	10	ECM
BMEHK15B	Medium	208/240	1	60	15	ECM
BLEHK05B	Large	208/240	1	60	5	ECM
BLEHK10B	Large	208/240	1	60	10	ECM
BLEHK15B	Large	208/240	1	60	15	ECM
BLEHK20B	Large	208/240	1	60	20	ECM

Table 11: Electric Heater Kit Model Numbers

NOTE: All models have factory installed circuit breakers and electric heater kits have field installed circuit breakers. The models are MS, MM, US, UM are configured as follows:

Small cabinet MS**18, 24
Medium cabinet MS**25, 30, 36
Large cabinet MS**37, 42, 48, 60, 72

POWER SUPPLY CONNECTIONS

If the air handler has been installed prior to installing the electric heaters or if an older air handler 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 6 - 9 for correct wire size. If the supply power wire size is incorrect, new wires will need to be installed.

FOR CIRCUIT BREAKER MODELS ONLY: After the supply wiring has been connected to the circuit breakers, remove the transformer and indoor blower motor wires from the terminal block (See Figure 15) and connect them to load side of circuit breaker #1.

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 SECTION 9 of these instructions.

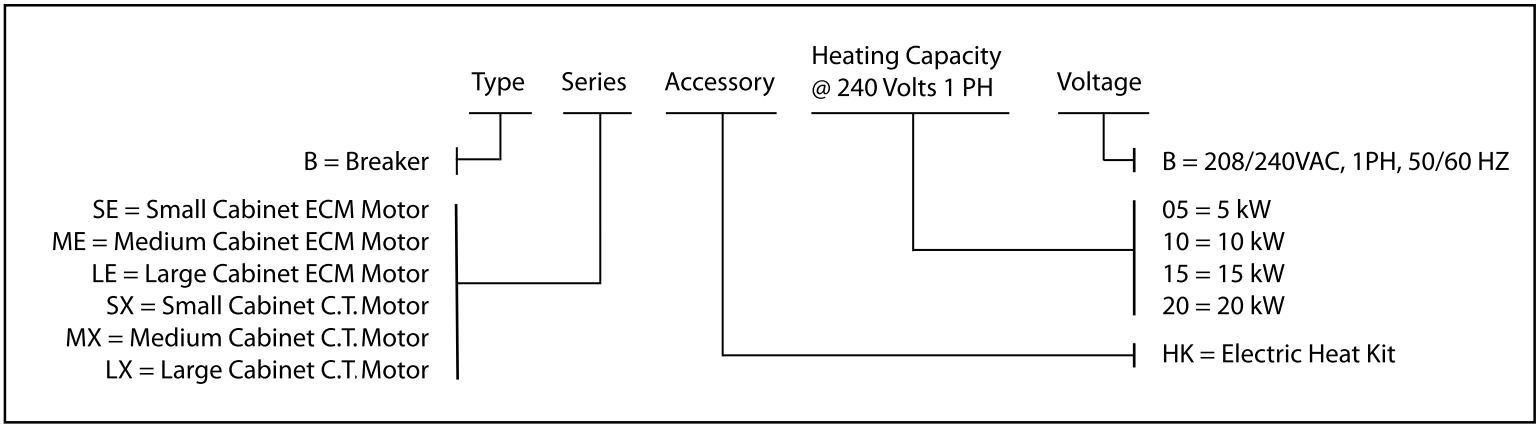


Table 12: Accessory Electric Heater Kit Model Number Nomenclature

⚠ CAUTION

To prevent damage, carefully insert the electric heating assembly through the rectangular opening in the front of the discharge opening so the heat element support rod is seated into the hole on the back side of the discharge opening.

⚠ CAUTION

After installing the electric heater, a one-inch clearance must be maintained on all sides of the supply air duct and/ or plenum for a minimum of 36 inches from the air handler discharge opening

SECTION 9: THERMOSTAT WIRING AND CONNECTIONS

Thermostat Wiring

Thermostat wires connect through side of air handler and should be no smaller than 22 gauge. Refer to Table 13 for recommended wire gauge, lengths and maximum current for each wire gauge. Thermostat wires can enter through the side or top of the air handler casing. When bringing wiring through the top or side of the air handler casing, cable connectors must be installed to hold wiring in place and to relieve any strain on the wiring.

Max. Thermostat Wire Length	Thermostat Wire Gauge	Thermostat Wire Maximum Current
0 - 100 Feet	22	3.0 Amps
0 - 125 Feet	20	3.0 amps
0 - 250 Feet	18	3.0 amps

Table 13: Low Voltage Wire Gauge and Max Lengths

The use of an 8 conductor cable from the thermostat to the air handler is recommended. The thermostat wire colors and the typical heating / cooling connections are listed in Table 14. The thermostat wire colors and the typical heat pump connections are listed in Table 15.

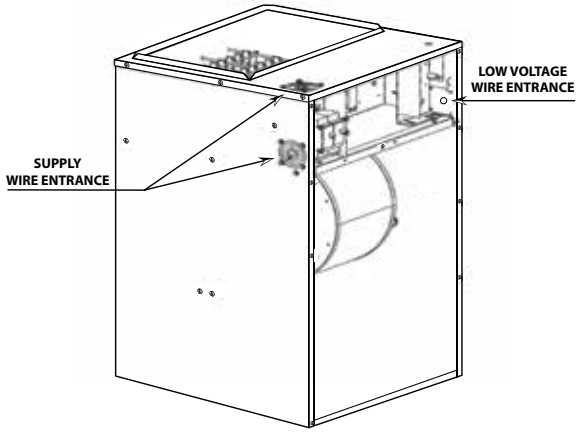


Figure 18: Cabinet Wiring Entrances

Thermostat Installation

The 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 air handler. Locating height of thermostat is important. If possible, the thermostat should be located in a hallway upstream from the air handler return airflow, not within 3 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 air-distribution supply air registers.

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

⚠ CAUTION

Do not locate thermostat within 3 feet of any of the following items:

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

Air Handler and Outdoor Unit With Separate Transformers

If the air-hander and the outdoor unit have separate transformers, it is important to use a thermostat with isolated heating and cooling contacts "RC" and "RH" to prevent interconnection of Class II 24 Volt Systems. Most modern thermostats have separate heating and cooling contacts for use with homes that have an air handler and outdoor unit 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 outdoor 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. If the air handler and outdoor unit using separate transformers are both connected to the thermostat "R" terminal, a transformer burnout can occur or either the air handler or outdoor unit control system could go into lockout mode. If an air handler and outdoor unit with separate transformers are being installed and the thermostat does not have the "RC" and "RH" terminals, a new thermostat with "RC" and "RH" terminals must be purchased and installed.

IMPORTANT: Cycle the air handler and outdoor unit separately to make sure both operate correctly.

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 system will short cycle. If the heat anticipator setting is too high, the system will run long heat cycles thus causing the temperature to overrun the temperature setting. This will cause the homeowner or user to feel too warm by the time the blower completes its cycle and too cold by the time the system cycles on again. The heat anticipator should be set to 0.4 for all heating kW's.

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

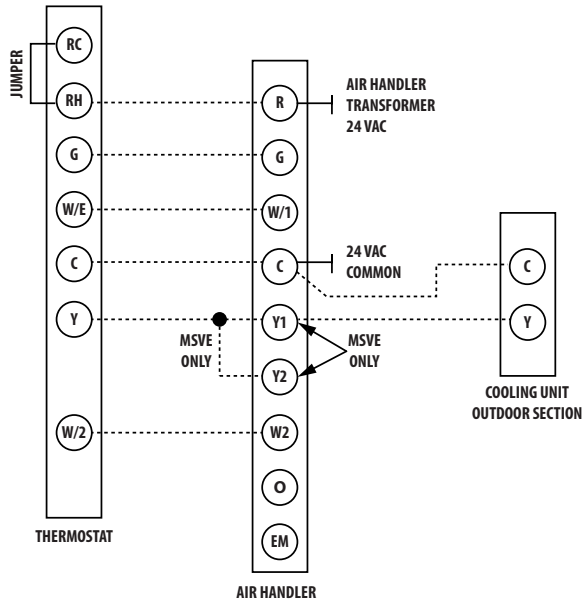


Figure 19: Typical Low Voltage Connections - Single-Stage Heat and Single-Stage Cooling

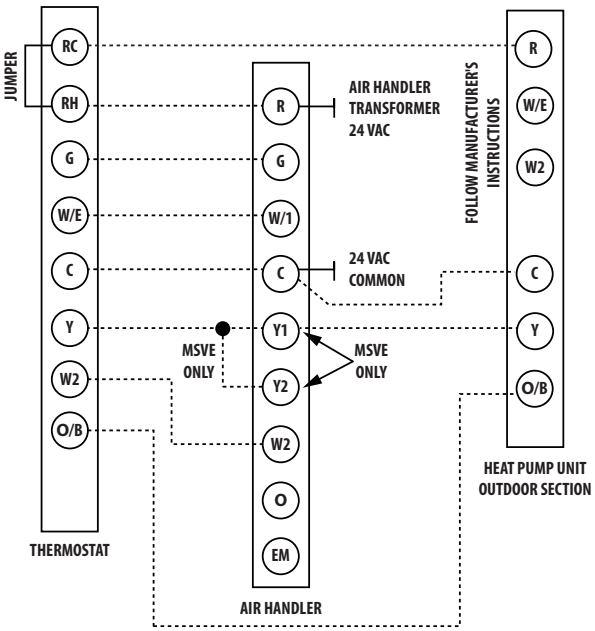


Figure 20: Typical Low Voltage Connections - Single-Stage Heat and Single-Stage Heat Pump

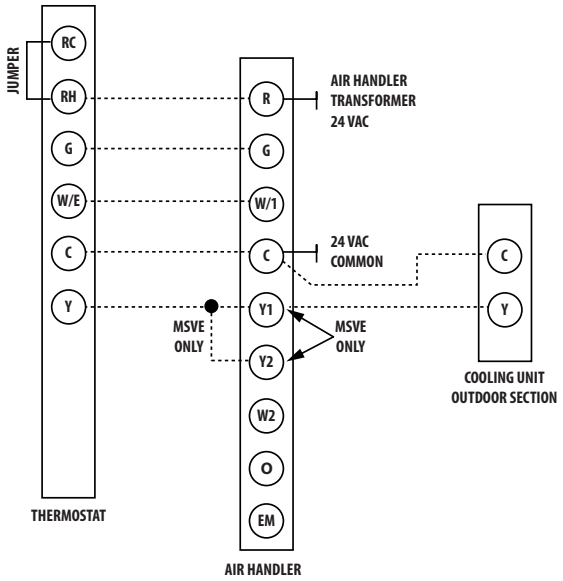


Figure 21: Typical Low Voltage Connections - Two-Stage Heat / Single-Stage Cooling

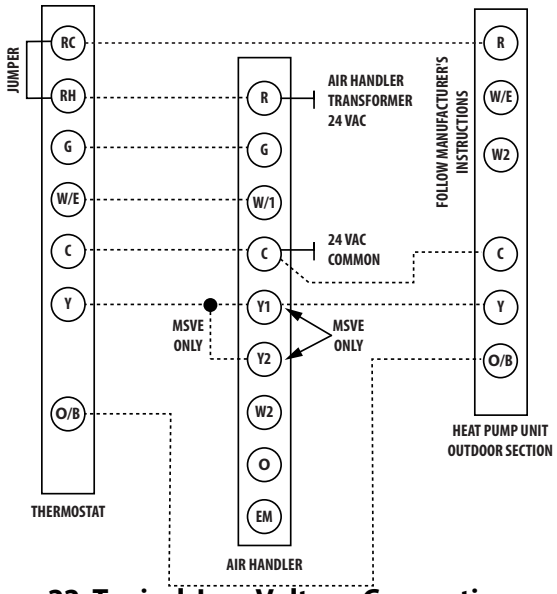


Figure 22: Typical Low Voltage Connections - Two-Stage Heat / Single-Stage Heat Pump

THERMOSTAT WIRE COLOR	DESCRIPTION	LETTER CODE	AIR HANDLER PIG TAIL WIRE CONNECTION	THERMOSTAT AND AIR HANDLER TERMINAL BLOCK CONNECTION	OUTDOOR UNIT CONNECTIONS
RED	24 VAC	R	RED	R	N/A
WHITE	1st Stage Heat	W1	WHITE	W or W1	N/A
BLACK	2nd Stage Heat	W2	BROWN	W2	N/A
GREEN	Indoor Fan	G	GREEN	G	N/A
YELLOW	Cooling /1st Stage Cooling	Y/Y1	YELLOW	Y/Y1	Y/Y1
BLUE	Optional 2nd Stage Cooling	Y2	BLUE	Y2	Y2
BROWN	24 VAC Common	C	GREY (ECM) BLUE (Constant Torque)	C	C

Table 14: Typical Heat / Cool Thermostat Wire Color Colors and Low Voltage Connections

Note: If a single-stage heat thermostat is used with an air handler with two-stage heat, install a jumper between W1 and W2 on the low voltage terminal block or connect the W1 and W2 pigtail wires together with the WHITE thermostat wire.

THERMOSTAT WIRE COLOR	DESCRIPTION	LETTER CODE	AIR HANDLER PIGTAIL WIRE CONNECTION	THERMOSTAT AND AIR HANDLER TERMINAL BLOCK CONNECTION	OUTDOOR UNIT CONNECTIONS
RED	24 VAC	R	RED	R	R
WHITE	1st Stage Electric Heat	W1	WHITE	E (Thermostat) W1 (Air Handler)	See Outdoor Unit Instructions
BLACK	2nd Stage Electric Heat	W2	BROWN	W2	N/A
GREEN	Indoor Fan	G	GREEN	G	N/A
YELLOW	Cooling /1st Stage Cooling	Y/Y1	YELLOW	Y/Y1	Y/Y1
BLUE	Optional 2nd Stage Cooling	Y2	BLUE	Y2	Y2
ORANGE	Heat Pump Reversing Valve (Most Brands)	O	N/A	O	See Outdoor Unit Instructions
ORANGE	Heat Pump Reversing Valve (Some Brands)	B	N/A	B	See Outdoor Unit Instructions
BROWN	24 VAC Common	C	GREY (ECM Mtr) BLUE (Constant Torque)	C	C

Table 15: Typical Heat Pump Thermostat Wire Color Colors and Low Voltage Connections

Typical Heating/Cooling Thermostat Wiring Connections

1. Remove blower / control box access panel.
2. Remove the control box cover.
3. Insert the wire cables from the thermostat and outdoor unit through the 9/16" diameter hole located in the top or side of the air handler and into the control box. Place the thermostat wire cable next to the air handler low voltage terminal block (LVTB) or low voltage pigtails. Secure the thermostat and outdoor unit wire cables in the 9/16" diameter hole with a strain relief to prevent wire connections from being pulled apart.
4. Strip 1/2" of the insulation on the end of each wire.
5. Connect the RED (24 VAC) supply thermostat wire to the "R" terminal on the LVTB or to the RED air handler pigtail wire and secure with a wire nut.
6. Connect the WHITE (first stage heating) thermostat wire to the "W1" terminal on the LVTB or to the WHITE air handler pigtail wire and secure with a wire nut.
7. Connect the GREEN wire from the thermostat "G" terminal thermostat wire to the "G" terminal on the LVTB or to the GREEN air handler pigtail wire and secure with a wire nut.
8. Connect the YELLOW wire from the thermostat "Y" terminal to the wire from the outdoor unit compressor contactor coil with a wire nut.
9. For MSVE models (ECM motor), also connect the YELLOW wire from the thermostat to both the YELLOW "Y1" and BLUE "Y2" air handler pigtails with a wire nut for single-stage cooling applications to assure full nominal airflow. For 2-stage cooling applications, connect the wires from the thermostat "Y1" terminal to the YELLOW "Y1" air handler pigtail and connect the wire from the thermostat "Y2" terminal to the BLUE "Y2" air handler pigtail.
10. Connect the BROWN 24 VAC common wire from the thermostat "C" terminal to the "C" terminal on the LVTB or to the air handler 24 VAC common pigtail wire (GRAY for ECM motor, BLUE for constant torque motor) with a wire nut. Also connect the 24 VAC common wire from the outdoor unit compressor contactor coil to the "C" terminal on the LVTB or to the thermostat and outdoor unit 24 VAC common wires with a wire nut.
11. For 15kW and 20kW models, connect the BLUE wire from the thermostat "W2" terminal (2nd stage heat) to the "W2" terminal on the LVTB or to the BROWN air handler pigtail wire and secure with a wire nut.

    NOTE: If single-stage heat thermostat is used with a 15kW or 20kW air handler, place a jumper between the "W1" and "W2" terminals on the LVTB or connect the BROWN and the WHITE air handler pigtail wires to the WHITE wire from the thermostat "W" terminal 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. Insert the wire cables from the thermostat and outdoor unit through the 9/16" diameter hole located on the top or side of the air handler and into the control box. Place the thermostat and outdoor unit wire cables next to the air handler low voltage terminal block (LVTB) or low voltage pigtails. Secure the thermostat and outdoor unit wire cable with a strain relief in the 9/16" diameter hole to prevent wire connections from being pulled apart.
4. Strip 1/2" of the insulation on the end of each wire.
5. Connect the RED (24 VAC) wire from the thermostat "R" terminal to the "R" terminal on the LVTB or to the RED air handler pigtail wire and with the wire from the "R" terminal or pigtail on the outdoor unit. Fasten the three wires together securely with a wire nut.
6. Connect the WHITE (emergency heat) wire from the thermostat "E" terminal to the "W1" terminal on the air handler LVTB or to the WHITE air handler pigtail wire with a wire nut. If applicable, also connect the wire from the outdoor control board that calls for supplemental heat during the defrost cycle to the "W1" terminal on the air handler LVTB or to the WHITE air handler pigtail wire. Refer to the outdoor unit installation instructions for additional information.
7. Connect the GREEN wire from the thermostat "G" terminal to the "G" terminal on the LVTB or to the GREEN air handler pigtail wire and securely fasten the two wires together with a wire nut.
8. Connect the YELLOW wire from the thermostat "Y" terminal to the wire from the outdoor unit "Y" terminal or pigtail with a wire nut.
9. For MSVE models (ECM motor), also connect the YELLOW wire from the thermostat to both the YELLOW "Y1" and BLUE "Y2" air handler pigtails with a wire nut for single-stage cooling applications to assure full nominal airflow. For 2-stage cooling applications, connect the wires from the thermostat "Y1" terminal to the YELLOW "Y1" air handler pigtail and connect the wire from the thermostat "Y2" terminal to the BLUE "Y2" air handler pigtail.
10. Connect the BROWN 24 VAC common wire from the thermostat "C" terminal to the "C" terminal on the LVTB or to the air handler 24 VAC common air handler pigtail wire (GRAY for ECM motor, BLUE for constant torque motor) with a wire nut. Also connect the 24 VAC common wire from the outdoor unit "C" terminal or pigtail to the "C" terminal on the LVTB or to the thermostat and outdoor unit 24 VAC common wires with a wire nut.
11. Connect the ORANGE wire from the thermostat "O" or "B" terminal with the wire from the outdoor unit "O" or "B" terminal or pigtail with a wire nut. Refer to the outdoor unit installation instructions for additional information.
12. For 15kW and 20kW models, connect the BLACK wire from the thermostat "W2" terminal (2nd stage heat) to the "W2" terminal on the LVTB or to the BROWN air handler pigtail wire and secure with a wire nut.

    NOTE: If single-stage heat thermostat is used with a 15kW or 20kW air handler, place a jumper between the "W1" and "W2" terminals on the LVTB or connect the BROWN and the WHITE air handler pigtail wires to the WHITE wire from the thermostat "W" terminal with a wire nut.

SECTION 10: BLOWER PERFORMANCE

Model Number	Motor HP	Volts 1 Ph. 50/60 Hz	Motor Code	Blower Wheel	Speed Tap	CFM @ 0.10" E.S.P	CFM @ 0.20" E.S.P	CFM @ 0.30" E.S.P	CFM @ 0.40" E.S.P	CFM @ 0.50" E.S.P	CFM @ 0.58" E.S.P
MSVT18 MSVT24 Electric Heat	1/3	208/240	VD1	10 X 7	5	1220	1157	1105	1049	985	916
					4	1139	1093	1042	982	918	873
					3	1067	1013	963	894	826	770
					2	924	872	814	726	663	576
					1	861	786	708	638	547	483
MSVT25 MSVT30 MSVT36 Electric Heat	1/2	208/240	VE1	10 X 8	5	1607	1576	1549	1556	1488	1463
					4	1274	1240	1210	1174	1136	1120
					3	1037	996	968	925	892	854
					2	915	833	797	759	706	621
					1	892	786	723	689	607	546
MSVT37 MSVT42 MSVT48 MSVT60 Electric Heat	3/4	208/240	VF1	12 X 9	5	1876	1870	1866	1850	1836	1802
					4	1802	1778	1771	1764	1718	1696
					3	1739	1746	1711	1674	1629	1600
					2	1685	1671	1626	1587	1544	1512
					1	1579	1560	1544	1491	1445	1406
MSVT72 Electric Heat	1	208/240	VV1	12 X 10	5	2504	2470	2441	2393	2351	2318
					4	2370	2339	2290	2246	2208	2178
					3	2240	2201	2162	2129	2088	2060
					2	2088	2054	2019	1969	1932	1900
					1	1910	1865	1826	1787	1750	1720

Table 16: MSVT Blower Performance Chart - Constant Torque Motors - Without Air Filter

Note: Minimum CFM for Electric Heat: 5 - 10kW = 650 CFM; 15kW = 1000 CFM; 20 kW = 1400 CFM

Model Number	Nominal Tons	Motor HP	Volts 1 Ph. 50/60 Hz.	Motor Code	Blower Wheel	Jumper	CFM @ 0.10"	CFM @ 0.20"	CFM @ 0.30"	CFM @ 0.40"	CFM @ 0.50"
MSVE18,24 Electric Heat	1.5 - 2.0	1/3	208/240	VA	9 X 6	A	837	837	824	817	806
						B	744	733	721	717	713
						C	705	697	689	681	677
						D	634	620	615	611	602
MSVE25,30,36 Electric Heat	1.5 - 3.0	1/2	208/240	VB	10 X 7	A	1422	1421	1421	1416	1416
						B	1215	1214	1214	1214	1208
						C	898	989	989	982	969
						D	865	865	865	866	858
MSVE37,42,48,60 Electric Heat	5.0	3/4	208/240	VC	12 X 9	A	1957	1919	1900	1871	1847
						B	1576	1565	1547	1517	1487
						C	1495	1482	1451	1432	1409
						D	1411	1385	1372	1338	1311
MSVE72 Electric Heat	6.0	1	208/240	VU	12 X 10	A	2393	2393	2393	2393	2388
						B	2227	2227	2221	2221	2221
						C	2012	2012	2005	2005	2005
						D	1795	1795	1795	1795	1795

Table 17: MSVE Blower Performance Chart - ECM Motors (Y1+Y2, W1, or W2) - Without Air Filter

Notes: 1) For single-stage cooling/heat pump systems, connect the wire from the "Y" thermostat terminal to both the "Y1" and "Y2" air handler low voltage pigtails to assure full nominal airflow.
2) "Y1" CFM (1st stage cooling/heat pump heating) is approximately 70% of the values shown in Table 17.
3) Continuous fan CFM is approximately 50% of the values shown in Table 17.
4) Minimum CFM for Electric Heat: 5 - 10kW = 650 CFM; 15kW = 1000 CFM; 20 kW = 1400 CFM

SECTION 11: MOTOR SPEED SELECTION AND AIR HANDLER STARTUP

Notice: Refer to the blower performance tables in Section 10 of this manual when selecting the motor speed for a specific application.

⚠ 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 air handler.

Selecting the Constant Torque Motor Speed

The constant torque motor operates on 208/240 VAC and the motor speed taps are controlled by 24 VAC. The speed taps can be changed by moving the BLACK and RED wires to different terminals on the motor terminal block (terminals 1 – 5). Table 18 shows the constant torque motor lead connection labeling and the connection definitions.

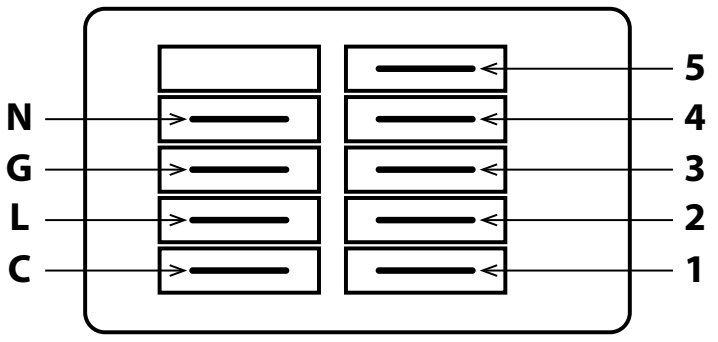


Figure 23: Constant Torque Motor Terminals

Terminal	Connection
C	Speed Tap Common - 24 VAC Common
L	Supply Voltage - 240 Vac Line 1
G	Ground Connection
N	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 18: Constant Torque Motor Terminal Connections

Changing Motor Speeds – Constant Torque Motor

1. Turn off all electrical supply circuits to the air handler at the main electrical panel.
2. Switch the air handler circuit breaker(s) to "OFF".
3. Remove the blower access panel.
4. Move the BLACK and RED wires connected to terminals 1-5 on the motor terminal block (See Figure 23) to the desired speed taps. See Table 18 for the speed tap descriptions.
5. Reinstall the blower access panel.
6. Turn the air handler circuit breakers to "ON".
7. Turn on all electrical supply circuits to the air handler at the main electrical panel.
8. Set the thermostat to the desired operating mode and temperature.

Changing Motor Speeds – ECM Motor

1. Turn off all electrical supply circuits to the air handler at the main electrical panel.
2. Switch the air handler circuit breaker(s) to "OFF'.
3. Remove the blower access panel.
4. Remove the control box cover.
5. Motor speed can be changed for both heating and cooling modes by moving the jumper on the "COOL" and "HEAT" jumper pins (See Figure 24) on the ECM control board to a different setting. Pin setting is as foll ows:
   A = High Speed, B = Medium High Speed, C = Medium Speed, and D = Low Speed.
6. The ADJUST pin (See Figure 24) is used to increase or decrease the cooling and heating blower motor CFM by 10 12% by moving the pin from the NORMAL position to either the + or – setting.
7. Reinstall the control box cover and blower box access panel.
8. Switch the air handler circuit breaker(s) to "ON".
9. Turn on all electrical supply circuits to the air handler at the main electrical panel.
10. Set the thermostat to the desired operating mode and temperature.

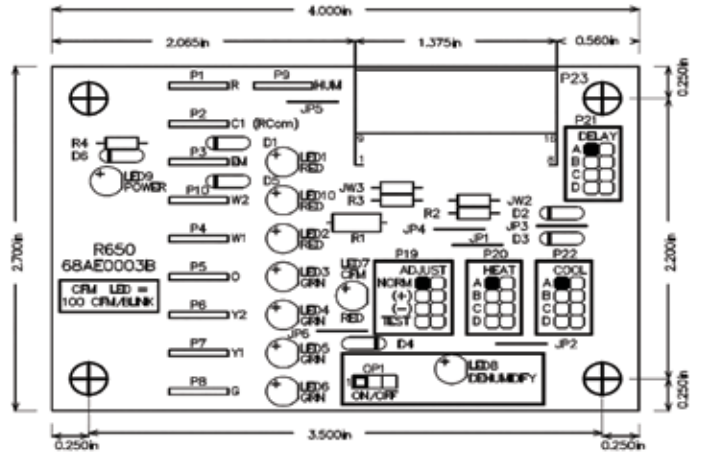


Figure 24: ECM Control Board Layout

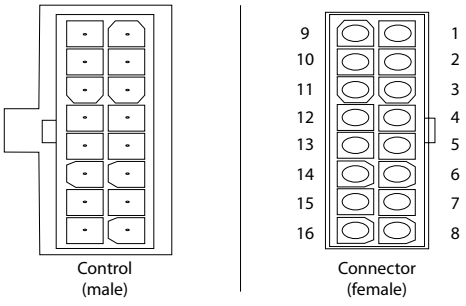


Figure 25: ECM Motor Control Pin Position

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 +COOL setting.

Table 19: ECM Motor Control Connector Terminal Descriptions

Dehumidify– The ECM control board has a jumper pin (OP1, See Figure 24) that can be selected to provide on demand dehumidification for the cooling system. If the jumper pin is moved the ON position, a 24 VAC signal must be present from a dehumidifying thermostat or humidistat when the humidity is below the set point. The humidistat contacts must open when humidity is above the set point.

Dehumidification can be enabled by moving the jumper pin 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. When humification is called for by the thermostat or humidistat, the blower CFM will be reduced by 10-12%. The LED on the ECM control board will be lit when the motor is in the "dehumidify" mode.

If the ECM motor dehumidify program is not desired by the homeowner or user, move the jumper pin back to the "OFF" position to disable the motor program.

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 this manual to determine the proper setting for the climate in the area where the air handler is being installed.

⚠ WARNING

The test setting on the ADJUST jumper pins must not be used except for trouble shooting to determine if the blower operates.

ECM Control Board Flash Code

The ECM control board has a CFM flash code when the air handler is in 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 pressure will be low due to the removed access panel, the blower 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.

SECTION 12: FINAL SYSTEM CHECKOUT

1. Refer to appropriate wiring diagram and recheck all wiring connections. Ensure that all wiring connections are secure.
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 air handler circuit breakers in the main electrical panel to the ON position.
6. Set the blower selector switch on the thermostat 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 on the thermostat 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.

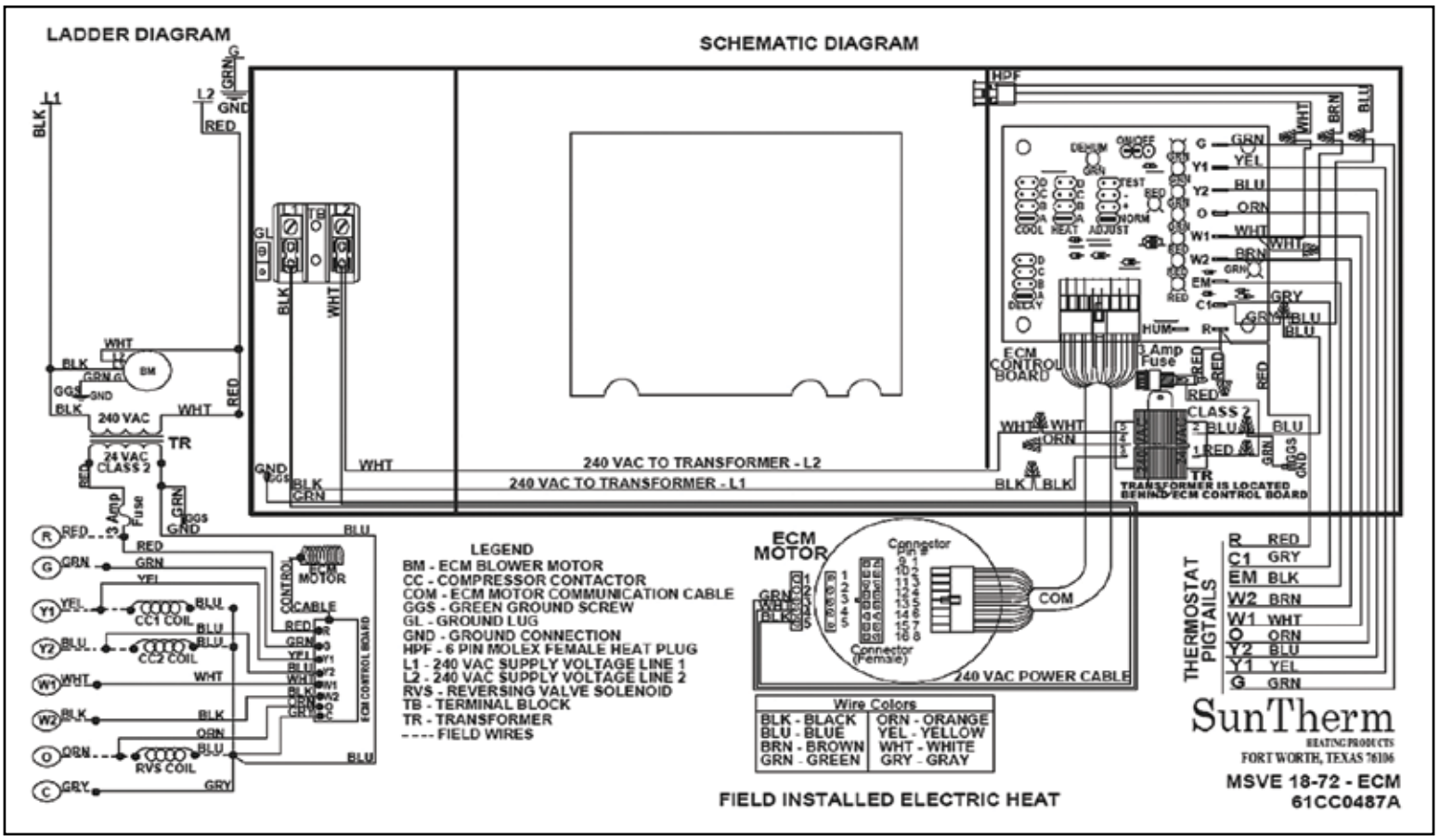


Figure 26: MSVE 18-72 – ECM Motor – No Electric Heater

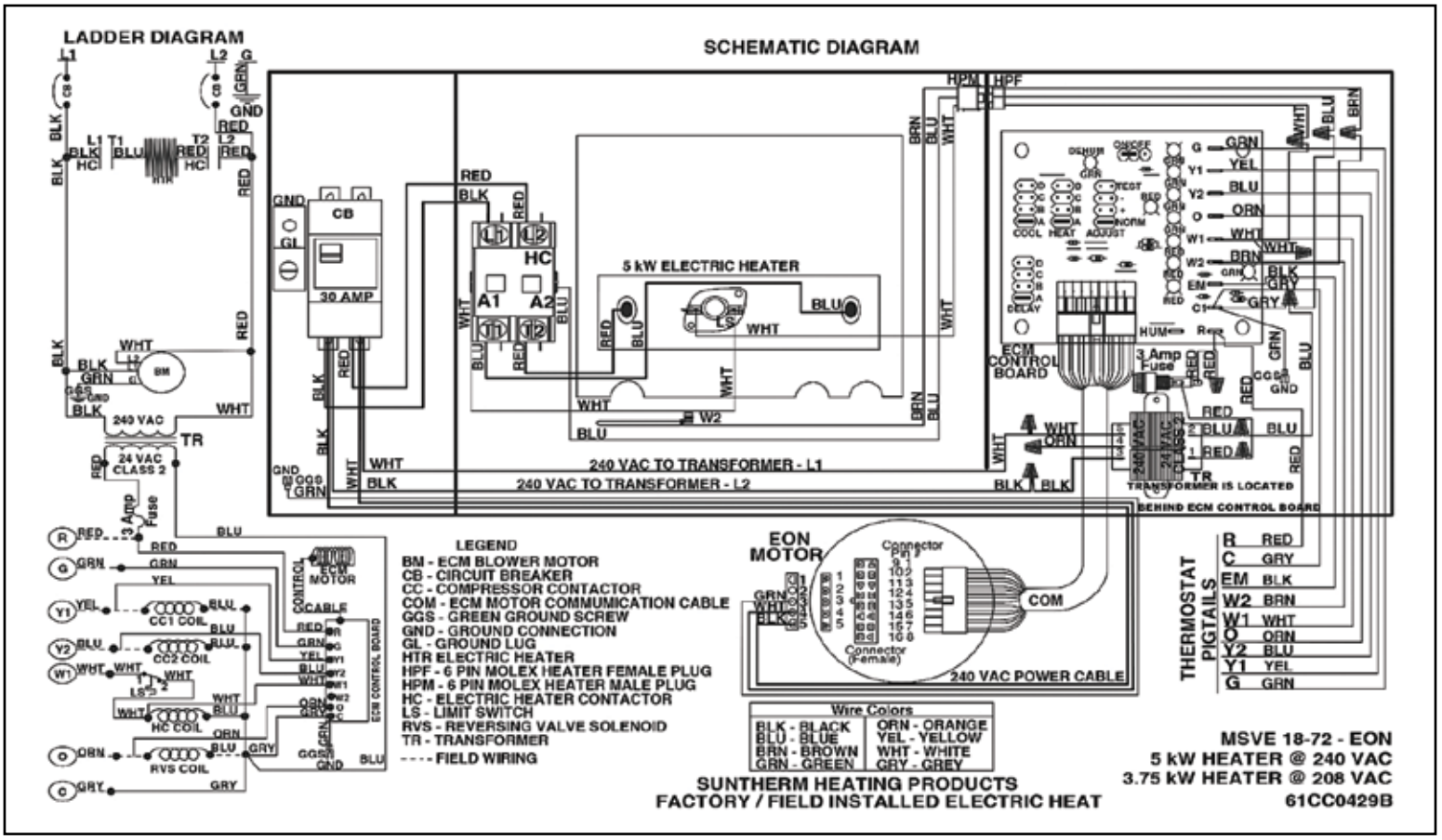


Figure 27: MSVE 18-72 – ECM Motor – 5 kW Electric Heater

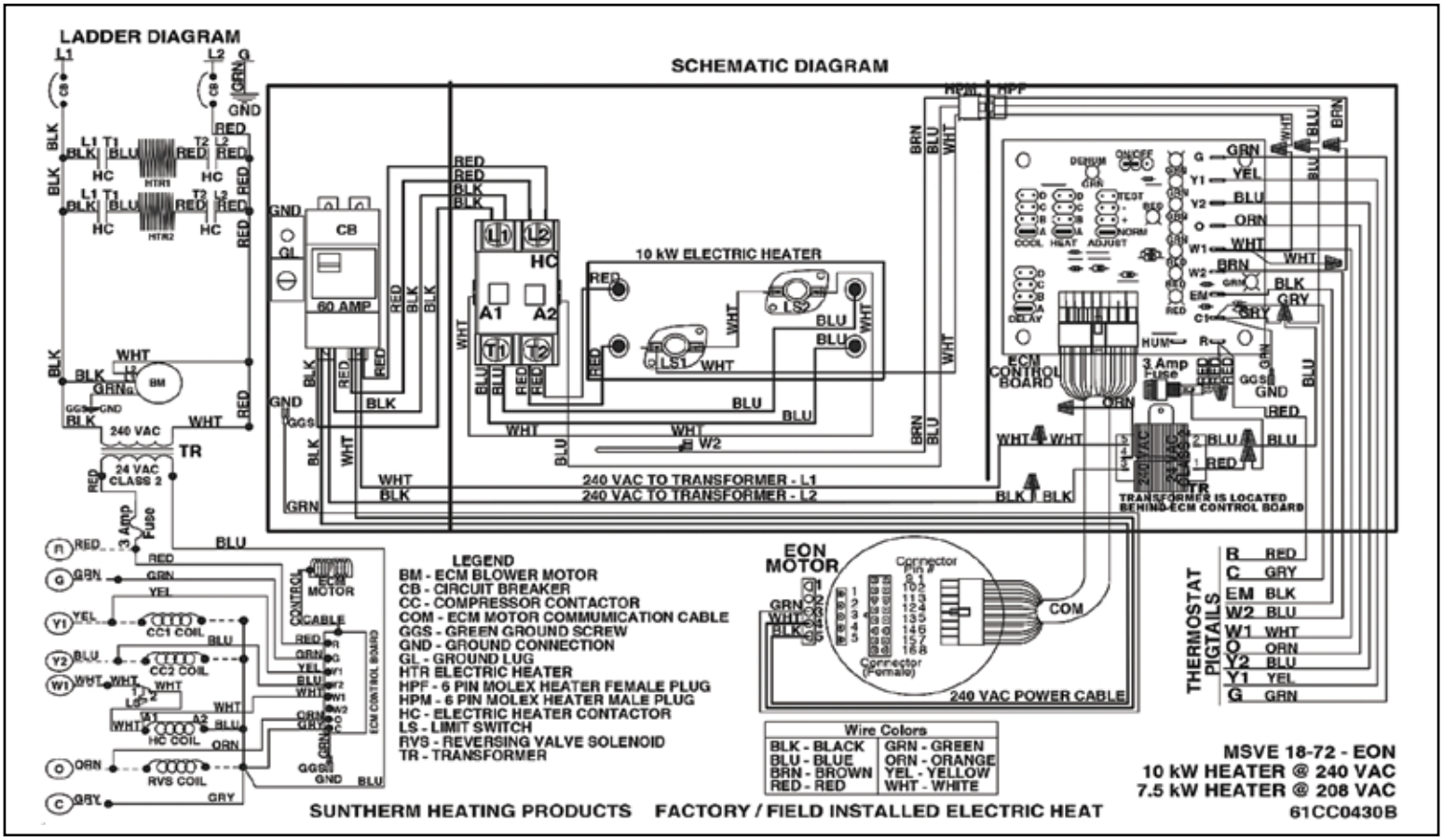


Figure 28: MSVE 18-72 – ECM Motor – 10 kW Electric Heater

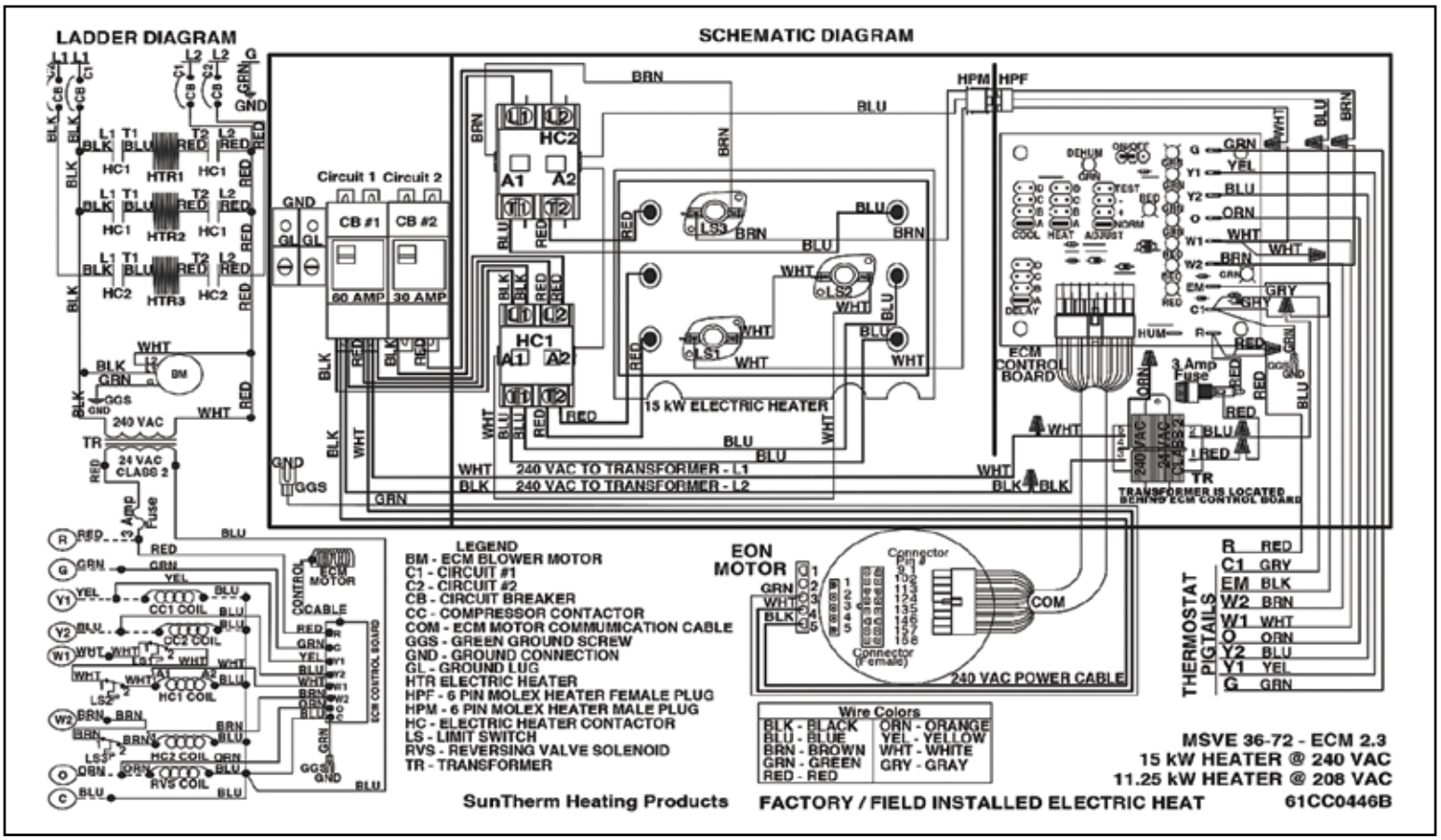


Figure 29: MSVE 25-72 – ECM Motor – 15 kW Electric Heater

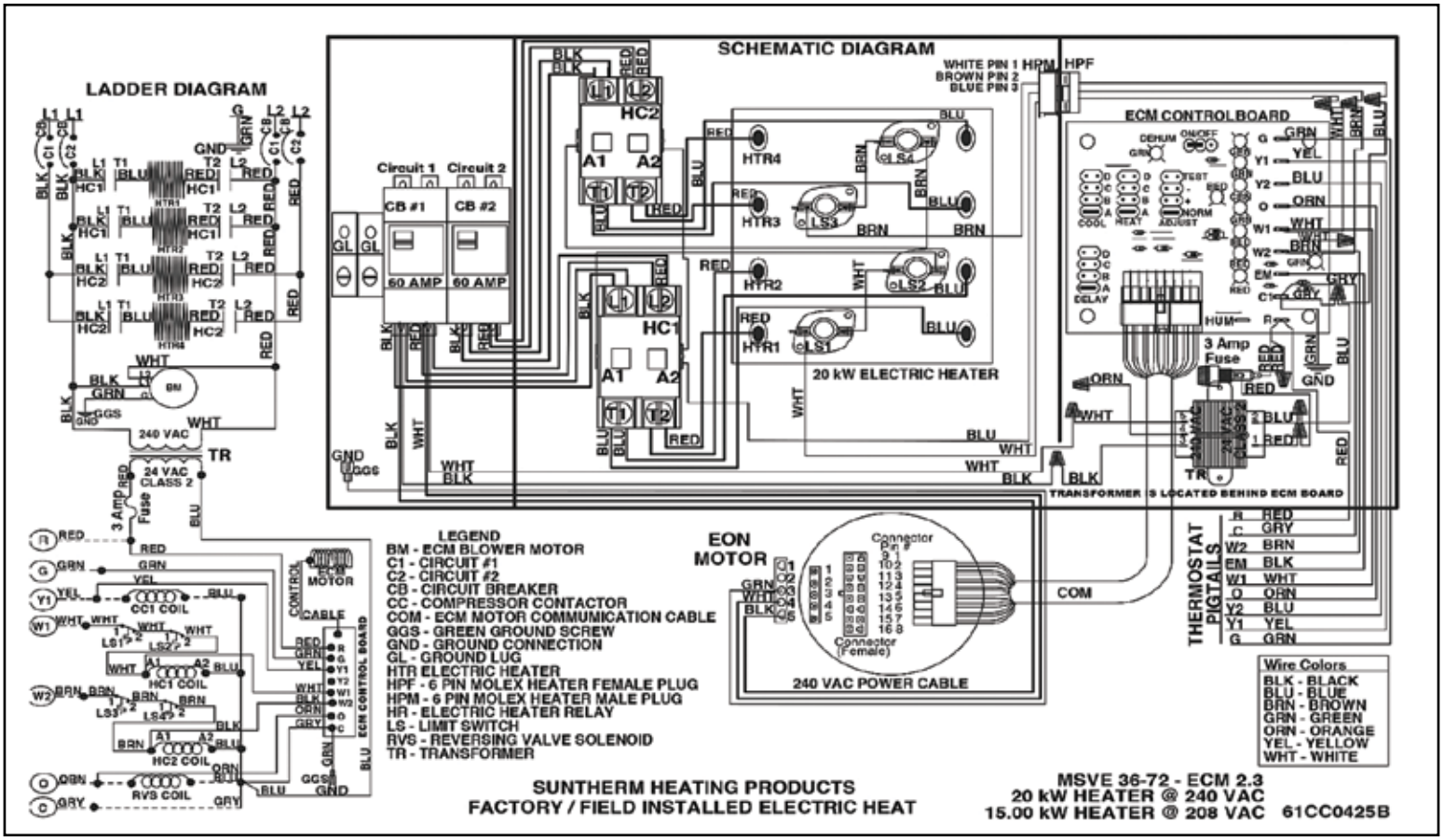


Figure 30: MSVE 37-72 – ECM Motor – 20 kW Electric Heater

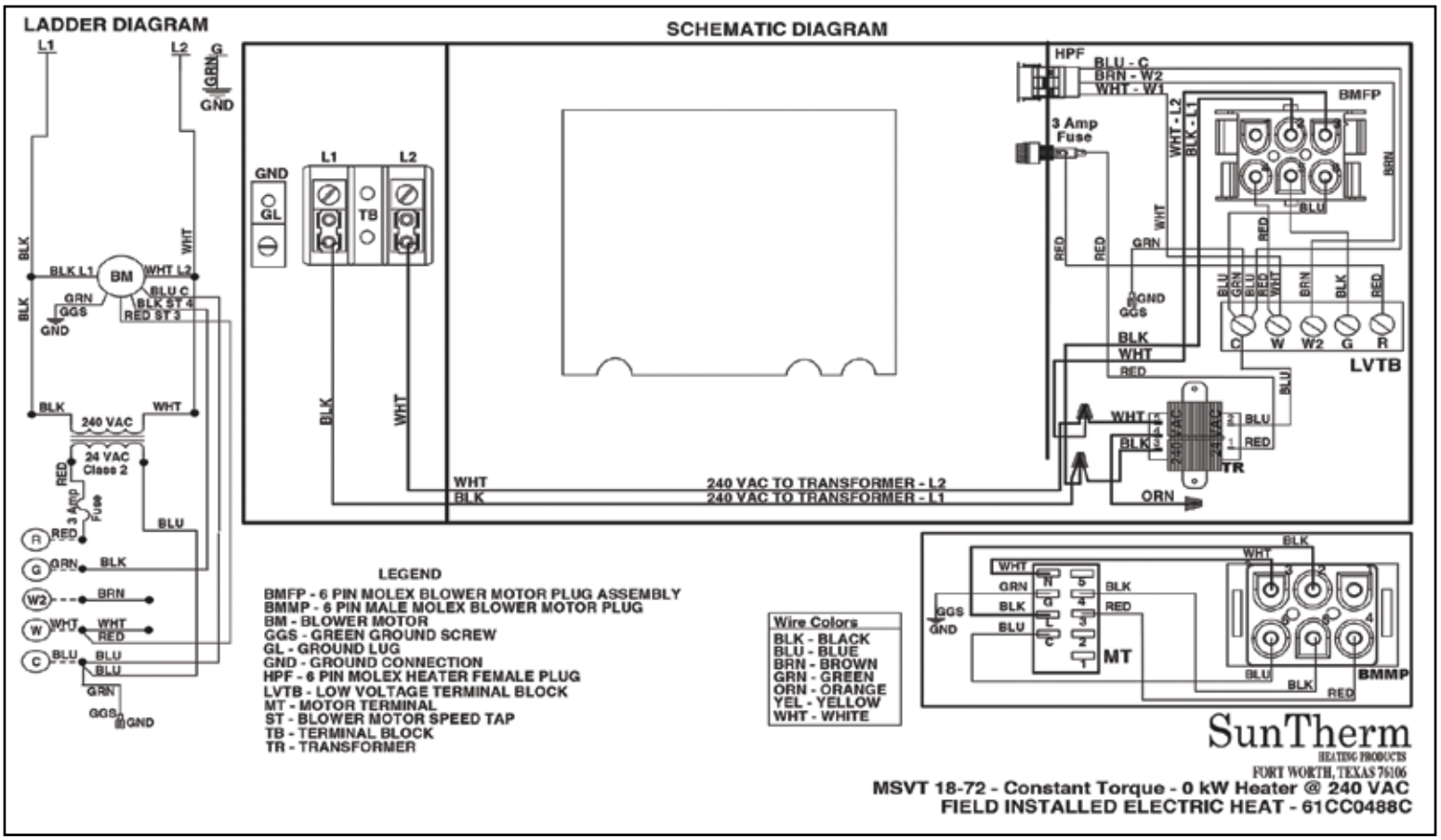


Figure 31: MSVT 18-72 – Constant Torque Motor – No Electric Heater

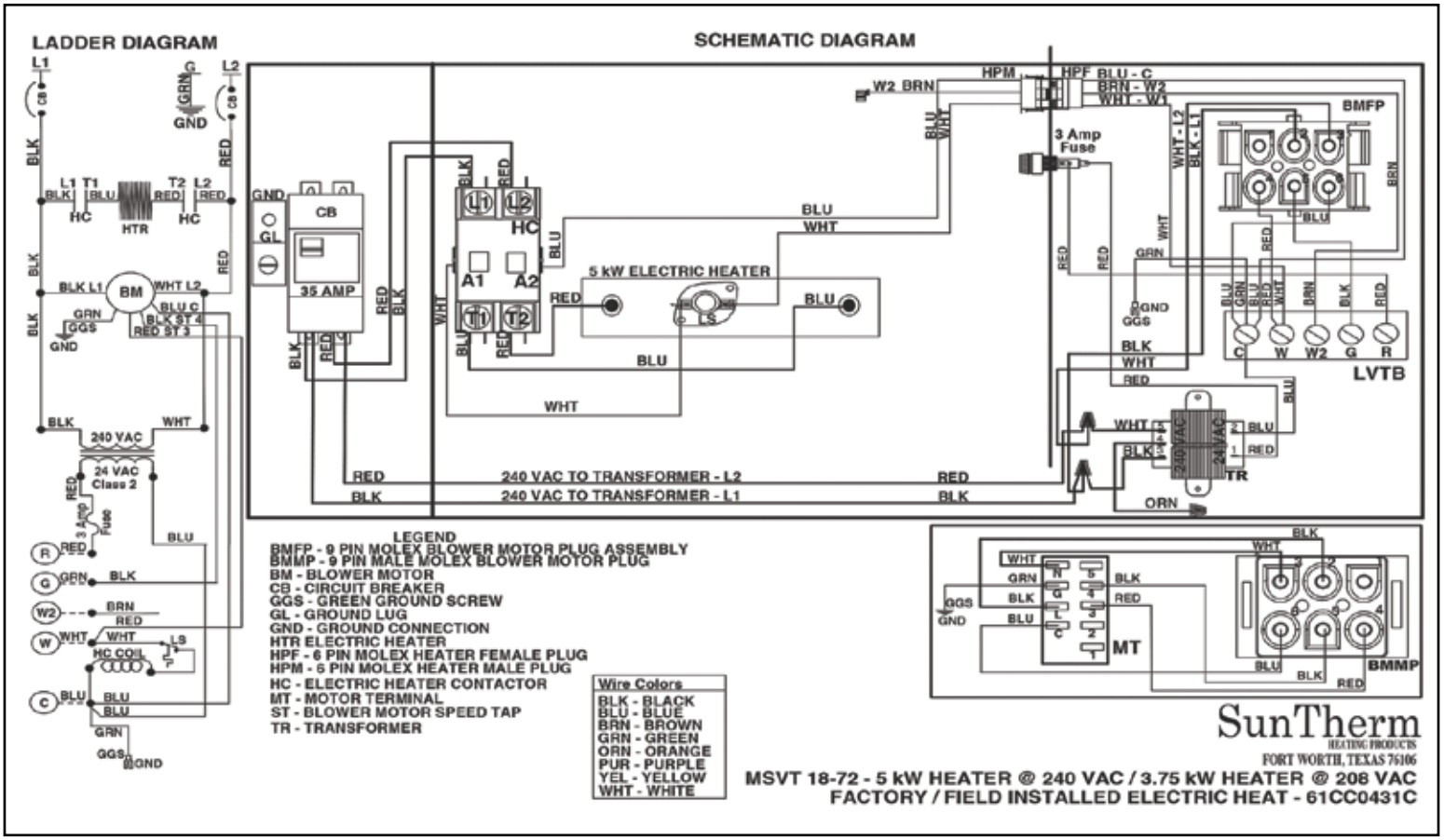


Figure 32: MSVT 18-72 – Constant Torque Motor – 5kW Electric Heater

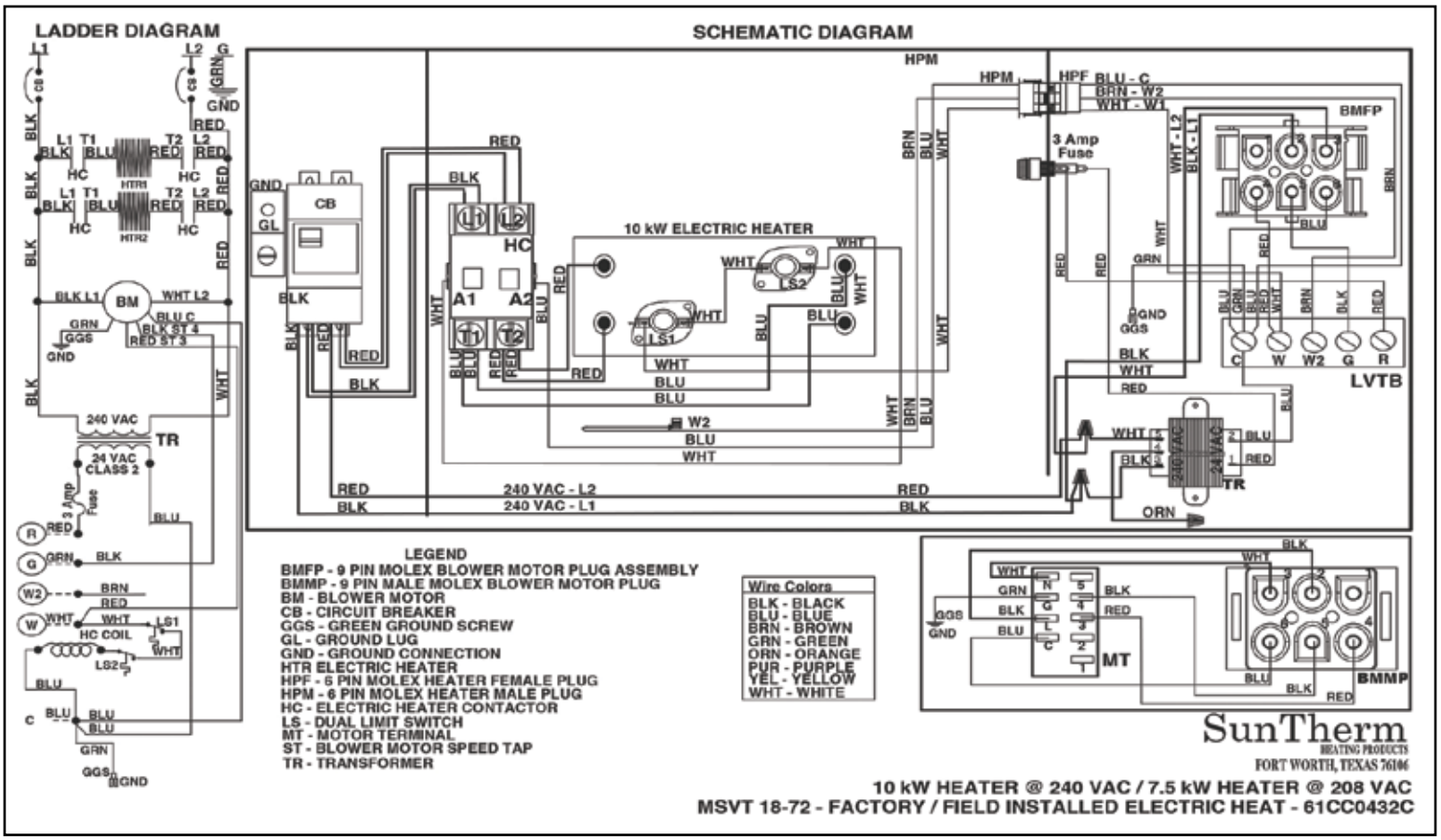


Figure 33: MSVT 18-72 – Constant Torque Motor – 10kW Electric Heater

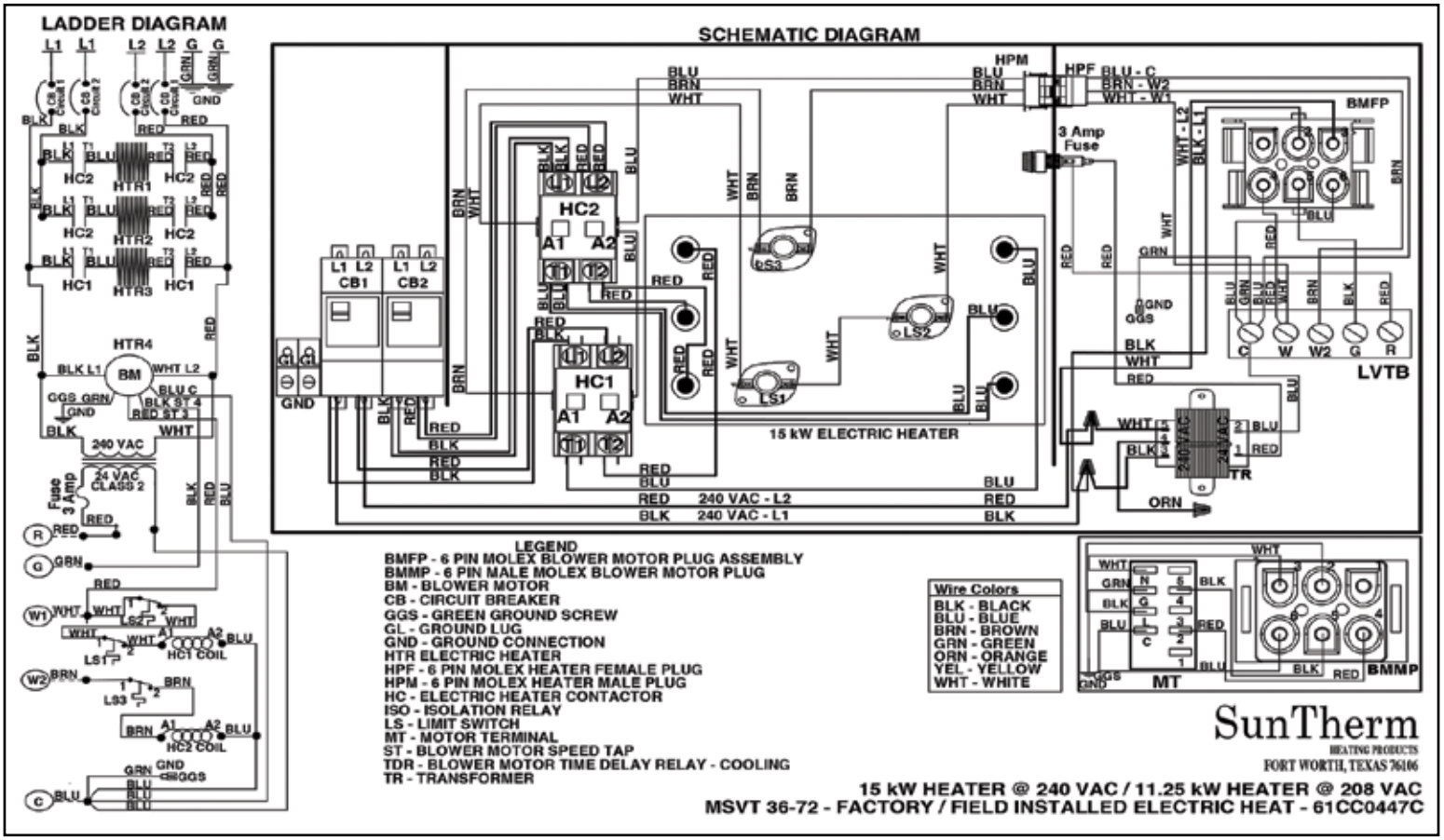


Figure 34: MSVT 25-72 – Constant Torque Motor – 15kW Electric Heater

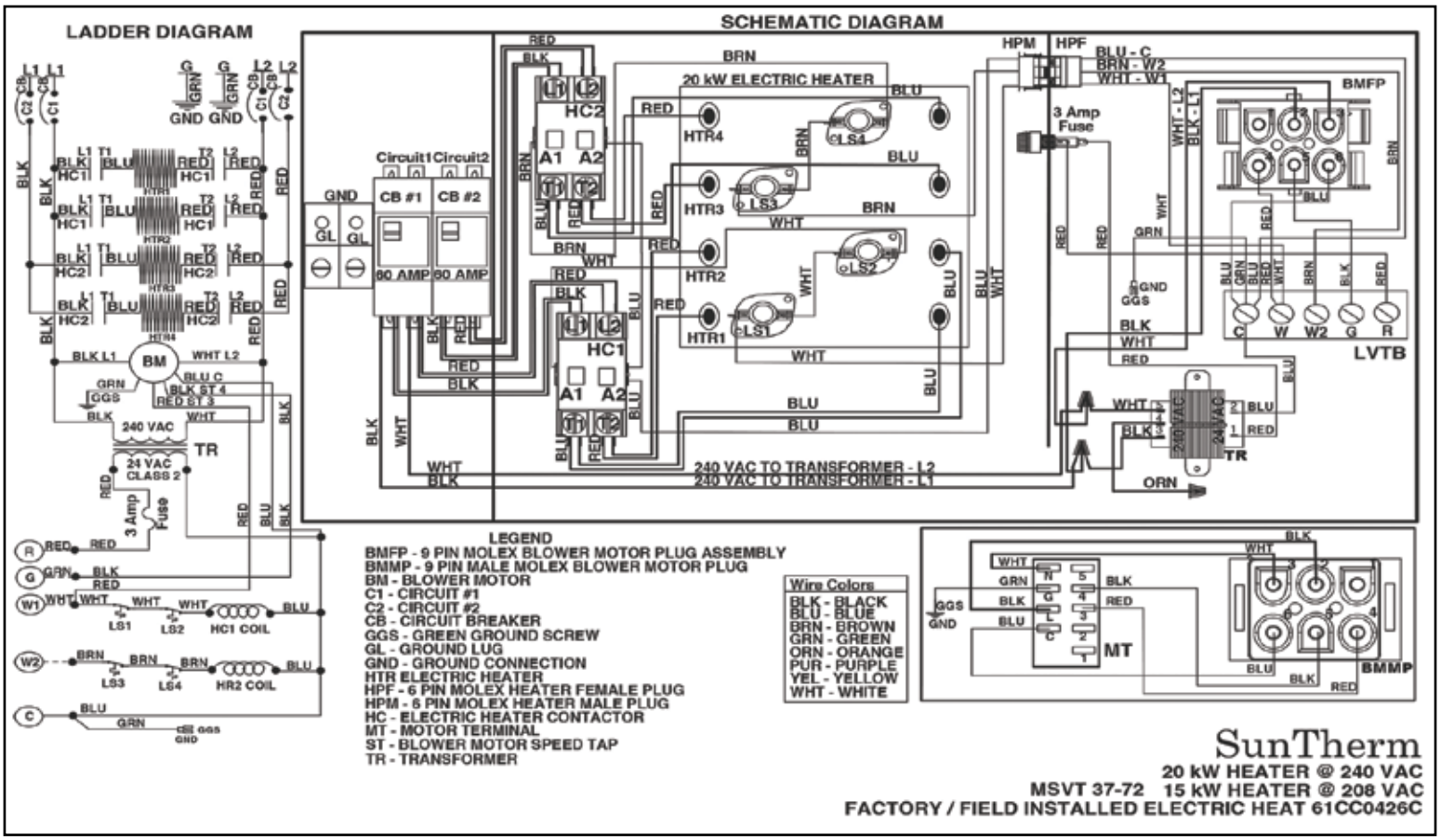


Figure 35: MSVT 37-72 – Constant Torque Motor – 20kW Electric Heater