INSTALLATION MANUAL

Upflow and Vertical Wall Mount Installation – Models Configured as DX or Chilled Water Cooling with Electric or Hot Water Heating

MODELS: B/S/H02 - B/S/H03 – WCW and WCW-HW SERIES

LIST OF SECTIONS

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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

B/S02 Electric Heat with DX Cooling Models
18/24WCW Electric Heat with Chilled Water Cooling

B/S03 Electric Heat with DX Cooling Models
30/36WCW Electric Heat with Chilled Water Cooling

H02 Hydronic Heat with DX Cooling Models
18/24WCW-HW Hydronic Heat with Chilled Water Cooling

H03 Hydronic Heat with DX Cooling Models
30/36WCW-HW Hydronic Heat with Chilled Water Cooling

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.
Installer 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.

⚠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 208/230 VAC models use nominal 208 or 230 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 or a vertical wall mount application. The versatile models may be used with a DX coil or a chilled water coil and can be configured with electric heat, without electric heat or with hot water heat. The direct drive (3) speed PSC motors provide a selection of air volume to match any application.
The unit can be positioned for bottom air return or front return.

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.
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.

Model No.	Nominal Tons	Blower Code	CFM @ 0.2" ESP With Coil	Nominal Heating Speed (CFM)/Spd	kW	Voltage / PH / HZ	Thermostat Circuit Voltage / PH / HZ	Max. External Static Duct Pressure (In. W.C.)
B02/S02/18WCW/24WCW	1.5 - 2.0	-45	850	780 / L	0 - 10	208-230 / 1 / 60	24 / 1 / 60	0.30
B02, S02	2.5	-34	1000	950 / L	0 - 10	208-230 / 1 / 60	24 / 1 / 60	0.30
B03/S03/30WCW/36WCW	3.0	-42	1200	870 / L	0 - 15	208-230 / 1 / 60	24 / 1 / 60	0.30
Model No.	Nominal Tons	Blower Size (in.)	CFM @ 0.2" ESP With Coil	Nominal Heating Speed (CFM)/Spd	Nominal Heating BTU/H	Voltage / PH / HZ	Thermostat Circuit Voltage / PH / HZ	Max. External Static Duct Pressure (In. W.C.)
H02/18WCW-HW/24WCW-HW	1.5 - 2.0	10 x 6	800	730 / L	26-30,000	115 / 1 / 60	24 / 1 / 60	0.30
H02	2.5	10 x 7	985	950 / L	34-39,000	115 / 1 / 60	24 / 1 / 60	0.30
30WCW-HW	2.5	10 x 7	960	900 / L	34-39,000	115 / 1 / 60	24 / 1 / 60	0.30
H03/36WCW-HW	3.0	10 x 8	1150	1015 / L	43-49,800	115 / 1 / 60	24 / 1 / 60	0.30

Table 1 Air Handler Model Specifications

Available Blower Motors

1. Blower Motor - 3 SPD PSC MOTOR

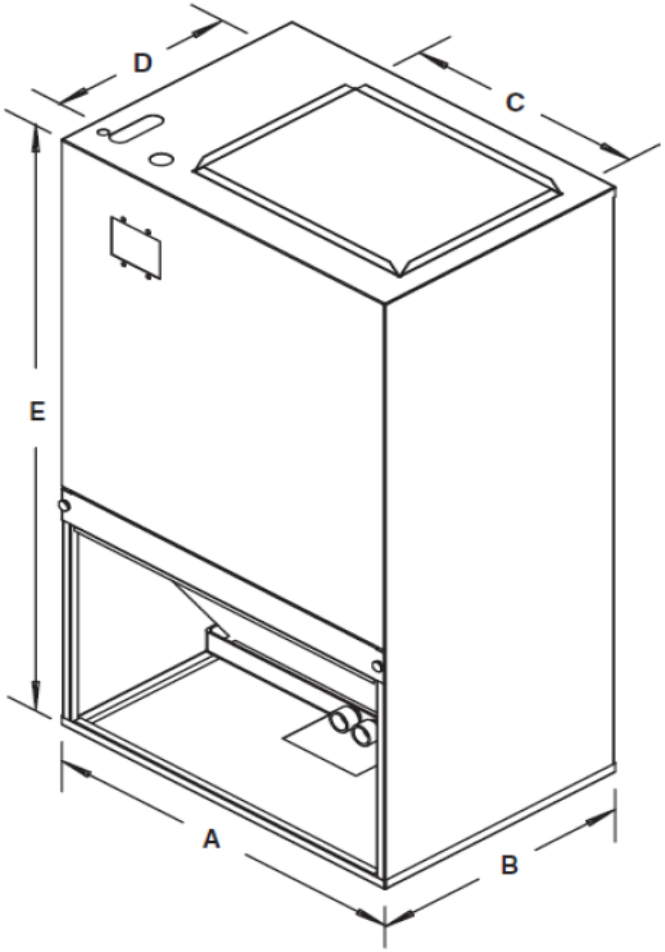


Figure 1: B-S02/B-S03/WCW DIMENSIONAL DATA DX COOLING WITH OR WITHOUT ELECTRIC HEAT

Model	A	B	C	D	E
B-S02/18WCW/24WCW	22.00	15.75	14.00	11.00	39.00
B-S03/30WCW/36WCW	22.00	15.75	14.00	11.00	44.25

Table 2: B-S02/B-S03/WCW DIMENSIONAL DATA DX COOLING WITH OR WITHOUT ELECTRIC HEAT

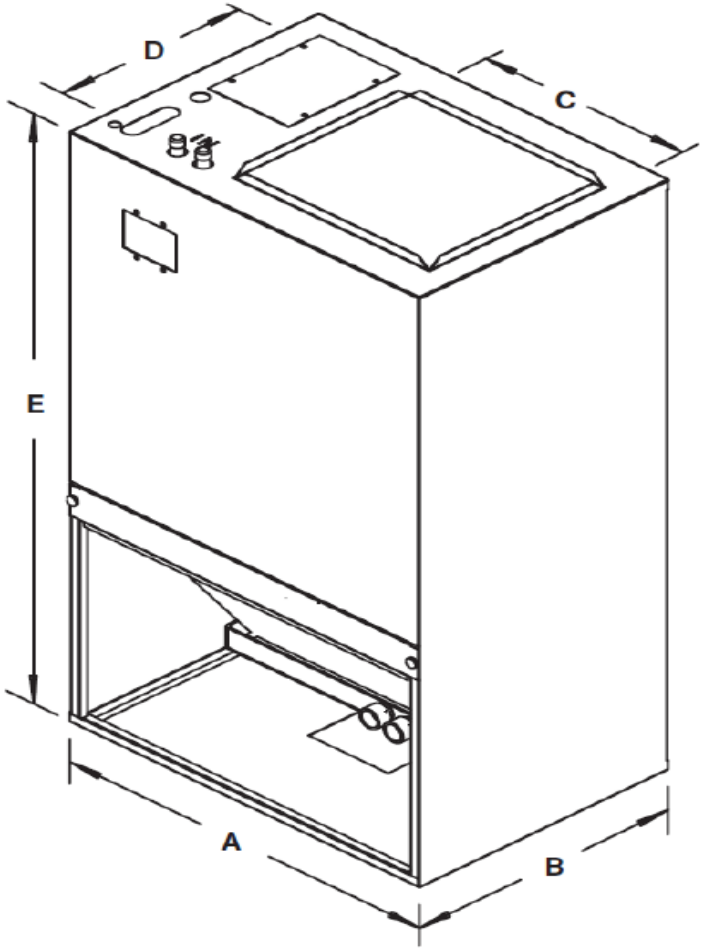


Figure 2: H02/H03/WCW-HW DIMENSIONAL DATA CHILLED WATER COOLING WITH AND WITHOUT HYDRONIC HEAT

Model	A	B	C	D	E
H02/18WCW-HW/24WCW-HW	22.00	15.75	12.25	11.125	39.00
H03/30WCW-HW/36WCW-HW	22.00	18.75	12.25	11.125	44.25

Table 3: H02/H03/WCW-HW DIMENSIONAL DATA CHILLED WATER COOLING WITH AND WITHOUT HYDRONIC HEAT

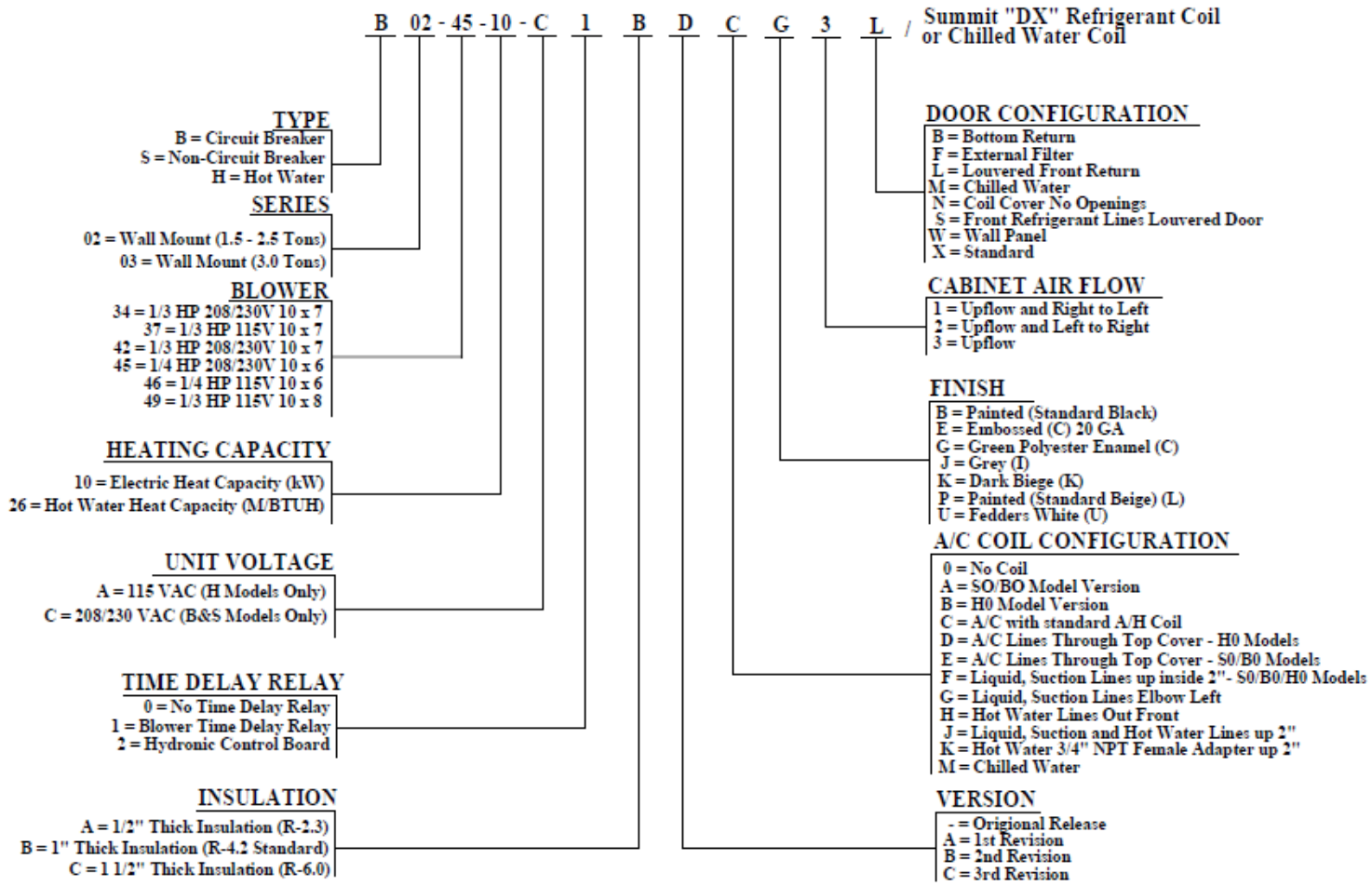


Table 4: B/S/H02 and B/S/H03 Model Nomenclature

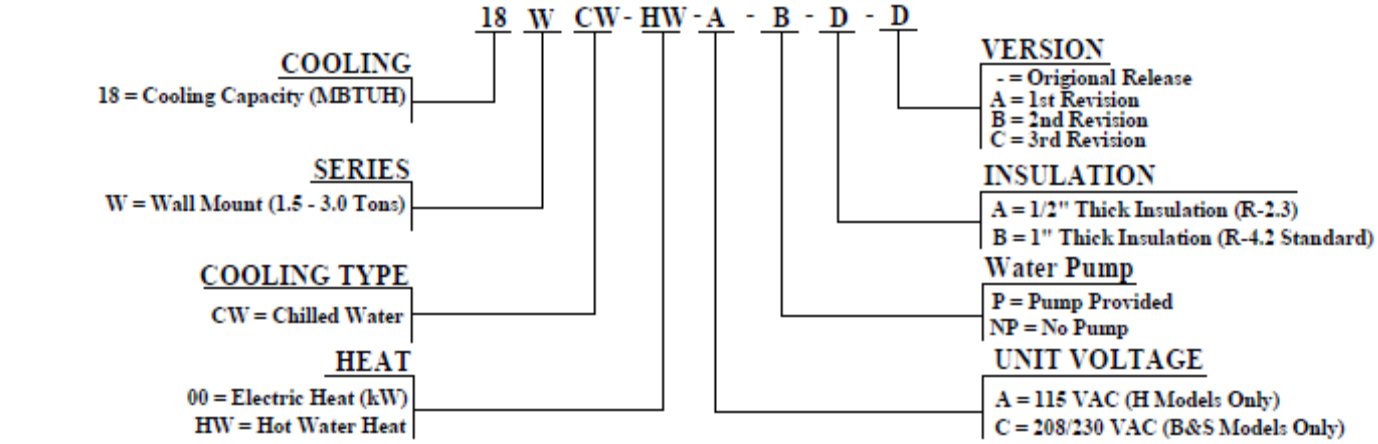


Table 5: WCW and WCW-HW Model Nomenclature

Shipping Data:
18 / 24 Models:
Max Shipping Weight with Coil: 115 lbs
Quantity Per Truck Load: 200

30 / 36 Models:
Max Shipping Weight with Coil: 125 lbs
Quantity Per Truck Load: 200

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. Locate appliance where refrigerant lines can be easily routed from the evaporator coil to the condenser.
7. Locate the appliance where condensate lines can be easily routed to an available drain. 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-thru application it will create a negative pressure situation in the condensate drain system. To prevent condensate from being drawn into the blower it is recommended to trap the primary (Main) and secondary (Overflow) drain line. Refer to CONDENSATE DRAIN SYSTEM and Figure 12 in these instructions.
   If the secondary drain is not used, it must be capped.
9. The draw-thru design will cause exterior surface of cabinet to sweat when units is installed in a non-conditioned space such as an attic or garage. Installer must provide protection such as full size auxiliary drain pan on all units installed in a non-conditioned space to prevent damage from condensation runoff.
10. 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 5 for clearance to combustibles information.

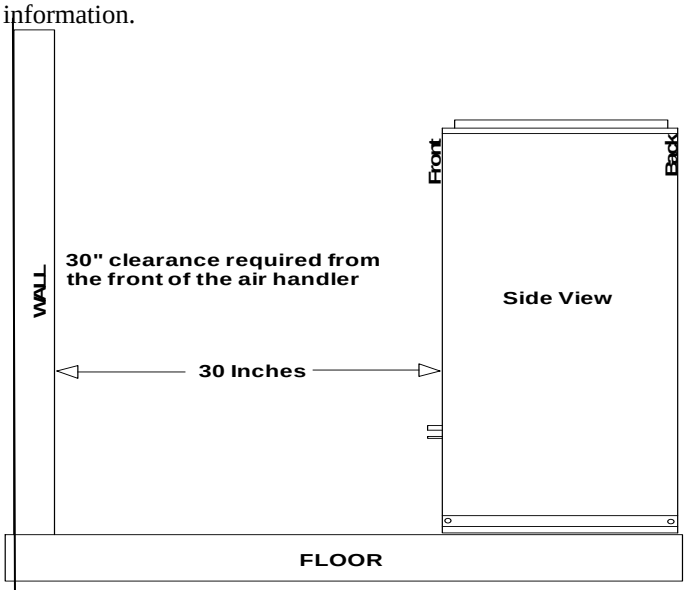


Figure 3: Clearance – Access for Service

MODEL	TOP (in)	BACK (in)	SIDES (in)	FRONT OF FURNACE			
				WALL PANEL DOOR (in)	ALCOVE (in)	CLOSET DOOR (in)	DUCT (in)
H02/H03/18-24-30-36WCW-HW	0	0	0	6	30	6	0
B-S02/B-S03/18-24-30-36WCW	0	0	0	6	30	6	1

Table 6: Clearances to Combustibles

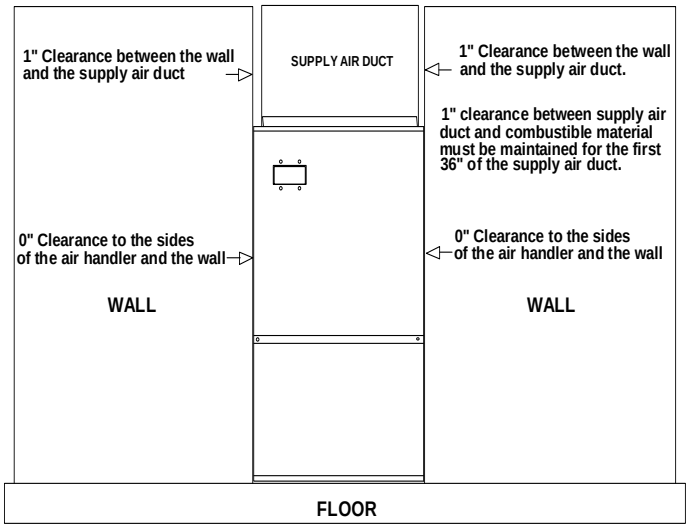


Figure 4: Closet Clearances

Return Air

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 A/C and HP Air Handlers 1/4 HP Blower Motor On (B/S02/WCW 18 & 24)

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

For A/C and HP Air Handlers 1/3 HP Blower Motors On (B/S03/WCW 30 & 36)

- 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

Closet Door Return Grille – 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

The return air opening can be located in the floor under the bottom return air opening. No clearance is required. The air handler is set directly on the duct. If the air handler is installed in a closet a return air grille can be located on the closet front door across from the furnace louvered panel. A 6” clearance is required between the grille and the louvered panel If the air handler is installed in a framed wall and the wall panel is used a 6” clearance is required between the louvered panel on the air handler and the wall panel. If opening for the return air is located above the furnace in the closet door or in the wall a 6” minimum clearance is required on all sides of the air handler except for the side where the opening is located. That side requires a 9.5” clearance for proper air return to the air handler.

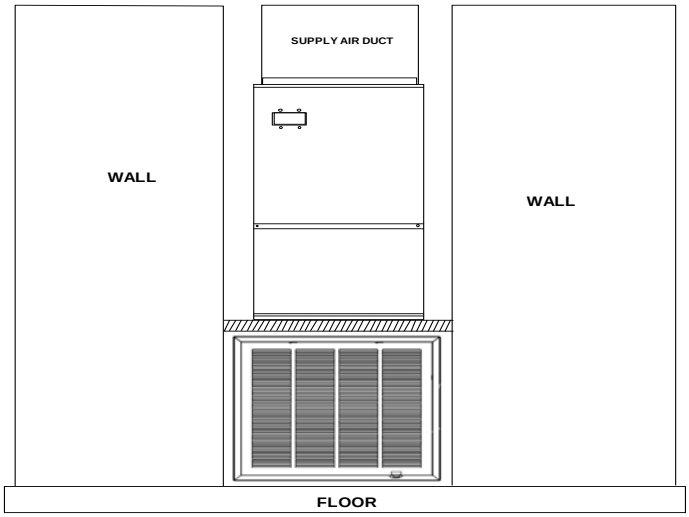


Figure 5: Typical Closet Installations

Provisions shall be made to permit the air in 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(s) causing premature heating element failure.

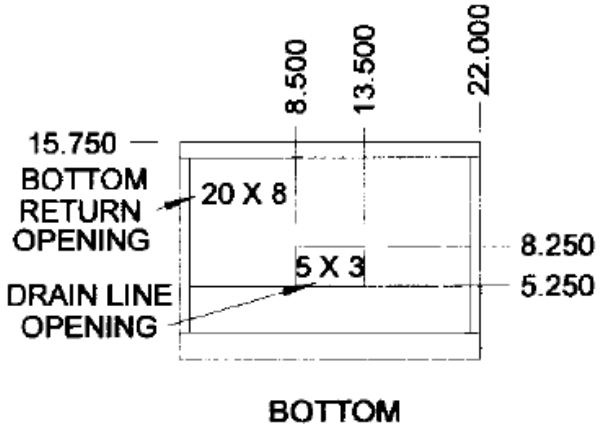


Figure 6: Air Handler Base Dimensions

WALL MOUNT INSTALLATION:

The air handlers are designed for recessed mounting in a wall or for hanging on the wall in a closet.

Unit shall be supported by 2x4 header between two 2x4 studs arranged as shown below. Use nail holes in front edge of unit to attach cabinet to framed opening. Be careful to locate unit so that sheet rock surface will be flush with edges of cabinet, permitting wall panel to be attached and cover opening. Cut edges of sheet rock. Also be sure, especially if 2x4 header is used on top of cabinet, to consider routing of refrigerant line and hot water piping.

Connect a supply air duct/plenum system to the supply air outlet flanges on the cabinet. The discharge air opening flanges measure approximately 14.00 by 11.00**.**

NOTE: Installation codes may limit the unit installation to a single story residence, when no return air duct is used.

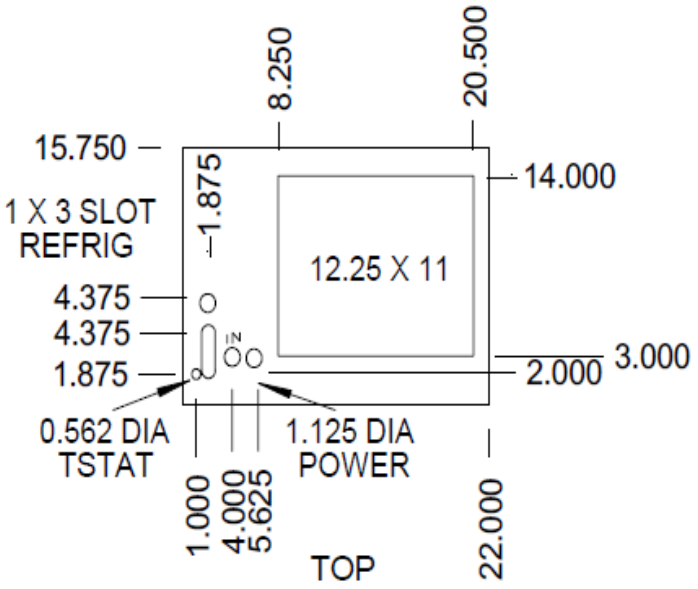


Figure 7: Air Handler Top Dimensions

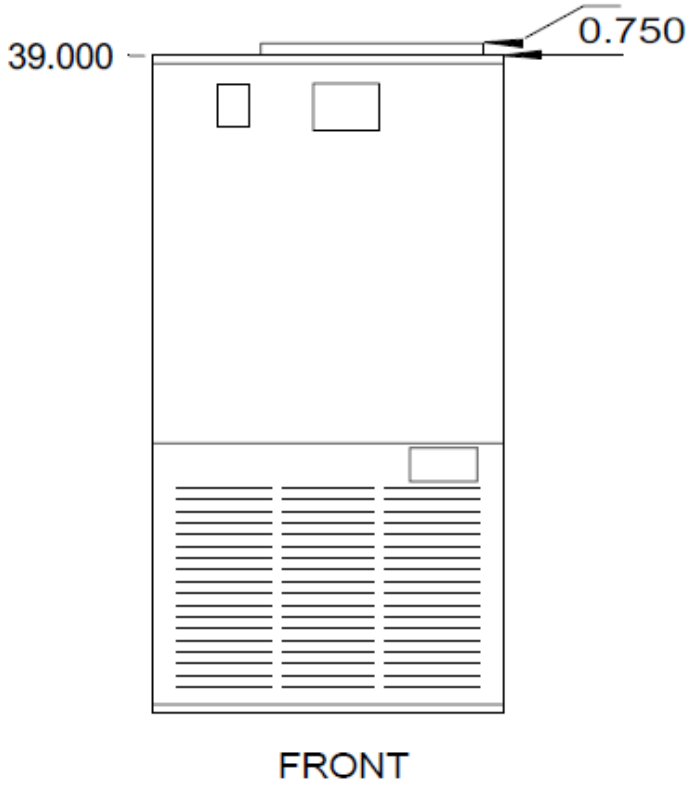


Figure 8: Air Handler Supply Duct Mounting Flange Dimensions

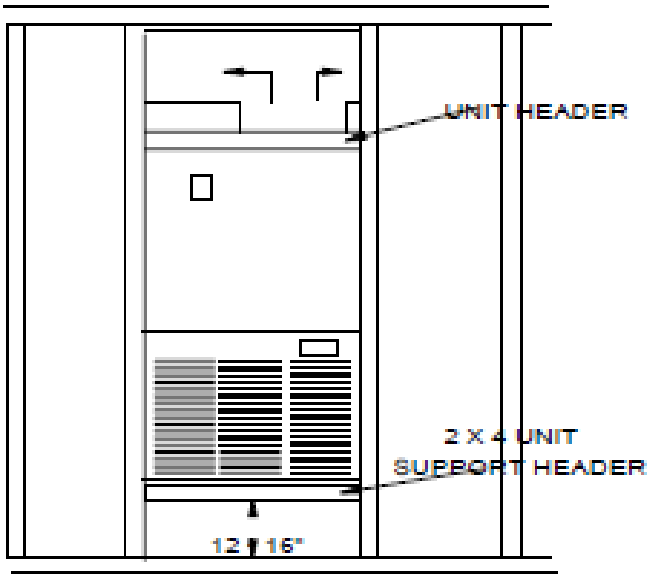


Figure 9: Typical Wall Mount Installation

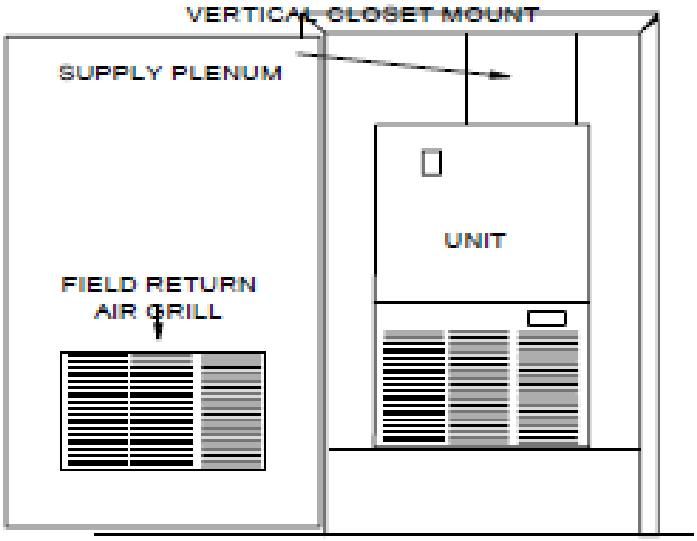


Figure 10: Typical Wall Mount Installation with Wall Panel Door

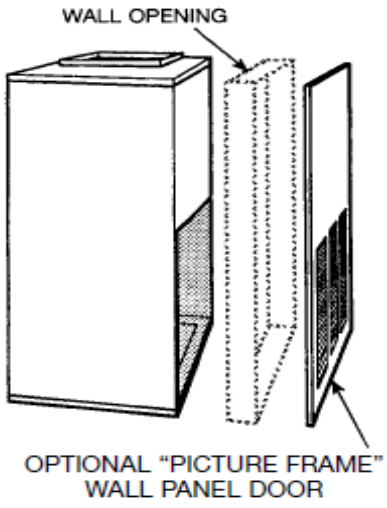


Figure 11: Side View Of A Typical Wall Mount Installation with Wall Panel Door

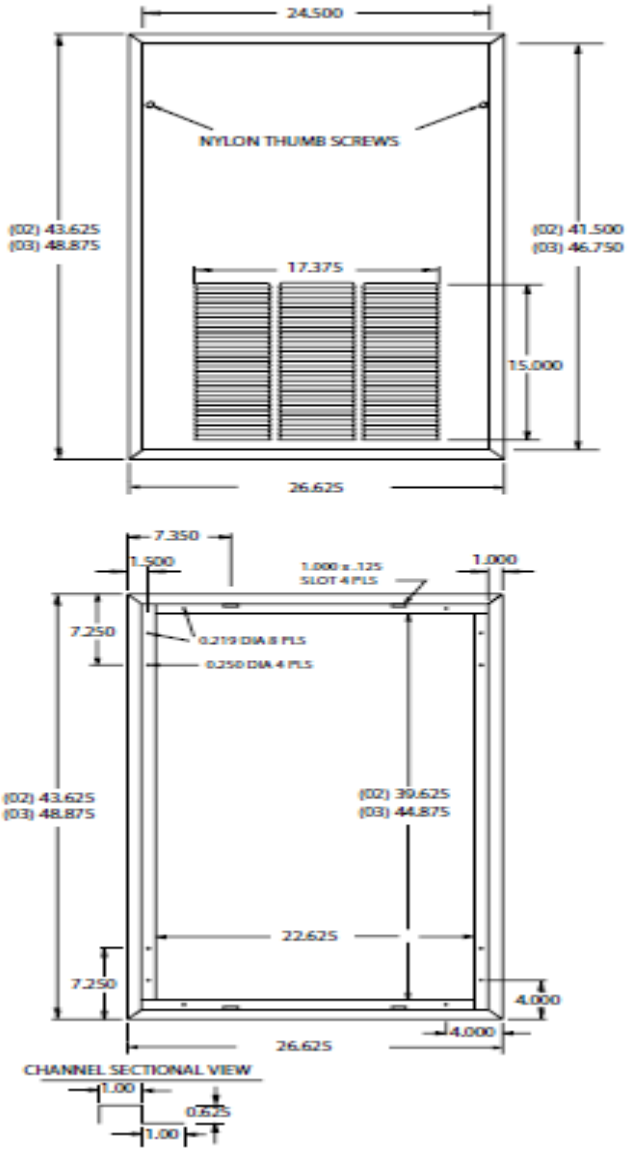


Figure 12: Optional Wall Panel Door Dimensions

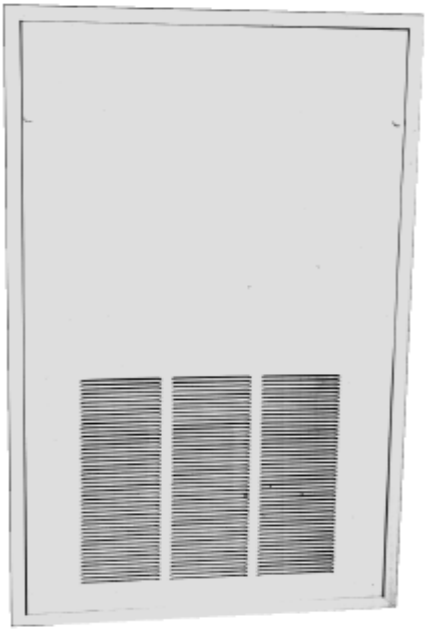


Figure 13: Optional Wall Panel Door

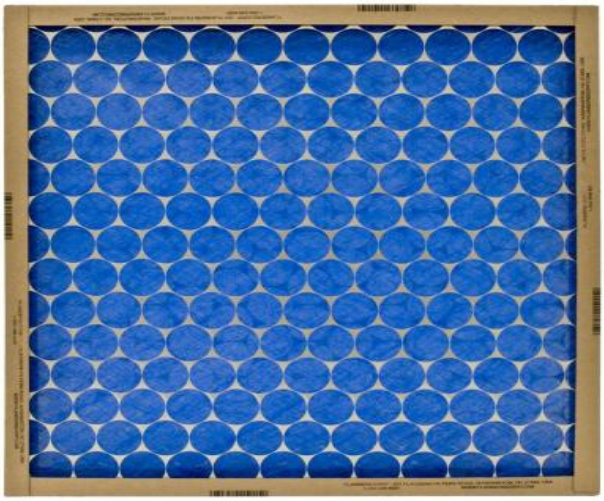


Figure 14: Field Installed Pleated Filter Drawing for 1" Air Filters.

SECTION IV: SUPPLY AIR DUCT INSTALLATION

ARRANGEMENT:

Unit is shipped from the factory arranged to be installed in an upflow air flow position only. These models are not designed to be used in a horizontal application.

UPFLOW APPLICATION:

In an upflow installation the discharge outlet is at the top. Care should be taken to insure unit is level to permit proper condensate drainage. Normal upflow installation will be in a closet, an alcove, a framed in wall mount or in a basement. If installed in a closet, the closet can 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 grille can be used that is located as described in RETURN AIR REQUIREMENTS. If a return air filter grille is desired instead of the factory installed air filters then follow the requirements below for proper filter sizing.
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

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
Pleated filters are not recommended for use with PSC Motors.

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.

SECTION V: AIR HANDLER 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. Remove the return (bottom) access panel (door).
5. Place the unit into position.
6. Secure the unit with 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 unit or between the opening on the unit 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 or the water lines (Chilled Water Applications) to the coil.
10. WCW-HW applications require the installer to connect the hot water lines to the heating coil.
11. Re-install the return compartment (bottom) access panel (door) and secure with the screws that were removed in step 4.
12. Re-install the blower and control box access panel (door) and secure with the screws that were removed in step 3
13. Turn the power on to the unit by following the procedure in the Users Information Manual.
14. Set the thermostat to the desired temperature.

SECTION VI: HOT WATER HEAT AND CHILLED WATER COOLING

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."

Hot Water Coils have been tested and certified to comply with NSF / ANSI61-2009 STANDARD.

Hot Water Piping:

If a residential water heater is used for space heating water, do not exceed a distance of 70ft 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.

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.

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.

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

⚠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.

Model No.	CFM	GPM	Hot Water Capacities @ 65° E.A.T. Entering Water Temperature						Water PD (Ft-Wtr.)
			130°F	140°F	150°F	160°F	170°F	180°F	
H02-46-26-A	730	4	23,000	26,000	30,300	33,900	37,600	41,700	1.9
H02-46-30-A	800	4	26,700	30,000	35,200	39,400	43,700	48,400	1.9
H02-46-37-A	780	4	32,000	37,000	42,500	47,500	52,800	58,000	2.9
H02-37-34-A	985	4	29,600	34,000	39,000	43,200	48,500	54,400	1.9
H02-37-39-A	960	4	34,000	39,000	43,000	48,500	56,000	62,800	2.9
H03-49-43-A	1125	4	37,100	43,400	49,800	56,200	62,500	68,800	4.8

Table 7: H02 / H03 Hot Water Heating Capacities

Air Handler Model	Hot Water Capacities @ 65° F Entering Air Temperature Entering Water Temperature				CFM	GPM	Pressure Drop Water (FT-Water)	Pressure Drop Air (W.C.)
	140° F	160° F	170° F	180° F				
18WCW/18WCW-HW (4-Row Slab Evaporator Coil) 18.0" F.H. x 18.25" F.L.	33,053	39,880	44,170	48,465	600	2.0	1.1	0.1"
	36,930	44,590	49,370	54,150		3.0	2.2	
	39,055	47,180	52,220	57,265		4.0	3.9	
	40,364	48,780	53,980	59,185		5.0	5.9	
	41,254	49,870	55,180	60,490		6.0	8.4	
24WCW/24WCW-HW (3-Row Slab Evaporator Coil) 18.0" F.H. x 18.25" F.L.	39,488	47,550	52,720	57,900	800	2.0	0.3	0.16"
	45,946	55,370	61,360	67,370		3.0	0.7	
	49,738	59,980	66,450	72,930		4.0	1.3	
	52,187	62,970	69,740	76,520		5.0	2.0	
	53,878	65,040	72,015	79,000		6.0	2.8	
30WCW/30WCW-HW (3-Row Slab Evaporator Coil) 24.0" F.H. x 18.25" F.L.	42,059	50,625	56,140	61,670	1000	2.0	0.8	0.19"
	49,813	59,990	66,510	73,040		3.0	1.8	
	54,601	65,800	72,925	80,060		4.0	3.1	
	57,806	69,705	77,225	84,760		5.0	4.7	
	60,091	72,490	80,295	88,110		6.0	6.7	
36WCW/36WCW-HW (4-Row Slab Evaporator Coil) 24.0" F.H. x 18.25" F.L.	49,534	59,773	61,200	72,630	1200	2.0	0.5	0.22"
	60,319	72,775	80,605	88,445		3.0	1.1	
	67,119	81,000	89,700	98,415		4.0	2.0	
	71,692	86,545	95,830	105,120		5.0	3.0	
	74,884	90,490	100,180	109,800		6.0	4.3	

Table 8: WCW/WCW-HW Hot Water Heating Capacities

Chilled Water Piping:

Supply and return chilled water piping to the coil should be ¾ inch ID up to 42,000 BTU's, 1 inch on units greater than 42,000 BTU's. Water piping must always be connected so that the entering water is on the leaving side of the coil.

Air Handler Model	Chilled Water Cooling Capacities @ E.A.T. / E.W.T.				CFM	GPM	Pressure Drop Water (FT-Water)	Pressure Drop Air (W.C.)
	80°F / 67°F / 45°F		80°F / 67°F / 42°F					
	Total	Sensible	Total	Sensible				
18WCW/18WCW-HW (3-Row Slab Evaporator Coil) 18.0" F.H. x 18.25" F.L.	14,125	12,430	15,375	13,030	600	2.0	1.1	0.10"
	17,225	13,940	18,995	14,685		3.0	2.2	
	19,590	14,960	21,720	15,845		4.0	3.9	
	21,400	15,725	23,790	16,725		5.0	5.9	
	22,800	16,315	25,400	17,410		6.0	8.4	
24WCW/24WCW-HW (4-Row Slab Evaporator Coil) 18.0" F.H. x 18.25" F.L.	16,450	15,025	18,805	15,870	800	2.0	0.3	0.16"
	18,915	16,720	20,720	17,500		3.0	0.7	
	21,885	18,185	23,895	19,035		4.0	1.3	
	24,345	19,275	26,700	20,250		5.0	2.0	
	26,345	20,130	29,085	21,260		6.0	2.8	
30WCW/30WCW-HW (3-Row Slab Evaporator Coil) 24.0" F.H. x 18.25" F.L.	17,935	16,800	19,335	17,750	1000	2.0	0.8	0.19"
	22,280	19,730	24,261	20,715		3.0	1.8	
	25,620	21,440	28,135	22,525		4.0	3.1	
	28,350	22,680	21,350	23,345		5.0	4.7	
	30,650	23,660	34,015	25,050		6.0	6.7	
36WCW/36WCW-HW (4-Row Slab Evaporator Coil) 24.0" F.H. x 18.25" F.L.	21,500	19,760	23,240	21,035	1200	2.0	0.5	0.22"
	26,220	23,380	28,220	24,545		3.0	1.1	
	30,335	25,830	32,915	27,030		4.0	2.0	
	33,680	27,475	36,845	28,385		5.0	3.0	
	36,550	28,770	40,195	30,295		6.0	4.3	

Table 9: WCW/ WCW-HW Chilled Water Cooling Capacities

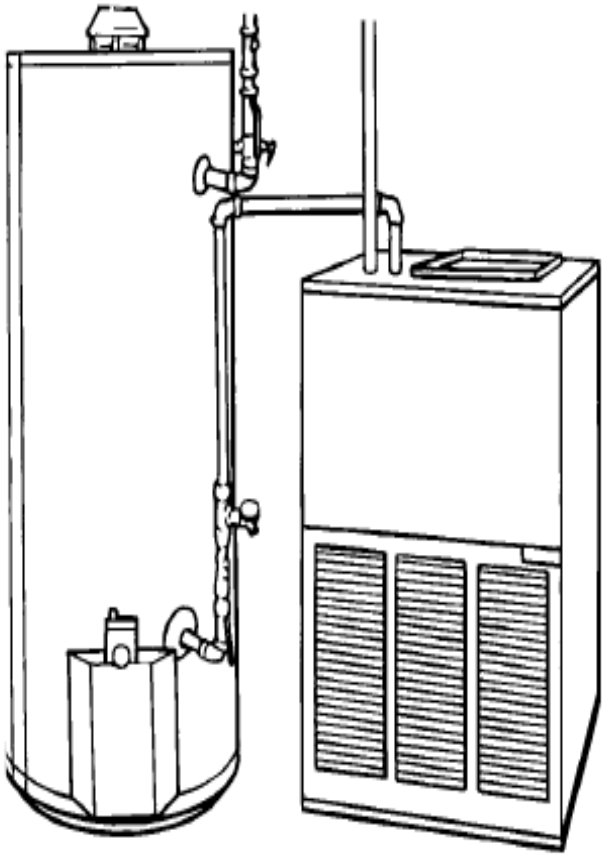


Figure 15: Typical Hot Water Tank Connections

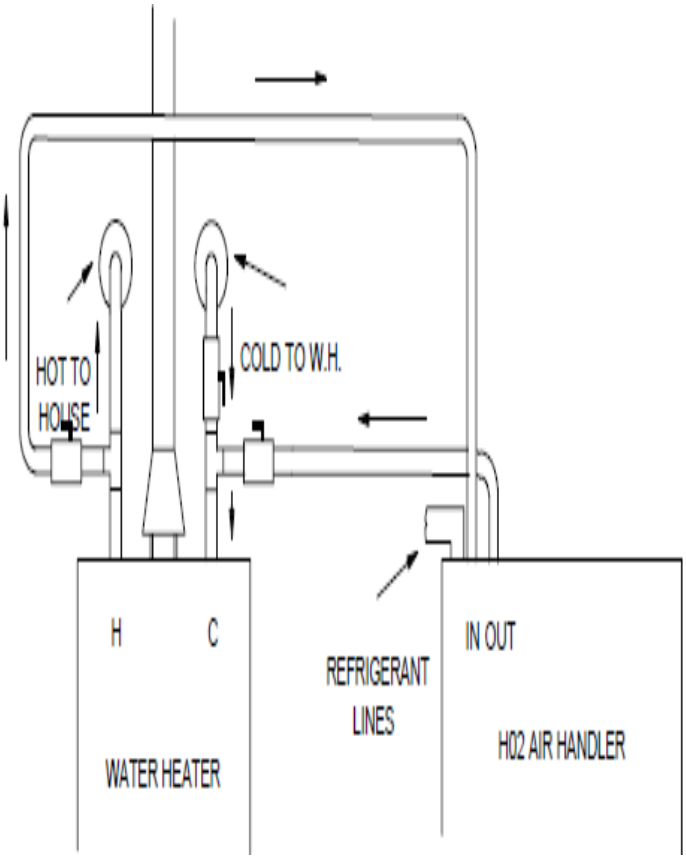


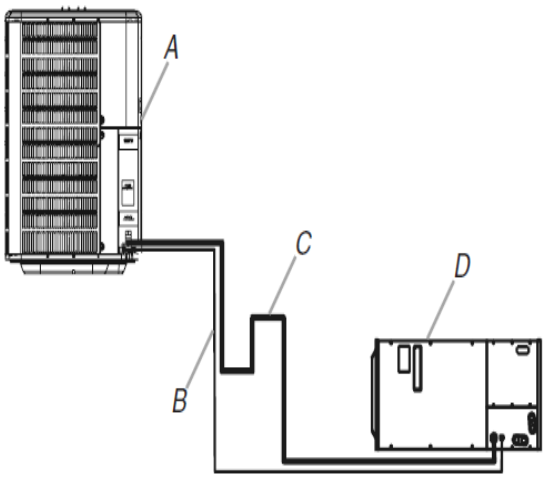
Figure 16: Typical Hot Water Tank and Refrigerant Line Connections

SECTION VII: COOLING, TXV, DISTRIBUTOR AND REFRIGERANT PIPING

DX Refrigerant Piping:

Air Handlers with DX type evaporator coils require liquid and suction piping sized in accordance with condensing unit manufacturer's instructions. The evaporator 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 (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 condensing unit is installed above evaporator coil then oil traps are required at equal intervals along suction line (see Figure 17). Horizontal suction lines should slope 1 inch for every 20 feet toward condensing unit. Manufacturer recommends that dry nitrogen be flowed through refrigerant lines during soldering operation.

- 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.



A. Condensing unit *C. Suction line*
B. Liquid line *D. Evaporator coil*

Figure 17 Evaporator Below Condenser Piping

SPECIAL INSTRUCTIONS FOR COILS WITH THERMAL EXPANSION VALVES (TXV)

Thermal expansion valve (TXV) have a built in check valve making them A/C and heat pump capable. Hard start kit may be required on non-bleed TXV's. The external equalizer line attached to the TXV has a female flare nut with built in Schrader valve depressor that attaches to the Schrader valve port provided on coils.

A thermostatic expansion valve (TXV) is built around a thermostatic element separated from the valve body by a diaphragm. It's purpose is to regulate the rate at which refrigerant flows into the evaporator.

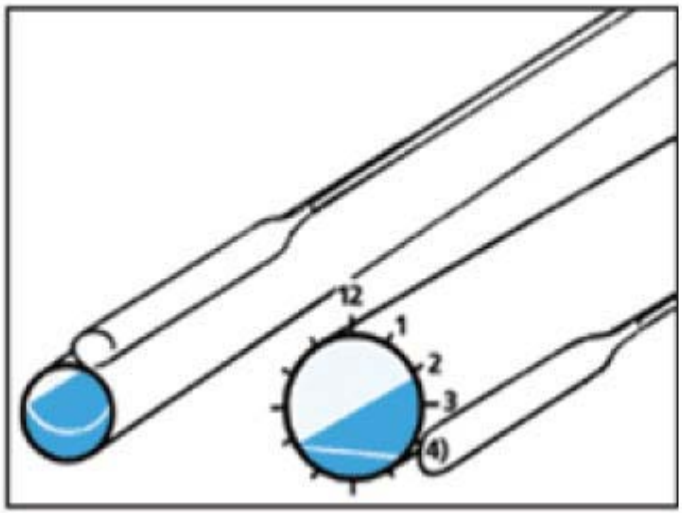


Figure 18: The TXV Bulb Best Placement

The bulb is best mounted on a horizontal suction line tube and in a position corresponding to between 1 o'clock and 4 o'clock. The location depends on the outside diameter of the tube. (Figure 18) .

Note: The bulb must never be located at the bottom of the suction line due to the possibility of oil laying in the bottom of the pipe causing false signals.

The bulb must be able to sense the temperature of the superheated suction vapor and must therefore not be located in a position that will expose it to extraneous heat/cold.

Be sure that the expansion valve provided is the proper size and type required to achieve rating. If a non-bleed type valve is to be used, the outdoor unit must be equipped with a hard start kit allowing the outdoor unit to start under load. Check with our factory if necessary.

How the TXV Controls Superheat

The thermostatic expansion valve (TXV) is a precision device designed to regulate the rate at which liquid refrigerant flows into the evaporator. This controlled flow is necessary to prevent the return of liquid refrigerant to the compressor.

The TXV separates the high pressure and low-pressure sides of a refrigeration or air conditioning system. Liquid refrigerant enters the valve under high pressure, but its pressure is reduced when the TXV limits the amount of refrigerant entering the evaporator.

Remember: the TXV controls only one thing: the rate of flow of liquid refrigerant into the evaporator. The TXV is not designed to control air temperature, head pressure, capacity, suction pressure, or humidity. Attempts to use the TXV to control any of these system variables will lead to poor system performance and possible compressor failure.

The TXV responds to the temperature of refrigerant gas as it leaves the evaporator. This temperature is detected by the sensing bulb, which is located near the evaporator outlet. The TXV also responds to the refrigerant pressure within the evaporator, which is transmitted to the TXV by an equalizer line. By responding to these variables, the TXV maintains a

predetermined superheat within the evaporator. This is how the TXV keeps the system in balance and operating properly. To understand how this works, we must have a clear understanding of superheat.

The TXV controls superheat by controlling the flow of liquid refrigerant. As it does this, it also reduces refrigerant pressure. Liquid refrigerant enters the TXV under high pressure. As the flow of liquid refrigerant is reduced, its pressure drops. The refrigerant leaving the TXV is now a combination of low-pressure liquid and vapor.

As the flow is restricted, several things happen:

- The pressure on the liquid refrigerant drops;
- A small amount of the liquid refrigerant is converted to gas, in response to the drop in pressure;
- This "flash gas" represents a high degree of energy transfer, as the sensible heat of the refrigerant is converted to latent heat;
- The low-pressure liquid and vapor combination moves into the evaporator, where the rest of the liquid refrigerant "boils off" into its gaseous state as it absorbs heat from its surroundings.

Changes in gas temperature at the evaporator outlet are detected by the sensing bulb, which then causes the valve pin to move in or out, regulating the flow of refrigerant through the TXV. In this way, the valve allows just enough refrigerant into the evaporator, to maintain the correct level of superheat in the suction line.

The TXV controls superheat by varying the size of the orifice through which the refrigerant flows. The pin angle, the size of the stroke (typically 0.015- to 0.035-in.) and the diameter of the orifice itself all affect how much refrigerant can pass through the valve. In addition, all valves have some leakage around the valve pin, although this is normally kept within acceptable limits.
It's important to remember that valve capacity is a function of the orifice diameter, pin angle, and stroke. Adjusting the superheat spring doesn't change valve capacity.

Trouble Shooting:

The thermostatic expansion valve (TXV) is like the carburetor in your car's engine. It opens and closes to allow the correct amount of refrigerant into your system. When the TXV isn't working properly, the efficiency of your unit is crippled. If you suspect you have a faulty TXV, perform these tests:

First, connect your gauges to the system and check that the refrigerant pressures, subcooling and superheat are where they should be (for pressures settings, refer to unit's pressure chart; for subcooling (usually around 10°F) and superheat (between 8°F-12°F) follow manufacturer's specification sheet.

Check to see if airflow through the system is good . There should be no dirty coils or air filters. Also check for proper CFMs readings across the system.

Make sure there's the right amount of refrigerant charge in the system (this step may require weighing out the refrigerant in the system). Once you've added or removed charge as necessary, check the pressures, subcooling and superheat again. If there is no change then it is probably the TXV.

Check the evaporator coil and remove the TXV's sensing bulb from the suction line.

Check the subcooling, superheat and pressures again. If there's no change, that's a further indication of a TXV problem. Another test is to put the sensing bulb in ice water and checking the pressures, superheat, and subcooling again. If they don't change, it's a bad TXV.

When a non-bleed expansion valve (TXV) is specified in a Summit AC or HP Rating, the following assumptions are made:

a) The TXV is a field or factory installed accessory to be field or factory installed in accordance with recommended TXV practice.
b) The combination of this non-bleed valve and the compressor in the outdoor unit results in a system that operates with a loaded condition on startup.
c) The outdoor unit is capable of starting against this loaded condition or a hard start kit is to be field installed.

APPLICATION DATA:

R72DB0005 (R-22) 15% Bleed Non-Adjustable - 1.5-3.0 Ton
"T" Valve Letter Code

R72DB0003 (R-410A) 15%-Bleed Non-Adjustable-1.5–2.5 Ton
"D" Valve Letter Code

R72DB0004 (R-410A) 15%-Bleed Non-Adjustable-3.0–5.0 Ton
"Y" Valve Letter Code

Inlet Fitting Male Rotalock / Outlet Fitting Female swivel nut.

R72DB0006 (R-22) 15% Bleed Non-Adjustable - 3.0-5.0 Ton
"X" Valve Letter Code

R72DB0044 (R-410A) Non-Bleed Adjustable - 3.0-6.0 Ton
"Z" Valve Letter Code
Inlet Fitting Male Rotalock / Outlet Fitting Female swivel nut.

TXV TROUBLE SHOOTING:

Changing parts might be the first reaction, BUT…

1. May not be necessary and…
2. Does not always solve the problem.

SUPERHEAT AND SUCTION PRESSURE

LOW SUCTION PRESSURE – HIGH SUPERHEAT
POSSIBLE CAUSES:

1. Undersized valve
2. High superheat adjustment
3. Evaporator pressure drop – no external equalizer
4. External equalizer location – needs to be located on suction line after the last feeder tube.
5. Restricted or capped external equalizer
6. Low refrigerant charge
7. Plugged dryer or strainer
8. Low pressure drop across valve:
   a. Plugged dryer or strainer
   b. Low condensing temperature

HIGH SUCTION PRESSURE – LOW SUPERHEAT
POSSIBLE CAUSES:

1. Oversized valve
2. TXV seat leak
3. Low superheat adjustment
4. Bulb installation:
   a. Poor thermal contact

b. Warm location
5. Bad compressor – low capacity
6. Incorrectly located external equalizer line – needs to be located on suction line after the last feeder tube.

LOW SUCTION PRESSURE – LOW SUPERHEAT

POSSIBLE CAUSES:

1. Low load:
   a. Not enough air
   b. Dirty air filters
   c. Air too cold
   d. Coil icing or frosting
2. Poor air distribution
3. Improper compressor evaporator balance – coil too big or small or incorrect balance on heat pump systems.
4. Oil is trapped in the evaporator

Check these things before removing the TXV

1. Remove the sensing bulb and hold in your hand. The high side pressure should drop and low side pressure should increase as the TXV opens.
2. Loosen the flare nut on the TXV external equalizer tube that is connected with a flare nut on the suction line. If you get a lot of pressure when the nut has been loosened then tighten the nut. If you get a slight pressure or no pressure; the Schrader valve stem is not being depressed. Install a anti blow back fitting to the external equalizer line of the TXV to depress the Schrader valve stem and check for proper operation of the TXV.

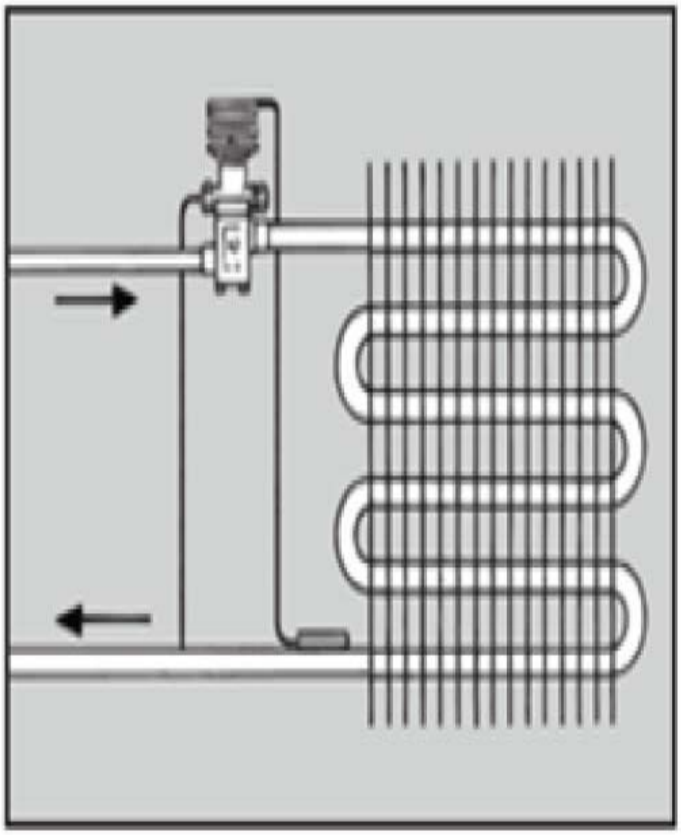


Figure 19: TXV Sensing Bulb Location

INSTALLATION NOTES:

With reference to the Figure 7, the TXV assembly is to be installed between the distributor and the existing liquid line

⚠WARNING

Coil is pressurized with nitrogen. Relieve pressure before installing TXV by depressing Schrader valve on coil manifold.

Field Installed :

1. After coil pressure has been relieved, turn the female swivel nut counter-clockwise to remove.
2. If Flowrator Distributor Assembly is being replaced by a TXV, remove the piston orifice from the flowrator distributor assembly using a small diameter wire or paper clip.
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 rotalock fitting on TXV inlet (Aligning Teflon seal first) ***and torque swivel nut to 10-30 ft. lbs.***
5. Remove the cap on Schrader valve port on coil manifold. Attach equalizer tubing with 1/4" female flare nut that includes depressor to this male Schrader port. ***Torque nut to 10-30 ft. lb***
6. Install the TXV bulb to the suction manifold of coil or the suction line using the two bulb clamps furnished with kit.
   a. Bulb should be installed on a horizontal run of the manifold if possible. On line less than 7/8" OD the bulb may be installed on top of the line. With 7/8" OD and over, the bulb should be installed in a position at about 4 or 8 o'clock.
   b. If bulb installation is made 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.
   c. The bulb should be insulated using thermal insulation to protect it from the effect of the surrounding ambient temperature.
7. After completing installation of TXV (including equalizer tube), it will be necessary to leak check the coil and evacuate the coil through the service access fittings of liquid and suction line valves.

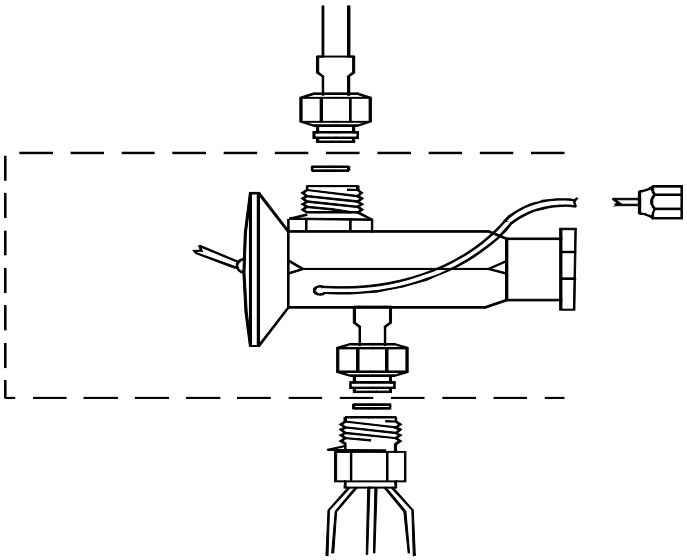


Figure 20 Typical TXV Connections

SPECIAL INSTRUCTIONS FOR COILS WITH FLOWRATOR DISTRIBUTOR ASSEMBLIES

The sizing of the orifice piston should be based strictly on the rated capacity of the outdoor unit and coil match.

Summit provides capacity performance ratings that match both same size and upsized coils with specific manufacturer's outdoor units. At the Summit distributor's request, the orifice piston is selected and installed in each coil for the specific range of cooling capacities likely to be encountered. The factory installed orifice piston size is marked on the flowrator distributor assembly and on the front of the coil carton.

When using this coil with an outdoor unit of another capacity, select an orifice piston from the table below if the capacity range for the coil and outdoor unit to be used differs.

Failure to install the proper orifice piston can lead to poor system performance and possible compressor damage. A variation of one piston size is not normally critical. Summit reserves the right to substitute a factory installed piston one size smaller or greater if the piston size ordered is out of stock.

A selection of replacement orifice pistons is available from your Summit supplier.

FLOWRATOR TO TXV CONVERSION:

While thermal expansion valves can be factory installed, they are normally available in kit form for field installation. For kit version, follow the installation instructions provided with the kit. Normally these can be field installed before system is charges without requiring cutting and brazing. **BE SURE FLOWRATER PISTON HAS BEEN REMOVED FROM THE FLOWRATER DISTRIBUTOR BODY PRIOR TO INSTALLATION OF EXPANSION VALVE.**

ORIFICE PISTON REPLACEMENT:

If the flowrator distributor assembly is being used the piston is to be installed as shown in Figure 9 in the distributor body then the existing liquid line attached to the flowrator distributor.

1. After 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. Replace the orifice piston with the correct piston for the coil you are using. Make sure the tapered end of the piston is facing the feeder tubes on the distributor body.
4. ***Turn the female swivel nut on clockwise the flowrator distributor (aligning Teflon seal first) and torque swivel nut to 10-30 ft. lbs.***
5. After completing the replacement of the orifice piston, it will be necessary to leak check the coil and evacuate the coil through the service access fittings of liquid and suction line valves.

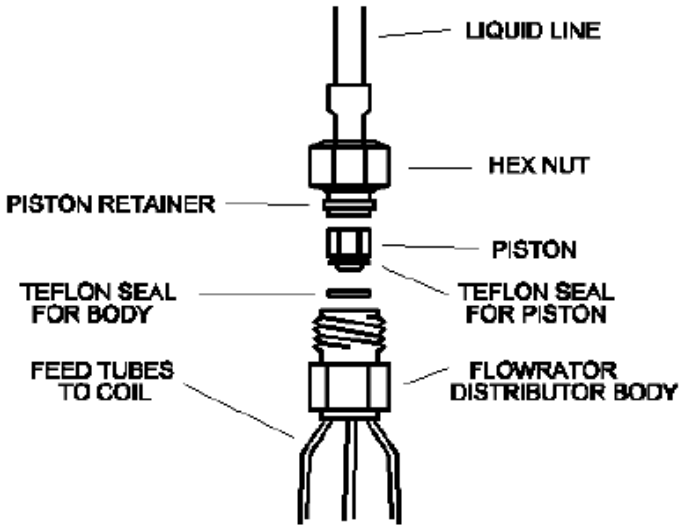


Figure 21: Flowrator Distributor

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 1-1/2 minimum trap 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. Cap unused connection.

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

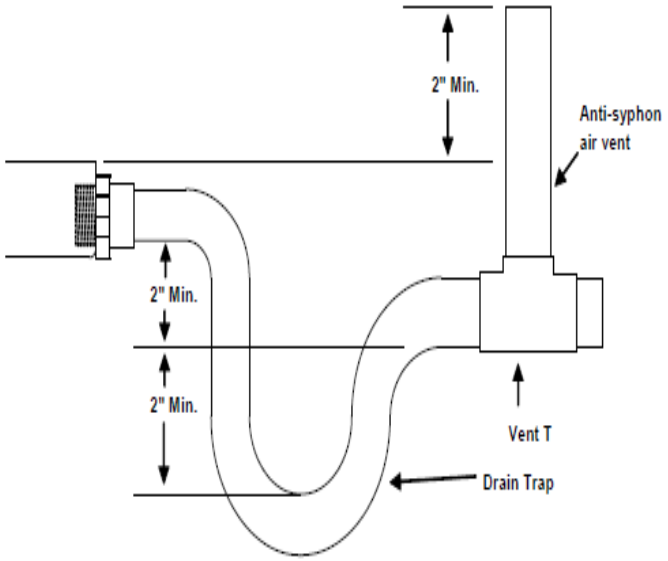


Figure 22: Typical Condensate Trap

SECTION VIII: 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 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 Wiring Connections – B/S40, B/S41, B/S14, B/S15, CWA2

1. Remove the blower and control box access panel (door).
2. Remove the control box cover.
3. Install the cable (strain Relief) 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 supply voltage wires through the holes in the casing and through the cable connectors.
6. Insert the black wire into the L1 screw terminal on the 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 circuit breaker down from the top and tighten the set screw to clamp down on the wire.
8. If you are using a single circuit for a 15kW or 20 kW model you will need to 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 13, 14, 15, 16 and 17 for circuit breaker locations.
9. Insert the green wire into the ground lug and tighten the set screw.

B40, B41, B14, B15, CWA2 Dual Circuit Line Wiring Connections: 15kW Models

10. You will need to 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.
11. You will need to 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.
12. You will need to insert the green wires into the second ground lug and tighten the set screw.
13. Tighten the screws on the cable connectors until the power supply wires are securely fastened to the connector.

Single Circuit Line Wiring Connections – S40, S41, S14, S15, CWA2

1. Remove the blower and control box access panel (door).
2. Install the cable (strain Relief) connectors on the 7/8" dia holes on the right side of the control box.
3. Strip ½" of the insulation on the end of each wire.
4. Insert the supply voltage wires through the holes in the casing and through the cable connectors.
5. Connect the black L1 supply voltage wire to the black pigtail wire using a wire nut. Tighten the wire nut to securely fasten the supply voltage wire to the pigtail wire.
6. Connect the white L2 supply voltage wire to the red pigtail wire using a wire nut. Tighten the wire nut to fasten the red pigtail wire to the white L2 wire.
7. Insert the green wire into the ground lug and tighten the set screw.

Single Circuit Line Wiring Connections – H40, H41, H14, H15

1. Remove the blower and control box access panel (door).
2. Remove the control box cover.
3. Install the cable (strain Relief) 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 supply voltage wires through the holes in the casing and through the cable connectors.
6. Connect the black L1 supply voltage wire L1 screw terminal on the terminal block. Tighten the set screw to securely fasten the supply voltage wire to the L1 screw terminal on the terminal block.
7. Connect the black L2 supply voltage wire L2 screw terminal on the terminal block. Tighten the set screw to securely fasten the supply voltage wire to the L2 screw terminal on the terminal block.
8. Insert the green wire into the ground lug and tighten the set screw.

NOTE: The furnaces are equipped with either one or two circuit breakers. These circuit breakers protect the wiring inside of the furnace in the event of a short circuit. Additionally, these breakers provide a means of disconnecting the power to the unit. The circuit breakers in the furnace are not meant to protect the branch circuit wiring between the furnace 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 furnace or the tables this manual for more information.

The 15kW models may be connected to a single or dual branch circuit.

	AIR HANDLER MODELS		
	B/S02-45-**	B/S02-34-**	B/S03-42-**
Indoor Blower Type	PSC	PSC	PSC
Indoor Blower Amps	1.70	2.70	3.20
Heater - kW	5	5	5
Circuit Load - FLA - 230 VAC	2.20	3.20	3.70
Min. Wire Size (90°C)	#14	#14	#14
Minimum Wire Size (75°C)	#14	#14	#14
Minimum Wire Size (60°C)	#14	#14	#14
Ground Wire Size	*	*	*
Max Fuse Amps	15	15	15

Table 10: Wiring Requirements – 208/230 VAC No Electric Heat

	AIR HANDLER MODELS										
	B/S02-45-**			B/S02-34-**			B/S03-42-**				
5 kW Heater Amps - 208/230 VAC	18.0/20.88			18.0/20.88			18.0/20.88				
8 kW Heater Amps - 208/230 VAC	24.99/33.33			24.99/33.33			24.99/33.33				
10 kW Heater Amps - 208/230 VAC	36.1/41.66			36.1/41.66			36.1/41.66				
12 kW Heater Amps - 208/230 VAC	37.5/50.0			37.5/50.0			37.5/50.0				
15 kW Heater Amps - 208/230 VAC	N/A			N/A			46.875/62.5				
Indoor Blower Type	PSC			PSC			PSC				
Indoor Blower Amps	1.70			2.70			3.20				
Heater - kW	5	8	10	5	8	10	5	8	10	12	15
Circuit Load - FLA - 230 VAC	22.58	35.03	43.36	23.58	36.03	44.36	24.08	36.53	44.86	53.20	65.70
Min. Wire Size (90°C)	#10	#8	#6	#10	#8	#6	#10	#8	#6	#6	#4
Minimum Wire Size (75°C)	#10	#8	#6	#10	#8	#6	#10	#8	#6	#4	#3
Minimum Wire Size (60°C)	#10	#6	#4	#10	#6	#4	#10	#6	#4	#4	#2
Ground Wire Size	*	*	*	*	*	*	*	*	*	*	*
Max Fuse Amps	30	45	60	30	45	60	35	50	60	70	90

Table 11: Wiring Requirements – 208/230 VAC Electric Heat - Single Branch Circuit

15kW, Two Stage models may have a dual or single power supply.
Single power supply will require circuit breaker 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 Tables 11.

	B/S03-42-**			
12 kW Heater Amps - 208/230 VAC	37.5/50.0			
15 kW Heater Amps - 208/230 VAC	46.875/62.5			
Indoor Blower Type	PSC			
Indoor Blower Amps	3.20			
Heater - kW	12		15	
Circuit Number	1	2	1	2
Heater Amps Per Circuit	25	25	41.66	20.88
Circuit Load - FLA - 230 VAC	28.20	28.20	44.86	24.08
Min. Wire Size (90°C)	#8	#8	#6	#8
Minimum Wire Size (75°C)	#8	#8	#6	#8
Minimum Wire Size (60°C)	#8	#8	#4	#8
Ground Wire Size	*	*	*	*
Max Fuse Amps	40	40	60	35

Table 12: Wiring Requirements – 208/230 VAC Electric Heat – Dual Branch Circuit

15kW, and 20kW Two Stage models may have a dual or single power supply. - Single power supply may require 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 12.

		ELECTRIC HEATER SIZES						
		5 kW	8 kW	10 kW	12 kW		15 kW	
	BRANCH CIRCUIT	1	1	1	1	2	1	2
240 VAC, 60 HZ, 1 PH	BTU	17,033	27,297	34,067	20,473	20,473	34,067	17,033
	kW	4.99	8	10	6	6	10	4.99
230 VAC, 60 HZ, 1 PH	BTU	15,876	25,437	33,686	19,078	19,078	33,686	15,876
	kW	4.65	7.4549	9.78	5.59	5.5912	9.78	4.65
220 VAC, 60 HZ, 1 PH	BTU	14,736	23,624	30,222	17,718	17,718	30,222	14,736
	kW	4.3186	6.9236	8.8572	5.1927	5.1927	8.8572	4.3186
Heating Element Capacity	BTU	17,033	27,297	34,067	40,946		51,149	
	kW	4.99	8	9.9984	12		14.9904	

Table 13: Electric Heater Element Capacity Data

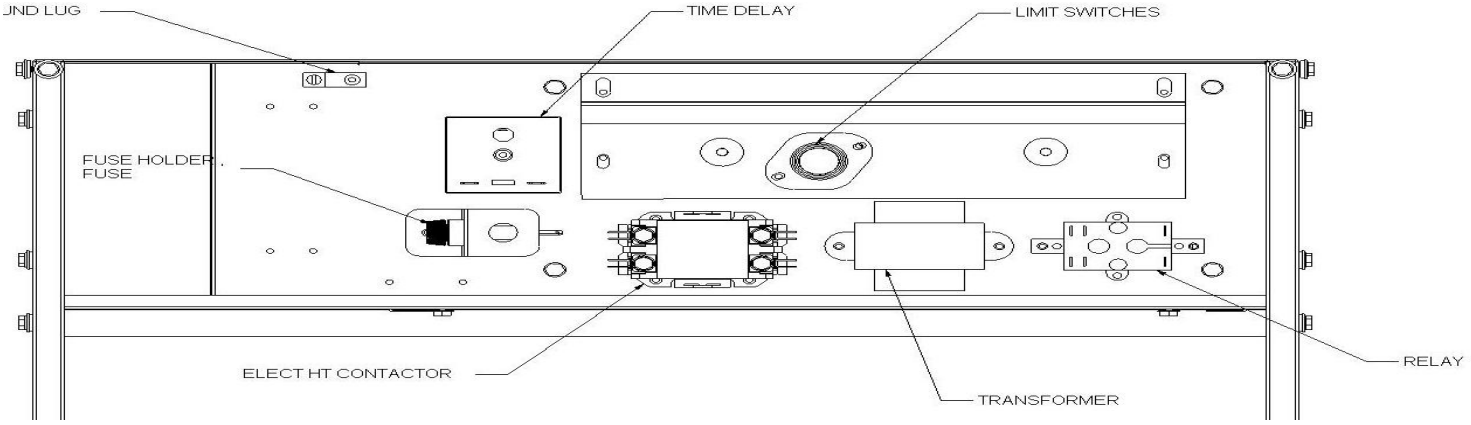


Figure 23: Component Locations – S Model Electric Heat Control Box

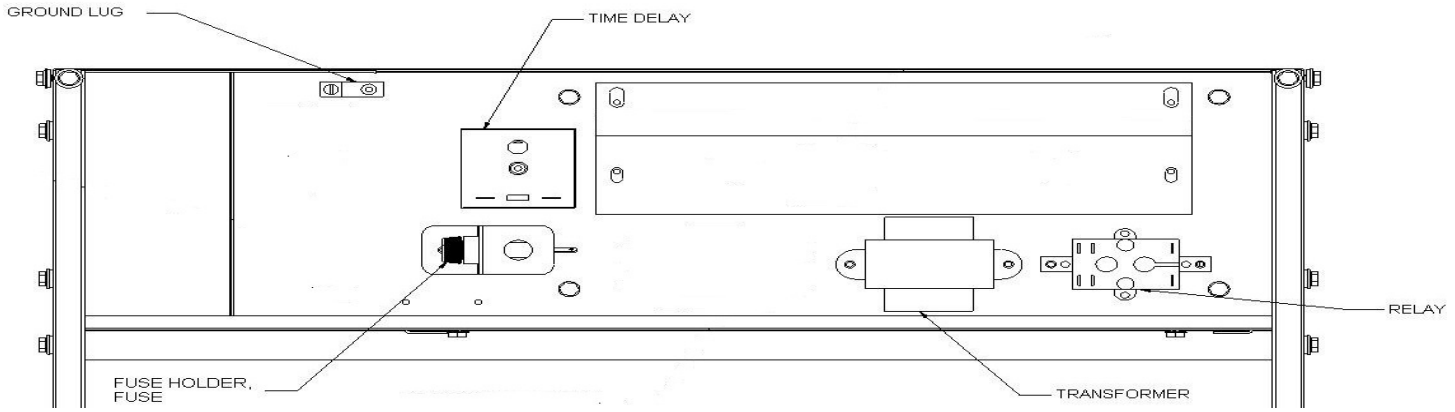


Figure 24: Component Locations – No Heat Control Box

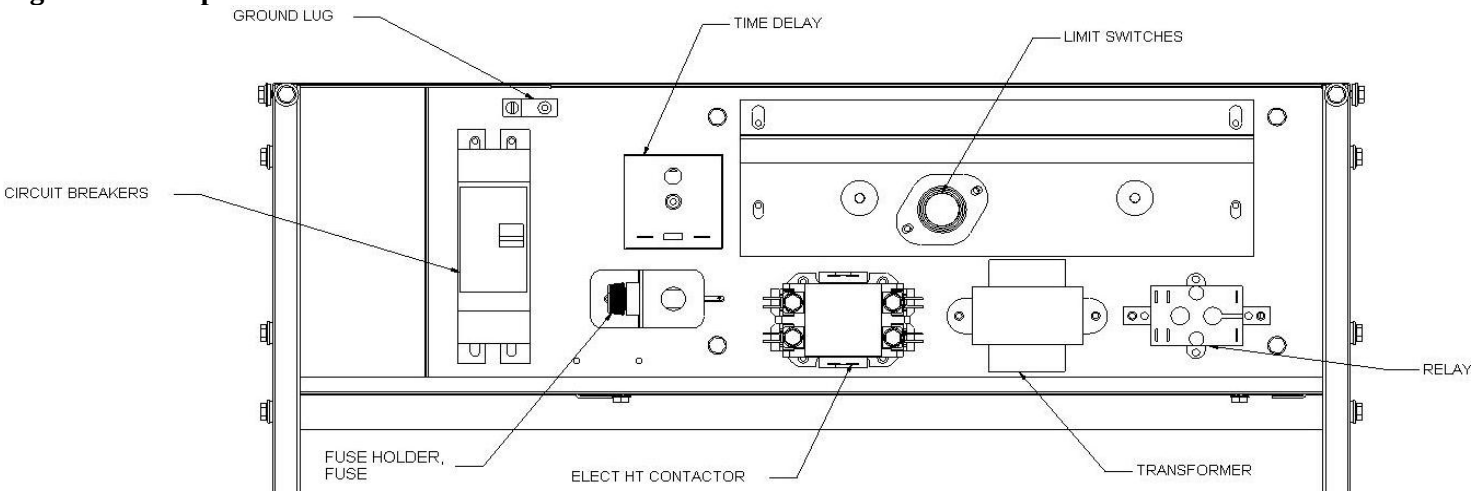


Figure 25: Component Locations – B Model Electric Heat Control Box

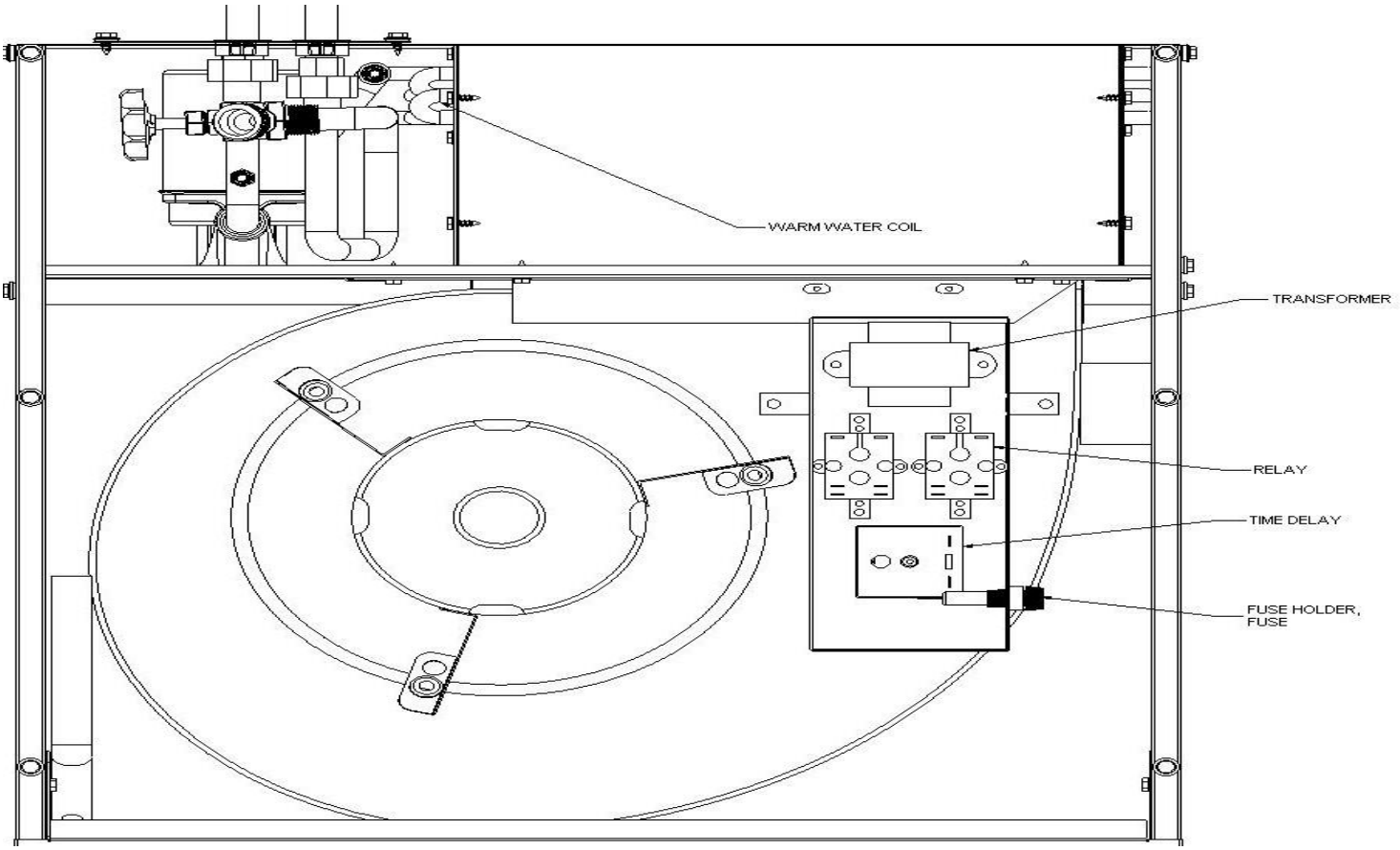


Figure 26: Component Locations – Hydronic Heat Control Box

⚠WARNING

This air handler is not equipped with a shield that covers the line voltage electrical supply wires the terminal block connections or the circuit breaker connections

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.

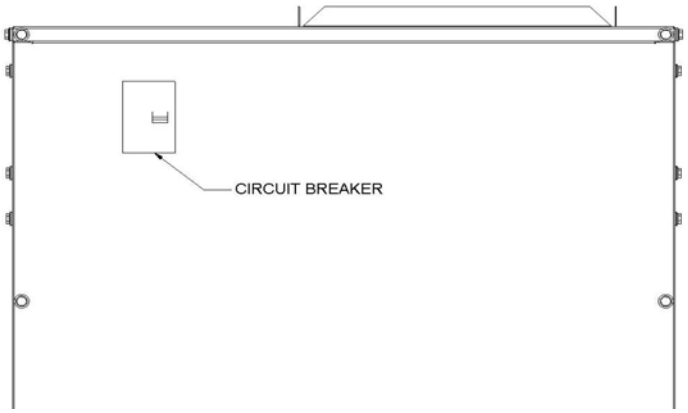


Figure 27: Front Panel Circuit Breaker Location

SECTION IX: 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
0 - 100 Feet	22	3.0 Amps
0 - 125 Feet	20	3.0 amps
0 - 250 Feet	18	3.0 amps

Table 14: 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 thermostat wire colors and the typical heating/cooling connections are listed in Tables 14 and 15.

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 Tables 14 and 15.

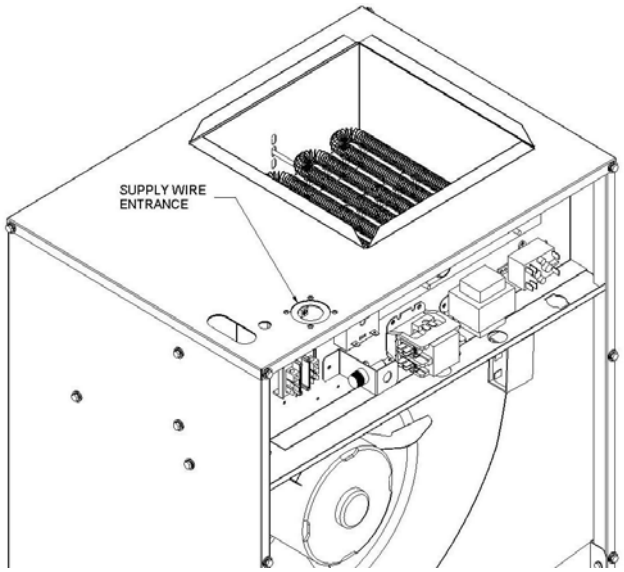


Figure 28: Supply Wire Knockout and Low Voltage Thermostat Wire Entrance Locations

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. 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 18 and 25 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.

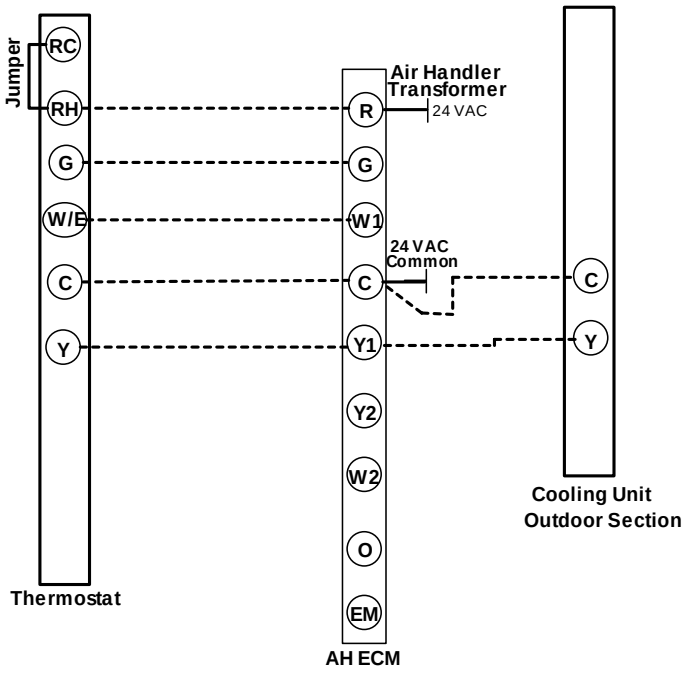


Figure 29: Typical Single Stage Heat with Single Stage Split System Cooling

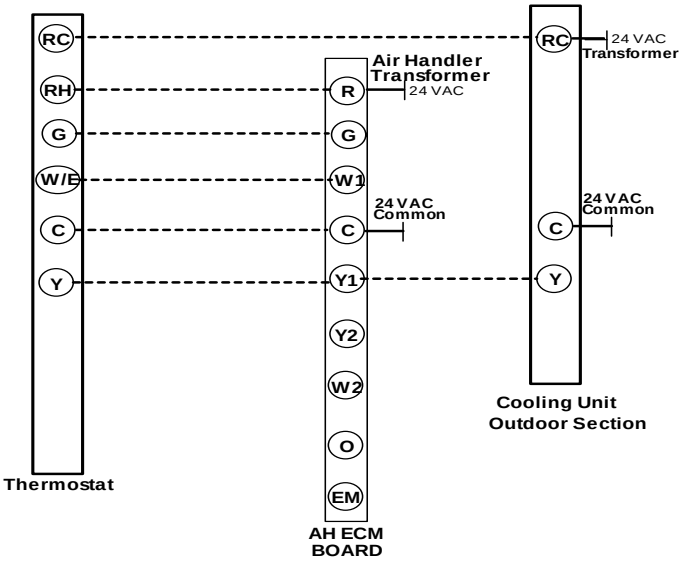


Figure 30 Typical Single Stage Heat with Single Stage Package Cooling Unit

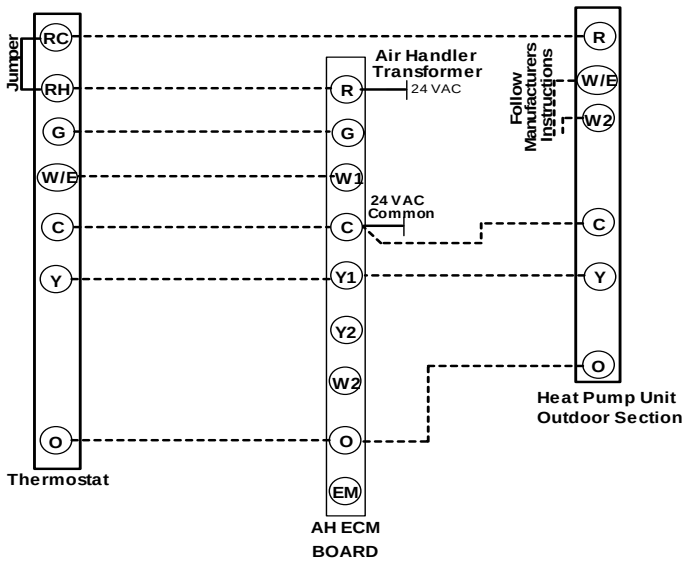


Figure 31: Typical Single Stage Heat with Single Stage Split System Heat Pump

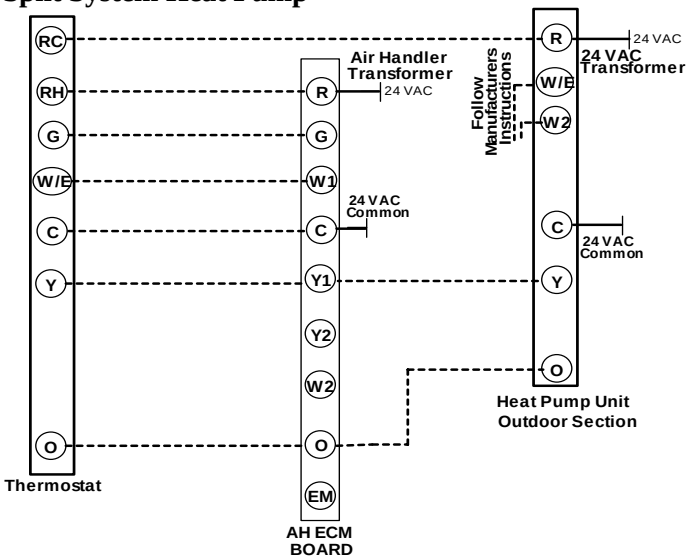


Figure 32: Typical Single Stage Heat with Single Stage Package Heat Pump Unit

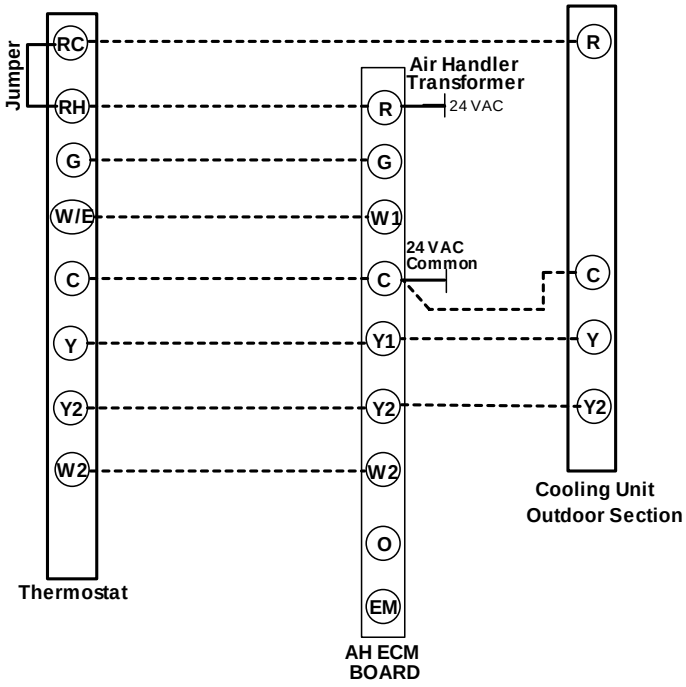


Figure 33: Typical Two Stage Heat with Two Stage Split System Cooling

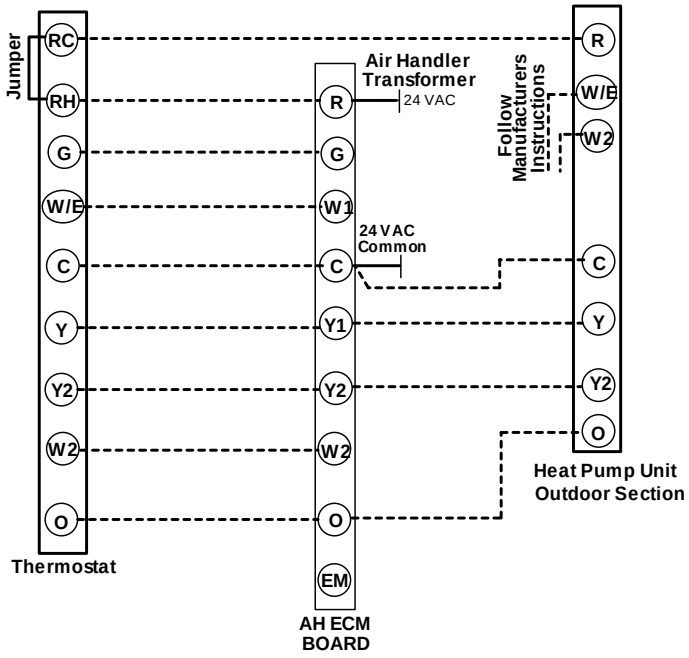


Figure 35: Typical Two Stage Heating with Two Stage Split System Heat Pump

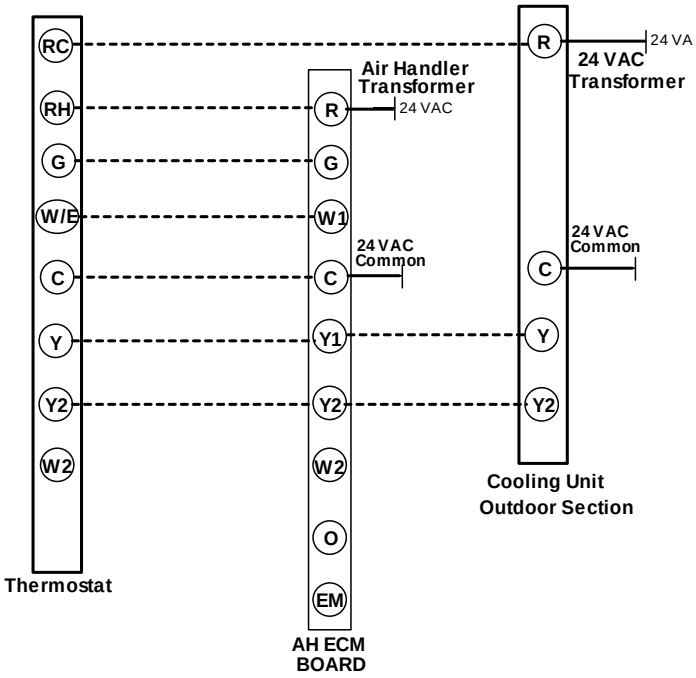


Figure 34: Typical Single Stage Heat with Two Stage Package Cooling Unit

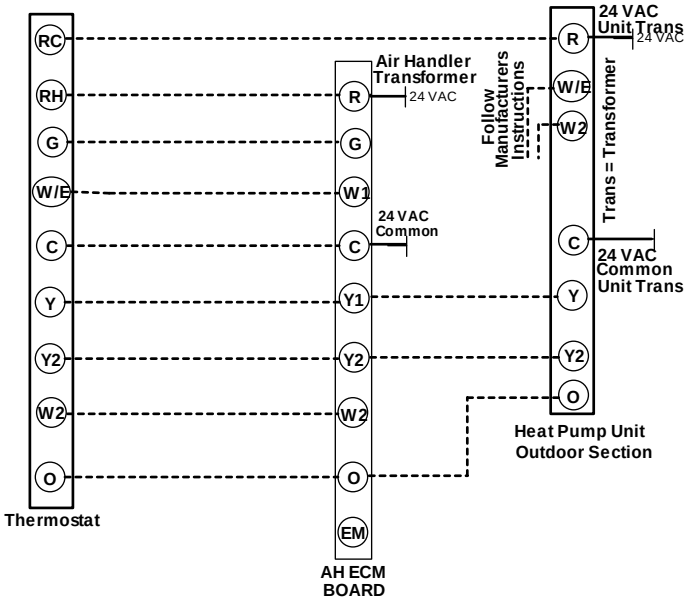


Figure 36: Typical Two Stage Heat with Two Stage Package Heat Pump

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

Note: Single stage thermostat on two stage models must connect white (W1) pigtail wire and black (W2) pigtail wire together in low voltage box with W wire from the thermostat.

Table 15: Air Handler Thermostat Pigtail Wire Color Code

Wire Color	Description	Letter Code	Thermostat Connection
RED	24 VAC	R	R
WHITE	Heat (1st Stage Heat)	W	E
BLACK	Heat (2nd Stage Heat)	BL	W2
GREEN	Indoor Fan	G	G
YELLOW	Cooling - Stage 1	Y	Y or Y1
BROWN	24 VAC Common	BRN	C

Table 16: Recommended Heating / Cooling Thermostat Wire Color Codes and Connections.

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

Table 17: Recommended Heating / Cooling/ Heat Pump Thermostat Wire Color Codes and Connections.

Typical Heating/Cooling Thermostat Wiring Connections

1. Remove blower 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 on the air handler 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 compressor contactor on the condenser unit. Fasten the two wires together securely with a wire nut.
10. Connect the Brown (24 VAC Common) wire from the thermostat with the yellow low voltage pigtail wire on the air handler and with the brown (Common) wire from the compressor contactor on the outdoor unit. Fasten the three wires together securely with a wire nut.
11. Connect the Black (2nd stage heating) thermostat wire to the black 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 black 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 together; then, secure all three wires with a wire nut.

Typical Heat Pump - Heating/Cooling Thermostat Wiring Connections

1. Remove the blower 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. Fasten the wires together securely with a wire nut. If the outdoor unit has a red wire or “R” terminal then connect the red wire from the outdoor unit with the Red thermostat wire from the second cable and connect this red wire to the “RC” terminal on the thermostat. Fasten the 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 brown (24 VAC Common) wire from the thermostat with the yellow low voltage pigtail wire on the air handler and with the brown (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 Black (2nd stage heating) thermostat wire to the black 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 black 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 black and the white air handler pigtail wires together; then, secure all three wires with a wire nut.

SECTION X: MOTOR, BLOWER AND AIR HANDLER STARTUP

⚠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 16 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 18: Constant Torque 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.

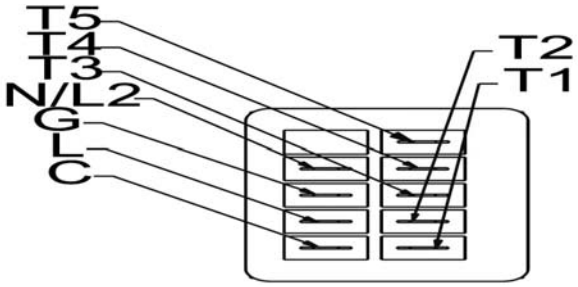


Figure 37: Constant Torque Motor Terminals

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 three screws on the left side of the blower mounting plate.
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.

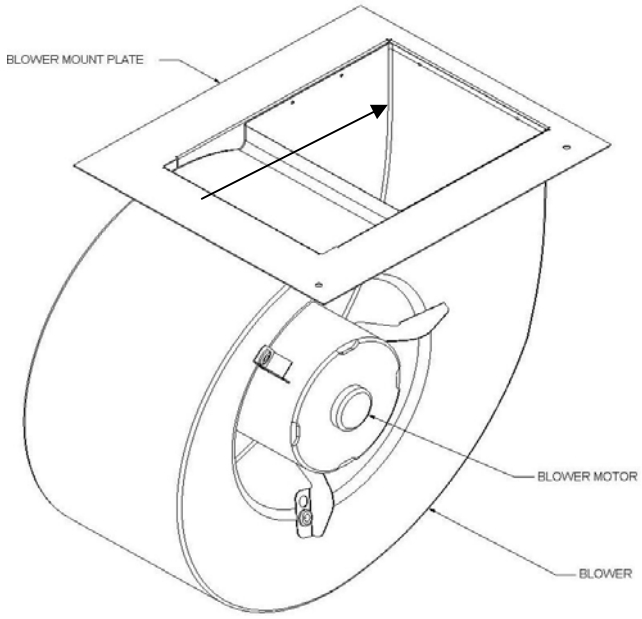


Figure 38: Blower Assembly and Blower Deck

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 27 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 XI: 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 air handler circuit breakers in the main service (House Circuit Breaker) 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.

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, 8kW, 10kW, 12kW and 15kW set at 0.4

SECTION XII: WIRING DIAGRAMS

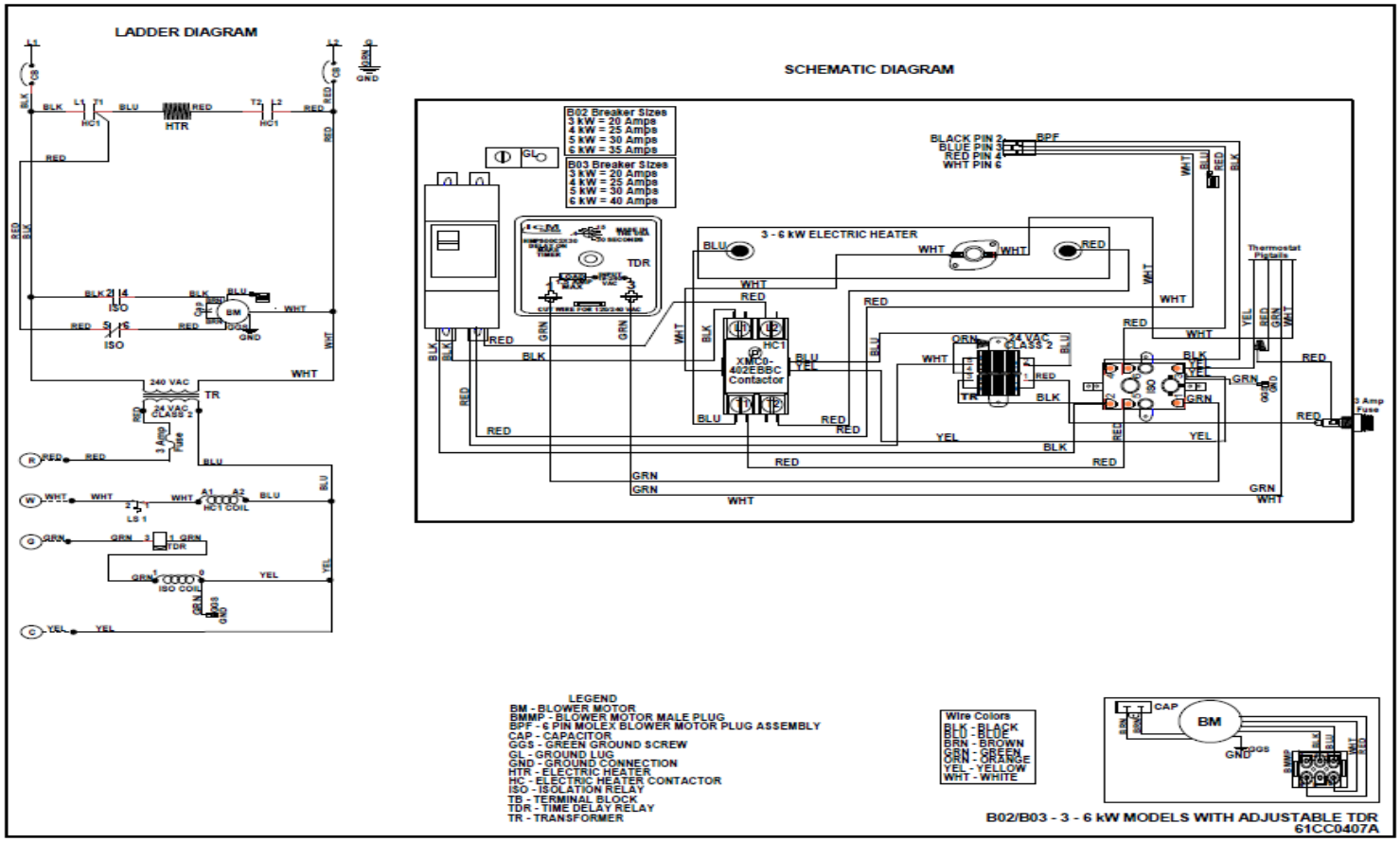


Figure 39: B02/B03 – 3kW - 6kW Electric Heat – PSC Blower Motor Wiring Diagram

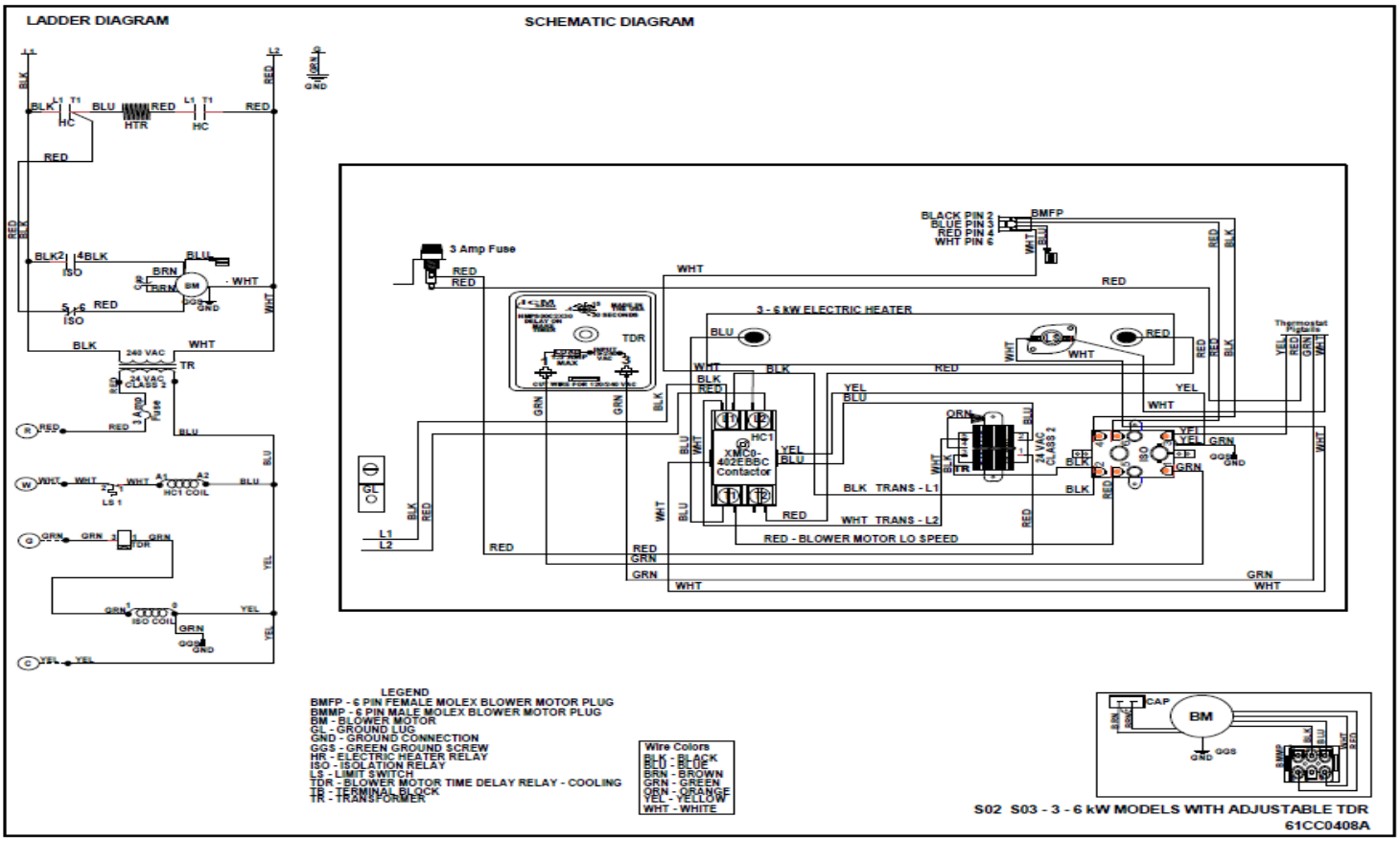


Figure 40: S02/S03 – 3kW - 6kW Electric Heat. – PSC Blower Motor Wiring Diagram

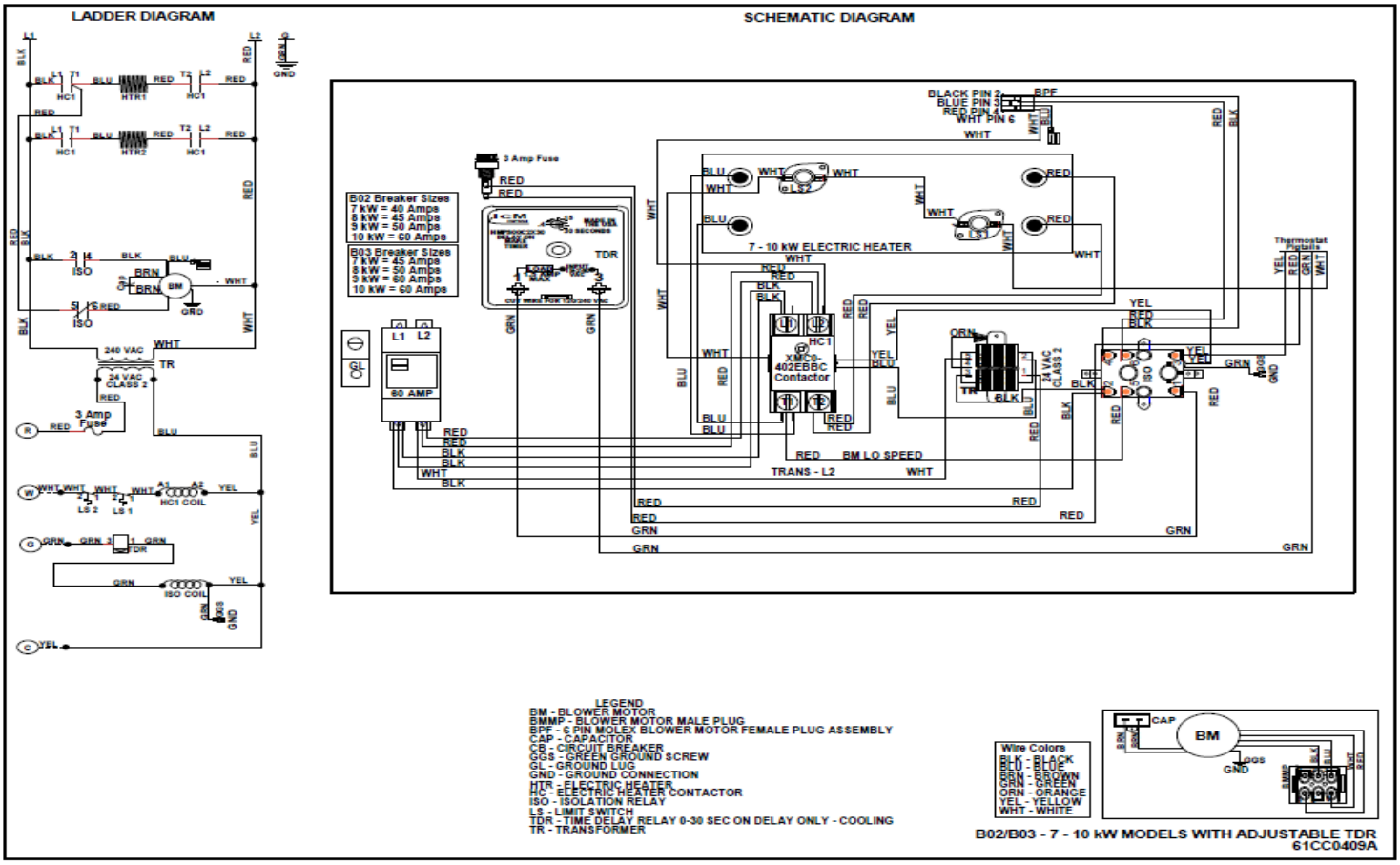


Figure 41: B02/B03 7kW – 10kW Electric Heat – PSC Blower Motor Wiring Diagram

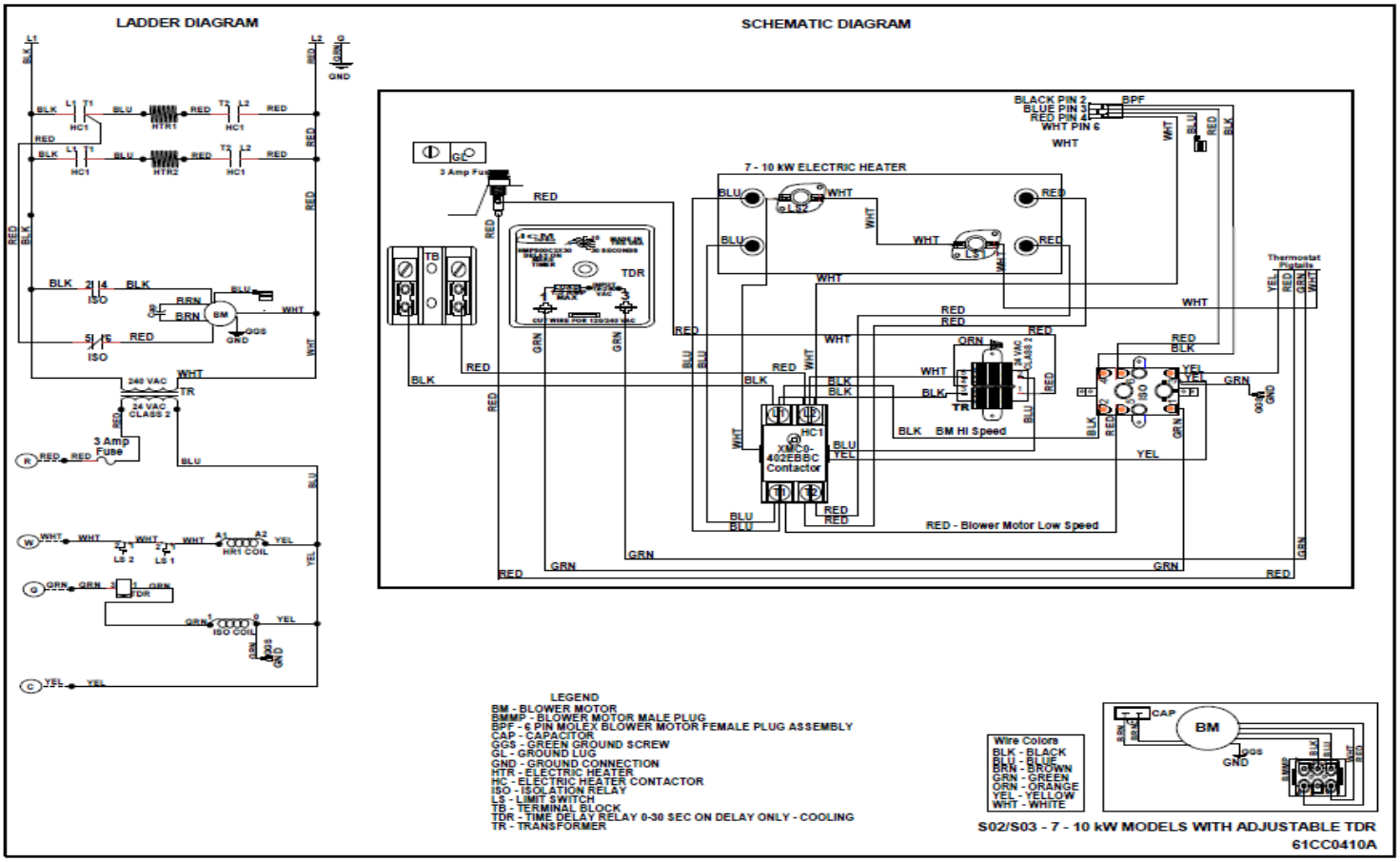


Figure 42 S02/S03 7kW – 10kW Electric Heat – PSC Blower Motor Wiring Diagram

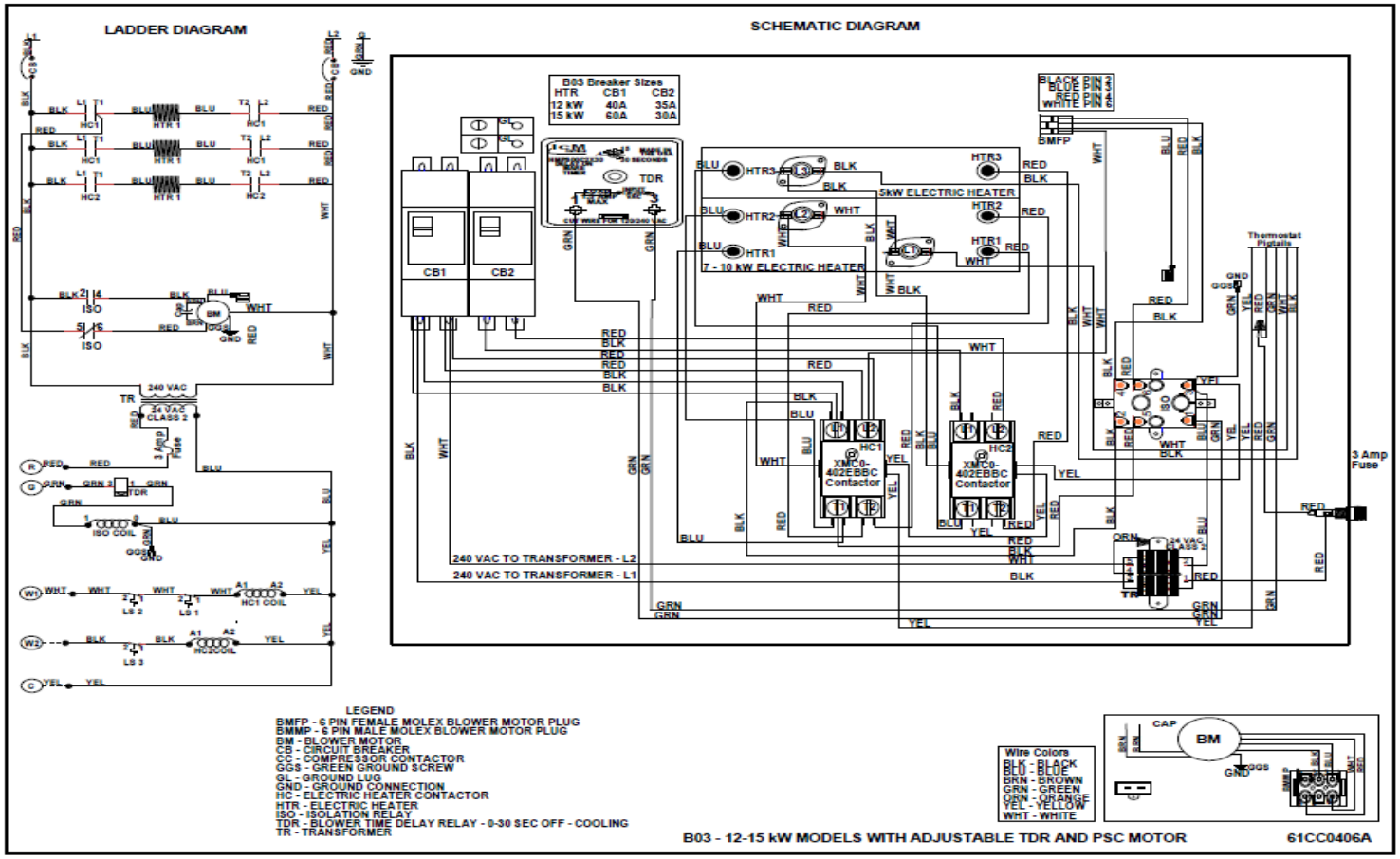


Figure 43 B03 12kW – 15kW Electric Heat – PSC Blower Motor Wiring Diagram

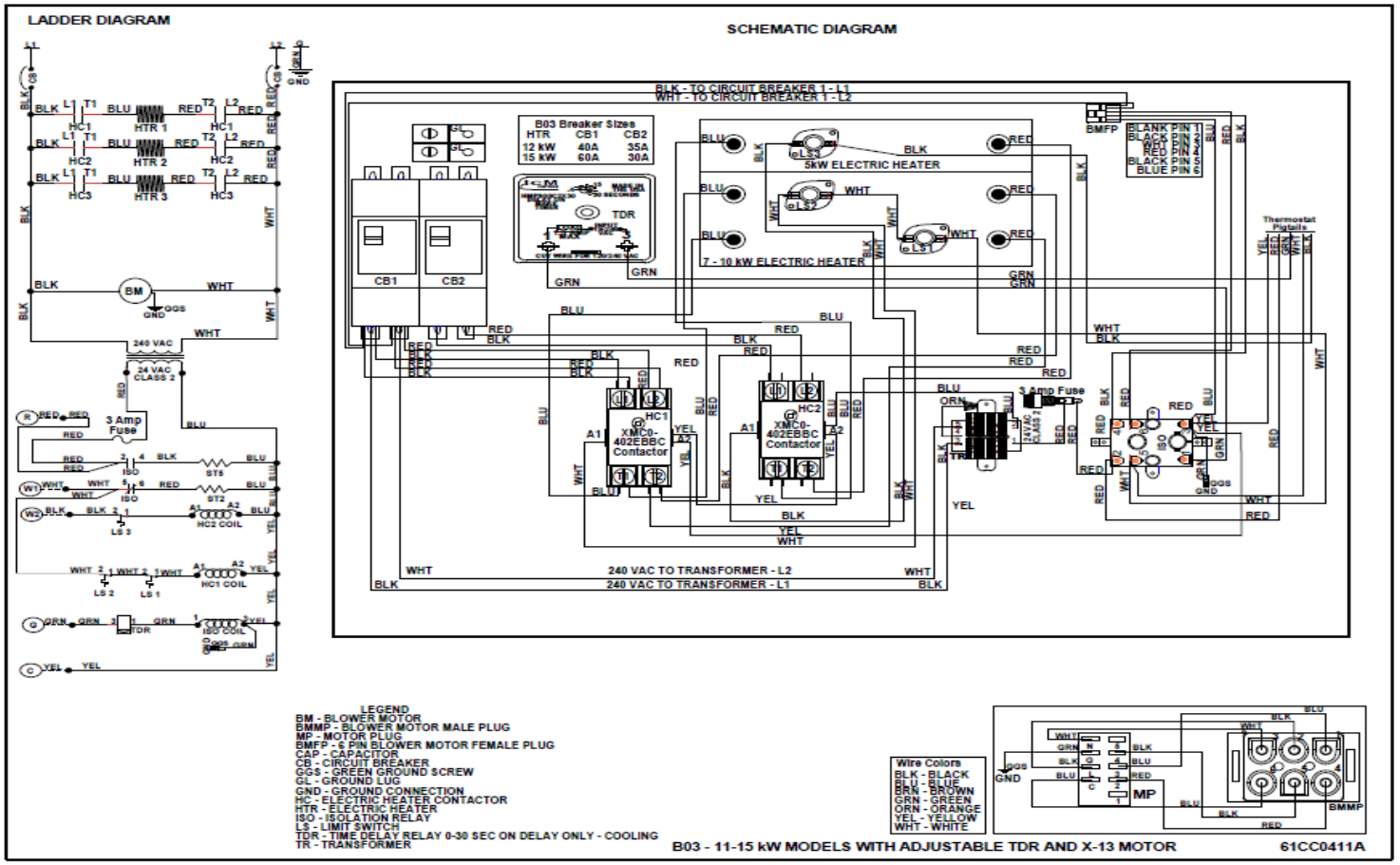


Figure 44 B03 12kW – 15kW Electric Heat – Constant Torque Blower Motor

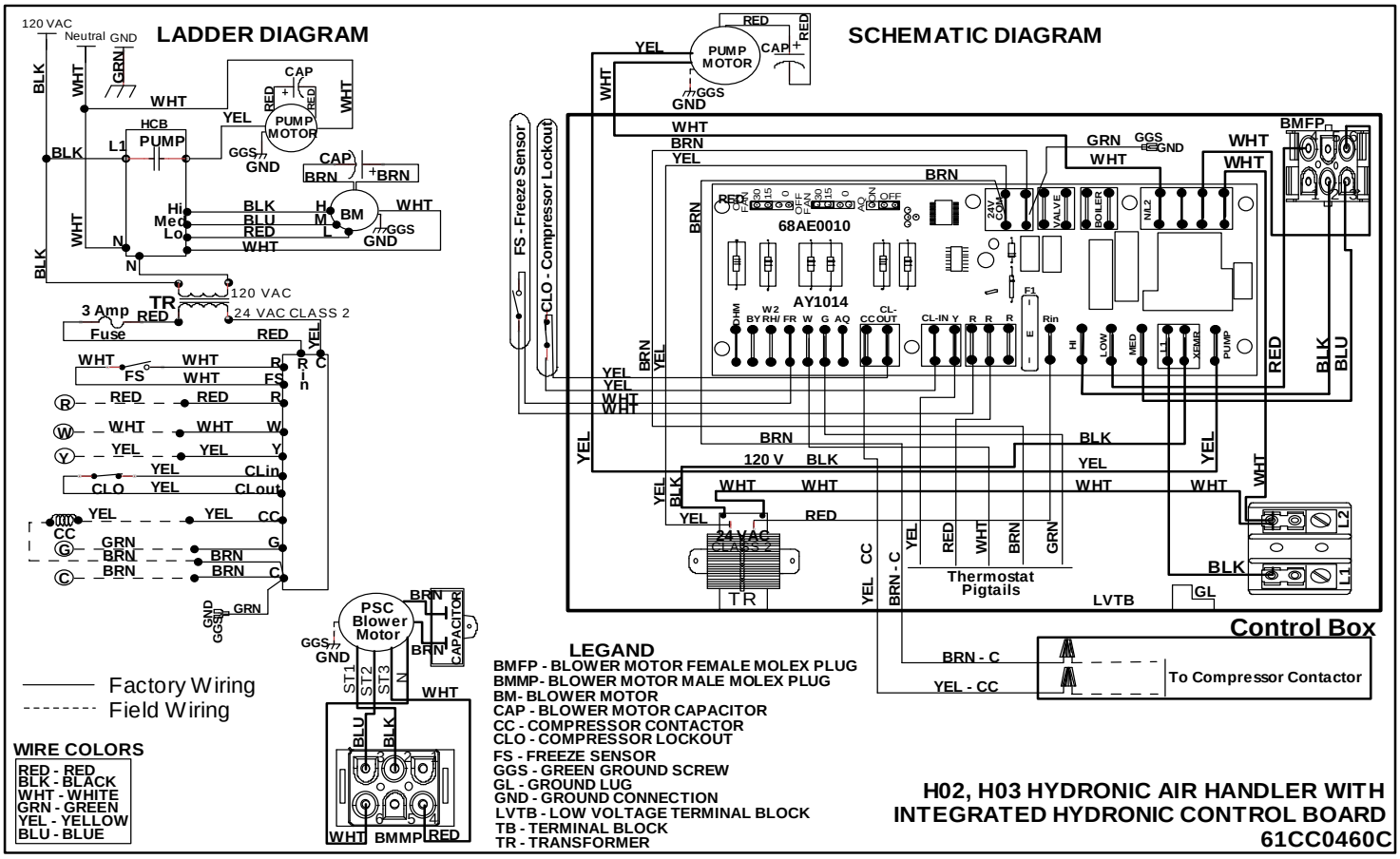


Figure 45 H02 / H03 Hydronic Heat - With Pump, CLO and Freeze Stat – PSC Blower Motor

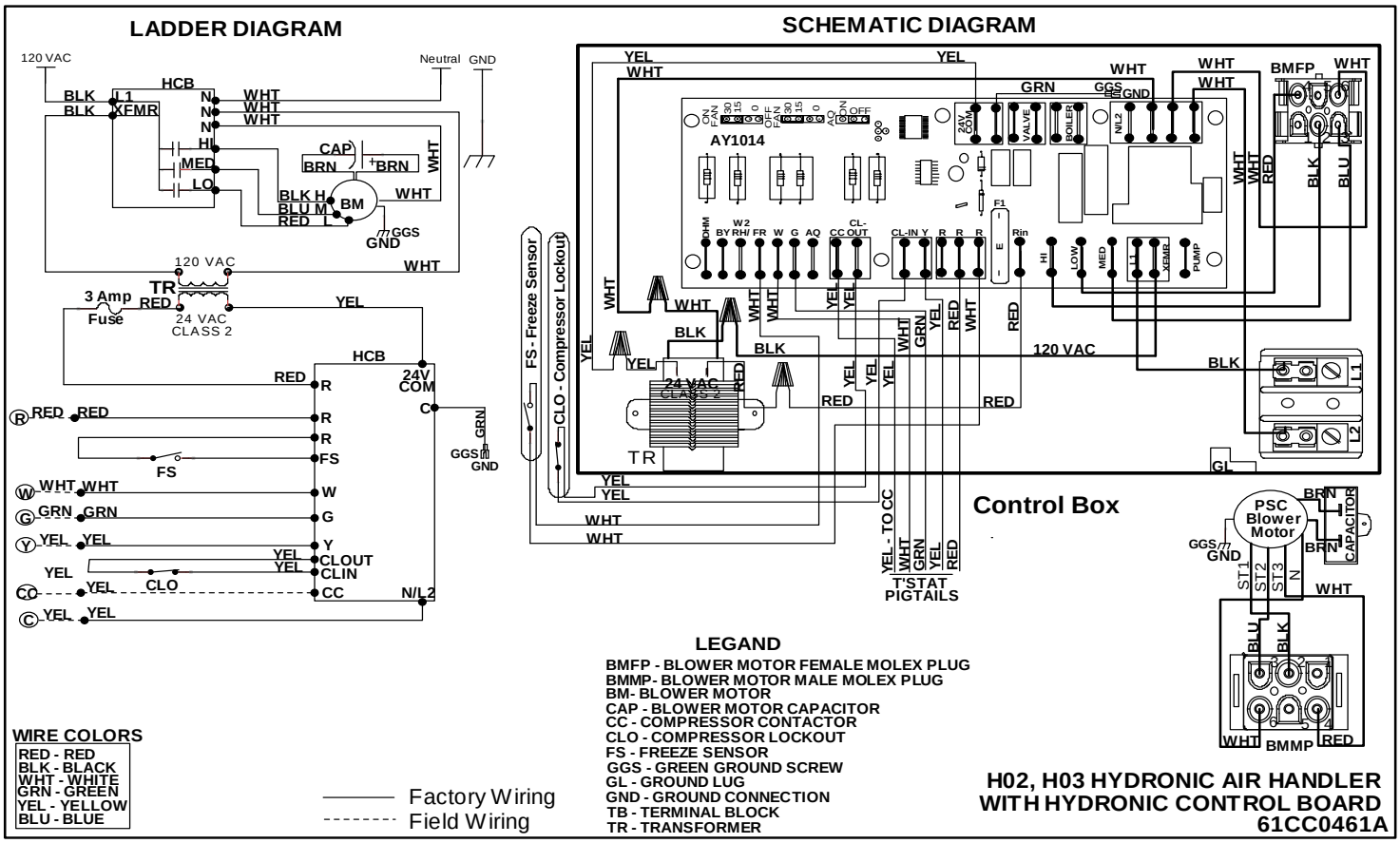


Figure 46 H02 / H03 Hydronic Heat - No Pump - With CLO and Freeze Stat – PSC Blower Motor

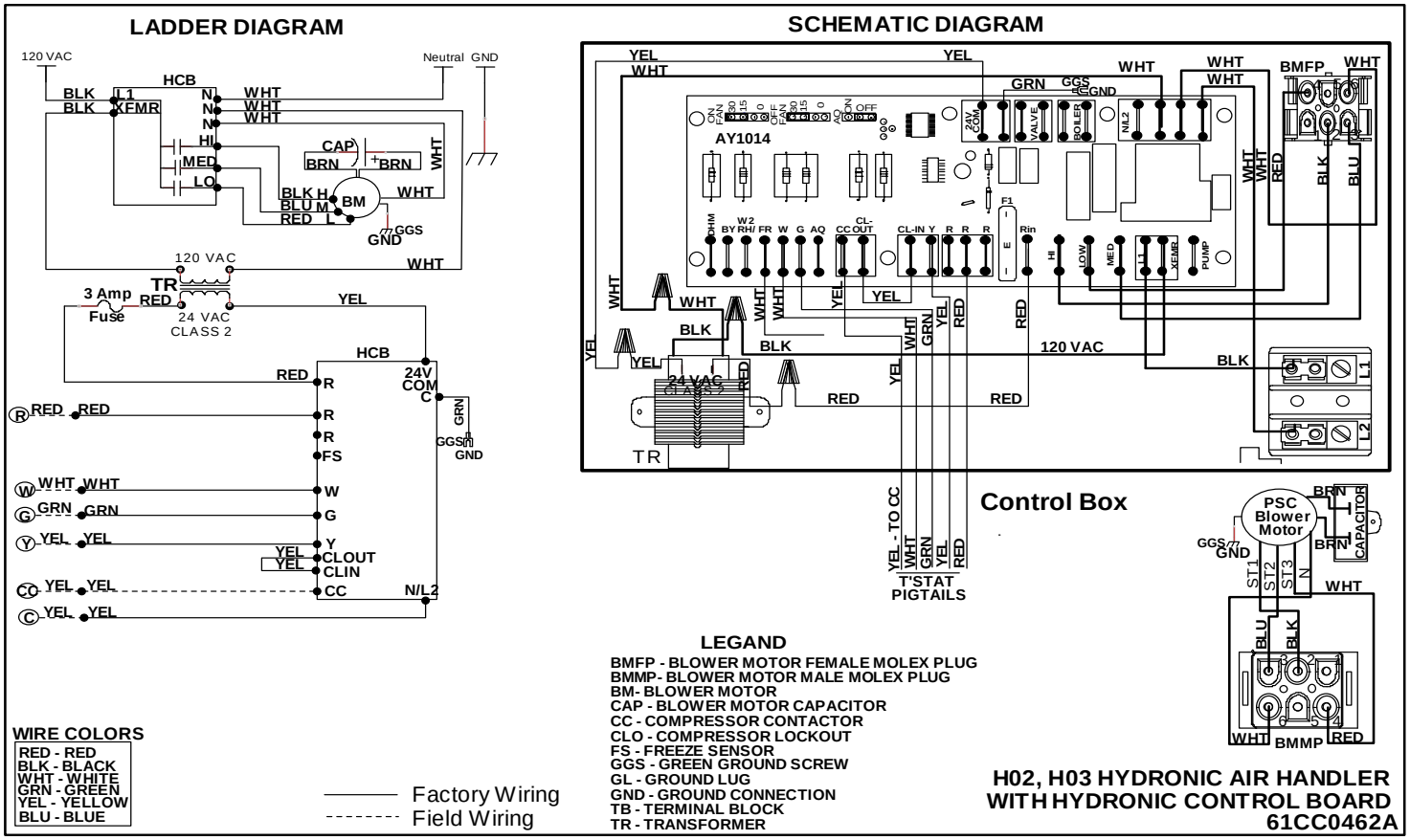


Figure 47 H02 / H03 Hydronic Heat - No Pump, CLO or Freeze Stat – PSC Blower Motor

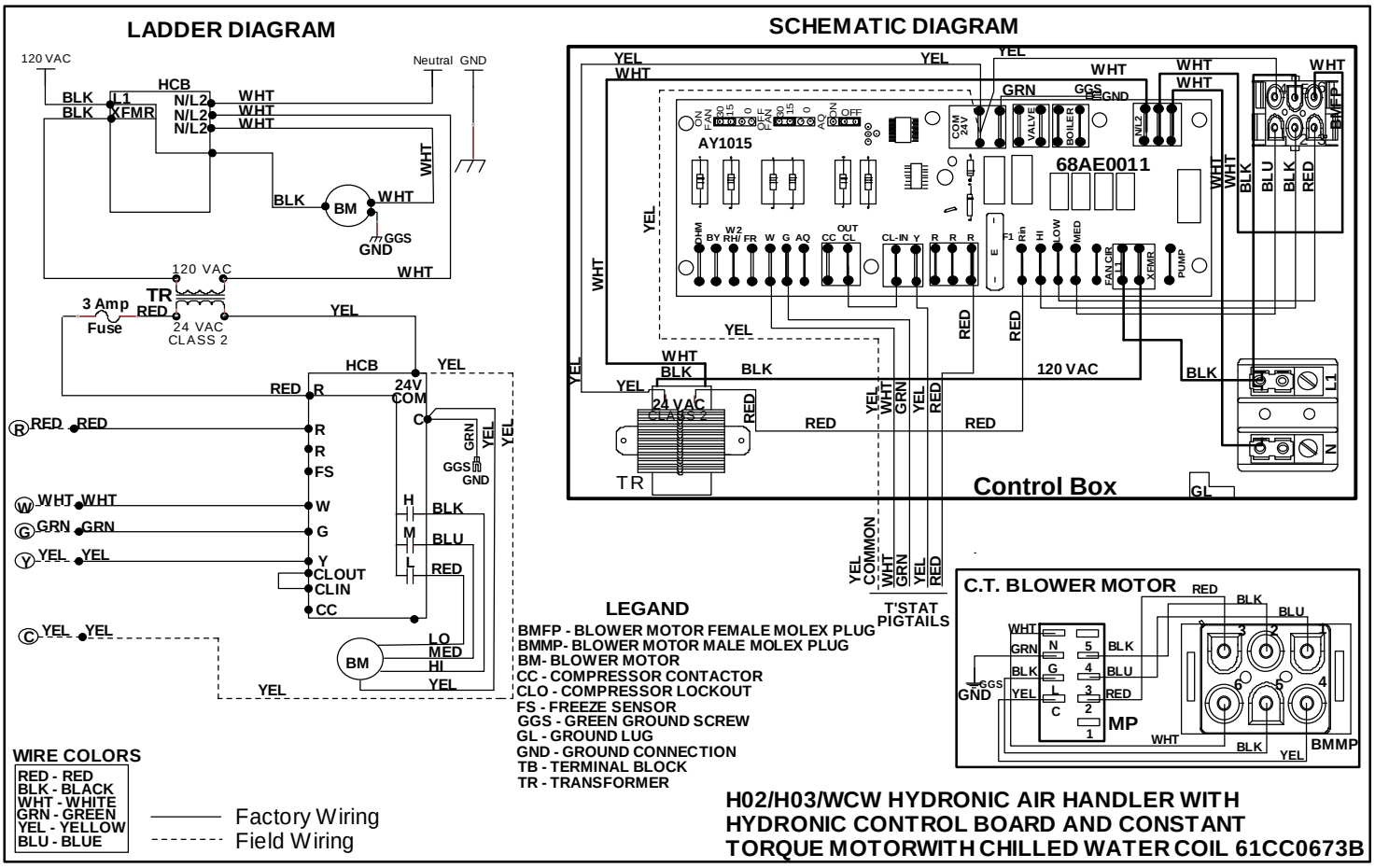


Figure 48 H02 / H03 Hydronic Heat - No Pump, CLO or Freeze Stat – Constant Torque Blower Motor

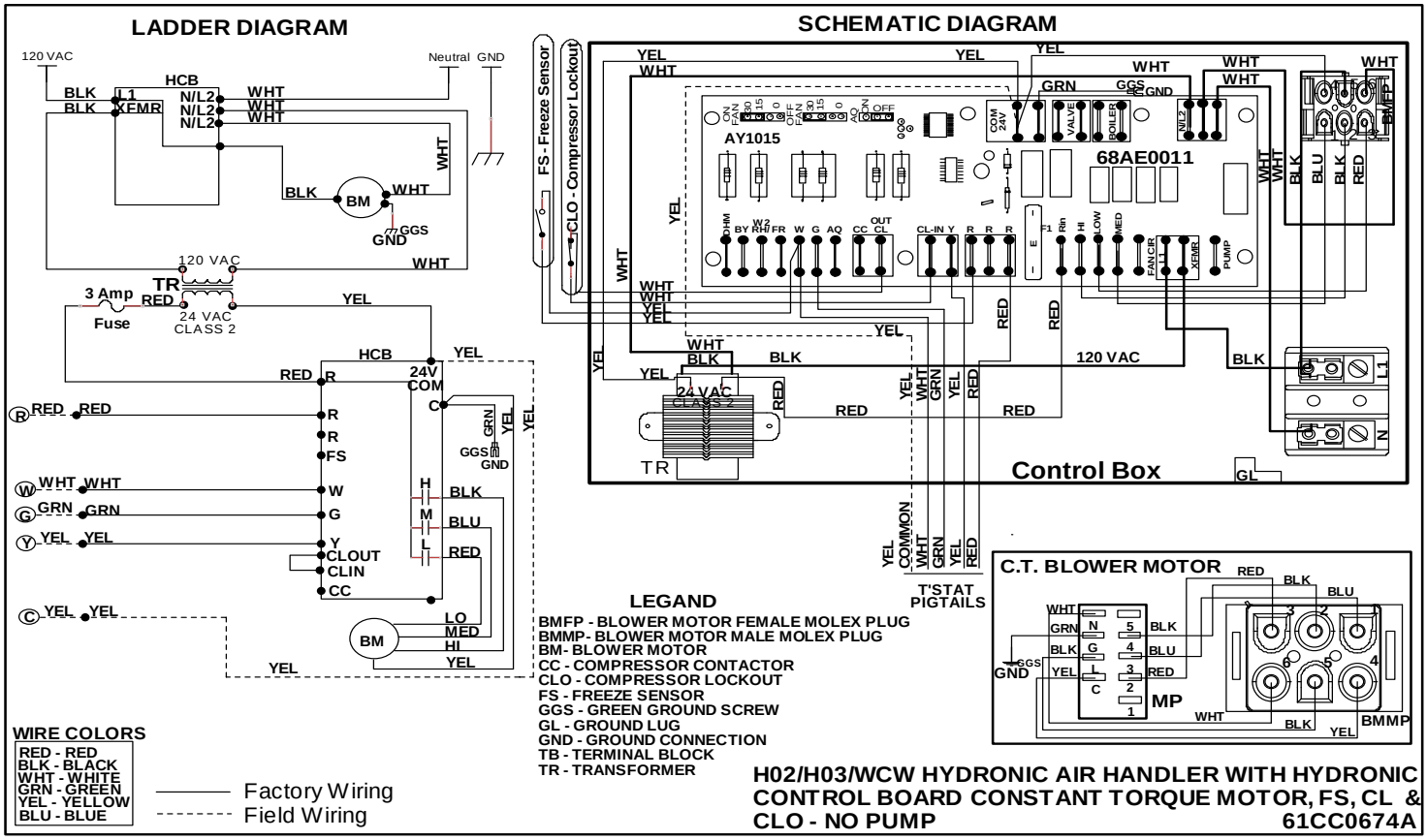


Figure 49 H02 / H03 Hydronic Heat - No Pump, With CLO and Freeze Stat – Constant Torque Blower Motor

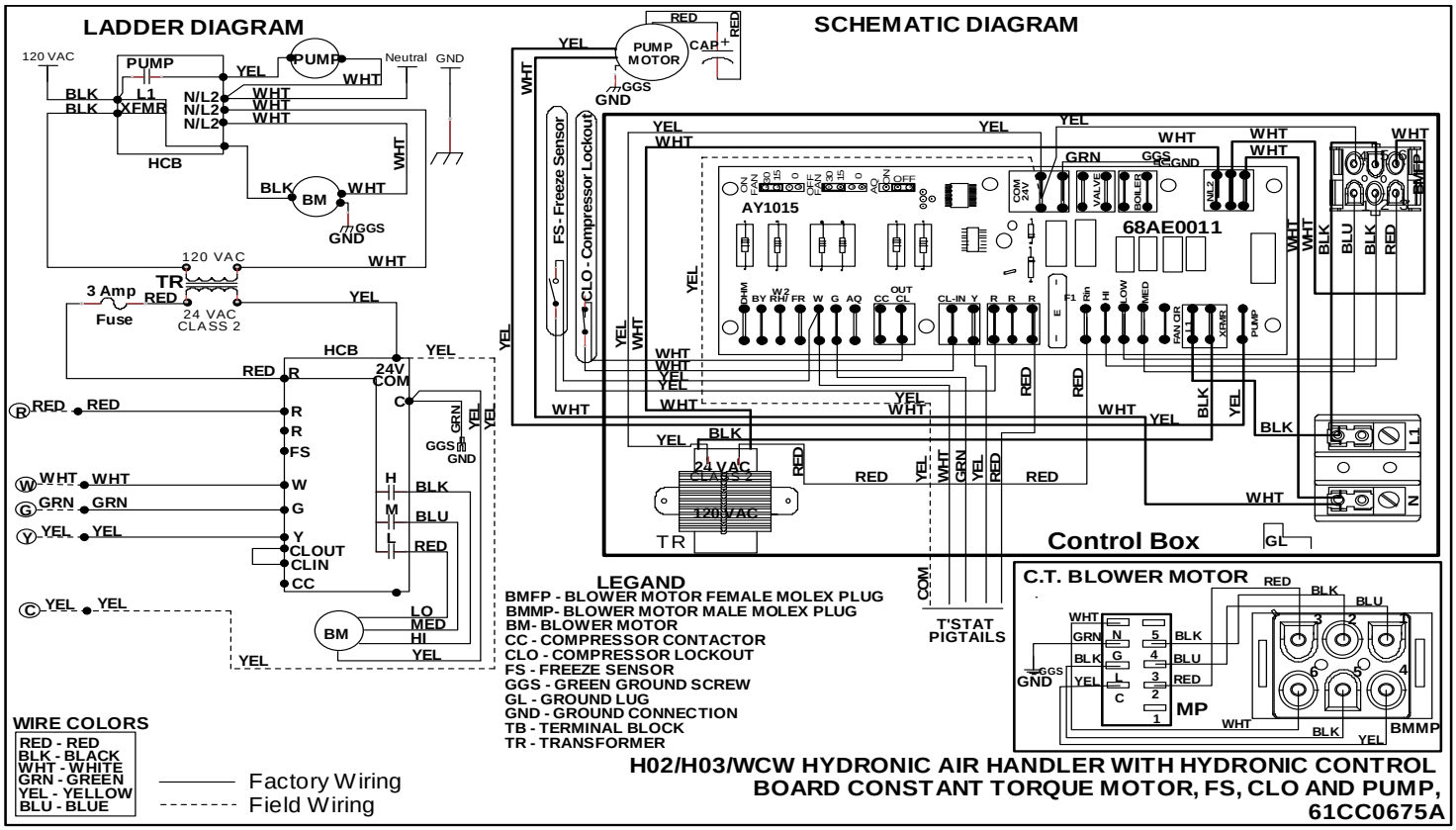


Figure 50 H02 / H03 Hydronic Heat - With Pump, CLO and Freeze Stat – Constant Torque Blower Motor

Subject to change without notice

61BA0070

Supersedes: 61BF0006 and 61 BF0007