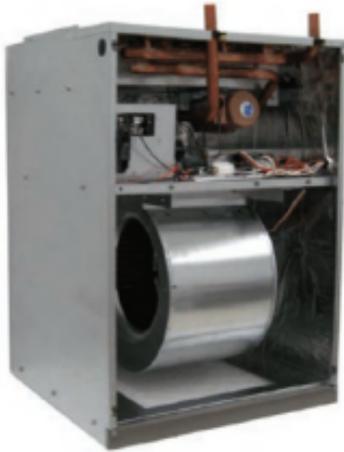




INSTALLATION GUIDE & OPERATION MANUAL ASPEN MULTI-POSITION AIR HANDLERS

AF(L,M,S) SERIES – MULTI-POSITION AIR HANDLER - COPPER COIL (HYDRONIC HEAT)



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1. IMPORTANT SAFETY INSTRUCTION

Potential safety hazards are alerted using the following symbols. The symbol is used in conjunction with terms that indicate the intensity of the hazard. It is the responsibility of the owner and the installer to read and comply with the safety information and the instructions accompanying these symbols.



Read the precautions in this manual carefully before operating the unit.



Read the instructions in this manual carefully before operating the unit.



Read the instructions in this manual carefully before servicing the unit.



Read the instructions in this manual carefully before wiring the unit.



Warning or Caution

▲ WARNING

This symbol indicates a potentially hazardous situation, which if not avoided, could result in serious injury, property damage, product damage or death.

▲ CAUTION

This symbol indicates a potentially hazardous situation, which if not avoided, may result in moderate injury or property damage.

▲ WARNING

Certified technicians or those individuals meeting the requirements specified by NATE may use this information. Property and product damage or personal injury hazard may occur without such background.

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children must be supervised to ensure that they do not play with the appliance.

Product designed and manufactured to permit installation in accordance with local and national building codes. It is the installer's responsibility to ensure that the product is installed in strict compliance with the aforementioned codes. Manufacturer assumes no responsibility for damage (personal, product or property) caused due to installations violating regulations.

▲ WARNING

Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury, or death.

▲ WARNING

This unit is not approved for outdoor installations.

▲ WARNING

HAZARDOUS VOLTAGE!

Failure to follow this warning could result in property damage, severe personal injury, or death.

Disconnect ALL electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized

▲ WARNING

The unit is designed for operation with 120 V, single phase, 60 Hz power supply. Aspen will not be responsible for damages caused due to modification of the unit to operate with alternative power sources.

WARNING

When this unit is installed in an enclosed area, such as a garage or utility room with any Carbon Monoxide producing devices (i.e. automobile, space heater, water heater etc.) ensure that the enclosed area is properly ventilated.

▲ WARNING

This product designed and manufactured to permit installation in accordance with local and national building codes. It is the installer's responsibility to ensure that product is installed in strict compliance with national and local codes. Manufacturer takes no responsibility for damage (personal, product or property) caused due to installations violating regulations. Installation of this unit shall be made in accordance with the National Electric Code, NFPA No. 90A and 90B, and any other local codes or utilities requirements.

▲ WARNING

Do not bypass safety devices.

▲ WARNING

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

▲ CAUTION

Only factory authorized kits and accessories should be used when installing or modifying this unit unless it is so noted in these instructions. Some localities may require a licensed installer/service personnel.

▲ WARNING

This product can expose you to chemicals including lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.65Warnings.ca.gov

▲ WARNING

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

- This appliance shall be installed in accordance with national wiring regulations.
- The of the space necessary for correct installation of the appliance including the minimum permissible distance to adjacent structures is specified in Section 5 of this manual under "INSTALLATION INSTRUCTIONS AND CLEARANCES".
- For air handlers with supplementary heaters, the minimum clearance from the appliance to combustible surfaces is specified in Section 5 of this manual under "INSTALLATION INSTRUCTIONS AND CLEARANCES", the equipment was tested for 0" clearance.
- A wiring diagram with clear indication of the connections to external control devices and supply cord can be found in Section 12 of this manual.
- The range of external static pressure at which the appliance was tested (add-on heat pumps and ducted appliances with supplementary heaters only) is available in Section 8 of this manual.
- The method of connecting the appliance to the electrical supply and interconnection of separate components is detailed in Section 7, LOW VOLTAGE CONNECTIONS and in Section 12, WIRING DIAGRAM.
- None of the components in this product family are designed or approved to be suitable for outdoor use.
- Refer to Section 9 of this manual for details of Hydronic Heat Kits that may be used in conjunction with the appliance, field installed heater kit fitting/installation instructions are supplied with the heater kits.

This Air Handler unit is a PARTIAL UNIT AIR CONDITIONER, complying with PARTIAL UNIT requirements of Standard UL 60335-2-40/CSA 22.2 NO. 60335-2-40, and must only be connected to other units that have been confirmed as complying to corresponding PARTIAL UNIT requirements of this Standard.

This appliance is not intended for use at altitudes exceeding 2,000 meters.

2. INTRODUCTION & GENERAL INFORMATION

These air handlers are versatile multi-positional units with the following standard features:

- **Application Versatility:** This unit is designed for use in upflow, downflow, horizontal left and right applications. Follow section 4 & 5 for installation and conversion instructions.
- **Motor:** Constant torque ECM speeds and torques are controlled by software embedded in the motor to maintain constant torque. Motors are pre-programmed at the factory.

- **Cabinet:** Sturdy, short, galvanized steel cabinet with painted front panels. Cabinet fully insulated with 1/2" faced insulation to prevent sweating and mold growth, to encapsulate glass fibers, and to provide excellent R-value. Stick pins ensure insulation remains in place. Units ship with disposable filter in filter rack.
- **Hydronic Coil:** Available with either circuit breakers or terminal blocks. Hydronic Coils come in 2, 3 and 4 row with the options of pump or no pump configurations.
- **Blower:** Direct drive multi-speed blowers circulate air quietly and efficiently. Motor speeds can be easily selected via motor terminals. Swing mounted blowers can be easily removed for service.
- **Electronic Circuit Board:** Electronic circuit board provides 30 sec. ON/OFF blower time delay extracting more heat/cool from the coil
- **Warranty:** Five-year limited parts warranty.

3. INSPECTION

On receiving the product, visually inspect it for any major shipping related damages. Shipping damages are the carrier's responsibility. Inspect the product labels to verify the model number and options are in accordance with your order. Manufacturer will not accept damage claims for incorrectly shipped products.

4. EQUIPMENT SIZING

4.1. Air Handler Selection

Select an air handler with a heating output that exceeds the space heating loss of the structure and that has a cooling coil sized to match the outdoor condensing unit. Special note... the heating output of the air handler or hot water coil will not be greater than the output of the selected hot water heater. Therefore, if the water heater is undersized the heating BTUH of the air handler will be LESS than it's rated output.

4.2. Water Heater Selection

The following size information should only be used as a basic guide to adequate water heater sizing because of variations in each family's domestic hot water requirements. For additional assistance in water heater sizing contact a professional engineer.

Proper water heater sizing should consider both the gallon capacity AND the BTU input of the water heater.

I. To determine water heater GALLON CAPACITY:

A minimum 40 gallon high recovery and/or high efficiency gas or oil-fired water heater is recommended. The following volume sizing guide is satisfactory in most areas of the country:

- 600-800 CFM air handlers minimum 40 gallon water heater
- 1000-1200 CFM air handlers minimum 50 gallon water heater
- 1400-1600 CFM air handler either two 40 gallon water heaters piped together, one high input 50 gallon (63,000 to 75,000 BTU input), or one 72 to 75 gallon.

- 2000 CFM air handler any combination of water heaters having at least 105,000 BTU OUTPUT.

II. To determine water heater BTU INPUT:

(assumes a water heater recovery efficiency of 76%)

- For mild climates: $BTU\ INPUT = \text{structure's heat loss} \times 1.51$
- For colder climates: $BTU\ INPUT = \text{structure's heat loss} \times 1.58$

5. INSTALLATION INSTRUCTIONS AND CLEARANCES

This furnace is designed for zero clearance installation on three sides and adequate clearance to provide access for service in the front. A minimum of 2.5 – 3.5 feet clearance is recommended on the front end (Fig 4.1).

▲ CAUTION

If a back flow preventer is installed in the system, an expansion tank is necessary.

▲ CAUTION

The hot water coil and water lines must be purged of air before the hot water pump can be energized. Failure to purge the water system of air can result damage to the pump.

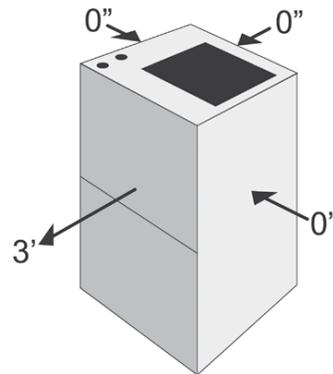


Fig 5.1. Minimum Clearance for Air Handler

5.1. Product Location

In an attic installation, where unit is resting on the floor, a suitable isolation pad should be provided to minimize equipment sound transmission to ceiling below.

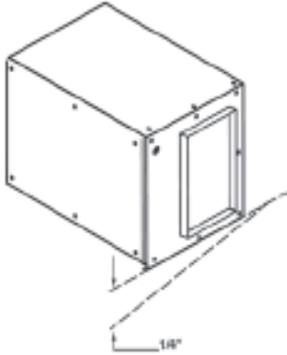
FURTHERMORE, IN ALL COOLING APPLICATIONS, A SECONDARY DRAIN PAN MUST BE PROVIDED BY THE INSTALLER AND PLACED UNDER THE ENTIRE UNIT WITH A SEPARATE DRAIN LINE PROPERLY SLOPED AND TERMINATED IN AN AREA VISIBLE TO OWNER. THIS SECONDARY PAN CAN PROVIDE EXTRA PROTECTION TO THE AREA UNDER THE UNIT SHOULD THE PRIMARY DRAIN PLUG UP AND OVERFLOW. AS EXPRESSED IN OUR PRODUCT WARRANTY, ASPEN WILL NOT BE BILLED FOR ANY STRUCTURAL DAMAGE DUE TO THE FAILURE TO FOLLOW THIS INSTALLATION REQUIREMENT.

5.2. Installation Notes

This unit must be installed in accordance with all local and national codes. The furnace is completely serviceable from the front. All Units are approved for 0" clearance. This Hydronic Furnace allows substantial freedom in positioning the product to

best serve the structure requirements. Units may, without field modification, be positioned for upflow, horizontal left or horizontal right installation. The downflow position requires a slight field modification (See section 8F). Use a low temperature, NON-LEAD solder on all water line copper joints. Insulate all water piping as necessary to prevent freezing. If screws or holes must be drilled into fan coil cabinet, check carefully to insure that no damage is done to internal components.

5.3. Horizontal Application



Pitch unit 1/4" toward drain side.

5.4. Special Instructions For Counterflow Applications [AFL]

The AFL Hydronic Furnace is specifically designed for the use in upflow, horizontal and counterflow positions. Should the application be for counterflow, the following steps should be taken:

1. Some units are supplied with factory installed circuit breakers. If the air handler has circuit breakers, they must be snapped out of the factory installed bracket and inverted to reflect "up" as the "on" and "down" as the "off" position.
2. The above procedure should be done at the job site, as the unit is not designed to be shipped in the counterflow mode.

6. ELECTRICAL LINE VOLTAGE WIRING

▲ WARNING

Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury, or death.

▲ WARNING

Before obtaining access to terminals, all supply circuits must be disconnected.

▲ WARNING

A fused disconnect switch must be field provided for the unit to be in compliance with UL 60335-2-40 Clause 7.12.2.

These units are designed for single phase 120 volts, 60 HZ power supply. Wire selection and wiring must be in accordance with the latest edition of the National Electric Code, or in Canada the Canadian electrical Code, and local codes to determine correct wire sizing. Unit terminals are designed to accommodate copper and aluminum wiring. If aluminum wiring is used: All applicable

local and national codes must be followed please observe special precautions relative to sizing, wire connections and corrosion protection.

Line voltage wiring should be routed through the access holes at the top of the air handler. To minimize air leakage, seal the wiring entry point on the outside of the unit. Proper electrical conduit connection fittings should be used. Connect the power wiring to the line side connections on the air handler. The electrical ground wire should be connected to the grounding lug. Ensure both the field supplied ground wire and air handler GREEN ground wire are both secured to the grounding lug of the air handler.



Fig 5.1

7. LOW VOLTAGE CONNECTIONS

A 24 V power supply is provided by an internally wired low voltage transformer that is standard on all models. (See Fig 7.1). See the Wiring diagram, Section 12.

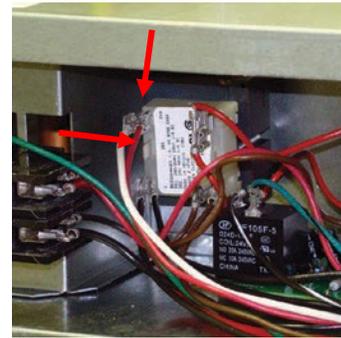


Fig 7.1

Connect the field wiring at the pigtails supplied with the air handler as specified in Wiring diagram. To minimize air leakage, seal the wiring entry point at the outside of the unit.

▲ NOTICE

All wiring must comply with local and national electrical code requirements. Read and heed all unit caution labels.

7.1. Single Stage Cooling with Hydronic Heat

The air handler comes factory setup for a single stage cooling system. The hydronic heat are preinstalled, and will also have a low voltage wire for field connection (Fig 7.2).

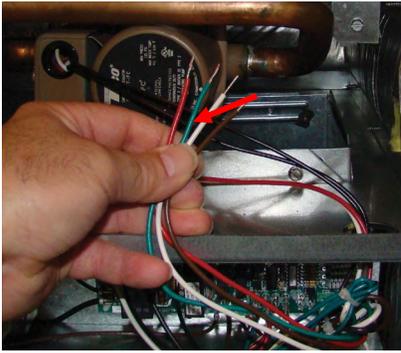


Fig 7.2

During cooling mode operation, the indoor blower G wire will energize a time delay relay inside the air handler. After a short time delay period, the time delay relay will send out a 24-volt signal to the low voltage terminal on the motor. Fan delay periods are 7 seconds ON delay and 65 seconds OFF delay. (See wiring in Section)

The Y wire from the thermostat is not connected at the air handler. This wire goes directly to the outdoor unit 24 volt wiring to turn on the outdoor condensing unit when a call for cooling takes place. The 24-volt common for the outdoor unit circuits is connected at the air handler Brown wire.

The hydronic heater low voltage wiring W terminal is wired directly from the thermostat to the air handler. The blower will delay on a heat call ON for a period of 5 seconds. The OFF-delay period is 60 seconds.

7.2 Two Stage Condensing Units

If the outdoor condensing unit is a two-stage model, a field provided Y2 wire can be connected to the motor using an electrical spade connector. The number 4 and 5 terminals on the motor are speed taps that will increase the blower speed for second stage cooling operation. Both the G and Y2 terminals will be energized at the same time during a call for second stage blower speed operation. The motor will run at the speed where the Y2 wire is connected (Fig 7.2).



Fig 7.2

Operating CFM based upon each speed tap number is shown on the electrical wiring diagram of the unit. Final air volume adjustments should be made by referencing total external static pressure (Table 8.1 below).

7.3. Jumper Placement – Control Board

The unit ships with a control board which controls the electrical functioning of the unit. An inspection of the controls is recommended prior to startup.

Fig. 7.3 provides a schematic of the control board present in the unit. The unit ships from the factory with the aquastat jumper (AQ) in the OFF position (right two pins) and the heating selector in the HW position (right two pins). If an aquastat (AQ) is used in the application, the jumper should be changed to the ON position (left two pins). Terminals T and N located on the top right side of the board are not intended for field use and should be left disconnected.

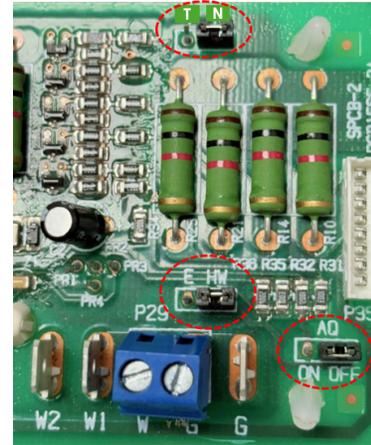


Fig 7.3

7.4. Pump/ Boiler/Valve Wiring

Pump (Factory Installed): If a unit is equipped with the pump (Fig 7.4), it will be energized on a call for heat.



Fig 7.4

Boiler (Field Install): For field install boiler, connect two wires on the “BOILER” terminals marked as T T (Fig 7.4a). See wiring diagram for proper connections.

In an application where a valve or pump is used to regulate the hot water supply, the two wires connected on the “BOILER” T T terminals should be removed and placed on the two terminals marked as “VALVE 24V” (Fig 10.4a). These wires should be connected to a 24V valve or pump relay according to local requirements and instructions of the valve or relay manufacturer.

On a call for heat, 24V will be sent to the field-installed valve or pump relay, the valve will open or pump relay will close contacts allowing the pump to run. Water will circulate through the hydronic coil for 60 seconds prior to energizing the blower. After

MODEL	SPEED TAP	CFM VS EXTERNAL STATIC				
		0.10	0.20	0.30	0.40	0.50
AFLS+ WC2SR WC3SR	T5	900	855	800	740	675
	T4	670	650	615	600	550
	T3	460	445	420	400	385
	T2	900	655	800	740	675
	T1	350	335	315	300	280
AFLM+ WC2SR WC3SR WC4SR	T5	1200	1130	1085	1030	985
	T4	1140	1090	1030	975	910
	T3	905	870	835	800	740
	T2	760	730	695	650	605
	T1	475	450	425	400	375
AFL+ WC2LR WC3LR WC4LR	T5	1875	1800	1730	1690	1625
	T4	1705	1660	1600	1530	1480
	T3	1495	1460	1430	1400	1365
	T2	1340	1295	1255	1200	1140
	T1	910	875	840	800	745

TABLE 8.1 – AFL Airflow Table

NOTE:

- Airflow data indicated is at 120V, bottom return, dry coil conditions only; tested with hydronic coil & without filters.
- Air handler units are tested to UL60335-2-40 standards up to 0.5 in. w.c. external static pressure.
- The above charts are for information only. For optimal performance, external static pressures of 0.2 in. w.c. to 0.5 in. w.c. are recommended. Heating applications are tested at 0.5 in. w.c. external static pressure. For satisfactory operation, external static pressure must not exceed value shown.
- Airflow data shown is from testing performed at 120 Volts. The AFL units are equipped with a standard 5 speed ECM constant torque motor
- The above data can be used for airflow at other distribution voltages.

9. HYDRONIC HEAT

9.1 Hydronic Coil Connection

▲ WARNING
The hot water (hydronic) coil and all water lines **MUST** be purged of air prior to starting the pump. Failure to do so could result in pump damage. Aspen will not be responsible for any property or personnel damage caused by failure to follow this instruction.

▲ WARNING
Hot water flowing to the coil should be in the range of 120° - 180° F. Water at these temperatures can cause first-degree burns. Use of proper safety gear while installing or servicing the equipment is strongly recommended as is installation of a water-tempering valve (for water temperatures of above 140°F) to supply lower temperature water to fixtures in the house. N170L series or equivalent should be used.

▲ WARNING
Installer **MUST** open water lines and run system to a.) ensure pump is primed and waterflow is constant and b.) ensure there are no leaks in the coils, connections, and/or water piping. Failure to do so could result in water leaks and property damage. Aspen will not be responsible for any damage caused by failure to follow this instruction.

▲ NOTICE
Plumbing must be in compliance with state or local codes (Code CMR248 in Massachusetts)

▲ NOTICE
Soldering Copper Tubing: The common method of joining copper tubing in hydronic heating systems is soft soldering. Plumbing codes do not allow solders containing lead to be used for domestic water service.

▲ WARNING
USE NO-LEAD SOLDER for all piping systems that incorporate a domestic water supply.

Connect the hydronic coil to the water heater system by using flexible piping. Connect the hot water to “IN” from the water heater discharge and from the hydronic coil discharge water “OUT” back to water heater inlet as shown in Fig 9.1

7/8” OD copper stubs are provided for plumbing connections. Bleed the air from the system through the bleeder port or optional valve and insulate all the pipes.

The hydronic heat air handler units have different top and heater box configurations. This configuration is not suitable for electric heat. DO NOT try to install a hydronic heater in a unit not equipped for it.

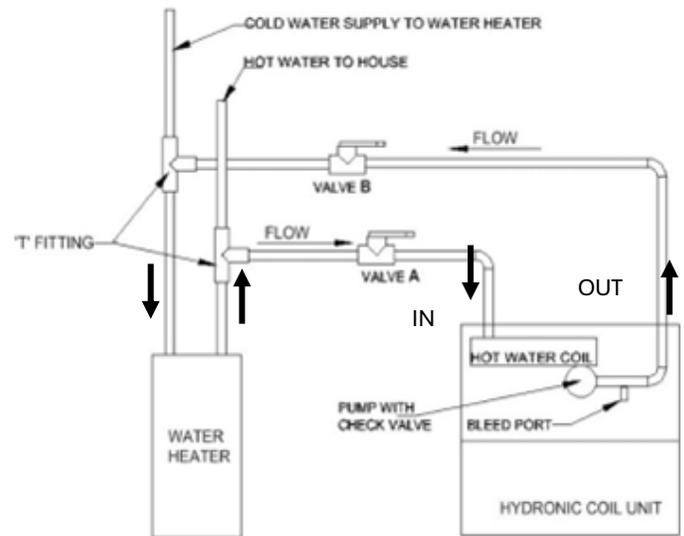


Fig. 9.1

9.2 Purging the System

1. Open air vent and allow water heater to fill with water. Close the air vent when the water heater is full, and all air has been purged.
2. Ignite water heater. Set the thermostat on the water heater to 140 degrees.
3. Close the valve on the hot water supply from the water heater ("A") and open the valve on the cold water return to the water heater ("B"). Then open the air vent in the fan coil. Use bucket or hose to discard water during purging process at air bleed valve. Purge air completely from the line.
4. Once air is purged, close return valve ("B") and open supply valve ("A"). Purge the coil and lines of air completely.
5. After air is purged from the system and filled with water, open the return valve ("B"). Then close the air vent in the fan coil.
6. Apply power to the fan coil and set the room thermostat on heat. Raise the temperature setting to activate the circulating pump.
7. Check the pump to ensure proper operation. The water inlet of the unit should be hot if the water temperature in the water heater has reached the set point. If water is not being circulated through the coil but the pump is running, then open the air bleed valve in the unit and purge any air left in the system.
8. Adjust the water heater thermostat so that the water temperature entering the hot water coils is 120 – 180°F depending on the amount of heat required by the structure. This is done with the unit energized and operating long enough for all temperatures to stabilize.

10. START UP & MAINTENANCE

10.1. Heat Anticipator Adjustments

After all connections are made, start-up and check-out must be performed before proper evaluation of the entire system can be made. Make sure that the heat anticipator is properly set as noted on thermostat instructions.

Load requirements can vary in each residence, and it may be necessary for the installer or homeowner to make slight adjustments to the heat anticipator setting for longer or shorter cycles. It is recommended to change the setting to no more than plus or minus 0.05 amps at a time. Greater changes can cause the unit to rapid cycle or remain on excessively.

To properly check the unit's operation, the installer should have an electrical current measuring device (0-10 amp, Amprobe Fluke), air pressure measuring device (0-1.0 inch slope gauge), and a temperature-measuring device (0-200°F thermometer).

Install the Amprobe to measure blower current, the slope gauge to measure static air pressure at the units and the temperature device to measure unit supply and return air temperature. Before taking measurements, be sure that all registers, grilles and dampers are open or are set to their proper positions. Be sure that clean filters are in place. Temperature measuring device must be installed to obtain average temperature at both inlet and outlet. For outlet, measure temperature of each main trunk at a location far enough away to avoid heater radiation and read the

average temperatures. Airflow Table 7.1 for AFL shows the CFM that should be achieved at various external static pressures.

10.2. Checking Air Flow/Temperature Rise Method

Turn on the power supply. Set thermostat fan switch to on. Set the cooling indicator to maximum, heating to minimum. The system switch may be on heat or cool. Check slope gauge measurement against appropriate air flow chart. Make damper, register and motor speed adjustments to obtain required airflow.

Set thermostat fan switch to auto, system to heat and thermostat heating indicator to maximum heat. Blower should start and all heat be energized.

Check air flow using temperature rise method formula:

$$CFM = \frac{OUTPUT(BTUH)}{1.08 \bullet TEMP.RISE}$$

Note: BTUH output should be computed by 500 x Gallons Per Minute x System Temperature Change = BTUH OUTPUT.

10.3. Pump Replacement:

1. Disconnect electrical power to the unit before servicing.
2. Remove access door to reveal pump. Close supply valve ("A") and return valve ("B"). Open the air bleed valve to release pressurize in the system and drain water.
3. Remove the metal pump housing by loosening the four screws on the pump.
Note: DO NOT UN-SOLDER PUMP.
4. Replace the new pump housing assembly and reconnect components to the pump. Before you assemble, make sure that the runner on the o-ring is in place on the pump housing.
5. Purge the system of the air as described earlier and re-connect the electrical power.

10.4. Trouble Shooting:

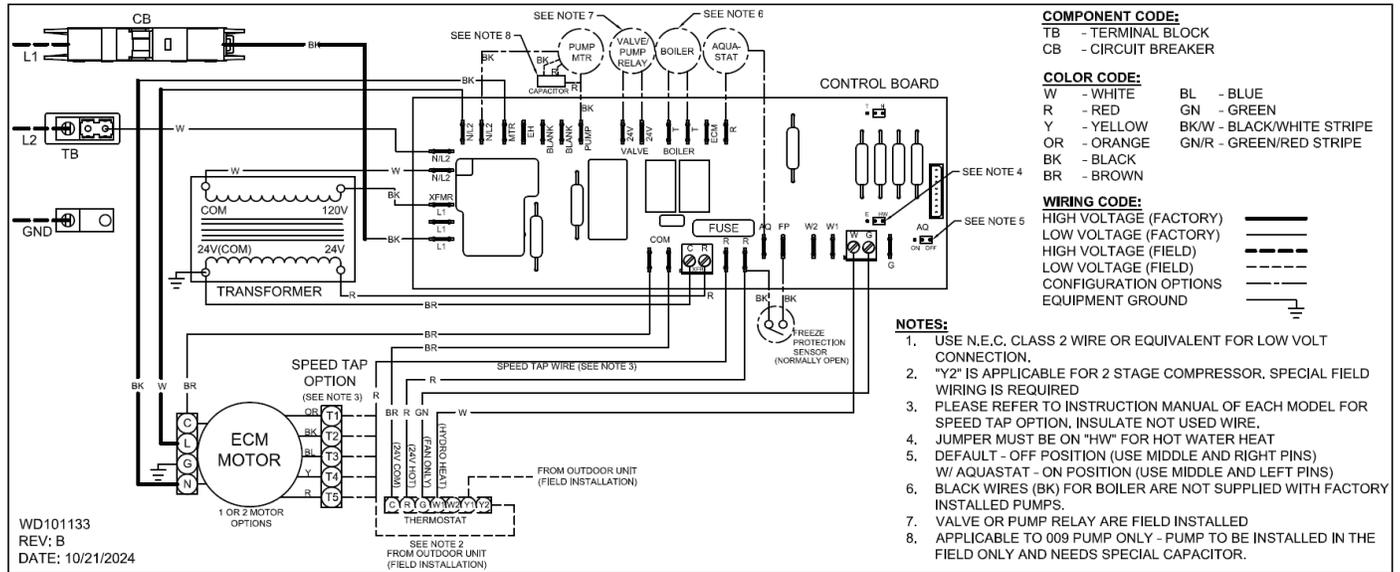
- Noisy Pump: System may not be totally purged of air. Purge the system again as described in the start-up section above.
- T&P valve on water heater weeps: This normally occurs when a backflow preventer has been installed in the cold water supply line to the water heater. An expansion tank may be necessary to correct this problem. Please contact a qualified plumbing professional for assistance.
- Hot water is circulating through the water coil during cooling cycle: The check valve may be stuck open and allowing hot water to circulate through the coil.
- Little or no heat from water coil:
 - Purge the system.

- The inlet connections may be reversed at the fan coil.
- The water heater thermostat is not set at proper temp.
- The water heater thermostat is not calibrated.
- The dip tube in the water heater may not be installed correctly or could be restricted.
- Look for restrictions in heating system from water heater to fan coil. Some water heaters are supplied with check valves, remove any extra check valves except for the one supplied with the fan coil.
- The air handler is undersized for space being heated.
- The water heater is undersized.

11. FINAL SYSTEM CHECKOUT

- 11.1.1. Make certain all cabinet openings are properly sealed, and any grommets moved during installation are moved into proper place.
- 11.1.2. With cooling system operating, check for condensate leakage.
- 11.1.3. Perform leak detection inspection of refrigerant circuit and connecting piping.
- 11.1.4. Secure all cabinet doors. All panels must be in place and secured. For airtight application, all gaskets must remain intact on all surfaces as shipped with the unit at prescribed locations to achieve 1.4% low leakage.

12. WIRING DIAGRAMS



ECM Motor

NOTE: Wiring Diagram is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

Figure 12.1



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Subject to change without notice and without incurring obligation.

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