

# **CAH SERIES**

# **INSTALLATION & MAINTENANCE**



# MODELS CAH 33-44-50 CAH 49-54-70

# CAH VARIABLE SPEED AIR HANDLERS

DIMENSIONS	3
TECHNICAL SPECS	4
INSTALLATION DON'TS	5
INSTALLATION DO'S	6
FREEZE STAT REQUIRED FOR AIR CONDITIONING	7
INSTALLATION INSTRUCTION	8
LOCATING THE AIR HANDLER	8
LINE AND CONTROL WIRING REQUIREMENTS	8
SUPPLY AND RETURN DUCT REQUIREMENTS	9
THERMOSTAT SELECTION	12
SELECTING FAN SPEEDS	12
BLOWER MOTOR WIRE SELECTION CHART	13
HOT WATER COIL PIPING	14
OPERATION AND MAINTENANCE	15
INITIAL START-UP	15
AIR FILTER	18
BLOWER MOTOR	18
CIRCULATION PUMP REPLACEMENT	18
PUMP CONTROL:	19
SEQUENCE OF OPERATION IN HEATING MODE:	19
TROUBLESHOOTING	20
MOST LIKELY PROBLEMS AND CAUSES	20
FAULTY CIRCUIT BOARD:	22
WIRING DIAGRAMS	23
REPLACEMENT PARTS LIST	24

# DIMENSIONS



MODEL	Α	В	С	D	Ε	F
CAH 33-44-50	17"	23"	35.5"	12"	18"	11"
САН 49-54-70	21.25"	23"	43.75"	16"	18"	17"

#### ALL MEASUREMENTS IN INCHES

# **TECHNICAL SPECS**

MODEL	CAH 33-44-50	CAH 49-54-70
@ 600 CFM	37,000 *	-
@ 800 CFM	45,000 *	-
@ 1000 CFM	52,000 *	58,000 **
@1200 CFM	-	65,000 **
@1600 CFM	-	76,000 **
POWER SUPPLY	120 VAC, 1PH, 60HZ	120 VAC, 1PH, 60HZ
TOTAL AMPS	5.5	9.5
MAXIMUM FUSE	15	15
TRANSFORMER	30 VA	30 VA
BLOWER MOTOR	1/3HP ECM	3/4HP ECM
PUMP	3 SPEED	3 SPEED
WATER CONNECTIONS	1/2"	1/2"
FILTER SIZE	12" x 20" x 1"	18" x 20" x 1"

\* OUTPUT (BTU) @ 3GPM \*\* OUTPUT (BTU) @ 4GPM

# **INSTALLATION DO'S AND DON'TS**

## INSTALLATION DON'TS

**Do Not** use with piping that has been treated with chromates, boiler seal or other chemicals.

**Do Not** add boiler treatment or any chemicals to equipment and related piping, since the piping contains potable water for Domestic Use.

**Do Not** use with ferrous piping. The system should be installed with new piping that is suitable for potable water, such as copper. DO Not use with PVC Piping.

**Do Not** use valves that may cause excessive restriction to water flow. Use Full Flow Ball or Gate Valves Only.

**Do Not** use unit with any water heater not having a properly sized and installed Temperature and Pressure (T&P) Relief Valve. Some water heaters include factory-installed valves. Others must be field-installed. Follow the instructions of the water heater manufacturer and local codes when installing the T&P valve.

Do Not alter the water heater controls, dip tube, relief valve fitting, etc.

**Do Not** install unit or connecting piping in any manner except as shown in this instruction manual.

**Do Not** install a DX cooling Coil in close proximity to the Hot Water Coil. A DX cooling coil should be a minimum 12 inches away from the Hot Water Coil and a freeze stat must be installed on the DX coil to prevent freezing of the DX Coil which in turn may freeze the Hot Water Coil and cause damage or water escape.

Use **EXTREME CAUTION** when fastening duct work to coil area. Screws should be no longer that 3/8" and should be fastened into the flange rather than the face of the unit. This will reduce the risk of puncturing the copper tubing on the coil.

# INSTALLATION DO'S

**Do** flush out all supply and return water lines between the unit and the water heater after installation and before start-up to eliminate flux, metal chips, sand, or any other particulate matter just as you would with any other plumbing systems.

Do use only non-lead solder and flux agents.

**Do** remember to install a properly designed mixing valve to the domestic service should the water heater be set as to deliver water at a temperature greater than  $120 \text{ }^{\circ}\text{F}$ .

#### \*SPECIAL NOTE\*

**SOME JURISDICTIONS** may require a backflow preventer in the incoming cold water line to the water heater. In such cases the Temperature and Pressure Valve of the water heater may weep OR relieve due to expansion of the water when heated. Note that this would occur even if this air handler were not installed. A small diaphragm-type thermal expansion tank will normally eliminate the weeping condition. Please read and follow the manufacturer's instruction for installation of such tanks.

# Further Note : The above DO'S and DON'TS apply to air heaters which are installed with water heaters in a hydro-air application.

However, our air handlers can be installed on closed loop boiler systems as well. When doing so, make sure you follow all locally approved codes and installation practices.

In keeping with our policy on continuous product improvement, we reserve the right to make changes without prior notice.

## FREEZE STAT REQUIRED FOR AIR CONDITIONING

A freeze stat MUST be installed for systems that have air conditioning to minimize the chance of the hot water coil freezing during a call for cooling. The freeze stat typically opens at  $38^{\circ}$ F, closes at  $60^{\circ}$ F, and is wired to interrupt the A/C compressor operation.

Mount the freeze stat on the suction line of the cooling coil and wrap with cork tape covering both the stat and the suction line.

If the freeze stat is not securely fastened and insulated to the suction line the compressor may not shut off if the evaporator coil freezes up.



# INSTALLATION INSTRUCTION

ENERZONE assumes no responsibility for the installation of equipment that is in violation of any building code, plumbing code, or electrical code requirements. These instructions give information specific to installation of CAH fan coil units only. For other related equipment, refer to proper instructions supplied by others.

## LOCATING THE AIR HANDLER

#### THE INSTALLER MUST COMPLY WITH ALL LOCAL AND NATIONAL CODE REQUIREMENTS RELATING TO THE INSTALLATION OF THIS EQUIPMENT. BUILDING CODES ARE <u>CONSTANTLY CHANGING.</u> THE INSTALLER IS RESPONSIBLE TO MEET THEM.

CAH units can be installed in multi-positional applications and all models comply with zero clearance installation to combustible materials. Sufficient clearance must be provided to allow access to electrical controls and to the blower motor assembly for servicing. This clearance distance should be approximately the same as the depth of the fan coil unit at a minimum.

### LINE AND CONTROL WIRING REQUIREMENTS

All wiring must meet with local and national code requirements. Units are provided with wiring diagrams and serial-plate data to provide information required for necessary field wiring. Knockouts are provided on the cabinet for connection of power supply. These fan coil units are provided with a transformer for 24-volt control circuits. Electrical connections should be made according to the electrical diagram located on the reverse side of the electrical panel cover.

## SUPPLY AND RETURN DUCT REQUIREMENTS

All duct work must adhere strictly to all local and national code requirements. It is critical that the return air duct has the same free area as the opening provided on the fan coil unit. If there is no ducted return, installation codes may limit the unit to installation only in a single story residence. Ducting should normally be sized for external static pressures of 0.15 to 0.3 inches  $H_2O$  total.



- Figure 1: Correct way to duct plenum off of air handler whenever possible in a new installation.
- Figure 2: Incorrect way to duct plenum off of air handler.



Figure 3

Figure 4

Figure 3: Correct way to install duct work. Figure 4: Incorrect way to install duct work

### Typical Air Handler Schematic

![](_page_10_Figure_1.jpeg)

# THERMOSTAT SELECTION

Most standard 24VAC thermostats will work with the Enerzone CAH EC Motor air handlers.

POWER SUPPLY:NON-POWER STEALING (Battery or 24 VAC<br/>Voltage supply)DISPLAY:ANALOG OR DIGITAL with or without

programmable set points.

NOTE : ENERZONE recommends hard wiring the thermostat to run off the 24VAC transformer in place of using POWER STEALING THERMOSTATS.

### SELECTING FAN SPEEDS

Blower motor torque settings are selected by moving the wires on the motor tap selection tree located in the blower mounted electrical box.

Use the Blower Motor Wire Selection Chart in this manual to select the proper wires for your application

![](_page_11_Picture_7.jpeg)

HEAT / COOL FAN SPEED – select the appropriate motor tap wire to plug into this terminal. This is the speed the motor will run for both heating and cooling.

LOW CONTINUOUS FAN: select the appropriate motor tap wire to plug into this terminal. This is the speed the motor will run when the thermostat Fan switch is set to the ON position.

SPARE: Plug any unused motor tap wires onto this terminal.

### **BLOWER MOTOR WIRE SELECTION CHART**

AIR HANDLER MODEL	CAH 33-44-50	CAH 49-54-70
RED/TRACE	LOW CONTINUOUS SPEED	LOW CONTINUOUS SPEED
YELLOW/TRACE	600 CFM	1000 CFM
BLUE/TRACE	800 CFM	1200 CFM
PURPLE/TRACE	800 CFM BOOST	1200 CFM BOOST
BLACK/TRACE	1000 CFM	1600 CFM

#### EXAMPLE:

Model CAH 33-44-50 Blue/Trace wire onto the heat / cool fan speed Terminal Unit will run at 800 cfm for both heating and cooling (@0.4" external static)

# HOT WATER COIL PIPING

The water coil connections are:

 $^{1}\!\!/^{2}$  nominal (5/8"OD) copper on all models with internal pump factory installed.

An air purge valve must be installed between the air handler outlet and the return water isolation valve.

Flow stickers indicate the proper water flow direction.

Isolation valves must be placed in both the hot water supply and return water lines to the hot water tank so that the CAH unit may be serviced or repaired without causing excessive water discharge. All piping between the water heater and the air handler should be copper and should never exceed 100 feet of total equivalent piping. On runs over 60 feet equivalent, it is recommended that <sup>3</sup>/<sub>4</sub>" nominal (7/8" OD) piping be used to prevent excessive system pressure drop. Vertical rises should be kept as short as possible. Where extended runs or large vertical rises are required (greater than 5 feet) it is recommended that the installer consult the factory for proper installation practices.

NOTE: It is not recommended to locate water piping in unconditioned spaces.

All copper joints in the water lines must be made with low temperature, non-lead solder. Due to the use of domestic hot water in the units, all local and national plumbing codes relating to potable water must be complied with for proper installation.

# **OPERATION AND MAINTENANCE**

### INITIAL START-UP

#### THE "DO'S AND DON'TS" PAGES ARE AN INTEGRAL PART OF THE INSTALLATION INSTRUCTIONS. IT MUST BE READ AND THOROUGHLY UNDERSTOOD PRIOR TO ATTEMPTING TO INSTALL CAH AIR HANDLERS

Prior to start-up, inspect the blower to confirm the blower wheel turns freely without interfering with the housing. Replace the service access panel.

Note: The service access panel must be in place for the unit to operate due to the "door switch", which interrupts the power supply when the access panel is not in place.

#### WARNING

To prevent pump damage, the air handler should not be operated in heating mode until the user supplied/installed isolation valves have been opened and the hot water coil and hot water lines have been purged of air.

Heating Mode – Initial Operation

- 1. Fill the water heater (refer to water heater instruction). Open a domestic hot water faucet while filling the water heater to vent the air. When the tank is full and all of the air is purged close the faucet.
- 2. Ignite the water heater (see water heater instructions) and set the thermostat to 140 °F nominally, but never higher than 180 °F as this is the maximum temperature this air handler is designed to accommodate.
- 3. Purge the air from the hot water coil and the lines. Located inside of each CAH hot water fan coil is an air purge valve. This valve is necessary to enable air to be evacuated from the water lines.

To purge the air from the system once your installation is complete do the following steps:

- (A) Attach a hose to the air purge valve and run the hose to a bucket or drain. This hose is a modified refrigeration Schrader valve charging hose.
- (B) Close the isolation valves on the hot water supply and return.
- (D) Open the hot water supply isolation valve and let the water flow until all air is evacuated.
- (E) Open the hot water return isolation valve and let the water flow until all air is evacuated.
- (F) All air is now purged from the system.
- (G) Remove the hose to close off the air purge valve and replace the brass cap.
- (H) Open the hot water supply and return isolation valves to allow water to flow through the system.

<u>Note</u>: it will often require purging several gallons of water so either have a bucket available or an alternate means of discarding the water.

4. Switch the room thermostat to the "heat" position and raise the temperature setting to a position approximately five to ten degrees above the room temperature. Note: The door switch must be activated to operate the unit. The pump will energize and begin circulating hot water through the coil. If the pump is operating properly and the water temperature in the water heater has reached the set point, then the hot water inlet at the fan coil unit will be approximately the same temperature as the water heater setting. If the pump is running but the hot water is not circulating, repeat step 3 (purging air out of system).

5. The thermostat on the water heater should be adjusted so that the water temperature entering the hot water coil is nominally at 140 °F (See DO'S and DON'TS section for mixing valve requirement for higher temperatures), depending upon unit selection temperature. Allow the system to operate long enough for all temperatures to stabilize and recheck temperature setting. Remember that the domestic supply water temperature should be kept to 120 °F or lower by means of an appropriate mixing valve.

### AIR FILTER

The air filter should be cleaned as often as necessary to prevent restriction of air flow (every three months under normal conditions). Always replace the filter with the same type as originally furnished.

#### **BLOWER MOTOR**

The Variable speed motor has sealed bearings and routine oiling is not required or possible. The motor may be wiped down with a cloth or blown out to remove any accumulated dirt and dust to help the motor cool.

To remove the blower and motor:

- turn off all power to the air handler.
- Disconnect the thermostat wiring from the 5 position terminal strip on the blower mounted electrical box.
- Unplug the power supply MOLEX terminal from the top of the blower mounted electrical box.
- Remove the two blower mount screws and slide blower and motor from the unit.

### CIRCULATION PUMP REPLACEMENT

#### Disconnect electrical power before servicing the unit.

To replace the circulating pump, close the isolation valves and relieve the water pressure from within the heating loop. Remove the four hex head screws that secure the pump head to its volute. Disconnect the pump's 115VAC power lines from within the electrical control box and remove the pump from the unit.

Reverse the above steps for re-assembly of the pump. Refer to initial start-up procedure for instructions regarding purging air from the system.

# PUMP CONTROL:

#### LOW VOLTAGE CONTROL BOARD

![](_page_18_Figure_2.jpeg)

Note: Upon powering up the air handler circuit board starts a 15 second initialization during which the pump operates for 5 seconds.

Circuit board LED illuminates when the pump is operating during heating and pump purge cycles.

During the heating season the pump is controlled by the low voltage circuit control board.

The control board also operates as an off season pump circulator to eliminate stagnant water in the heat exchanger. This pump cycle will operate for 1 minute every 12 hours after the last call for heat.

## SEQUENCE OF OPERATION IN HEATING MODE:

- 1. When the thermostat calls for heat (W) the pump and blower motor will run at the selected operating fan speed.
- 2. When the thermostat ends the call for heat (W) the pump and blower turn off. The blower will continue running at the continuous low speed if the thermostat is set to FAN-ON.

# TROUBLESHOOTING

## MOST LIKELY PROBLEMS AND CAUSES

**Important:** For system to operate properly power should be turned ON and all shut-off valves/isolation valves must be open.

#### If Pump Does Not Run:

- Circuit board controls operation of pump. Check that pump LED is illuminated. Check for 24VAC at pump terminal on circuit board. If faulty refer to "Faulty Circuit Board" section.
- 2. Check line voltage wiring to pump. Check for 120 VAC at pump relay and inside the pump electrical box.

#### **Pump is Noisy:**

Air may be trapped in the water circuit. Purge air from the system as described under "start-up procedure".

#### **Insufficient or No Heat:**

- 1. Air may still be trapped in heating loop. Purge air from the system as described under "start-up procedure".
- 2. Water heater thermostat not turned up high enough. (Remember, higher than 120  $^{\circ}F$  = mixing valve for domestic service).
- 3. Inlet and outlet piping connection at the air handler may be reversed. See "Hot Water Piping").
- 4. Water heater thermostat not calibrated properly.
- 5. Excessive pressure drop caused by restriction somewhere in the hot water loop does not allow sufficient water to flow to air handler.
- 6. Air handler not sized large enough for heat load.
- 7. Water heater not large enough to satisfy heat load.

#### EC Motor Won't Start:

Disconnect power before plugging/ unplugging motor cables. CAUTION – motor is supplied with 120 VAC continuously. 24VAC thermostat signals communicate with the motor to initiate operation.

- Circuit board controls the blower motor in Heating mode. Check that LOW FAN or HIGH FAN LED is illuminated. Also check for 24VAC at these terminals on the circuit board. If faulty refer to "Faulty Circuit Board" section.
- 2. Ensure motor cables are properly installed and firmly plugged into the motor. Check voltages in the cables.
- 3. Check door switch depressed, power supply, and thermostat lines are wired properly. Refer to the electrical diagram supplied with each air handler.
- 4. Check the voltages at motor plugs (120VAC and 24VAC).
- 5. There may be a faulty TAP on the motor. Select a different speed on the motor tap selection tree. Refer to the "Selecting Fan Speeds" section.
- 6. Possible defective motor. Contact Enerzone for assistance. When ordering a new motor the air handler model number and serial number will be required. Each EC motor must be programmed with the same torque settings as the original motor to operate properly.

# FAULTY CIRCUIT BOARD:

The circuit board has a Green power LED and 3 function LED's. When any of the 3 output LED's are illuminated 24VAC is supplied to the corresponding  $\frac{1}{4}$ " Spade terminal on the board.

If the Green power LED is not illuminated check that the board fuse is not blown and replace if necessary.

If there is malfunction a temporary circuit board bypassed can be utilized until a replacement circuit board is installed.

With the power off

- remove the fuse from the circuit board
- Move the "PUMP" wire (Orange/Black stripe) and the "High Fan" wire (White/Red Stripe) to the two extra W terminals.

This will allow the pump and blower to run with a call for heat from the thermostat.

# WIRING DIAGRAMS

![](_page_22_Figure_1.jpeg)

![](_page_22_Figure_2.jpeg)

# **REPLACEMENT PARTS LIST**

MODEL	CAH 33-44-50	CAH 49-54-70
RELAY	PTRA-1C-24C-T5-X	PTRA-1C-24C-T5-X
TRANSFORMER	PU30va	PU30va
MOTOR	CAH37-1/3ECM	CAH58-3/4ECM
DOOR SWITCH	CARLING-TA20B	CARLING-TA20B
COIL	BC9061	BC7923FX
HOUSING	DC1016-600-5	DC1020-800-5
PUMP	UPS15-58RU	UPS15-58RU
CHECK VALVE	96806141	96806141
CONTROL BOARD	PT-ECB V1.0	PT-ECB V1.0