ecosmart™
simplifying comfort

ES50HVP/ES90HVP/ES100HVP HIGH VELOCITY AIR HANDLER

Installation, Operation and Maintenance Manual

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ecosmartair.com

ETL LISTED
c   US
Intertek

P/N 14002C

Contents

All technical information subject to change without notice.

SAFETY INFORMATION

It is the responsibility of the installer to ensure the installation complies with all national and local building codes and standards, in addition to the instructions outlined in this manual. All applicable codes take precedence over any instructions made in this document.

This symbol indicates safety alerts. When you see this symbol on labels or in this manual, 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, <u>**will result in death or serious injury.**</u>

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

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

⚠️	WARNING - Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Only a qualified contractor, installer or service agency should install this product. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance.
⚠️	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.
⚠️	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.
⚠️	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. To avoid severe burns, allow equipment to cool before performing maintenance.

INTRODUCTION

The **ecosmart** HV (High Velocity) hydronic furnace is designed to maximize performance and comfort in residential or light commercial applications. The **ecosmart** can be used with a variety of heat sources such as boilers and water heaters and can be implemented in combo systems that provide domestic hot water as well as space heating. Smart control systems within the **ecosmart** allow extraction of maximum heat by allowing condensing high efficiency heat sources to work at their maximum efficiency while providing ultimate comfort with unmatched performance.

The **ecosmart** HV features:

- Simple, independent heat/cool airflows and system parameters that can easily be set by the installer to adjust for a wide variety of installations.
- A 0-10V input from a Building Automation System (BAS) to control fan speed and pump operation.
- Standard 120VAC pump or a variable speed pump from the 0-10V interface providing multi-flow functionality.
- Constant Pressure Technology (CPT™) automatically maintains the desired airflow within the ductwork irrespective of outlet vents opening and closing.

MODES OF OPERATION

- **MULTI STAGE** – fan runs through 3 airflow stages with 5-minute intervals until the selected airflow is reached, and the pump, if a variable type is installed, runs through 3 speeds in unison with the fan stages. Note: if a standard pump is used, the pump will run at a single speed only.
- **SINGLE STAGE** – fan runs at the selected airflow and the pump runs at a single speed.

PERFORMANCE RATINGS

Performance Data - Hot Water Capacities (BTUH) @ 70°F Entering Air Temperature									WATER PD ('WC) @140°F
ES50HVP		Entering Water Temperature							
CFM	GPM	120°F	130°F	140°F	150°F	160°F	170°F	180°F	
300	3	15070	18110	21160	24200	27260	30310	33370	2.32
	4	15380	18470	21570	24680	27780	30880	33990	3.87
	5	15550	18680	21810	24940	28070	31210	34340	5.77
400	3	19060	22930	26790	30670	34550	38440	42330	2.32
	4	19680	23650	27630	31610	35600	39600	43590	3.87
	5	20030	24070	28110	32150	36210	40260	44310	5.77
500	3	22550	27130	31730	36340	40960	45580	50210	2.32
	4	23540	28300	33080	37870	42660	47460	52270	3.87
	5	24120	29000	33880	38770	43670	48570	53480	5.77
600	3	25590	30810	36050	41300	46570	51840	57130	2.32
	4	27000	32490	37990	43500	49020	54550	60090	3.87
	5	27860	33500	39160	44820	50500	56180	61870	5.77
700	3	28260	34040	39840	45660	51500	57340	63200	2.32
	4	30110	36250	42400	48570	54750	60940	67150	3.87
	5	31270	37620	43980	50360	56760	63160	69570	5.77

ES50HVP ECM blower performance (CFM/amps)

SWITCH SETTING	0.8" WC	0.9" WC	1" WC	1.1" WC	1.2" WC	1.3" WC	1.4" WC	1.5" WC
55%	446 2.7	433 2.76	415 2.82	406 2.89	385 2.95	378 3.02	362 3.11	338 3.19
60%	478 2.88	455 2.95	439 3.01	436 3.07	419 3.14	407 3.19	380 3.23	367 3.35
70%	536 3.52	521 3.61	516 3.64	492 3.73	484 3.76	465 3.85	448 3.89	438 3.98
75%	577 3.9	558 3.96	545 4.02	533 4.07	524 4.14	510 4.17	502 4.25	478 4.35
80%	617 4.26	598 4.37	587 4.38	575 4.52	555 4.56	544 4.59	531 4.68	512 4.76
85%	642 4.67	618 4.68	611 4.79	585 4.85	582 4.9	570 4.93	563 5.02	545 5.11
90%	680 5.26	666 5.29	652 5.38	633 5.4	621 5.5	605 5.52	600 5.62	582 5.73
100%	722 5.9	712 5.98	687 6	678 6.11	672 6.14	670 6.17	660 602	625 6.37

Performance Data - Hot Water Capacities (BTUH) @ 70°F Entering Air Temperature									WATER PD ('WC) @140°F
ES90HVP		Entering Water Temperature							
CFM	GPM	120°F	130°F	140°F	150°F	160°F	170°F	180°F	
400	4	20260	24350	28440	32540	36640	40750	44860	1.32
	5	20590	24730	28880	33040	37190	41360	45520	1.95
	7	20930	25140	29350	33560	37770	41990	46210	3.55
500	4	24390	29330	34280	39230	44200	49170	54140	1.32
	5	24960	30000	35050	40100	45160	50230	55300	1.95
	7	25570	30720	35880	41040	46200	51370	56540	3.55
600	4	28130	33840	39570	45310	51060	56820	62590	1.32
	5	28990	34860	40740	46630	52530	58440	64360	1.95
	7	29940	35980	42030	48080	54150	60220	66290	3.55
700	4	31550	37930	44370	50820	57290	63770	70260	1.32
	5	32700	39330	45990	52650	59330	66020	72720	1.95
	7	34030	40910	47810	54710	61630	68550	75480	3.55
800	4	34570	41620	48710	55810	62930	70070	77220	1.32
	5	36100	43450	50820	58200	65600	73020	80440	1.95
	7	37870	45550	53240	60940	68660	76390	84120	3.55
900	4	37330	44970	52640	60340	68050	75790	83540	1.32
	5	39230	47230	55260	63310	71390	79470	87570	1.95
	7	41480	49890	58330	66790	75270	83750	92250	3.55

ES90HVP ECM blower performance (CFM/amps)

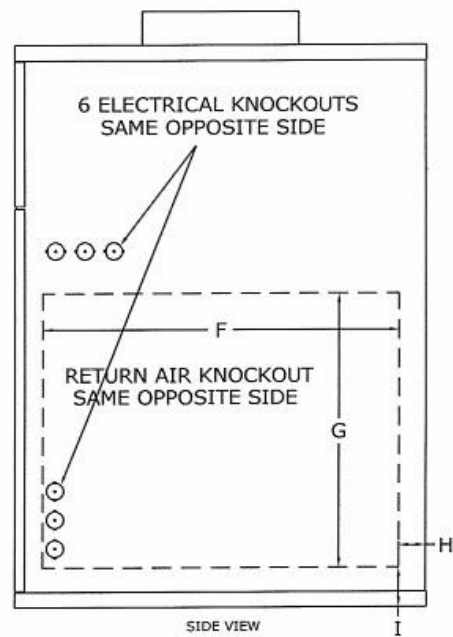| SWITCH SETTING	0.8" WC	0.9" WC	1" WC	1.1" WC	1.2" WC	1.3" WC	1.4" WC	1.5" WC
65%	672 4.53	654 4.58	637 4.62	615 4.68	587 4.79	565 4.8	550 4.92	532 4.93
70%	712 4.94	697 5.03	682 5.07	665 5.19	634 5.25	618 5.28	590 5.4	578 5.41
75%	743 5.35	737 5.39	718 5.46	687 5.53	672 5.62	655 5.69	625 5.77	611 5.83
80%	782 5.93	762 6.05	751 6.1	744 6.13	719 6.16	707 6.29	682 6.36	663 6.37
85%	822 6.5	804 6.58	795 6.66	780 6.73	773 6.79	757 6.8	733 6.96	720 6.98
90%	865 7.19	840 7.23	837 7.25	821 7.35	817 7.41	786 7.43	769 7.56	752 7.67
95%	883 7.67	878 7.73	856 7.76	852 7.77	832 7.87	820 7.9	803 8.02	778 8.11
100%	920 8.15	898 8.16	887 8.28	876 8.34	863 8.4	854 8.43	839 8.47	815 8.49

Performance Data - Hot Water Capacities (BTUH) @ 70°F Entering Air Temperature									WATER PD ('WC) @140°F
ES100HVP		Entering Water Temperature							
CFM	GPM	120°F	130°F	140°F	150°F	160°F	170°F	180°F	
700	4	32060	38550	45060	51590	58120	64660	71210	3.87
	5	33150	39860	46570	53300	60030	66770	73520	5.79
	7	34380	41310	48250	55200	62150	69110	76070	10.69
800	4	35260	42410	49590	56790	63990	71210	78430	3.87
	5	36690	44130	51580	59040	66510	73990	81480	5.79
	7	38330	46070	53820	61580	69350	77130	84910	10.69
900	4	38160	45930	53720	61520	69340	77170	85010	3.87
	5	39970	48070	56200	64350	72510	80680	88860	5.79
	7	42050	50550	59070	67600	76140	84690	93250	10.69
1000	4	40810	49130	57470	65840	74220	82610	91020	3.87
	5	42990	51730	60490	69270	78060	86870	95690	5.79
	7	45550	54770	64010	73270	82540	91830	101120	10.69
1100	4	43230	52050	60900	69780	78670	87590	96510	3.87
	5	45790	55110	64450	73820	83210	92610	102030	5.79
	7	48850	58750	68680	78620	88580	98550	108540	10.69
1200	4	45430	54710	64030	73380	82750	92130	101530	3.87
	5	48380	58240	68130	78040	87980	97940	107900	5.79
	7	51950	62500	73070	83660	94280	104900	115540	10.69

ES100HVP ECM blower performance (CFM/amps)

SWITCH SETTING	0.8" WC	0.9" WC	1" WC	1.1" WC	1.2" WC	1.3" WC	1.4" WC	1.5" WC
65%	1043 4.24	1012 4.41	989 4.56	950 4.71	914 4.85	858 4.98	812 5.10	782 5.17
70%	1106 4.65	1073 4.77	1047 4.90	1016 5.02	985 5.14	937 5.28	886 5.44	842 5.58
75%	1150 5.04	1128 5.14	1092 5.26	1070 5.41	1041 5.55	1004 5.71	964 5.84	918 5.96
80%	1175 5.22	1160 5.35	1137 5.49	1107 5.61	1079 5.82	1054 5.93	1021 6.08	970 6.22
85%	1215 5.55	1202 5.68	1172 5.80	1150 5.95	1116 6.10	1092 6.23	1054 6.38	1028 6.49
90%	1275 5.98	1259 6.16	1238 6.32	1212 6.44	1192 6.60	1164 6.74	1134 6.87	1095 7.08
95%	1324 6.44	1299 6.58	1280 6.74	1259 6.87	1233 7.04	1204 7.17	1193 7.35	1162 7.49
100%	1368 6.86	1347 7.04	1330 7.14	1305 7.34	1283 7.50	1262 7.62	1233 7.77	1215 7.90

SPECIFICATIONS

PHYSICAL DATA - INCHES										
Model	Overall Dimensions W x D x H			Supply Opening W x D		Side Return				Piping Location	
	A	B	C	D	E	F	G	H	I	J	K
ES50HVP	14.0	21.0	29.0	8.0	1.8	18.3	14.3	1.4	2.0	2.8	2.4
ES90HVP	21.0	21.0	29.0	8.0	1.8	18.3	14.3	1.4	2.0	2.8	2.4
ES100HVP	21.0	21.0	29.0	10.0	1.8	18.3	14.3	1.4	2.0	2.8	2.4

SUPPLY AIR OPENING

D

B

A

TOP VIEW

ISOMETRIC VIEW

J

E

J

K

WATER OUT

WATER IN

K

C

FRONT VIEW

6 ELECTRICAL KNOCKOUTS SAME OPPOSITE SIDE

F

RETURN AIR KNOCKOUT SAME OPPOSITE SIDE

G

H

SIDE VIEW

I
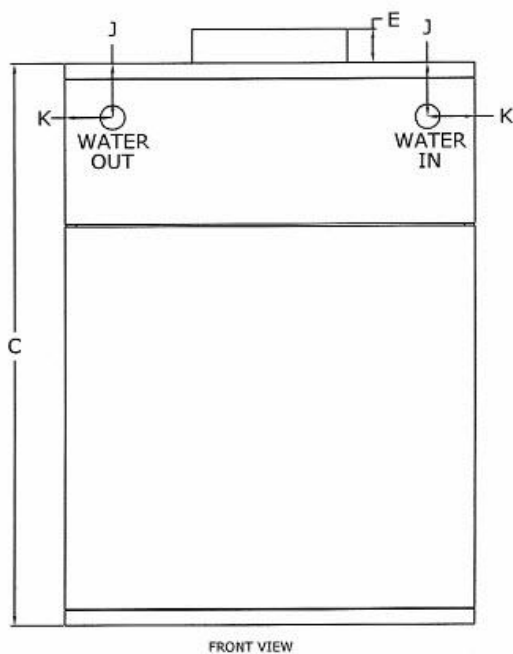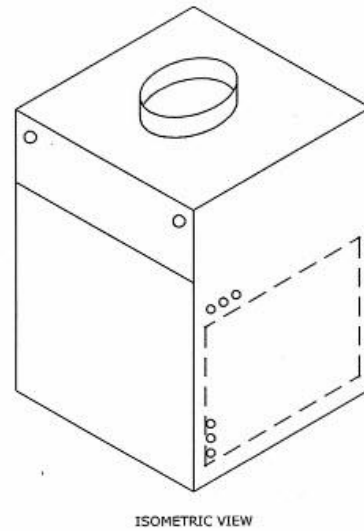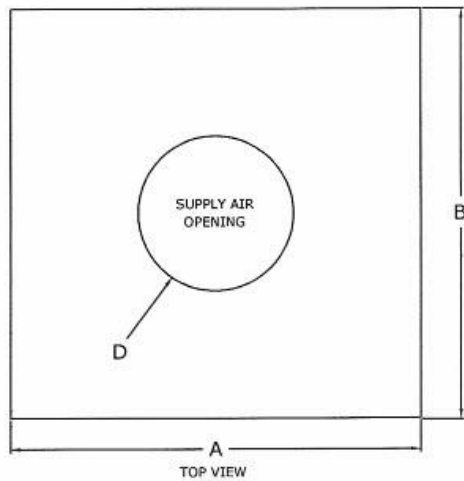
MODEL	ES50HVP	ES90HVP	ES100HVP
DX Cooling Capacity (tons)	1 to 2	2 to 2.5	2 to 3
Power (Volts/Phase/Hz)	120/1/60	120/1/60	120/1/60
Cabinet Size W x D x H (in)	14 x 21 x 29	21 x 21 x 29	21 x 21 x 29
Supply Air Opening D (in)	8	8	10
Side Return Air Opening (in)	18.3 X 14.3	18.3 X 14.3	18.3 X 14.3
Recommended Filter Size (in)	16 x 20	16 x 20	16 x 20
Shipping Weight (lb)	85	95	98
Shipping Dimensions W x D x H (in)	15 x 24 x 30.5	22 x 24 x 30.5	22 x 24 x 30.5

QUICK START-UP PROCEDURES

Refer to the installation instructions before following the start-up procedures.

1. Fill the system with water. Do not start the system.
2. Purge all air from the system. Isolation and purge valves are strongly recommended.
3. Purge all air from the space heating loop by closing the isolation valve on the return leg of the loop and open the drain to purge air. Open the return leg isolation valve and then close the drain valve.
4. Start the hot water generating equipment per the manufacturer's recommendations. Set the design water temperature to deliver the necessary number of BTUs to the air handler.
5. Once all air has been purged, turn on the power to the **ecosmart** and set the room thermostat to heat and set the temperature high enough to initiate a call for heat. This will energize the air handler an in turn the fan and pump.
6. Once the heat source is supplying hot water, check supply and return pipes for a temperature difference to make sure there is flow. There should be a noticeable difference in temperature between supply and return lines. Use caution when supply water temperature is above 125°F / 51°C.

INSTALLATION

The installer must comply with all local and national code requirements pertaining to the installation of this equipment.

Clearances

The **ecosmart** is approved for up-flow, down-flow, and horizontal configurations. Clearances do not change with orientation. This hydronic furnace is for indoor installation only.

	Clearance from Combustibles (in)	Recommended Service Clearance (in)
Top	0	0
Bottom	0	0
Front	0	24
Back	0	0
Sides	0	0

Freeze Protection

It is not recommended to install the **ecosmart** in an unheated space.

Should the **ecosmart** be installed in an area where the ambient temperature may fall below freezing, ethylene or propylene glycol should be added into the hydronic heating system to protect against damage, which would not be covered under warranty. Make sure the glycol is compatible with all system components and is permitted by local and national codes.

Rear Piping Connections

The heating coil may be reversed to allow rear piping:

- Remove upper door
- Disconnect supply air sensor from extension cable
- Slide out heating coil
- Re-mount supply air sensor and grommet to opposite end of heating coil
- Remove rear knock-outs
- Slide in heating coil
- Use plastic plugs (provided) to close up holes on upper door

Ecosmart Mounting

The **ecosmart** can be installed in up flow, down flow and left or right horizontal applications. Install the **ecosmart** with the door in place to make sure the cabinet remains square. Flip the

unit for down flow applications so that the top of the unit is now the bottom. No modification is required for any configuration.

The **ecosmart** can be suspended from floor joists, rafters or concrete using rods, pipe, angle supports or straps. Units must be hung level to ensure quiet operation.

> ⚠️ CAUTION - Use any of the existing screw holes in the cabinet when using straps. If the existing screw is too short for securing a mounting strap, a longer screw should be used provided care is taken not to damage any internal components. <u>Product warranty does not cover any damage or claims resulting from damage from longer screws or from the unit being improperly suspended.</u>

The cabinet is designed so that the return air can be located on either side of the cabinet, or from the bottom of the cabinet. Position a filter rack so that the filter is readily accessible. A filter and filter rack are not included. Sides are marked for a standard 16 x 20 in filter rack.

> ⚠️ WARNING - Special care should be taken in the vicinity of the coil to avoid puncture. Screw into opening flange instead of top of cabinet when fastening the supply air duct.

Plumbing

Install a ½ in sediment faucet or ball valve for use as a drain/purge valve. The drain valve must be located downstream of the pump and check valve, and upstream of the isolation valve (if isolation valve is present). With this arrangement, any air trapped in the system can easily be flushed out following the instructions in the Start-up & Troubleshooting sections. Isolation valves are recommended, but not required. Installing isolation valves facilitates easy servicing.

When the space heating loop connections are made to the domestic water connections:

- The heating loop connections should be positioned horizontally in a vertical section of the domestic water line for both inlet and outlet. Refer to the piping schematic for details.
- Connect the heating loop to the domestic water connections as close to the water heater as possible

Avoid sections of pipe in the heating loop that can trap air where possible. It is usually impossible to install a system without having at least one part of the system or heating coil able to trap air. This will not be a problem if the connection to the domestic water lines is made properly, and purge valves and air eliminator devices are installed.

- Following the flushing procedures in the start-up section will ensure that there is no air in the system after initial set-up.

Follow recommendations supplied by the manufacturer of the heating source being used. **ecosmart** includes a flow switch connection where a flow switch can be connected to allow for domestic water priority. Note: the correct type of flow switch is a normally open (NO) device. The flow switch closes when domestic water is flowing.

Check Valve

A check valve may be required for your system to meet local codes and to work effectively. A check valve:

- Protects against back-flow of water to avoid short circuiting around the water heater during domestic use
- Protects against thermal siphoning
- Is required in all potable water systems

A drain pan is recommended underneath the appliance for all installations.

Pump

A pump is not included inside the **ecosmart**. Whether you are using an external pump or an internal built-in pump, it should be sized for the system. Pumps supplied with the heat generating units can be used as the sole pump provided it meets the needs of the system. This is especially the case in retrofit applications where a much larger pump may have previously been used in the system.

- When set up in multi-stage mode, the pump will operate as a 3-speed pump if it is a variable 0-10V type. If the pump is a standard 120VAC type, it will operate at a single speed only.
- When set up in single-stage mode, the pump will operate as a single-speed pump.
- The **ecosmart** controller has a built-in pump timer that exercises the pump for 1 minute every 24 hours to prevent the possibility of 'sticking' due to sediment etc.

Water Heater or Boiler Setup

Follow the manufacturer's installation and start-up instructions of the water heater or boiler. Make sure the equipment is turned off during installation and service.   Make certain the equipment has been refilled and all air is purged from the system before turning on the heater.
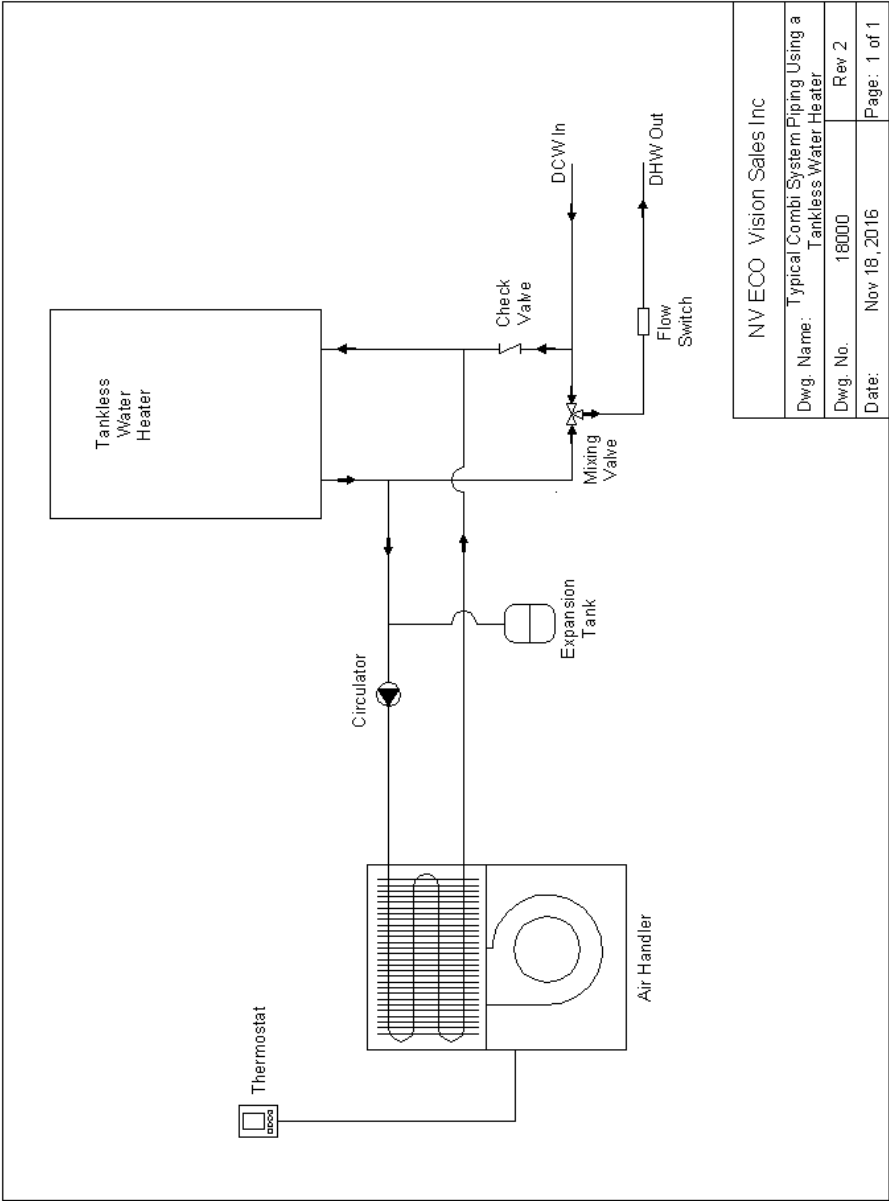
> ⚠️ WARNING - When the system requires water temperatures higher than 125°F, a mixing valve shall be installed to reduce domestic hot water temperature to safeguard against scalding.
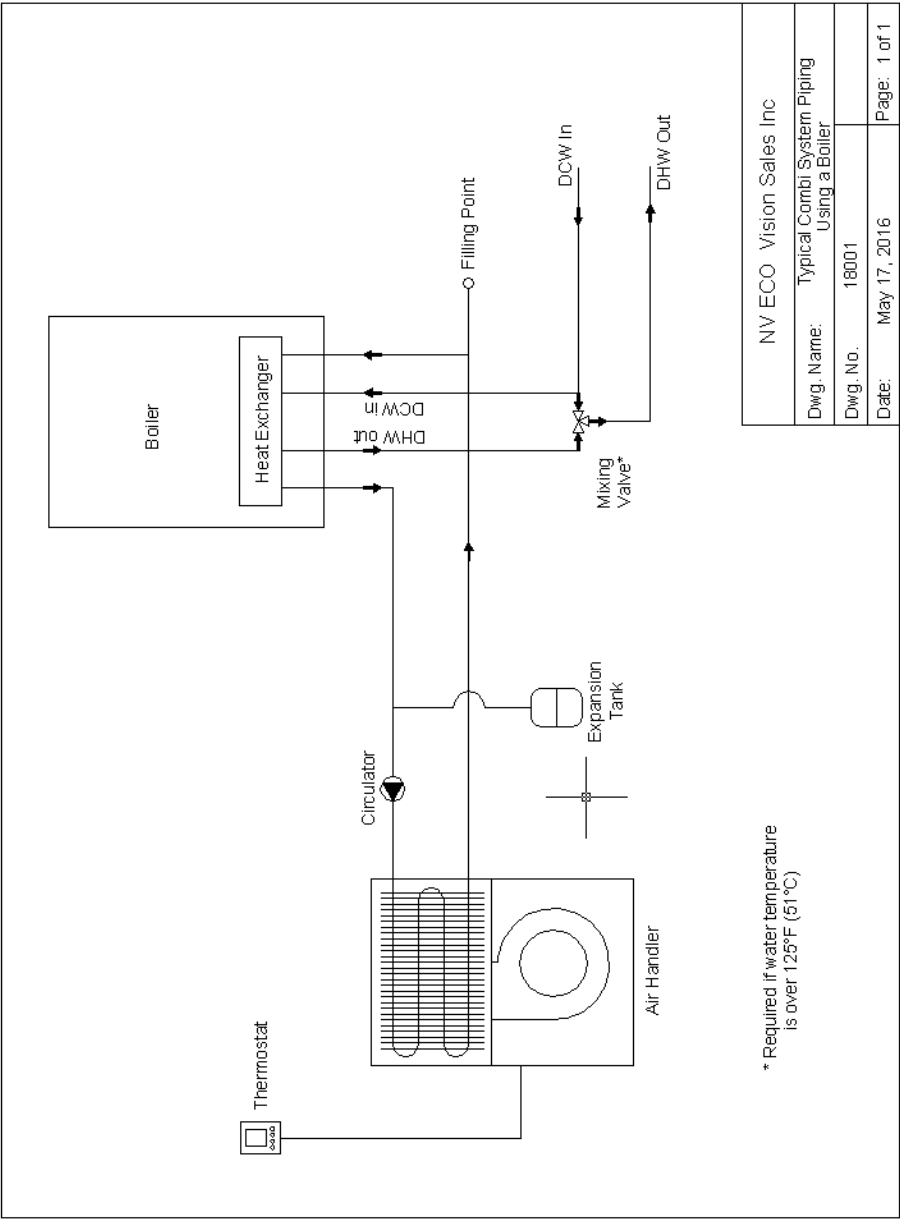
Combo Systems

The **ecosmart** is ideal for use in combo systems which provide space heating and domestic hot water from a single heat source. Any properly sized gas, propane or oil fired water heater or boiler will work in a combo system. Make sure any water heater being used is approved for combo applications.

PIPING DIAGRAMS

Tankless Water Heater Piping

Dwg. Name: Typical Combi System Piping Using a Tankless Water Heater
NV ECO Vision Sales Inc
Dwg. No. 18000 Rev 2
Date: Nov 18, 2016 Page: 1 of 1

DCW In
DHW Out
Check Valve
Flow Switch
Mixing Valve
Tankless Water Heater
Expansion Tank
Circulator
Air Handler
Thermostat

Combi-Boiler Piping

Typical Combi System Piping Using a Boiler — NV ECO Vision Sales Inc

Dwg. No. 18001

Date: May 17, 2016

Page: 1 of 1

* Required if water temperature is over 125°F (51°C)

ELECTRICAL

<table>
<tr>
<td>⚠</td>
<td>WARNING - Make sure the installation meets all national and local electrical codes.</td>
</tr>
</table>

Electrical Information

The ecosmart wiring diagram is located on the cover of the electrical box behind the lower front panel. Ratings data is located on the lower front panel.

- The ecosmart operates on 120VAC 60Hz single phase line voltage and should have its own dedicated breaker or fuse rated as per the MOP on the ratings label
- All control circuits are standard 24VAC
- **ecosmart** must be grounded via the green wire within the control box

Electrical Connections Made to Quick Connects

- Stranded or solid wire may be used
- Male tab size on control board: 0.250 in x 0.032 in
- Correct female disconnects to mate with male tabs:

    o   Wire range: 22-18 AWG (Red) Panduit # DNF18-250 or equivalent
        Wire range: 16-14 AWG (Blue) Panduit # DNF14-250 or equivalent

<table>
<tr>
<td>⚠</td>
<td>- Use a quality ratchet crimping tool to ensure reliable connections</td>
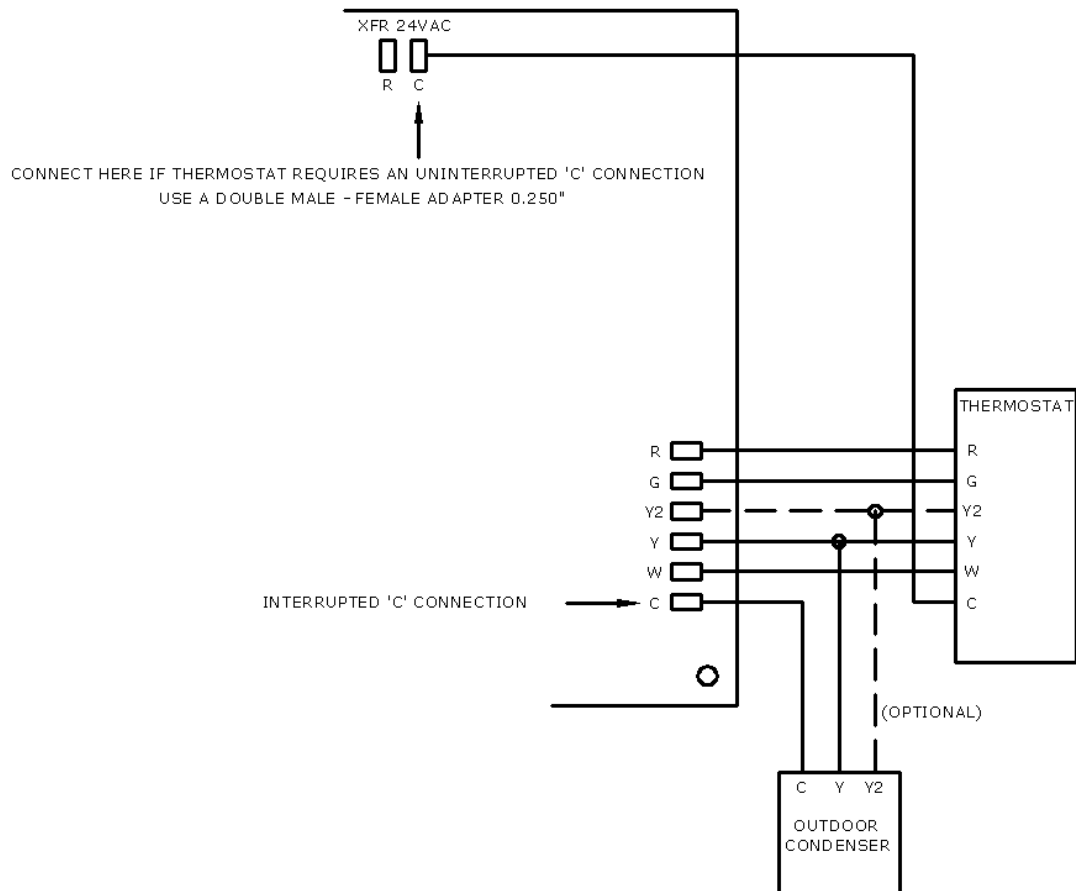</tr>
</table>

Thermostat Wiring

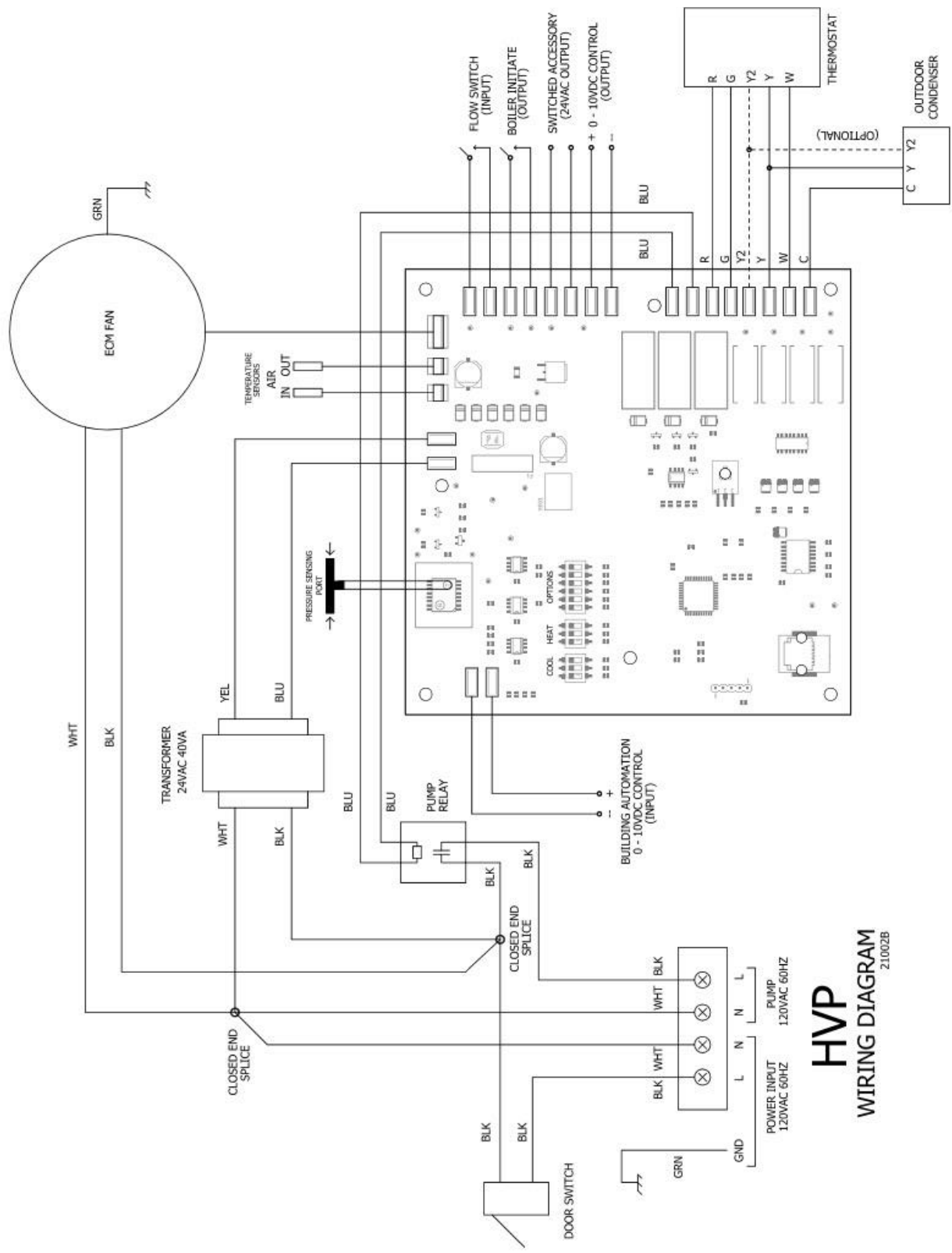Any standard heat/cool thermostat is compatible with the **ecosmart**.

'Smart' thermostats usually require an uninterrupted 'C' connection (see wiring diagram below).

Wire thermostat to lower right tabs as marked.
The **ecosmart** supports optional 2-stage cooling if required.

Ecosmart Wiring Diagram

HVP
WIRING DIAGRAM
21002B

Miscellaneous wiring to the upper right tabs of control board as marked:

- **FLOW** – When using a water heater and domestic water priority is required, connect a normally open (NO) flow switch. If there is a call for DHW, fan and pump will shut down after 1 minute. If flow switch is active longer than 30 minutes, fan and pump will resume normal operation.
- **BOILER** – dry contacts to initiate heat source.
- **AUX 24V** – 24VAC output for humidifier or other accessory. Active when heating is on.
- **0-10V OUTPUT** – drives a variable speed pump (if installed). Variable speed pump will run at LO, MED or HI speeds in the multi-stage mode. Note if a standard AC pump is used, the pump will run at a single speed.
- **0-10V INPUT** – input command from a Building Automation System (BAS).
    - **Fan:** 0V = off, 2V = low speed, varying to 10V = high speed.
    - **Pump (variable and standard if installed):** 0V = off, 2V or higher = on.
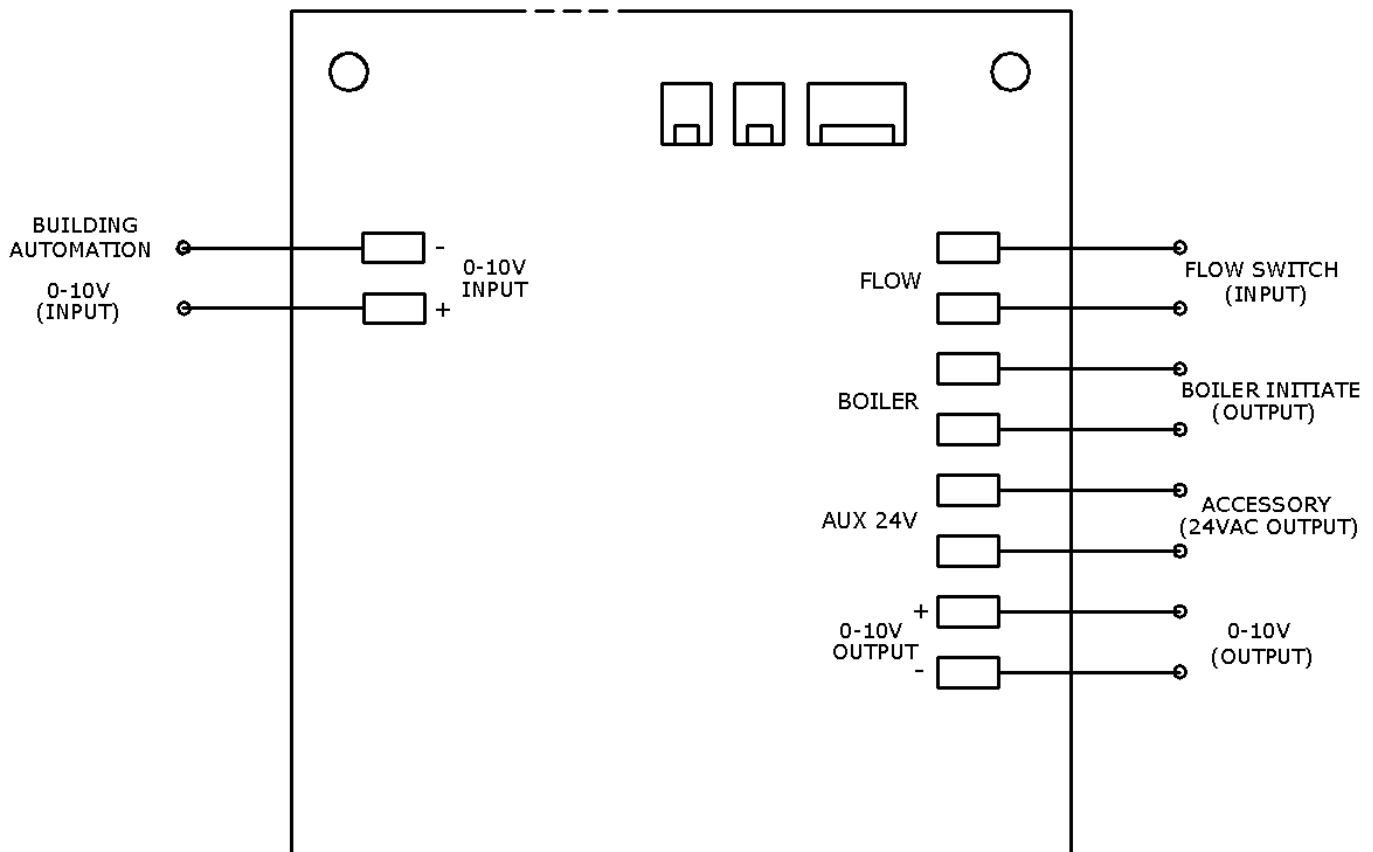
DIP SWITCH OPTIONS

Switch Settings

Three DIP switches located on the top left section of the control board set heating, cooling and various system options.

WARNING – to prevent damage, use a small screwdriver or equivalent to change switch position.
Up is ON as marked on the switch body and each switch is identified with numbers below.

OPTIONS – sets system options
COOL – sets cooling airflow (8 settings)
HEAT – sets heating airflow (8 settings)
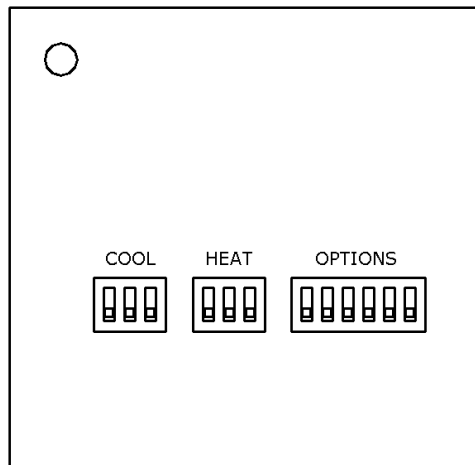
Constant Pressure Technology – Calibration Procedure

Constant Pressure Technology (CPT™) automatically maintains the desired airflow within the ductwork irrespective of outlet vents opening and closing when in heating mode. CPT™ is designed to reduce airflow noise caused when vents are partially or fully closed. CPT™ is unavailable when in cooling mode to prevent potential freezing of the DX coil. To enable the CPT™ function, follow the steps below:

STEP 1
Set thermostat to 'OFF" position.

STEP 2
Set desired heat airflow rate using the HEAT DIP switch.

STEP 3

Set OPTION switch 6 to the ON position and allow the system to run for at least 1 minute, then set OPTION switch 6 to the OFF position. The calibration parameter is now permanently stored in the controller and will be retained even if power is removed from the **ecosmart.**
If the heat airflow rate setting is changed, calibration must be repeated for correct operation.

STEP 4

Set OPTION switch 4 to the on position to enable CPT™.

STEP 5

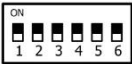Set thermostat for normal operation.

Test Mode

Set OPTION switch 6 to the ON position to bring on TEST mode which turns on the pump 100% and runs the fan at the rate set by the HEAT switch. TEST mode simplifies the bleeding of air from the hydronic system. **Once air bleeding is completed, set OPTION switch 6 to the OFF position.**

Building Automation Mode

Set OPTION switch 5 to ON.

- **0-10V INPUT** – input command from a Building Automation System (BAS).
    - **Fan:** 0V = off, 2V = low speed varying to 10V = high speed.
    - **Pump (variable and standard if installed):** 0V = off, 1V or higher = on.

| OPTIONS			
1	OFF	Constant circulating fan runs at HEAT airflow	
	ON	Constant low circulating fan (runs at 50% of HEAT airflow)	
2	OFF	Single stage operation	
	ON	Multi stage operation	
3	OFF	Cooling fan runs at COOL airflow	
	ON	Dehumidification - Cooling fan runs at 85% of COOL airflow for 10 minutes and then reverts to COOL airflow	
4	OFF	Fixed airflow control	
	ON	Auto airflow control (CPT™)	
5	OFF	Normal thermostat input control. Building automation is disabled.	
	ON	Building Automation System control (0 – 10V input). Thermostat connections are disabled.	
6	OFF	Test/Calibration mode off	
	ON	Test mode on - heat source turned on, fan runs as selected on HEAT airflow switch and pump runs at full speed. Calibration mode on - acquires pressure reference for CPT™	

HEAT/COOL SETTINGS ES50HVP											
FAN CFM								AIR FLOW SETTING	1	2	3
0.8"	0.9"	1.0"	1.1"	1.2"	1.3"	1.4"	1.5"				
446	433	415	406	385	378	362	338	55%	OFF	OFF	OFF
478	455	439	436	419	407	380	367	60%	ON	OFF	OFF
536	521	516	492	484	465	448	438	70%	OFF	ON	OFF
577	558	545	533	524	510	502	478	75%	ON	ON	OFF
617	598	587	575	555	544	531	512	80%	OFF	OFF	ON
642	618	611	585	582	570	563	545	85%	ON	OFF	ON
680	666	652	633	621	605	600	582	90%	OFF	ON	ON
722	712	687	678	672	670	660	625	100%	ON	ON	ON

HEAT/COOL SETTINGS ES90HVP								DN 1 2 3			
FAN CFM								AIR FLOW SETTING	1	2	3
0.8"	0.9"	1.0"	1.1"	1.2"	1.3"	1.4"	1.5"				
672	654	637	615	587	565	550	532	65%	OFF	OFF	OFF
712	697	682	665	634	618	590	578	70%	ON	OFF	OFF
743	737	718	687	672	655	625	611	75%	OFF	ON	OFF
782	762	751	744	719	707	682	663	80%	ON	ON	OFF
822	804	795	780	773	757	733	720	85%	OFF	OFF	ON
865	840	837	821	817	786	769	752	90%	ON	OFF	ON
883	878	856	852	832	820	803	778	95%	OFF	ON	ON
920	898	887	876	863	854	839	815	100%	ON	ON	ON

| HEAT/COOL SETTINGS ES100HVP								DN 1 2 3			
FAN CFM								AIR FLOW SETTING	1	2	3
0.8"	0.9"	1.0"	1.1"	1.2"	1.3"	1.4"	1.5"				
1043	1012	989	950	914	858	812	782	65%	OFF	OFF	OFF
1106	1073	1047	1016	985	937	886	842	70%	ON	OFF	OFF
1150	1128	1092	1070	1041	1004	964	918	75%	OFF	ON	OFF
1175	1160	1137	1107	1079	1054	1021	970	80%	ON	ON	OFF
1215	1202	1172	1150	1116	1092	1054	1028	85%	OFF	OFF	ON
1275	1259	1238	1212	1192	1164	1134	1095	90%	ON	OFF	ON
1324	1299	1280	1259	1233	1204	1193	1162	95%	OFF	ON	ON
1368	1347	1330	1305	1283	1262	1233	1215	100%	ON	ON	ON

Multi Stage Mode

- Fan increases airflow through stages 1 to 3 with 5-minute intervals until stage 3 is reached.
- If a variable speed pump is connected to the 0 – 10V output and OPTION switch 2 is ON, it runs through 3 speeds in unison with the fan stages.
- If a standard 120VAC pump is installed it runs at HI speed.

HEAT					OPTION		
			AIR FLOW SETTING	STAGE	MULTI STAGE SELECTED	VARIABLE PUMP SPEED	STANDARD PUMP SPEED
Heat - 1	Heat - 2	Heat - 3			Option - 2	0-10VDC	120VAC
OFF	OFF	OFF	55%	3	ON	HI	HI
			47%	2	ON	MED	HI
			39%	1	ON	LO	HI
ON	OFF	OFF	60%	3	ON	HI	HI
			51%	2	ON	MED	HI
			42%	1	ON	LO	HI
OFF	ON	OFF	70%	3	ON	HI	HI
			60%	2	ON	MED	HI
			49%	1	ON	LO	HI
ON	ON	OFF	75%	3	ON	HI	HI
			64%	2	ON	MED	HI
			53%	1	ON	LO	HI
OFF	OFF	ON	80%	3	ON	HI	HI
			68%	2	ON	MED	HI
			56%	1	ON	LO	HI

ON	OFF	ON	85%	3	ON	HI	HI
			72%	2	ON	MED	HI
			60%	1	ON	LO	HI
OFF	ON	ON	90%	3	ON	HI	HI
			77%	2	ON	MED	HI
			63%	1	ON	LO	HI
ON	ON	ON	100%	3	ON	HI	HI
			85%	2	ON	MED	HI
			70%	1	ON	LO	HI

Single Stage Mode

- Fan runs at selected airflow.
- If a variable speed pump is connected to the 0 – 10V output and OPTION switch 2 is OFF, it runs at Hi speed. If a standard 120VAC pump is installed it runs at HI speed.

HEAT				OPTION
1	2	3	AIR FLOW SETTING	SINGLE STAGE SELECTED
Heat - 1	Heat - 2	Heat - 3		Option - 2
OFF	OFF	OFF	55%	OFF
ON	OFF	OFF	60%	OFF
OFF	ON	OFF	70%	OFF
ON	ON	OFF	75%	OFF
OFF	OFF	ON	80%	OFF
ON	OFF	ON	85%	OFF
OFF	ON	ON	90%	OFF
ON	ON	ON	100%	OFF

SEQUENCE OF OPERATION

Multi-stage Operation

Thermostat calls for heat
- R is connected to W
- Heat generator is turned on
- Auxiliary 24VAC power is turned on
- Pump turns on 100%
- After a 15 second delay to allow for system water to heat up coil, fan ramps up as follows:
    1. **Stage 1 - Lower HEAT airflow for 5 minutes**
       If a variable speed pump is installed, it runs at LO. If a standard single speed AC pump is installed it runs at HI.

    2. **Stage 2 - Medium HEAT airflow for 5 minutes**
       If a variable speed pump is installed, it runs at MED. If a standard single speed AC pump is installed it runs at HI.

    3. **Stage 3 - High HEAT airflow until thermostat is satisfied**
       If a variable speed pump is installed, it runs at HI. If a standard single speed AC pump is installed it runs at HI.

Thermostat is satisfied
- R is disconnected from W
- Heat generator is turned off
- Auxiliary 24VAC power is turned off
- Pump turns off and fan speed ramps down to zero, extracting any remaining heat in the coil

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Single-stage Operation

- R is connected to W
- Heat generator is turned on
- Auxiliary 24VAC power is turned on
- Pump turns on at 100%

- After a 15 second delay to allow for system water to heat up coil, fan ramps up to selected static pressure
- If a variable speed pump is installed, it runs at HI. If a standard single speed AC pump is installed it runs at HI

Thermostat is satisfied
- R is disconnected from W
- Heat generator is turned off
- Auxiliary 24VAC power is turned off
- Pump turns off and fan speed ramps down to zero, extracting any remaining heat in the coil

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Cooling Mode (Multi and Single stage)

(Assumes a condenser and DX coil is installed)

- R is connected to Y and Y2*
- Condenser turns on
- Fan ramps up to COOL airflow setting

* If thermostat and condenser support 2-stage cooling

Thermostat is satisfied
- Condenser turns off
- Fan speed ramps down to zero, extracting any remaining cooling from the DX coil

Dehumidification

When in cooling mode, a dehumidification function can be set using system switch 3 as follows:

- OFF - Normal cooling fan runs at rate set by COOL airflow
- ON – Dehumidification Fan Cooling runs at 85% of COOL airflow rate for 10 min. and then reverts to COOL airflow

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Fan Mode

- R is connected to G
- If fan is set to "ON" on thermostat, fan runs at HEAT airflow rate

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Constant Low Fan Circulation

Fan may be run at a low rate using OPTION switch 1 as follows:

- OPTION switch 1 is OFF – fan runs at HEAT airflow rate
- OPTION switch 1 is ON – fan runs at 50% of HEAT airflow rate

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Condenser Lockout/Freeze Protection

The **ecosmart** is equipped with a condenser lockout / freeze protection sensor to help prevent any damage to the hot water coil from a freeze up. In any mode, heating, cooling or standby, when the outlet air temperature sensor reads a temperature of 40°F or lower the **ecosmart** will bring on the circulating fan and energize the pump relay. If in cooling mode, the **ecosmart** will also turn off the condenser by breaking the C connection.

Pump Exerciser

- The circulating pump is exercised for 1 min every 24 hr when the **ecosmart** is OFF, COOLING (Y), COOLING2 (Y2) or FAN (G) to prevent the possibility of 'sticking' due to sediment and local codes

- During the 1 min pump on-time, the fan is turned off and resumes once the pump exercising is completed
- Pump runs continuously if the outlet air temperature drops below 40°F to prevent the chance of freezing

SERVICE AND MAINTENANCE

NOTE: The **ecosmart** is not to be used for temporary heat during construction. Use for this purpose will void equipment warranty.

Filter

Inspect the filter monthly and replace, remove and vacuum or rinse as required. A clogged or inadequate filter may void product warranty. Replacement filter size is 16 x 20 x 1.

Coils

Air conditioning and heating coils should not require cleaning if the filter maintenance schedule is adhered to. If a filter is damaged or collapses from plugging, dust may foul the coils. If this happens, replace the filter and carefully vacuum the coils. The fan may need to be removed to gain access to the face of the heating coil.

Fan and Motor

Check fan for dust once a year. If dirty, vacuum or wash to remove dust. Keeping the fan blades clean will reduce noise and improve capacity and efficiency of the heating system.

TROUBLESHOOTING

Removing blower/control assembly

Blower and control assembly can be removed as a single piece:
- Turn off power to **ecosmart**
- Disconnect AIR OUT temperature sensor (white plug/socket) just above front centre plate
- Disconnect power, thermostat and other wiring from within control box
- Undo (Qty. 2) #1/4-20 bolts, lock washers and flat washers
- Slide out blower assembly

Thermostat call error

If the **ecosmart** does not run when the thermostat is calling, jumper R to W for heating or R to Y (Y2) to verify if the problem is with the thermostat or **ecosmart** control. Note that some thermostats have a delay (typically five minutes) before they will re-start cooling to prevent compressor damage.

External pump does not run

In areas where hard water is present the pump may stick and fail to run. Often, closing the isolation valve on the return leg and opening the drain port so that water flows through the pump can free this. If this fails to free the pump, removal for cleaning or replacement is necessary. The daily pump exerciser will help prevent pump sticking.

External pump is noisy at start-up

If sound has not diminished within 1 minute, air may be present in the system and may need re-purging. If the heat source is a water heater, check to make sure branch connections for the heating loop are horizontal to prevent the collecting of air in the loop.

Water heater temperature and pressure relief valve is weeping

A check valve or back-flow preventer may have been installed in the system. Some form of pressure relief may be required. Consult water heater manufacturer's instructions. Options are:
- Install expansion tank
- Install pressure relief valve; locate outlet over laundry tub or floor drain

Insufficient or no heat

- Check that the heat generator is functioning properly
- Plugged air filter or coil. Refer to maintenance section for filter care and coil cleaning
- Air in heating loop - purge system
- Inlet and outlet connections to **ecosmart** are backwards - reverse connections
- Water heater dip tube is restricted or damaged; check and/or replace
- Supply water temperature set too low or not calibrated properly - check water temperature
- Restrictions on heating loop - remove restrictions, check if valve is stuck, isolation valves could be too restrictive or left partially closed after purging, or a closed valve

Cold water at hot faucet

When the heat source is a water heater, the most probable cause is reverse flow through the heating loop from a stuck check valve - repair or replace valve.

Fan runs for cooling but not for heating

The room thermostat may be connected improperly. Refer to Electrical section or wiring schematic on **ecosmart** for proper installation.

Heating during standby mode

Probable cause is thermal siphoning. Make sure piping elevation instructions shown in piping drawings have been followed. Repair or replace check valve. Check elevation of **ecosmart** above water heater to see if motorized valve required for positive shut-off.

WARRANTY

Warranty is 2 years' parts. Visit ecosmartair.com for full details.