



ES50LVP / ES90LVP MODULATING AIR HANDLER

Installation, Operation and Maintenance Manual



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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, **will result in death or serious injury.**

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

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

Simple, independent heat/cool and system parameters can easily be set by the installer to adjust for a wide variety of installations. Various parameters are automatically monitored and fan and pump speeds vary simultaneously. The **ecosmart** has a built-in variable speed pump controller that can vary the speed of a standard single speed AC pump.

MODES OF OPERATION

Three modes of operation are available:

1. Full modulation – full control of fan and pump (requires outdoor temperature sensor).
2. Step modulation – timed fan and pump sequencing.
3. Single stage – standard furnace emulation.

Modulating Mode

(**ecosmart** outdoor sensor installed)

Water temperature is set at the heat generator by referring to the heat generator performance data. It is best to maintain constant water temperature at the heat generator.



If the heat generator comes with an optional outdoor temperature sensor do **not** install it as it will conflict with the **ecosmart** control.

The fan operates at the speed selected on the HEAT CFM switch during the setup. Fan and pump speed automatically reduce as outdoor temperature rises. Fan CFM may reduce by up to 30% from the HEAT CFM switch setting depending on outdoor temperature.

If the heat generator includes a built-in pump, and it is directly connected to the **ecosmart**, the **ecosmart** will vary the pump automatically. If the system is configured for primary/secondary pumping and the heat generator includes a pump, the secondary pump can be controlled by the **ecosmart**.

Step Modulating Mode

(**ecosmart** outdoor sensor not installed)

Water temperature is set at the heat generator by referring to the heat generator performance data. Fan operates at 50% of the HEAT CFM setting for 5 minutes then increases to 75% for a further 5 minutes, then increases to 100% until the thermostat is satisfied. If the pump is controlled by the **ecosmart**, its speed will be adjusted accordingly as the **ecosmart** goes through its stages. If the pump is controlled by the heat source, it will function according to the heat source control strategy.

Basic Mode

(**ecosmart** outdoor sensor not installed)

Water temperature is set at the heat generator by referring to the heat generator performance data. Fan operates at 100% of selected HEAT CFM and pump operates at maximum speed until the thermostat is satisfied.

PERFORMANCE RATINGS

ES50LVP

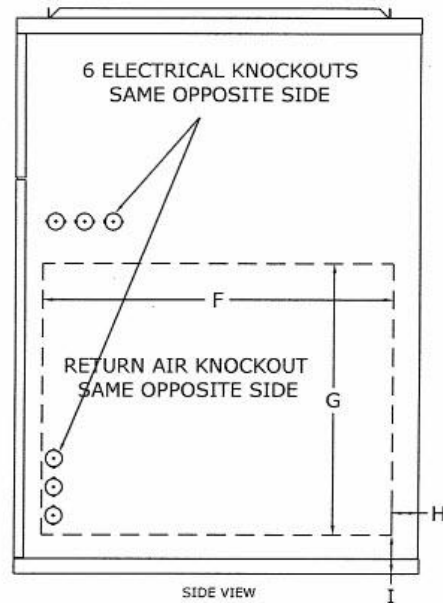
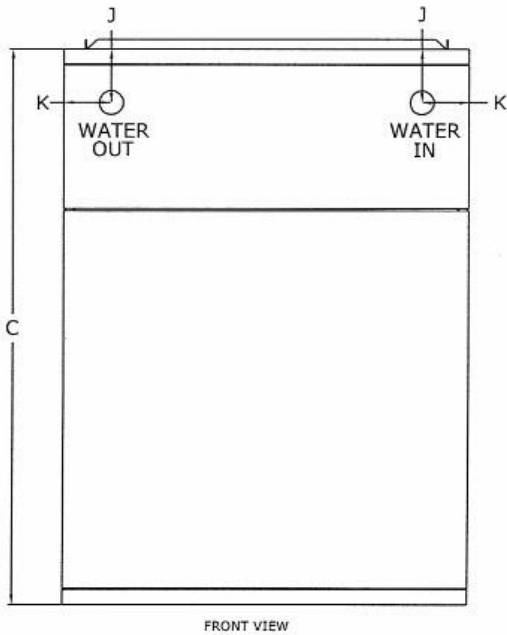
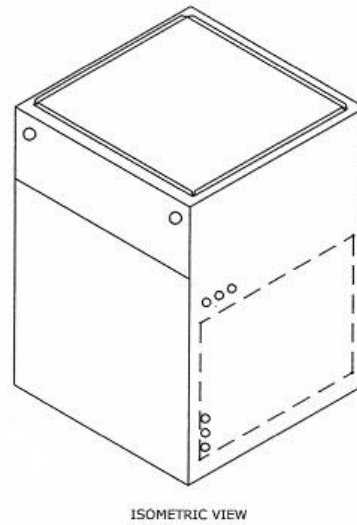
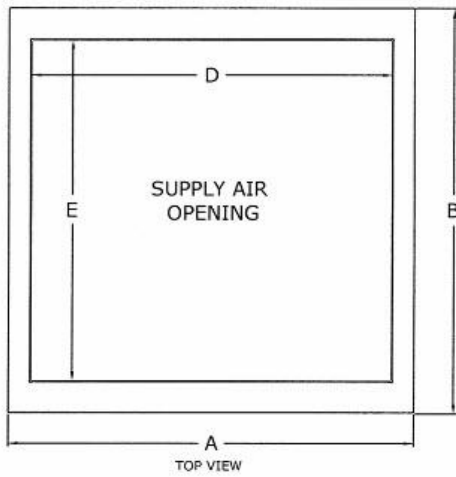
Performance Data - Hot Water Capacities (BTUH) @ 70°F Entering Air Temperature										
Entering Water Temperature										
CFM	GPM	110°F	120°F	130°F	140°F	150°F	160°F	170°F	180°F	Water PD feet WC @140°F
300	3	10,700	13,400	16,100	18,810	21,520	24,240	26,960	29,680	2.32
	4	10,970	13,730	16,500	19,270	22,050	24,820	27,600	30,380	3.87
	5	11,140	13,940	16,740	19,550	22,360	25,180	27,990	30,810	5.77
400	3	13,260	16,610	19,980	23,350	26,730	30,110	33,500	36,890	2.32
	4	13,730	17,190	20,670	24,150	27,640	31,130	34,620	38,120	3.87
	5	14,020	17,550	21,090	24,640	28,190	31,740	35,300	38,860	5.77
500	3	15,470	19,390	23,330	27,280	31,240	35,210	39,180	43,160	2.32
	4	16,160	20,250	24,360	28,470	32,590	36,710	40,840	44,970	3.87
	5	16,600	20,790	24,990	29,200	33,420	37,640	41,870	46,100	5.77
600	3	17,390	21,820	26,260	30,720	35,180	39,660	44,150	48,640	2.32
	4	18,330	22,980	27,640	32,320	37,000	41,700	46,400	51,100	3.87
	5	18,920	23,710	28,510	33,320	38,150	42,970	47,810	52,650	5.77
700	3	19,090	23,950	28,840	33,740	38,660	43,590	48,530	53,470	2.32
	4	20,270	25,420	30,590	35,770	40,970	46,180	51,390	56,610	3.87
	5	21,030	26,360	31,710	37,070	42,440	47,820	53,210	58,610	5.77
800	3	20,580	25,840	31,120	36,420	41,730	47,070	52,410	57,760	2.32
	4	22,020	27,620	33,250	38,890	44,550	50,220	55,900	61,590	3.87
	5	22,950	28,770	34,620	40,480	46,360	52,250	58,150	64,050	5.77
900	3	21,910	27,510	33,150	38,800	44,480	50,170	55,870	61,590	2.32
	4	23,600	29,610	35,650	41,720	47,800	53,890	60,000	66,110	3.87
	5	24,710	30,990	37,290	43,620	49,960	56,310	62,680	69,050	5.77

ES90LVP

Performance Data - Hot Water Capacities (BTUH) @ 70°F Entering Air Temperature										
Entering Water Temperature										
CFM	GPM	110°F	120°F	130°F	140°F	150°F	160°F	170°F	180°F	Water PD feet WC @140°F
600	3	18,930	23,720	28,530	33,350	38,180	43,020	47,860	52,710	1.96
	4	19,890	24,920	29,960	35,010	40,070	45,140	50,210	55,280	3.26
	5	20,500	25,670	30,850	36,040	41,240	46,440	51,650	56,860	4.84
700	3	20,890	26,190	31,510	36,840	42,180	47,540	52,900	58,260	1.96
	4	22,140	27,740	33,360	38,990	44,640	50,290	55,940	61,600	3.26
	5	22,930	28,720	34,520	40,340	46,170	52,000	57,840	63,690	4.84
800	3	22,630	28,380	34,150	39,940	45,750	51,560	57,380	63,210	1.96
	4	24,170	30,300	36,450	42,610	48,790	54,970	61,160	67,360	3.26
	5	25,160	31,520	37,910	44,300	50,710	57,130	63,550	69,980	4.84
900	3	24,180	30,340	36,520	42,720	48,930	55,160	61,400	67,640	1.96
	4	26,030	32,630	39,260	45,910	52,570	59,250	65,930	72,610	3.26
	5	27,220	34,110	41,030	47,960	54,900	61,860	68,820	75,790	4.84
1,000	3	25,580	32,100	38,640	45,210	51,790	58,400	65,000	71,620	1.96
	4	27,720	34,770	41,840	48,930	56,040	63,160	70,290	77,430	3.26
	5	29,120	36,510	43,910	51,340	58,780	66,240	73,700	81,170	4.84
1,100	3	26,830	33,680	40,550	47,450	54,370	61,310	68,260	75,210	1.96
	4	29,270	36,720	44,200	51,700	59,210	66,750	74,290	81,840	3.26
	5	30,880	38,720	46,590	54,480	62,380	70,310	78,240	86,170	4.84
1200	3	27,970	35,110	42,280	49,480	56,710	63,950	71,200	78,460	1.96
	4	30,700	38,520	46,370	54,240	62,140	70,050	77,980	85,910	3.26
	5	32,520	40,790	49,080	57,400	65,730	74,090	82,450	90,830	4.84
1,300	3	28,990	36,400	43,850	51,320	58,820	66,340	73,860	81,400	1.96
	4	32,020	40,170	48,370	56,590	64,840	73,100	81,380	89,670	3.26
	5	34,050	42,710	51,400	60,120	68,860	77,620	86,380	95,170	4.84

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
ES50LVP	14.0	21.0	29.0	11.8	17.8	18.3	14.3	1.4	2.0	2.8	2.4
ES90LVP	21.0	21.0	29.0	18.8	17.8	18.3	14.3	1.4	2.0	2.8	2.4



MODEL	ES50LVP	ES90LVP
DX Cooling Capacity (tons)	1 to 2	1.5 to 3.5
Power (Volts/Phase/Hz)	120/1/60	120/1/60
Cabinet Size W x D x H (in)	14 x 21 x 29	21 x 21 x 29
Supply Air Opening W x D (in)	11.8 X 17.8	18.8 x 17.8
Side Return Air Opening (in)	18.3 X 14.3	18.3 X 14.3
Recommended Filter Size (in)	16 x 20	16 x 20
Shipping Weight (lb)	85	95
Shipping Dimensions W x D x H (in)	15 x 24 x 30.5	22 x 24 x 30.5

ES50LVP ECM blower performance (CFM/amps)

SWITCH SETTING	0.1" WC	0.2" WC	0.3" WC	0.4" WC	0.5" WC	0.6" WC	0.7" WC	0.8" WC
300 CFM	298 0.36	315 0.55	338 0.70	342 0.91	348 1.1	350 1.31	366 1.46	352 1.62
400 CFM	352 0.45	384 0.66	392 0.85	408 1.04	411 1.22	402 1.44	405 1.68	402 1.88
500 CFM	478 0.7	491 0.92	497 0.95	511 1.34	519 1.56	472 1.80	492 2.01	498 2.28
600 CFM	615 1.13	624 1.35	630 1.61	643 1.86	655 2.13	590 2.41	592 2.65	600 2.88
700 CFM	681 1.47	698 1.74	726 2.02	733 2.32	736 2.56	667 2.92	670 3.13	668 3.34
800 CFM	800 2.01	798 2.31	806 2.58	831 2.95	849 3.26	760 3.65	766 3.96	768 4.13
900 CFM	905 2.70	908 2.99	916 3.31	927 3.65	937 3.9	832 4.44	823 4.52	807 4.61

ES90LVP ECM blower performance (CFM/amps)

SWITCH SETTING	0.1" WC	0.2" WC	0.3" WC	0.4" WC	0.5" WC	0.6" WC	0.7" WC	0.8" WC
600 CFM	603 0.82	607 1.02	610 1.25	618 1.49	620 1.7	652 1.95	662 2.19	666 2.44
700 CFM	681 1.04	688 1.26	699 1.47	702 1.76	708 1.99	740 2.23	736 2.53	748 2.79
800 CFM	756 1.22	782 1.58	800 1.92	823 2.28	844 2.58	875 2.98	877 3.25	884 3.52
900 CFM	874 1.7	894 2.08	918 2.44	927 2.82	940 3.11	987 3.61	1001 3.93	1012 4.25
1000 CFM	1000 2.31	1022 2.76	1034 3.14	1045 3.53	1060 3.89	1114 4.41	1118 4.76	1115 5.10
1100 CFM	1120 3.07	1133 3.5	1145 3.93	1153 4.38	1170 4.8	1219 5.41	1227 5.82	1233 6.19
1200 CFM	1195 3.56	1205 4.07	1211 4.5	1223 4.9	1228 5.38	1295 6.16	1300 6.58	1290 6.87
1300 CFM	1282 4.32	1286 4.74	1295 5.2	1305 5.73	1312 6.17	1332 6.61	1312 6.76	1305 6.87

QUICK START-UP PROCEDURES

Refer to the superseding 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 amount 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 and 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 120 F / 49 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. Product warranty does not cover any damage or claims resulting from damage from longer screws or from the unit being improperly suspended.

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 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 ease of 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

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.

The **ecosmart** includes a built-in variable speed pump controller that can control a standard single speed pump up to 250 watts. Operational modes are as follows:

- When set up in modulating mode, the pump will operate as a continuously variable speed pump
- When set up in step-modulating mode, the pump will operate as a multi-speed pump.
- When set up in basic 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 and local codes

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.



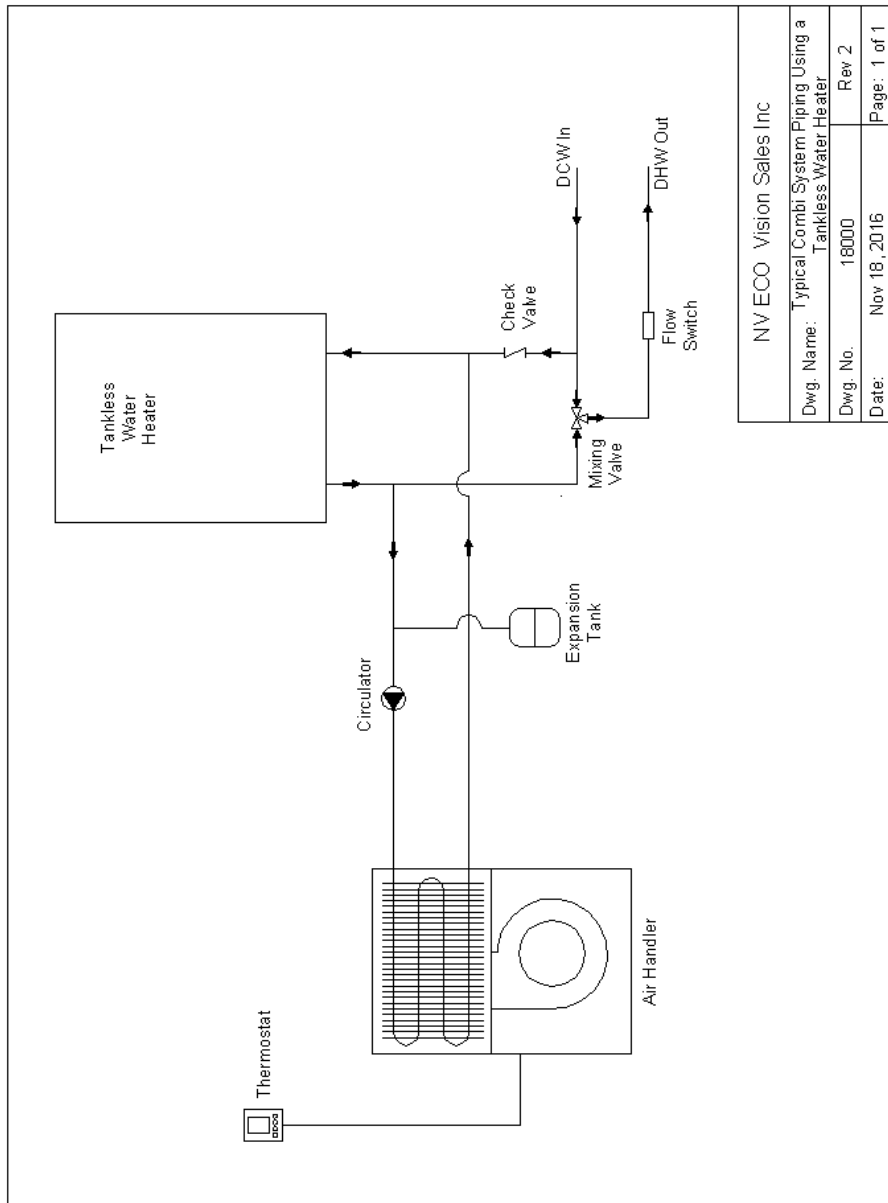
WARNING - When the system requires water temperatures higher than 120F, a mixing valve shall be installed to reduce domestic hot water temperature to safeguard against scalding.

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.

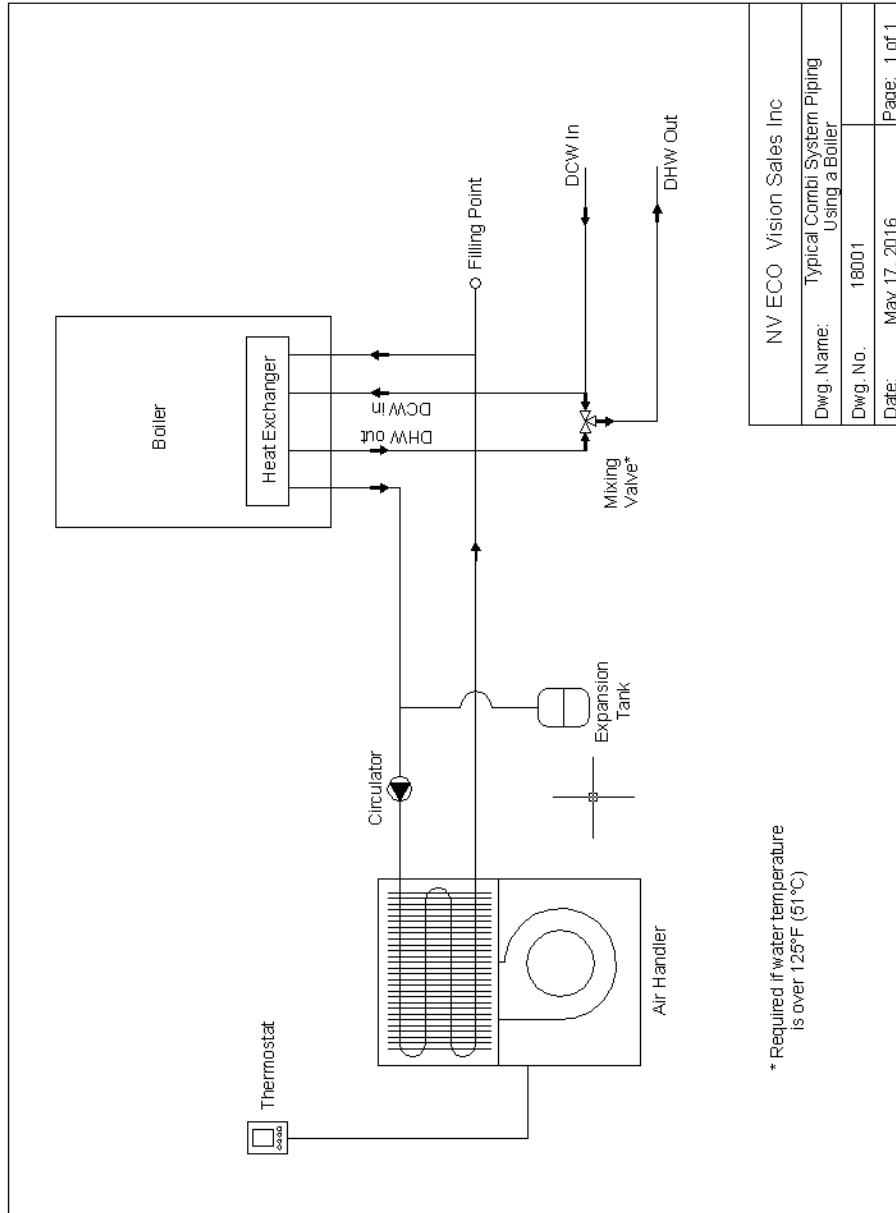
PIPING DIAGRAMS

Tankless Water Heater Piping



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

Combi-Boiler Piping



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

NV ECO Vision Sales Inc	
Dwg. Name:	Typical Combi System Piping Using a Boiler
Dwg. No.	18001
Date:	May 17, 2016
Page: 1 of 1	

ELECTRICAL



- WARNING - Make sure the installation meets all national and local electrical codes.

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



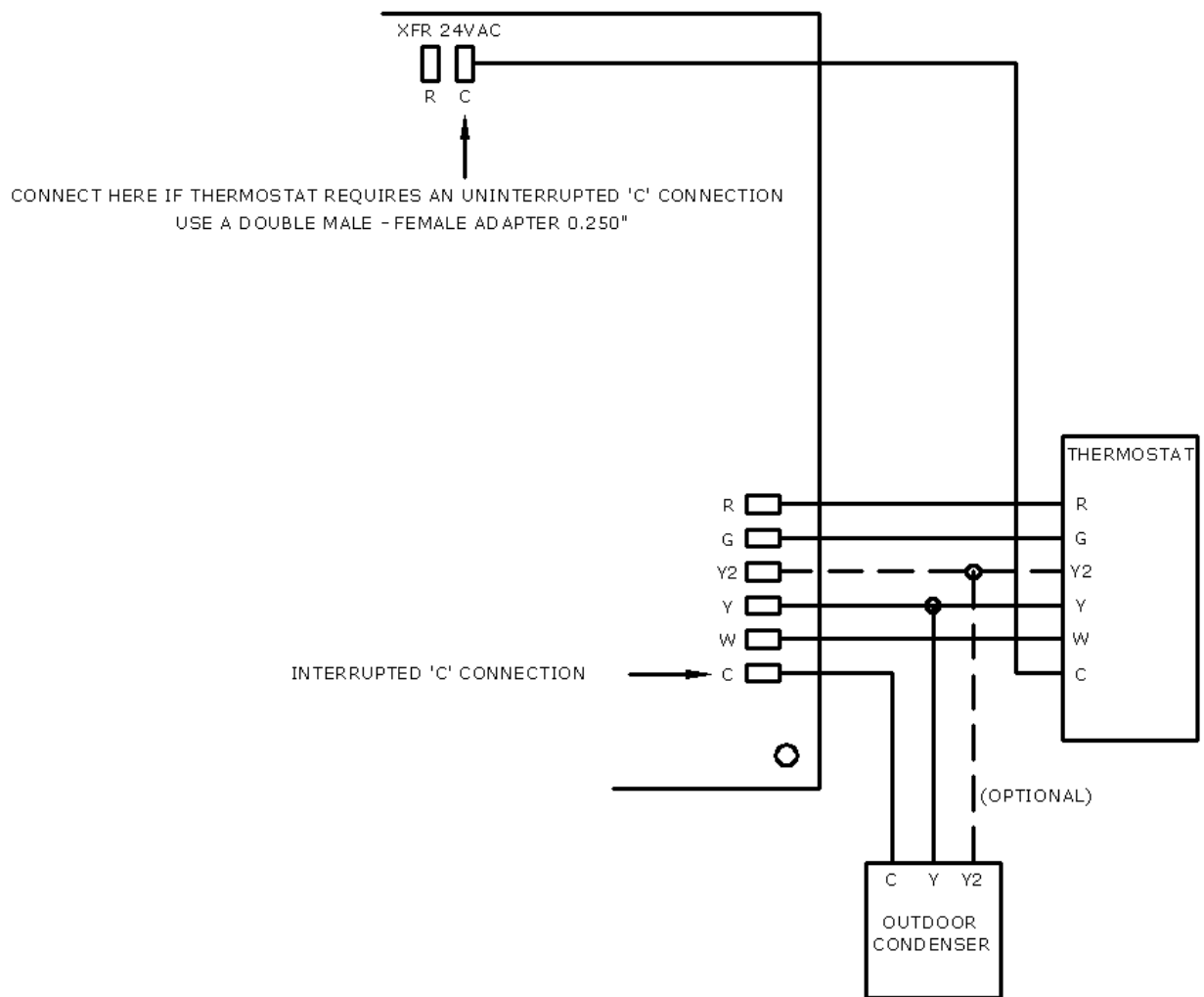
- Use a quality ratchet crimping tool to ensure reliable connections



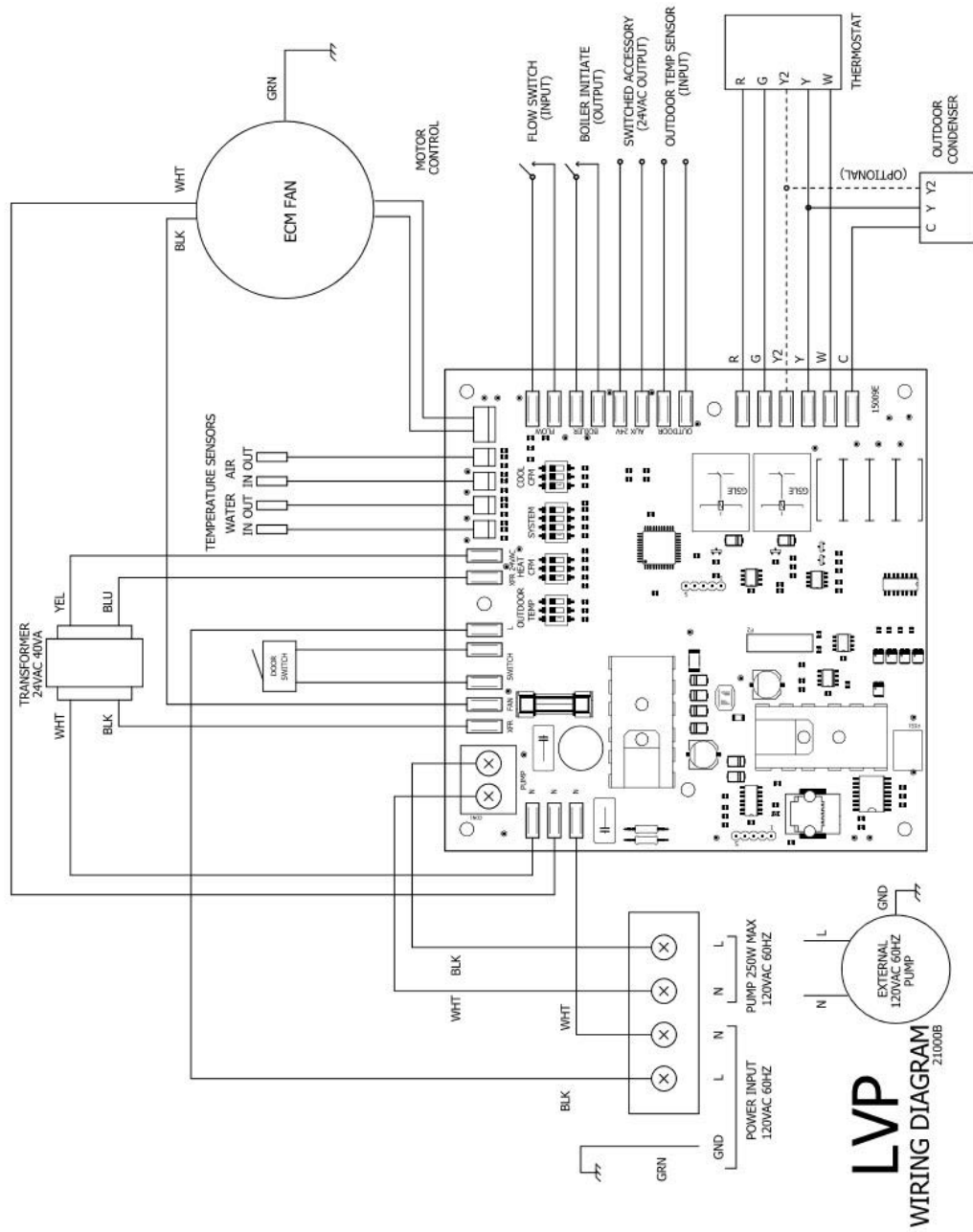
Thermostat Wiring

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

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



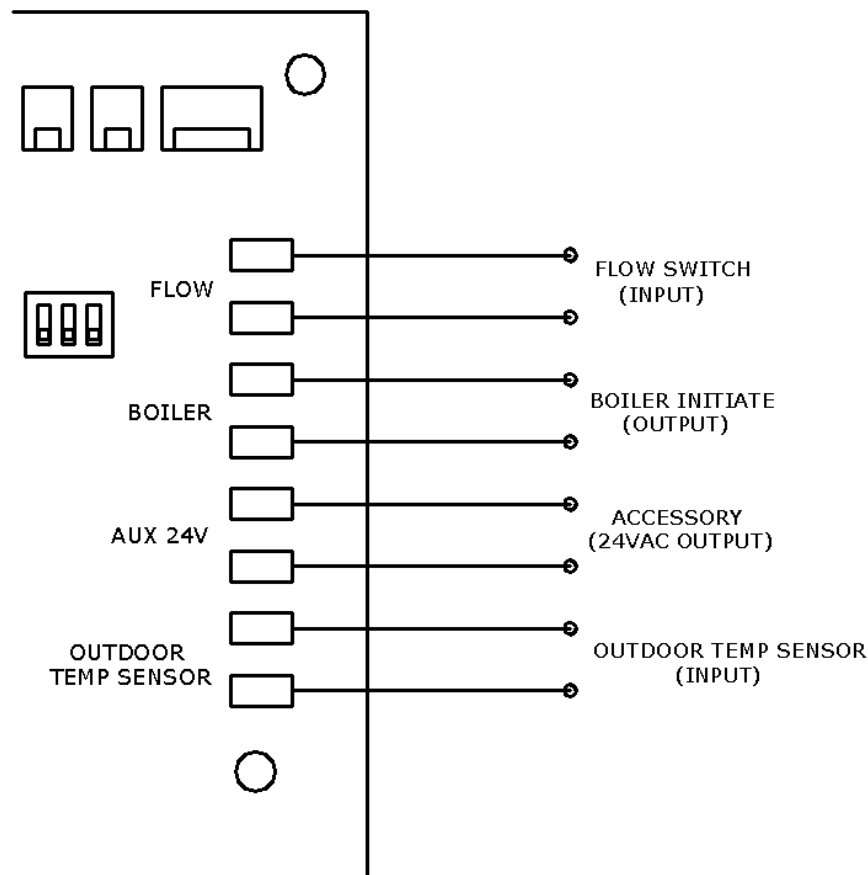
Ecosmart ES50LVP/ES90LVP Wiring Diagram



Miscellaneous Wiring

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
- **OUTDOOR** – included outdoor temperature sensor connects here. If sensor is not connected, **ecosmart** assumes coldest temperature is present and will not modulate fan and pump



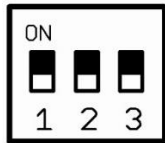
DIP SWITCH OPTIONS

Switch Locations

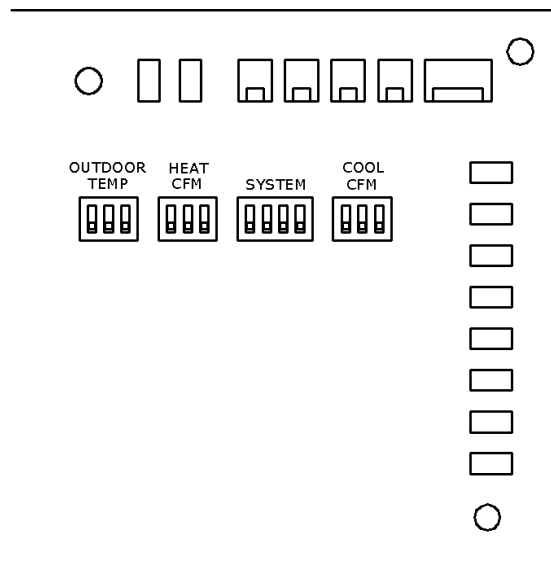
Four DIP switches are located on the top, mid-section of the control board.

WARNING – to prevent damage, use a small screwdriver to change switch position.

Up is ON as marked on the switch body and are identified with numbers below.



- **OUTDOOR TEMP** – set the lowest outdoor temperature expected
- **HEAT CFM** – set 1 of 8 fan CFM rates for heating
- **SYSTEM** – set various system parameters
- **COOL CFM** – set 1 of 8 fan CFM rates for cooling



Outdoor Temperature Select

Select lowest possible expected outdoor temperature.

DESIGN TEMP °C	DESIGN TEMP °F	SWITCH 1	SWITCH 2	SWITCH 3
< -18	< 0	OFF	OFF	OFF
-17 to -10	1 – 14	ON	OFF	OFF
-9 to 0	15 – 32	OFF	ON	OFF
1 to 10	33 – 50	ON	ON	OFF
>10	>50	OFF	OFF	ON
NOT USED		X	X	X
NOT USED		X	X	X
NOT USED		X	X	X

Heat CFM (ES90LVP)

Select required heating CFM.

CFM @ 0.5" WC	SWITCH 1	SWITCH 2	SWITCH 3
600	OFF	OFF	OFF
700	ON	OFF	OFF
800	OFF	ON	OFF
900	ON	ON	OFF
1000	OFF	OFF	ON
1100	ON	OFF	ON
1200	OFF	ON	ON
1300	ON	ON	ON

Heat CFM (ES50LVP)

Select required heating CFM.

CFM @ 0.5" WC	SWITCH 1	SWITCH 2	SWITCH 3
300	OFF	OFF	OFF
400	ON	OFF	OFF
500	OFF	ON	OFF
600	ON	ON	OFF
700	OFF	OFF	ON
800	ON	OFF	ON
900	OFF	ON	ON

System (ES990LVP and ES50LVP)

Select required system parameters.

Mode	SWITCH 1	SWITCH 2	SWITCH 3	SWITCH 4
Full Modulation	OFF	OFF	X	X
Step Modulation	ON	OFF	X	X
Single Stage	OFF	ON	X	X
Test Mode (1)	ON	ON	X	X
Normal Fan Cooling (2)	X	X	OFF	X
Dehumidification Fan Cooling (2)	X	X	ON	X
Normal Continuous Fan (3)	X	X	X	OFF
Low Speed Continuous Fan (3)	X	X	X	ON

(1) Test Mode - heat source is brought on, fan runs at HEAT CFM setting and pump runs at full speed irrespective of thermostat setting. Useful for eliminating air in the system during installation.

(2) Normal Fan Cooling runs at rate set by COOL CFM switch.

Dehumidification Fan Cooling runs at 85% of COOL CFM rate for 10 min. and then reverts back to rate set by COOL CFM.

(3) Normal Continuous Fan runs at rate set by HEAT CFM switch.

Low speed Continuous Fan runs at 50% of rate set by HEAT CFM switch.

Cool CFM (ES90LVP)

CFM @ 0.5" WC	SWITCH 1	SWITCH 2	SWITCH 3
600	OFF	OFF	OFF
700	ON	OFF	OFF
800	OFF	ON	OFF
900	ON	ON	OFF
1000	OFF	OFF	ON
1100	ON	OFF	ON
1200	OFF	ON	ON
1300	ON	ON	ON

Cool CFM (ES50LVP)

CFM @ 0.5" WC	SWITCH 1	SWITCH 2	SWITCH 3
300	OFF	OFF	OFF
400	ON	OFF	OFF
500	OFF	ON	OFF
600	ON	ON	OFF
700	OFF	OFF	ON
800	ON	OFF	ON
900	OFF	ON	ON

SEQUENCE OF OPERATION

Full Modulation

Heating Mode – (**ecosmart** outdoor sensor installed)

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 to HEAT CFM speed
- **ecosmart** control automatically adjusts fan and pump speeds to meet the outdoor temperature conditions

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
-

Step Modulation

Heating Mode – (**ecosmart** outdoor sensor not installed)

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 to HEAT CFM speed
- **ecosmart** goes through three steps:
 - 50% of HEAT CFM setting for 5 minutes – pump LO
 - 75% of HEAT CFM for 5 minutes – pump MID
 - 100% of HEAT CFM until thermostat is satisfied – pump 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
-

Basic Modulation Mode

Heating Mode – (**ecosmart** outdoor sensor not installed)

Thermostat calls for heat

- 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 HEAT CFM speed

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
-

Cooling Mode (Modulation, Step and Basic)

(**ecosmart** outdoor sensor not installed)

(Assumes a condenser and DX coil is installed within the system)

- R is connected to Y or Y2*
- Condenser turns on
- Fan ramps up to COOL CFM 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 CFM switch
 - ON - fan runs at 85% of COOL CFM rate for 10 min. and then reverts back to rate set by COOL CFM
-

Fan Mode

- R is connected to G
- If fan is set to “ON” on thermostat, fan runs as follows:
 - If SYSTEM switch 4 is OFF, fan runs at selected HEAT CFM rate
 - If SYSTEM switch 4 is ON, fan runs at 50% of selected HEAT CFM rate
- If fan is set to “OFF” on thermostat, fan runs at HEAT or COOL CFM settings

Constant Low Fan Circulation

Fan may be run at a low rate using system switch 4 as follows:

- OFF – fan runs at rate set by HEAT CFM switch
 - ON – fan runs at 50% of rate set by HEAT CFM switch
-

Freeze Protection

The **ecosmart** is equipped with a 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.

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 to meet 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 40F 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.

Control and Blower Assembly Removal

1. **Turn off main power.**
2. Disconnect power, thermostat and any other miscellaneous wiring from the control board and remove them from the control casing.

3. On the bottom side of the upper cover, disconnect the supply air temperature sensor by sliding out the rubber grommet.
4. Gently pull out the black wire until a white connector is revealed.
5. Unplug the white connector noting that there is a polarizing/locking feature when re-assembling.
6. Remove (Qty. 2) ¼-20 bolts, lockwashers and flat washers holding the control and blower assembly to the centre plate.
7. Slide out assembly.
8. Re-assemble in the reverse order.

TROUBLESHOOTING

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.

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. An expansion tank may be required.

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.
- Supply water temperature set too low or heat generator is not supplying water at the specified setting.
- 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.

Fan continues to run in cooling mode when thermostat is satisfied

The condenser shuts off but the **ecosmart** fan continues to run. This is often caused by older thermostats that have built-in heat anticipators. When cooling, the heat anticipator, in parallel with the thermostat contacts, allows a small current to flow to the **ecosmart** control board, keeping the fan on. The contactor in the condenser shuts off because it requires more current to stay on. Solution: replace with a modern thermostat which has no heat anticipator.

Heating during standby mode

Probable cause is thermal siphoning.

WARRANTY

Warranty is 3 years' parts. Visit ecosmartair.com/warranty.htm for full details.