Design and Installation Instructions

Silent Duct™
hot water air handler
and duct distribution system

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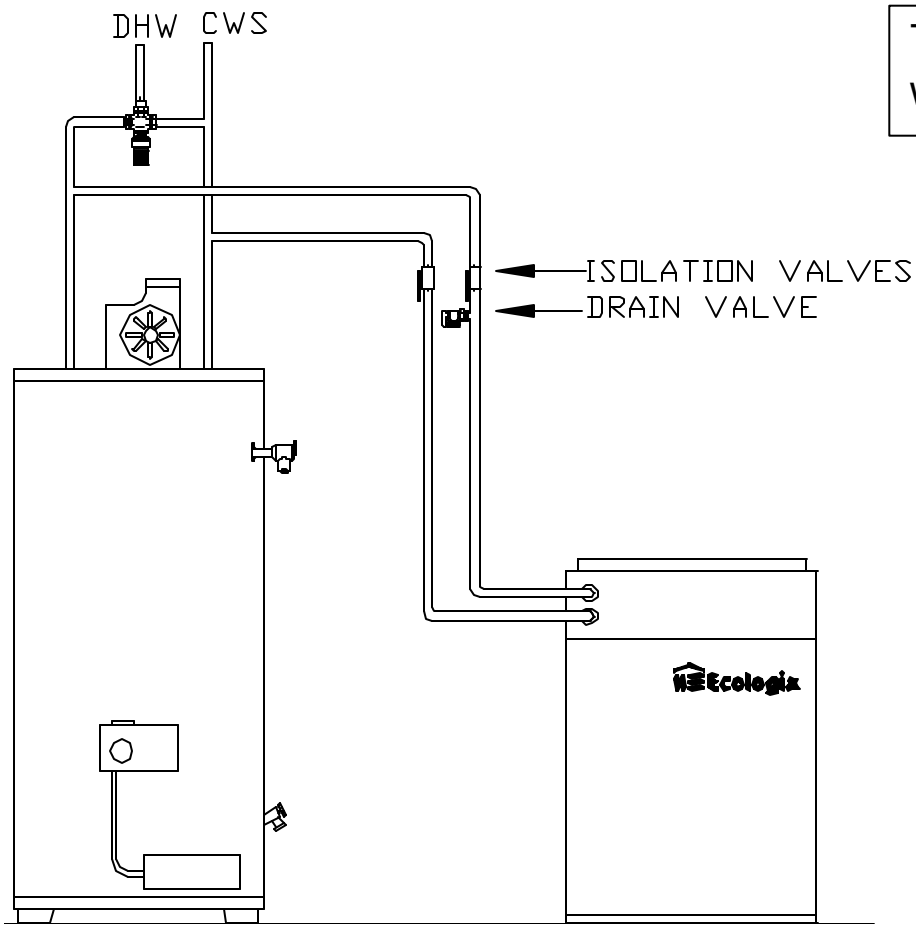
TYPICAL PLUMBING CONNECTIONS

Tank Type Water Heater with Air Handler



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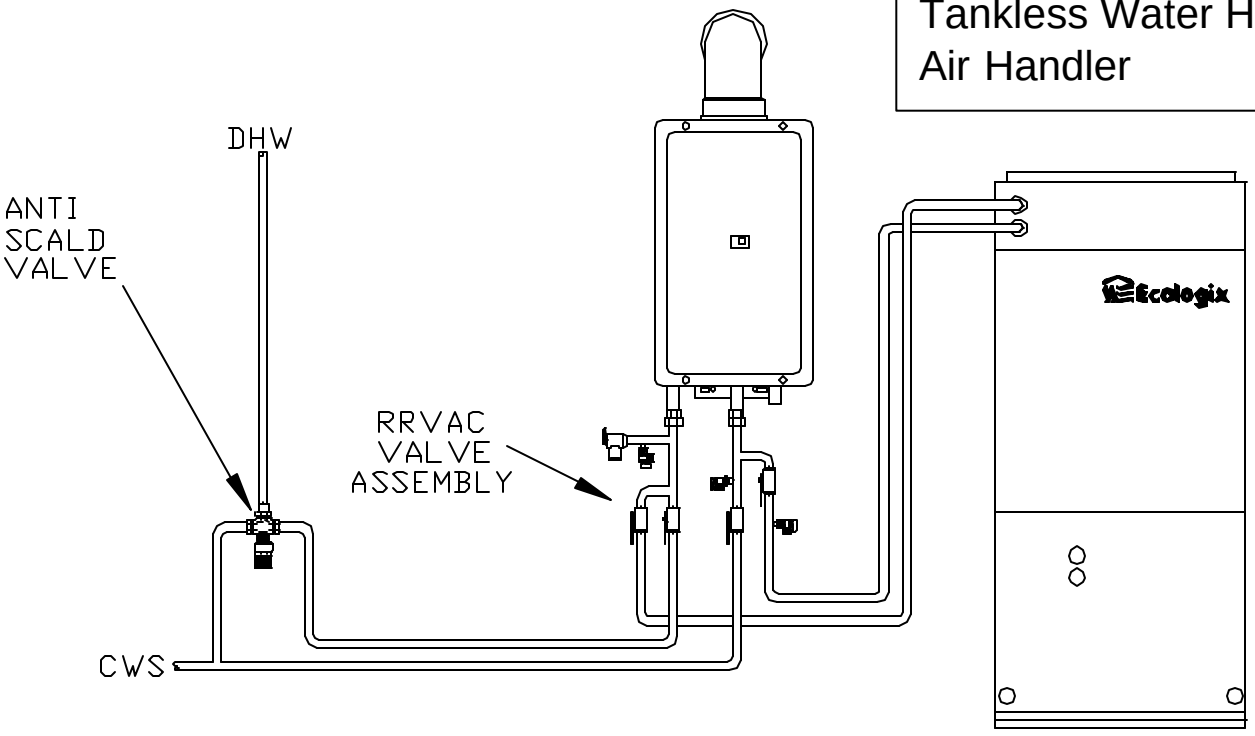
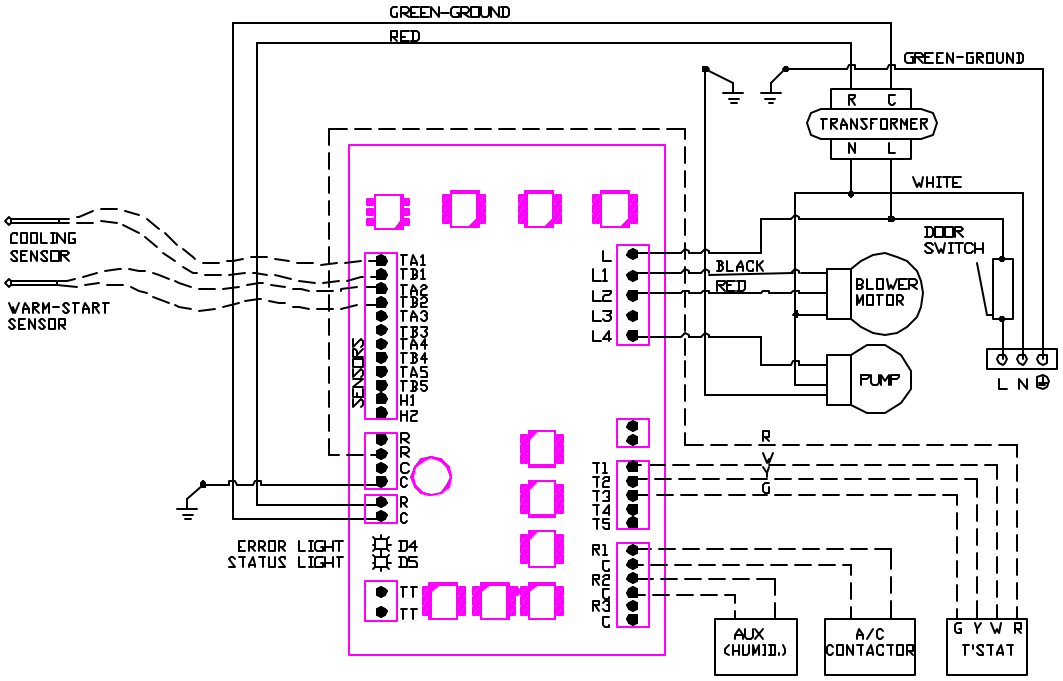


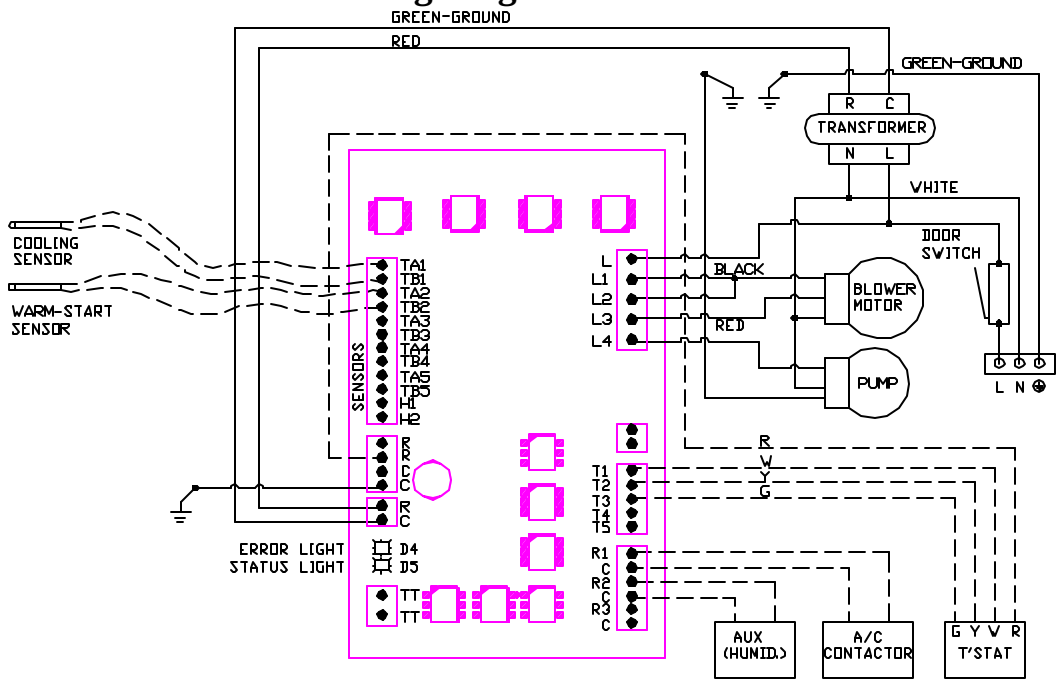
ELECTRICAL WIRING DIAGRAMS

Wiring Diagram for A3-05 and C3-06



PART# XELK501
DASHED LINES INDICATE FIELD INSTALLED WIRING

Wiring Diagram for C3-22



FOR HIGH MOTOR CURRENT APPLICATIONS, CONTROL MARKED WITH BLUE DOT (XELK512)
DASHED LINES INDICATE FIELD INSTALLED WIRING

EQUIPMENT SPECIFICATIONS AND SIZING TABLES

TABLE 1-AIR HANDLER SELECTION

Model	SD-12	SD-18	SD-24	SD-30	SD-36	SD-42	SD-48	SD-60
Minimum number of 3" outlets	8	12	15	18	22	26	30	36
Heating Capacity(Btu/h)@130ºF	15,000	21,000	35,000	41,000	46,000	49,000	52,000	58.000
Heating Capacity(Btu/h)@140ºF	18,000	25,000	41,000	48,000	54,000	57,000	61,000	67,000
Heating Capacity(Btu/h)@160ºF	25,000	33,000	53,000	62,000	69,000	74,000	78,000	86,000
Heating Capacity(Btu/h)@180ºF	30,000	40,000	65,000	76,000	85,000	91,000	96,000	105,000
Air flow rate at high speed(cfm)	360	540	720	900	1080	1260	1440	1800
Cooling Capacity(Tons)	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0
Blower Motor Full Load (Amps)	3.4	3.4	4.9	4.9	7.3	10	10	10
Circulator Full Load(Amps)	0.6	0.6	0.8	0.8	0.8	1.0	1.0	1.0
Cabinet Width	14"	14"	22"	22"	22"	22"	22"	22"
Cabinet Depth	20"	20"	22"	22"	22"	22"	22"	22"
Cabinet Height	24"	24"	31.5"	31.5"	31.5"	31.5"	31.5"	31.5"
Supply and Return air	12"x16"	12"x16	20"x20"	20"x20"	20"x20"	20"x20"	20"x20"	20"x20"
Supply and Return Water Connections	½"	½"	¾"	¾"	¾"	¾"	¾"	¾"
Weight-air handler only(pounds)	70	70	100	100	100	110	110	110

Heating capacity based on 70ºFreturn air, high speed, 20ºFwater temperature drop through the coil and 12.5 feet length per branch at 3" diameter

TABLE 2- SUPPLY MAIN DUCT SIZING

Main Size (inches)	Maximum Main Length							
	25	50	75	100	150	200	300	400
	Number of Branches							
4	2	2	1	1	0	0	0	0
5	5	3	2	2	1	1	1	0
6	7	5	4	3	2	2	1	1
7	10	8	6	5	4	3	2	1
8	13	12	9	7	5	4	3	3
9	16	15	13	9	8	6	5	4
10	20	20	18	13	10	8	7	5
12	28	30	26	22	18	14	10	8
14	38	40	38	34	28	20	16	12
16	50	50	50	50	40	32	25	20
18	60	65	65	65	50	40	36	30

TABLE 3

BRANCH DUCT EQUIVALENTS

Equivalent Length (ft)	Flex Duct Length (ft)	Rigid Duct Length (ft)	Total Duct Length (ft)
12.5	12.5	0	12.5
12.5	9	6	15
12.5	6	12	18
12.5	3	18	21
12.5	0	24	24

TABLE 4

EQUIVALENT LENGTHS FOR BENDS IN FLEX DUCT

Bend Radius	90?	180?
12”	0	0
8”	0	3’
4”	3’	6’
< 4”	N.R.	N.R.

TABLE 5

FACTOR MULTIPLIERS

Total Branch Length	Multiplier (duct in conditioned space)	Multiplier (duct in or adjacent to un-conditioned space)
6 feet	1.25	1
12.5 feet	1	0.8
15 feet	0.8	0.6
20 feet	0.6	0.5
25 feet	0.5	0.4
>25 feet	N.R.	N.R.

TABLE 6

EQUIVALENT LENGTHS FOR BENDS IN MAIN DUCTS

Round Duct Size	3 Section 90? elbow	5 Section 90? elbow
3”	6’	4’
4”	8’	6’
5”	10’	8’
6”	12’	10’.
7”	14’	12’
8”	16’	14’
10”	20’	16’
12”	24’	20’
14”	28’	24’

Steps for sizing and selection

Proper sizing of system components is crucial for proper operation. Detailed equipment sizing and selection is summarized on page 12 of this manual. Please ensure that these guidelines are thoroughly followed.

1. Obtain room by room heat loss and/or heat gain.
2. Determine heating loop supply temperature, and select air handler using table 1.
3. Sketch supply main duct layout. Use table 4 and estimated branch (from supply main to distribution boot) length from sketch to determine capacity multipliers. Use the longest branch for each room to determine capacity multiplier from table 5 Complete Silent Duct Sizing Form
4. Locate outlets for each room and sketch branch runs using flex duct, rigid duct or a combination.
5. Determine supply main duct length. Add equivalent lengths for supply main elbows(table 6). Size supply mains using total duct length as per Table 2
6. Size return air ductwork for a total pressure drop of 0.15”w.c.
7. Assemble equipment list.

SIZING FORM

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Silent Duct Sizing Form

		Air Handler Section:		Water Supply temperature=			
Total Heat loss =	btu/hr	Model:		Heating Cap:		Hfactor	
Total Heat Gain =	Tons	Outlets:		Cooling Cap:		Cfactor	
		(M)	(HL)	(Oh)	(HG)	(Oc)	(Ot)
Room	Total Branch Duct Length	Factor Multiplier	Heat Loss	Outlets (heating)	Heat Gain	outlets (cooling)	Outlets selected
Total							

Notes:
(M) = Capacity Multiplier Table 4

Formulas==>
Oh = HL/ (Hfactor * M)
Oc = CL / (Cf actor * M)

Cf = cooling capacity / # outlets
Hf = Heating cap./#outlets

INTRODUCTION

The **Silent Duct**ä air system is designed for use in hydronic (boiler) systems or combination space and water heating systems (Combo Systems). Combo heating systems use the home's water heater to provide both the space heating and domestic hot water, eliminating the need for a furnace. The equipment can be configured for heating only, heating and cooling or cooling only applications.

The **Silent Duct**ä duct system is much smaller than conventional ducting making it ideal for retrofit applications or where a conventional duct system would result in unsightly bulkheads and wasted space.

When used as the warm air distributor of a boiler heating system the **Silent Duct**ä air system can provide warmer more comfortable air temperature than a gas furnace with less noise and much smaller duct requirements. This is ideal for large custom homes where a premium heating product is required that is quiet, comfortable and out of site.

HOW IT WORKS

The key to the **Silent Duct**ä system is the level of comfort provided by the unique control system.

Cooling

Cool Start is a feature that allows the blower to run quietly until the A/C condenser is up to capacity. As the cooling effect is increased, the optional *cooling* ***sensor*** will make the blower's speed automatically adjust to suit the load. The fan will continuously modulate in cooling mode to help dehumidify the air in order to approach a relative humidity in the living space within an optimum range for occupant comfort. Blower modulation is only for proper dehumidification; the control does not change the output of the air conditioning compressor or the total cooling effect.

A/C Guard

A/C Guard is a feature that helps reduce wear and tear of the A/C compressor from hard starts and freezing up.

Condenser Freeze Protection

If the evaporator coil air temperature drops outside of the expected operating range this indicates a potential evaporator coil freeze condition. The ***A/C guard*** will respond by shutting off the outdoor cooling unit to allow the system to warm up. Note that this freeze condition is not normal and may indicate blocked ducts, dirty filter or an over-sized cooling unit. The error light on the controller will flash a slow amber (one second on, one second off) when the freeze protection is activated.

Hard Start Protection

To protect the A/C compressor from starting into a load from thermostat bouncing or brief power failures, ***A/C guard*** invokes a delay until the compressor can safely start. This means that the cooling unit will not run on initial power-up. Instead, the blower will run on low speed until the ***A/C Guard*** has allowed the compressor time for a no-load start. The error light on the controller will flash a slow amber (one second on, one second off) to indicate this process.

Heating

The objective of the heating strategy is to run the blower as quietly as possible in order to provide good air circulation at a low noise level. The fan automatically and gradually switches between speeds in order to heat the space at an optimum level. From time to time the blower will shut off to prevent over heating or at times when other internal heat sources are operating i.e. fireplaces.

The pump speed also changes with the heating load in order to maintain the ideal water temperature drop through the heating coil. This is extremely important for combo heating systems that use a tank type water heater as its engine. A controlled temperature drop improves the domestic hot water availability of the water heater. This temperature drop is also ideal for Hydronic systems that incorporate boilers.

On the initial call for heat, the fan and pump ramp up to medium-high speed. The air handler will track the heatloss of the space, shifting speeds up or down as necessary. *Note: Some times the technician is taken by surprise when he disconnects the thermostat. The unit appears to run-on without a call for heat. This is normal and will not exceed 15 minutes.*

Warm Start is a feature that allows the blower to run quietly until the ductwork is flooded with warm air. If the optional ***warm start sensor*** is in place, the blower's speed is automatically reduced until the ductwork is warm. This eliminates the period of room-temperature air creating uncomfortable drafts on each start up.

Coil Freeze Protection

This feature helps reduce the risk of the hot water coil failing due to freezing. Any of the air sensors in the air handler will activate the heat to prevent the coil from freezing. The error light on the controller will flash a slow red (one second on, one second off) to indicate the ***Coil Freeze Protection*** is in progress. This feature helps reduce the risk of coil freezing for applications when an air handler is in an unconditioned space like an attic or crawl space. This also can reduce the risk of freezing due to attached equipment failing. For example; A/C compressor contactors welding closed and causing a run on condition or an HRV or fresh air intake dumping freezing air into the ductwork.

Homesafe is a feature that is an extension of the ***Coil Freeze Protection***. The C***oil Freeze Protection*** mode will help maintain the temperature in the home above freezing until the problem is corrected. This feature helps reduce the risk of freezing pipes in the home if the thermostat were to fail or was turned off. This feature can be used to maintain a temperature of the home at a level just above freezing (lower than most room

thermostats). This can be ideal for recreational properties; however, precautions to mitigate freezing risk must be taken in the event there is equipment failure, open windows or power failure.

Continuous Fan

When the thermostat fan switch is set to continuous fan, the fan will run at low speed. When there is a call for heating or cooling, the normal heating or cooling speed will over-ride the continuous fan setting. Once the thermostat is satisfied, continuous fan speed will resume.

Error Light Codes

The Error light (LED) is beside the Status light located on the controller next to the R and C connections and is labeled D4. More than one error may occur, however, the codes are prioritized to flash the error with the greatest importance/priority. Fast flash has a period of 1 second with the light on for ½ second and off for ½ second. Slow flash has a period of 2 seconds with the light being on for 1 second and off for 1 second.

D4 LED **Error Codes**		
Priority	Pattern	Error
1	Solid red	Sanity Failure
2	Solid green	50 Hz Line frequency detected
3	Solid amber	
4	Slow red	Hot water Coil Freeze Protection activated, Heating mode on
5	Slow green	Room thermostat error; calls for heating and cooling at same time
6	Slow amber	A/C guard (A/C compressor lock-out) timer count down 5 minutes
7	Fast red	Warm Start Sensor or Cooling Sensor out of range or disconnected
8	Fast green	Humidity Sensor out of range or disconnected

Status Light Codes

The Status light (LED) is located on the controller next to the Error light above the T,T connections and is labeled D5. The codes are prioritized to flash the call with the greatest importance/priority. Fast flash has a period of 1 second with the light on for ½ second and light off for ½ second. Slow flash has a period of 2 seconds with the light being on for 1 second and off for 1 second.

D5 LED **Status Codes**		
Priority	Pattern	Status
1	Solid red	For 10 seconds on power up indicates a test mode.
2	Solid green	IrDA communications
3	Solid amber	Not used
4	Slow red	Call for heat interpreted from thermostat at terminal T1 (W)
5	Slow green	Call for cooling interpreted from thermostat at terminal T2 (Y)
6	Slow amber	Heating off cycle (for 15 minutes after call for heat is satisfied)
7	Fast red	Call for continuous blower interpreted from thermostat at T3 (G)
8	Fast green	Stand by (no calls)

PRODUCT DESCRIPTION

Cabinet

All cabinets have a tough, durable low maintenance pre-painted finish.

The air handler can be floor mounted or hung from straps. Hanging straps can be attached at all corners, using existing screws in existing locations without fear of damaging internal components.

Cabinet dimensions are designed to provide maximum installation flexibility. Refer to installation requirements for more details.

Heating coils

All heating coils are potable water grade copper suitable for use in plumbing systems. No lead solder is used in any component construction. All coils and internal piping conform to ASTM B68 or ASTM B88 standards.

High-density aluminum fins provide maximum heat transfer for small coil surface.

Fan

All fans are wide body dynamically balanced for extra quiet operation.

Multi-directional sleeve bearing motors allow mounting in any direction for maximum installation flexibility.

Circulating pump

The circulating pump is matched for maximum performance. Air handlers come with internally mounted pumps for ease of installation. Air handlers can be special ordered with external, field installed pumps, when it is desirable to locate the circulator below the air handler, such as in attic installations.

Check valve

Check valves serve two purposes:

- protect against back-flow of water to avoid short circuiting around the water heater during domestic water use.
- protect against thermal siphoning.

Thermal siphoning is flow of water through the space heating circuit while the circulating pump is not operating due to hot water rising by natural convection. During summer months this will cause overheating, interfere with air conditioning and waste energy.
All **Ecologix** air systems come supplied with spring loaded, vertical lift check valves. These check-valves have been tested and proven to resist thermal siphoning for installations where the air handler elevation does not exceed the distance above the water heater shown in the table below.

Check Valves

valve size	Maximum elevation
1/2”(12mm)	25 feet(8 metres)
3/4”(20mm)	50 feet(15 metres)

Water Heater

Any properly sized gas, propane or oil fired water heater will work in a combo heating system. Make sure the water heater being used is approved for combo applications. (Most manufacturers' heaters are approved.) Tank-less water heaters may reduce the capacity of air handlers due to the higher internal pressure drop. (Call Ecologix for details)

Boiler

All **Ecologix** air systems are compatible for use with boilers. Standard drawings are available from Ecologix for most boiler applications.

EQUIPMENT SELECTION AND SIZING

Proper sizing of system components is crucial for proper operation. Photocopy or pull out the blank sizing sheet on page 6 for easy reference.Contact Ecologix to have calculations prepared for you

Heat loss

Make sure a proper room-by-room heat loss and heat gain for the dwelling is calculated using HRAI, ASHRAE or other approved sizing method.

Air handler selection

Select the desired air system that will meet 100%-140% of the heating load and 80%-120% of the cooling load.

If using a boiler system, select a boiler that has an output that meets or exceeds the heat loss of the space being heated. If the boiler is meeting additional loads, size the boiler to meet the total combined load.

For combo heating systems, use an approved sizing method such as the Unified Combo Guidelines published by HRAI.

In areas where the UCG or a local sizing code is not applicable, use the following method for sizing combo systems:

1.Select an air handler that meets or exceeds the calculated heat loss at the water heater operating temperature (130F/55C or 140F/60C).
Select a water heater with an output that is at least 120% of the heat loss

Heating Factor – Cooling Factor

From the air handler performance tables determine the heating capacity at the inlet water conditions. Divide the heating capacity by the number of branches. This number is the Heating capacity per outlet or heating factor (Hf).

H_{factor} = Heating output/ # of branches

Calculate the number of branches per room for each room in the house using:

#outlets= H_{room} / H_{factor}
where:
H_{factor} = heating factor
H_{room} = heat loss per room

For cooling loads use the same procedure as for heating except using the C_{factor} Where:

C_{factor} = cooling capacity/ # branches

Capacity multiplier

Capacity multipliers can be determined by estimating the longest total branch duct length. Use table 5 and total branch duct length to select capacity multiplier.

Outlet selection

The minimum number of grilles in Table 1 is the minimum number of grilles required to meet the rated capacities listed in Table 1. The number of branches selected shall not be less than this minimum.

For optimum performance it is recommended to exceed the minimum number required by 30% but not more than 100%. Adhering to this guideline will ensure quiet operation.

If a partial branch is required, round up to the next whole number.

All branches are 3" diameter. Standard branch lengths are 12.5 feet.
For runs longer than 12.5 feet, 3" rigid duct may be used to increase actual allowable branch lengths. Substitute some of flex duct with 2 times the amount of rigid. (See Table 3, Silent Duct Reference Tables)

All bends in flex ducting should be long radius. Adjustments in total branch length must be made when there are tight bends in flex ducting. Each Branch run must total 12.5 equivalent feet. (See Table 3 and Table 4, Silent Duct Reference Tables)

Duct lengths less than 6 feet are not recommended. For branch lengths of 6 to 12 feet, at least ½ of the branch length should be flexible duct for sound attenuation purposes. For lengths over 12 feet, the entire branch can be rigid duct if preferred.

Duct layout

Supply air Plenum

Provide an acoustically insulated supply air plenum that is the same dimensions as the outlet flanges of the air handler and at least 36 inches long.

A smooth, square-to-round transition may be used in place of the supply air plenum for horizontal installations where there is only one supply main.

For vertical applications where the air conditioning coil is installed in the supply air plenum, the cooling coil must be supported at least 4 inches above the heating coil face on brackets or channel to ensure unimpeded airflow through the heating coil.

Plenum takeoffs may be mounted on the end of the plenum or the sides of the plenum, but not both. Spin in collars or transition takeoffs may be used, but not both.

When using side plenum takeoffs, the longest supply main must be connected to the side takeoff that is farthest from the air handler.

Supply mains

Plan duct layout to avoid branch runs in outside walls or attics and to minimize the length of the main duct
Size the main duct in accordance with Table 2 (page 8) of the Silent Duct Reference Tables. Please note that main size is dependant on total duct length.

Where practical, provide parallel main ducts to various floors or zones rather than running a single larger duct with tees. For applications with 3 or more floors or any application where a large seasonal adjustment in airflow is

anticipated, parallel main supply ducts must be used. Volume dampers in each of the main supply ducts must be installed and must be accessible for seasonal adjustments. For example; a 4-story town house will probably require vastly different air flow rates for the upper floors between cooling and heating seasons. If there are two main supply trunks, the supply trunk serving the upper 2 floors can be damped down in the heating season to better balance the air flows.

When determining the maximum length for sizing purposes, each main that has an independent take off from the supply air plenum can be sized independently.

Supply mains may be round duct or square with equivalent area.

Round duct can be spiral duct, welded or snap lock seams.

Rectangular duct must be at least 26 gauge for all dimensions. The aspect ratio for square ducts (wide dimension over short dimension) shall not exceed 2.5 to1.

Acceptable fittings (supply mains)

All round duct elbows shall be standard radius or long radius. Round duct tee connections shall use a reducing tee, wye, or reducing tee-wye connectors. Bullhead tees may be used ONLY if:

- The main length is at least 20' less than the maximum (Table 2)
- The tee is not a reducing tee
- The reducing transition to each branch is at least 1 foot downstream of the tee
- The largest air stream is no more than twice the smaller air stream.
- There are no more than 8 Branches in total downstream of the tee.

Square duct elbows must be radius elbows or have turning vanes.
Square duct Tees must be reducing tees for both downstream branches. Bullhead tees are acceptable in square duct mains provided both main branches have turning vanes.

For difficult configurations, it is acceptable to transition from round to square and back to round duct, provided all transitions are tapered smooth fittings to minimize transition loss.

Branches and grilles

Use only the approved saddles; flex duct; boots and grilles provided with the duct kit. This is a pre-engineered system that may not work with other configurations of fittings. Consult Ecologix for substitutions.

In determining the lengths and location of flexible and rigid portions of the branch duct it must be noted that:

- ALL vertical portions of branch connections to high wall grilles must be rigid duct.
- Flexible duct may be used in horizontal portions of the branch ONLY.

Silent Duct™ grilles provide a turbulent high velocity directional air jet rather than a diffused air pattern typical of most conventional grilles. Care must be taken to avoid areas where the air stream may impinge on a stationary person or may strike a desk or table that will deflect the air stream at a stationary person.

High wall grilles (over 7 feet from the floor) are preferred to ceiling or floor grilles. Ceiling grilles are preferred to floor outlets because they are much less likely to be obstructed by furniture. Avoid high traffic areas.
It is preferable but not necessary to put outlets near outside walls. Where possible, high wall grilles should be located so that the air stream sweeps an outside wall (on an interior wall within 4 feet of an outside wall) or is aimed toward an outside wall.

High wall grilles on interior walls facing outside walls should be within 15 feet of the outside wall. The optimum distance from an outside wall to provide coverage but not induce unwanted drafts would be 6 to 12 feet.

Return air duct

The return air duct or drop must be acoustically insulated for at least 6 feet nearest the air handler. The return air duct should be sized for a total pressure drop of 0.15”w.c. Using conventional sizing methods and installed in accordance with HRAI guidelines or equal.

Equipment list

The equipment list can be quickly assembled based on the layout. Count the number of branches to determine if extra branch run kits are needed.

INSTALLATION

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

Detailed instructions are shipped with all accessory items and should be followed in detail.

Air handler mounting

The **Ecologix** air handler can be installed in any direction. Its compact dimensions even allows for installation between joists. Some precautions must be observed for some of the possible mounting positions.

For installations where the access door faces up or down, select an air handler with an external pump to avoid the pump being mounted with its shaft vertical. The pump shaft must be mounted horizontally to avoid premature failure.

The air handler can be hung by securing straps through any of the existing screw holes in the cabinet. When the existing screw is too short for securing a mounting strap, a longer screw can be used provided care is taken not to damage any internal components. When fastening straps using screws other than those supplied with the cabinet, special care should be taken in the vicinity of the coil to avoid tube puncture.

The cabinet is designed so that the return air can be located on either side of the cabinet, through the bottom of the cabinet, or from the back. Position the filter rack so that the filter is readily accessible.

Install the air handler with the door firmly screwed in place to make sure the cabinet remains square.

Provide at least 2 feet (0.75 metres) of service clearance in front of the access panel of the air handler. Zero clearance is acceptable on all other faces.

Ductwork (general)

Ductwork installed in unheated spaces such as attics must be installed between the insulation and the heated space. Provide at least R-12 of insulation above ducts. If cooling is required, the branch and trunk lines must be insulated and sealed with a vapour barrier prior to applying house insulation.

If a fresh air duct is required, make connection to return air plenum at least 18 inches from filter. Insulate all fresh air ducts.

Supply Ductwork

Supply trunks may be square or round. SEAL all joints and seams with metal tape or sealing compound. Volume dampers for each of the main supply trunks must be accessible for balancing. (Near the supply plenum is preferred)

Locate outlets at least 6 inches from outside walls or window coverings.

One 25 ft length of flex duct will provide two 12.5ft branches

Trunk saddles and outlets are included with air handler. Extra branch kits may be ordered separately. Use only the approved flex duct with branch kits. Do not make substitutes.

All vertical portions of branch connections (such as to high wall grilles) must be rigid duct. Flexible duct may be used in horizontal portions of the branch ONLY.

Return Ductwork

Return air plenum should be the same cross sectional area as the air handler return air opening. In vertical installations, a conventional return air drop and elbow is acceptable. The return duct /drop must be acoustically lined for 6 feet nearest the air handler.

Risk of Freezing

Steps must be taken to prevent the hot water coil from freezing. Coils that have failed due to freezing and damage caused by frozen coils are not covered under warranty.

HRV and Fresh air connections

Fresh air and HRV connections to ductwork can pose a risk of dumping cold air into ductwork during periods of stand-by or continuous run. Calculate mixed air stream temperatures and provide interlock controls to prevent freezing conditions.

Evaporator coils

Evaporator cooling coils that are mounted above the hot water coil pose a risk to the hot water coil in the event that the compressor contactor on the condenser sticks in the on position. When the call for cooling is satisfied, the blower will stop running and allow cold air from the evaporator coil to fall on to the hot water coil. An optional freeze protection kit is available from Ecologix that mounts between the coils. If the sensor detects a near freezing condition it will close the R and W contact, which will bring on the pump and blower until it warms up. (See catalogue No. CP-FPK) The Freeze Protection Kit cannot protect an air handler if the power to the air handler has been disconnected.

Attic and crawl spaces

Air handlers may be located in areas subject to freezing conditions. It is necessary to protect the hot water coil from freezing. The optional Freeze protection kit (Catalogue No. CP-FPK) can be used to cycle on the pump and blower when conditions get close to freezing. The Freeze Protection Kit cannot protect piping that passes through unconditioned spaces.

ELECTRICAL

Warning! - Make sure unit is properly grounded. Locate air handler on a separate electric circuit, or, if a power vented water heater is used, use the same circuit as the water heater.

All air handlers operate on 115VAC/1ph/60hz line voltage. All control circuits are 24 VAC.

Thermostat

The **combo-pac**® air handlers are compatible with most standard heat/cool, heat pump, “electric heat”, “gas heat”, set-back or electronic thermostat. Some electronic thermostats (primarily “power robbing” types) require the addition of a resistor between the W & C terminals and the Y & C terminals. This is usually covered in the thermostat instruction manual. A 1,000 ohm, 5 watt resistor on each of the W and Y terminals will usually be enough to drain the current required to power the thermostat. Some thermostats will need 250 ohm, 10 watt resistors on each of the W and Y terminals.

Heat Anticipator Setting

For optimum comfort the anticipator setting should be set to provide approximately 4 cycles per hour

Typical Heat Anticipator Setting	**0.25 amps**

Thermostat wire from the thermostat is connected to screw terminals located on the control board inside the air handler.

The thermostat should be connected as follows:

(R) – power (24vac)
T1 (W) – heating
T2 (Y)– cooling (if present)
T3 (G) – continuous run fan (if present on thermostat)

Sensors

Cooling Sensor

The cooling senor is not polarity sensitive and is connected to TA1 And TB1. For proper cooling operation, the sensor must be installed in the airflow downstream of the cooling coil. It should not physically touch the coil. The cooling sensor comes from the factory mounted in the air handler ready for use with upstream (return) cooling coils. If the cooling coil is to be mounted on the supply side of the air handler, the sensor must be relocated.

Note: Failing to relocate the cooling sensor will result in the A/C evaporator coil freezing up.

The cooling sensor can easily be routed along the outside of the cabinet to a position downstream from the cooling coil. Drill a small hole in the duct and push enough of the wire into the duct so that the sensor is at least 1/3 of the way in to the duct. Secure the sensor and test the operation of the cooling system (weather permitting).

Warm Start Sensor

The optional *warm start senor* is not polarity sensitive and is connected to TA2 And TB2. For proper operation, sensor must be installed in the airflow downstream of the hot water coil. It should not physically touch the coil.

Recommendation: For installations that do not have cooling, the supplied *cooling sensor* should be switched to be a *warm start sensor*. Relocated the sensor to downstream of the hot water coil and change the connection points on the controller to TA2 and TB2.

Sensors can be checked with an Ohm-meter by disconnecting the sensors from the controller and measuring the resistance at the bare leads. Refer to the table: Resistance Vs. Temperature.

Resistance Vs. Temperature

K-Ohms	°C	°F
31.8	0	32
24.8	5	41
19.5	10	50
15.5	15	59
12.4	20	68
10.0	25	77
8.12	30	86
6.63	35	95
5.46	40	104
4.51	45	113
3.76	50	122
3.15	55	131
2.65	60	140

A/C Condensing Unit

To take advantage of *A/C Guard* (freeze protection and the hard start protection features), connect the wires from the A/C condenser contactor to the terminals labeled R1 and C. Alternatively the A/C condenser contactor can be connected to T2 (Y) and C to bypass or disable the *A/C Guard*.
Note: There is a 5-minute delay before the cooling compressor starts on initial start up.
For the purpose of testing, the A/C Guard timer can be momentarily disabled by applying 24 VAC to the terminal labeled T4. If the error LED is flashing a slow amber indicating the *A/C guard* timeout, use a short piece of wire to momentarily jumper between R and T4. The compressor will start immediately and the error light will resort to the next level of code

START-UP PROCEDURES

Do not start the air handler or water heater until ALL air has been purged!

1.Fill the boiler loop or water heater with water, but do not start it.

2.Purge all air from the boiler heating or domestic water system.

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 boiler or water heater according to the manufacturer's instructions. Set the design water temperature and wait for the system to shut off. You can check that the water heater is set properly during the warm up by running a small amount of water into a glass in a sink while the water heater is warming up. Using a thermometer measure the temperature of the water as soon as the water heater burner shuts off. If the set-point temperature is too low or is above 140F, reset the tank control, run water until the burner starts again and repeat the measurement.

5.Turn on the power to the air handler and set the room thermostat for heat to energize the fan and pump. If a gurgling sound is present, it should subside within one minute. If noise is still present after one minute, repeat step 3 to purge air as necessary.

6.Check pipes for heating to make sure there is flow and feel the pump motor to see if it is running hot.

SERVICE AND MAINTENANCE

Filter

The Ecologix air handler is provided with a reusable washable filter media. This filter should be inspected monthly and removed and vacuumed or rinsed as required. Use water only to clean the filter. The filter is designed to last for many years, but replacements can be purchased from any hardware store and cut to fit the filter rack. Pre-cut replacement filters and pleated paper filters are available from Ecologix.

Duct cleaning

If proper filter maintenance is adhered to, duct cleaning will not be required for the life of the equipment.

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 heating coil. The fan may need to be removed to gain access to the face of the heating coil.

Air conditioning coil

At the start of each cooling season, check the drain connection to the cooling coil to ensure it is free of debris. An easy way to do this is to blow into the tube to see if there is any obstruction. If a plugged air conditioning coil is suspected, call a service technician for testing and cleaning

Fan and motor

Oil the fan motor bearings every twelve months. (two oil ports total; only one drop of oil in each port)

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 the capacity and efficiency of the heating system. Take care to avoid wetting the motor! Remove the motor if required.

Pump

The circulating pump is water lubricated and should require no regular maintenance. The system control has a cycle timer to exercise the pump even during prolonged periods of no heat to avoid seizing from long idle periods.

TROUBLESHOOTING

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. For Grundfos pumps, remove the screw-on cover from the face of the pump, and rotate the shaft one turn with a slotted screwdriver. If either method fails to free the pump, removal for cleaning or replacement is necessary. The daily pump exerciser will help prevent pump sticking.

Pump is noisy at start-up

Air is present in heating loop. If sound has not diminished within 1 minute, purge air in accordance with the *Start-Up* procedures. If heat source is a water heater, check to make sure branch connections for heating loop are horizontal to prevent the collecting of air in the heating loop.

Water heater T&P is weeping

A check valve or back-flow preventer may have been installed in the system. Some form of pressure relief may be required. Options are:

- Install expansion tank
- Install pressure relief valve; locate outlet over laundry tub or floor drain.
- Install combination toilet tank/pressure relief valve

Insufficient or no heat

- 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 air handler backwards; reverse connections.
- Water heater supply tube (dip tube) is restricted or damaged; check and/or replace.
- Supply water temperature set too low or not calibrated properly; check water temperature. In the case of water heater; If the temperature has been set low because of homeowner preference, it may be necessary to install an anti-scald valve to control the faucet temperature and raise the operating temperature of the water heater.
- Restrictions in heating loop; remove restrictions, check valve stuck, isolation valves too restrictive, left partially closed after purging or closed valve.
- Water heater supply temperature is unstable or air handler goes to domestic hot water priority mode frequently; check water heater setting and temperature sensors for good contact on coil headers.

Cold water at hot faucet

When 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 heating

- Room thermostat may be connected improperly. Refer to *Electrical* section or wiring schematic on door of air handler for proper installation.
- If pump runs but fan does not start check temperature sensor on return header. See LED indications on page 14.

Heating during off cycle

Probable cause is thermal siphoning. See check valve description for details; repair or replace check valve. Check elevation of air handler above water heater to see if motorized valve required for positive shut-off.

AIR HANDLER PARTS & ACCESSORY LIST

Part No.	Description	SD12 SD18 SD24C	SD24H SD30 SD36	SD42	SD48 SD60
UC12163	Hot Water Coil -- 12”x16”	S			
UC18203	Hot Water Coil – 20”x18”		S	S	S
GUP15-42BUC5	Pump- Grundfos 1/2” c/w check	S			
GUP15-42BUC7	Pump-Grundfos 3/4” c/w check		S	S	S
T006B	Pump – Taco 006 1/2” sweat	A			
T008B	Pump – Taco 008 3/4” sweat		A	A	A
xPLC004	Vertical lift check valve 1/2”	A			
xPLC006	Vertical lift check valve 3/4”		A	A	A
xELK501	SRI controller – Version 1	S	S	S	
xELK512	SRI controller – Version 12 “BLUE DOT”	A	A	A	S
xELT501	Air Sensor - Warm Start and Cooling	S	S	S	S
xELT002	Transformer 24VAC, 40 VA	S	S	S	S
xELT003	Transformer 24VAC, 25 VA	A	A	A	A
xELD002	Door interlock switch	S	S	S	S
xELM002	Blower motor -- -1/4 HP	S			
xELM003	Blower motor -- -1/3 HP	A	S		
xELM004	Blower motor -- -1/2 HP			S	
xELM006	Blower motor -- -3/4 HP				S
xELC005	Capacitor 5 MFD	S			
xELC007	Capacitor 7.5 MFD	A	S	S	
xELC015	Capacitor 15 MFD				S
xBLF105T	Blower – 10x5T DD	S			
xBLF108	Blower – 10x8 DD		S	S	
xBLF128T	Blower – 12x8T DD				S
xCA103	Washable Filter – specify size	14x18	22X22	22X22	22X22
PF1418	Pleated filter - 14” x 18”				
PF2222	Pleated filter – 22” x 22”		S	S	S
PME01	External pump module, ½” plumbing c/w check valve	O			
PME02	External pump module, ¾” plumbing c/w check valve		O	O	O
CPVA	Valve Assembly – ¾” full port sweat ball valves plus hose bib for return	O	O	O	O

S=Standard, A=Alternate, O=Option or Accessory