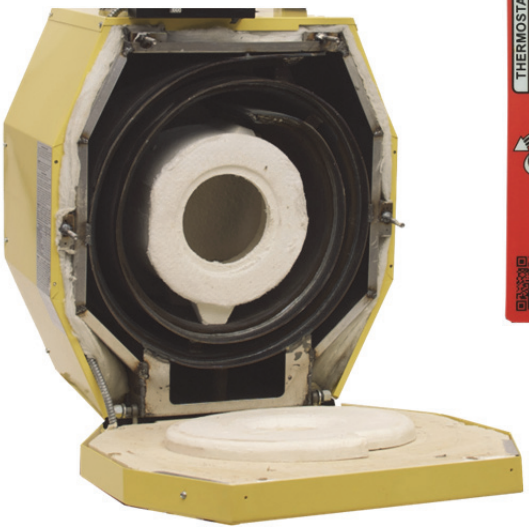

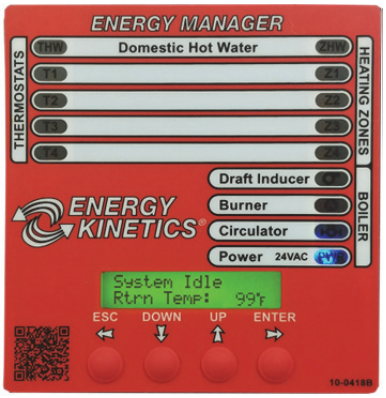

90+RESOLUTE™ BOILER

OWNER AND INSTALLATION MANUAL

OILHEAT and B100 EDITION

LISTED

MH28303
UL 726;
CAN/CSA-B140.7-05
CAN/CSA-B140.0-03
CAN/CSA-B139-M91
Low-Press Boiler

National Board Listed

H

ASME certified by EKI. Certificate plate is under the jacket on the steel vessel.

Manufactured By:

Energy Kinetics, Inc.
51 Molasses Hill Road
Lebanon, NJ 08833
(908) 735-2066
www.energykinetics.com

INSTALLER: **HANG THIS INSTRUCTION MANUAL AND ACCESSORY INSTRUCTIONS VISIBLY NEXT TO THE BOILER USING THE SUPPLIED POUCH.**

HOMEOWNER/USER: **READ AND SAVE THIS INSTRUCTION MANUAL AND ACCESSORY INSTRUCTIONS FOR FUTURE REFERENCE.**

Please Read This First…..

Special Attention Flags
Please pay particular attention to the following flags when you see them throughout this manual.

DANGER: Notifies you of hazards that **WILL** cause severe personal injury, death or substantial property damage.

WARNING: Notifies you of hazards that **CAN** cause severe personal injury, death or substantial property damage.

CAUTION: Notifies you of hazards that **WILL or CAN** cause minor personal injury or property damage.

NOTICE: Notifies you of special instructions on installation, operation, or maintenance that are important, but not normally related to injury or property damage hazards.

WARNING: Retain this manual for use by your qualified service technician only. Should you observe unusual or abnormal operation of the burner or boiler, contact your qualified service technician immediately. Do not attempt to service or repair this product yourself.

WARNING: Have the burner/boiler started up and serviced at least once annually by a qualified service technician. Professional care is necessary to properly service your equipment and verify it is operating reliably. Failure to properly maintain the equipment could result in severe personal injury, death or substantial property damage.

WARNING: You must keep the area around the burner/boiler free from the following. Failure to comply could result in severe personal injury, death or substantial property damage due to potential fire, explosion or equipment damage from corrosive flue products.

- Do not store or use gasoline or other flammable vapors or liquids near or in the same room as the burner.
- Do not use or store laundry products, paint, varnish, thinner or other such chemicals near or in the same room as the burner/boiler. These chemicals cause creation of acids in the burner, heat exchanger and vent system that can cause severe damage.
- Do not store combustible materials near or in the same room as the this boiler or any other combustion appliance.

CAUTION: DO NOT TAMPER WITH THE UNIT OR CONTROLS – CALL YOUR SERVICE PERSONNEL.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury (exposure to hazardous materials) or loss of life. Refer to the user's information manual provided with this boiler. Installation and service must be performed by a qualified installer, service agency or the gas supplier (who must read and follow the supplied instructions before installing, servicing, or removing this boiler. This boiler contains materials that have been identified as carcinogenic, or possibly carcinogenic, to humans).

Homeowner/User: General care and maintenance of your boiler:

☐ Please read through the information provided for you in this manual. Ask your qualified service technician to explain normal operation of your equipment.

☐ Daily inspect the space around the burner/boiler to verify the area is clean and free of the materials listed above.

☐ Monthly watch the operation of your burner/boiler through an operating cycle to verify normal operation. If you notice unusual conditions or equipment behavior, contact your qualified service technician. Follow the instructions on the next page to shut down the burner/boiler while waiting for the technician.

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Inside Back Cover	Warranty Transfer Agreement	Rear Cover	Limited Lifetime Warranty

HOMEOWNER/USER NOTE:

EMERGENCY SHUT DOWN INSTRUCTIONS:

Turn power off to boiler by switching the “Oil Burner Emergency Switch” (typically located at the top of basement stairway or at boiler room entrance) to the OFF position. If unable to locate the “Oil Burner Emergency Switch” then switch the “System Emergency Switch” located at the boiler, on the left hand side of the system junction box located on the top left hand side of the boiler. Shut off oil supply valve.

NOTICE

Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system which has been under water.

IN CASE OF NO HEAT

In case of no heat coming from the boiler, perform the following actions or call a qualified service agency for help.

- Look at the Energy Manager and write down all lights showing on the Energy Manager.
    - Refer to the Energy Manager Operation Summary for the meaning of the lights.
    - Reset the Energy Manager by turning off and back on the System Switch on the left side of the Manager.
- Remove the burner cover and look at the burner primary control display or lights. If the display on a Carlin 70200 Pro-X control indicates Lockout (or on a Beckett Genisys control, the red reset button on top of the control flashes), then press and hold in the reset button for one second. The burner will then try to relight. If the burner relights successfully, then no further action is needed.
- **If the burner goes into lock out again, contact a qualified service agency for help.**

ANNUAL MAINTENANCE

The SYSTEM 2000 boiler requires an annual tune-up by a qualified service agency to maintain top efficiency and peak performance and to verify proper performance of all safety devices.

PERIODIC MAINTENANCE

The SYSTEM 2000 boiler requires minimal attention from the user.

- Daily inspect the space around the burner/boiler to verify the area is clean and free of any flammable or combustible materials.

- Once a month it is recommended that the owner/user inspect the boiler and to watch the operation of the boiler. The owner/user should:

- Inspect flue connections.
    - Look for evidence of deterioration from corrosion or other sources. Watch the flue pipes during a start up of the boiler and look and smell for evidence of escaping flue products.
- Inspect for evidence of water, such as leakage from the safety pressure relief valve.
- Watch the Energy Manager during one heating cycle of the boiler.
- Verify the pressure gauge on the boiler is reading between 5 psi and 30 psi.
- Verify the temperature gauge on the boiler reads no more than 220F at the end of a heating call.

If any of the above items seem unusual or out of the ordinary, then immediately call your qualified service agency.

RECORD OF INSTALLATION

INSTALLER NAME: _____

INSTALLER ADDRESS: _____

INSTALLER CITY, STATE: _____

DATE INSTALLED: _____

NOTES: _____

_____

SCOPE

This manual covers the Energy Kinetics System 2000 Resolute Boiler. The boiler is designed and equipped and has been tested to generate hot water in a low pressure closed loop system. The boiler is a major component of a closed loop system that can be used as a heat source for hydronic, radiant, domestic hot water, spa, and/or pool heating systems. Call Energy Kinetics to obtain piping and wiring instructions for applications, such as hydronic heating, radiant heating, domestic hot water, swimming pool heating, multiple boilers, injection loops, etc. The installer of the system is responsible for the final design of the system and for adding the balance of the needed parts to complete the system.

COMMONWEALTH OF MASSACHUSETTS
When the boiler is installed within the Commonwealth of Massachusetts:

- **This product must be installed by a licensed plumber**
- **If antifreeze is used, a reduced pressure backflow preventer device shall be used**

INSTALLER NOTE:

ALL INSTALLATIONS MUST BE MADE IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL, PLUMBING, HEATING AND ELECTRICAL CODES THAT MAY DIFFER FROM THIS MANUAL AND IN ACCORDANCE WITH THE FOLLOWING CODES, AS APPLICABLE:

N.F.P.A. No. 70: National Electrical Code
Canadian Electrical Code, Part I
A.N.S.I. / N.F.P.A. No. 211: Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
A.N.S.I. / N.F.P.A. No. 31: Installation of Oil Burning Equipment

If this oil fired boiler is converted to gas fired by field mounting a listed gas conversion burner, then install in accordance with A.N.S.I. Z223.1/N.F.P.A. No. 54: National Fuel Gas Code

These codes are available from:
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269-9101.

A hot water boiler installed above radiation level or as required by the Authority having jurisdiction, must be provided with a low water cutoff device.

A boiler should be installed in such a manner that, if the pressure vessel or any connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.

A hot water storage tank should be installed in such a manner that, if the storage tank or any connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.

A boiler's pressure relief valve, hot water storage tank T&P relief valve, backflow preventer, and all other devices must be piped to the nearest drain to avoid damage in the event the valve is actuated.

Make sure relief discharge pipes from all reliefs are properly placed to safely contain discharge. Make sure relief discharge pipes, such as from a boiler or a hot water storage tank, will safely contain hot water and/or boiling water. Make sure relief discharge pipes, such as from a boiler or a radiant heating system, will safely contain water treated with boiler chemicals and/or antifreeze. Reliefs include the boiler pressure relief valve, the back flow preventer discharge port, and the domestic hot water tank temperature and pressure relief valve. Any other reliefs, such as from radiant heating systems, must also follow these guidelines.

SYSTEM 2000® RESOLUTE® BOILER

IMPORTANT MESSAGE TO HOMEOWNER/USER: *These instructions should be carefully read and kept for future reference to gain the best performance from your System 2000 Resolute boiler.*

CONGRATULATIONS ON YOUR PURCHASE OF THE SYSTEM 2000 RESOLUTE BOILER with its highly efficient low mass hydronic heat exchanger, the Energy Converter. It is the product of years of engineering and advanced design, which brings together in a single system all elements needed to provide efficient home heat and hot water. This operation and maintenance information has been prepared so that you may better understand and use your **Energy Kinetics Resolute Boiler and Heating System**.

SYSTEM 2000 BOILER - PRINCIPLE OF OPERATION

SYSTEM 2000 comprises a heat source, the energy converter, circulating water, and five (or more) zones controlled by an electronic control, the **Energy Manager.**

The Boiler sits cold until a thermostat calls for heat. The Energy manager receives the call for heat and turns on the main circulator and burner. Water circulates within the boiler as it warms up to operating temperature. When ready, the zone valves open and deliver heat to the zones calling for heat. When the thermostats are satisfied, the Energy Manager turns off the burner and enters the energy recovery stage. The circulator and zone valve stay energized to deliver the heat remaining in the boiler to your home or to the domestic hot water storage tank.

When energy recovery is complete and the Boiler has been cooled off, the Energy Manager turns off the system and waits for another thermostat (or tank aquastat) to call for heat. **SYSTEM 2000** runs the burner only when you need heat and delivers that heat only where you need heat.

The System 2000 Energy Converter is the product of advanced thermal engineering. It is designed with two separate passageways, nearly 15 feet long, coiled around each other. Water travels along one passageway from your home toward the center of the unit and heated gases travel from the unit center toward the chimney. This is a “forced circulation counter-flow” design and it provides very efficient transfer of heat from the burning fuel to the circulating water. The superior insulation of the boiler minimizes heat losses to the surroundings, resulting in directing heat to your home in an efficient and quiet manner.

SYSTEM 2000 has an extremely high annual efficiency (over 95% of steady state) because it runs only when your home or hot water storage tank needs heat. Energy recovery is completed at the end of each heat call, virtually eliminating off cycle losses.

Your System 2000 holds a minimal quantity of water so it begins to supply heat in about 2 minutes. This rapid response means that your rooms can be heated quickly when cold. The System 2000 EK1 Resolute can also provide heating of domestic water just as quickly.

A modern retention head oil burner fires into the center of System 2000 where a high temperature, light weight ceramic chamber provides ideal conditions for “near perfect” efficient, pollution-free combustion. Your System 2000 is tightly sealed so all products of combustion pass only to the sidewall Smart Vent.

The **RESOLUTE** Boiler is designed with a hinged front cover that allows access to the inside of the boiler for inspection and cleaning. All access for service is from the front, so the RESOLUTE Boiler can be placed against a wall or into a closet.

ENERGY MANAGER - PRINCIPLE OF OPERATION

The left side of the Manager is the input side, which provides 24-volt power supply and connections for thermostats. The right side is the output side, which starts the burner, circulator, zone valves or zone circulators and the domestic hot water circulator. See photo of the Manager on the cover.

Lights on the Energy Manager indicate what is calling for heat (left side) and (right side) lights indicate active zone(s), burner operation and circulator operation. These function lights are an aid in servicing. The following is a typical cycle.

1. **SYSTEM WAITING FOR A CALL:** The boiler is turned off and sits cold, waiting until a call for heat. The red power light on the Manager is glowing.
2. **CALL FOR HEAT:** A room thermostat call starts the cycle. The thermostat light on the left side will turn on for that zone.
3. **PRE-HEAT**: Output lights for the main circulator and burner turn on, the circulator starts, and the burner begins firing. The boiler water circulates through the energy converter via the bypass line, heating up the water.
4. **HEAT**: Once the boiler water has heated to 140F (about 90 seconds), the Manager will turn on the zone output light on the right side. The zone valve will open and hot water will flow to the zone needing heat. The burner runs as long as there is a thermostat calling and as long as heat is being delivered to the zone. The burner may shut off if the return temperature exceeds 170F/190F (RED burner light turns off) or if the high limit temperature is exceeded (RED burner light stays on, but the high limit aquastat shuts the burner off).
5. **ANOTHER CALL FOR HEAT:** If another zone calls for heat while the burner is already running and the return temperature is above 140F, the zone output will turn on, immediately supplying heat to the zone.

6. **MONITOR RETURN TEMPERATURE:** The Manager continually senses the return temperature and will turn off the zone outputs if the return temperature drops below 120° F (130° F if Option Switch #1 is ON). With the zone outputs closed, the boiler water will quickly reheat and once the return temperature reaches 140° F (150° F if Option Switch #1 is ON), then the Manager will reopen the zone valves.
7. **THERMOSTAT SATISFIED**: The thermostat light on the left side will go out. The burner light and the burner will then turn off.
8. **ENERGY RECOVERY**: The circulator and zone valve remain energized. The circulating water will remove the energy from the converter, sending the heat to the last zone that called. The energy recovery stage continues until the return temperature has dropped sufficiently or until maximum timing has been reached. The boiler is now sitting cold, waiting for the next call for heat. Maximum timing for heat recovery stage is usually set at twenty minutes for space heating zones and is fixed at five minutes for the Hot Water zone. *(See Energy Manager Option Switch Settings)*.

RECEIVING and UNPACKING

Inspect shipment upon receipt for external damage. When unpacking and uncrating, inspect each item for internal damage. Any damage found should immediately be reported to the freight carrier before installation. The receiver is responsible for following the claims procedure of the freight carrier. The freight carrier is responsible for taking prompt action on all claims. If freight cannot be inspected at the time of delivery, sign the bill of lading "Subject to Inspection" and inspect the shipment as soon as possible after receipt. Replacements for parts damaged in shipment are available upon receipt of a signed copy of a claim report *(concealed damage claims should be filed immediately against the freight carrier by the consignee).*

After unpacking, check each item against the packing list. Inspect it thoroughly for loose parts, instruction sheets and packing lists. Immediately report any missing items. It is wise to complete the installation before discarding packing material. Store all parts where they will not be damaged or lost during installation.

LOCATION and CLEARANCE

DANGER*:* Provide clearance to combustible surfaces in accordance with all local and national codes. Follow National Fire Protection Association Bulletin NFPA Installation of Oil Burning Equipment and all applicable codes.

Installation Clearances from Boiler Surfaces, Inches	Clearance to Combustibles	Clearance for Service
Front of boiler	15 1/2	20
Left side of boiler body	0	0
Right side of boiler body	0	0
Back of boiler body	4	4
Top of boiler body	16	16
Bottom of boiler legs to floor	0	9*

* Minimum recommended clearance to allow door to fully open.

Boiler Weight and Water Content	
Model	EK1 Resolute
Weight	270 lbs
Water Content	2-1/2 gallons
Air Inlet Pipe Size	2"
Boiler Flue Outlet	4"

Figure 1A Top View of Boiler –
Flue Connection Clearance to Combustibles

Z-Flex Z-Vent III Flue Connection/Pipe Clearance to Combustibles				
Flue Gas Temp	Clearance Enclosed		Clearance Unenclosed	
	Horizontal	Vertical	Horizontal	Vertical
300ºF	8"	4"	1"	1"
480ºF	8"	4"	1"	1"

For more information, see Z-Vent Model SVE Series III Installation and Maintenance Instruction

CENTROTHERM Flue Connection/Pipe Clearance to Combustibles				
Flue Gas Temp	Clearance Enclosed		Clearance Unenclosed	
	Horizontal	Vertical	Horizontal	Vertical
248ºF Max	0	0	0	0

For more information, see Centrotherm Installation Instructions

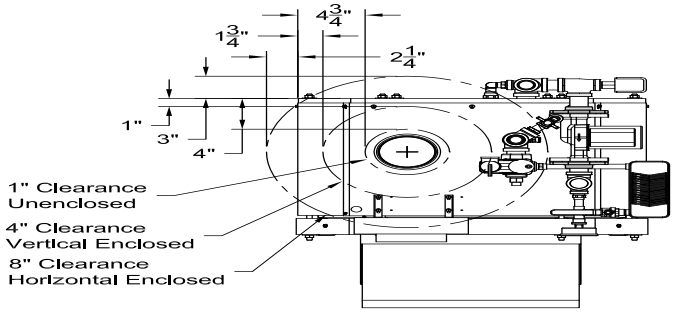


Figure 1A

Resolute boilers come with a stand mounted at the factory which provides a convenient, solid, level and smooth foundation for the boiler. Place the unit as near to the venting location as possible *allowing clearance for front cleaning and service as shown in Figure 1B*

NOTICE: The stand must be **level to slightly higher at the back**, to allow for proper venting of air from the boiler.

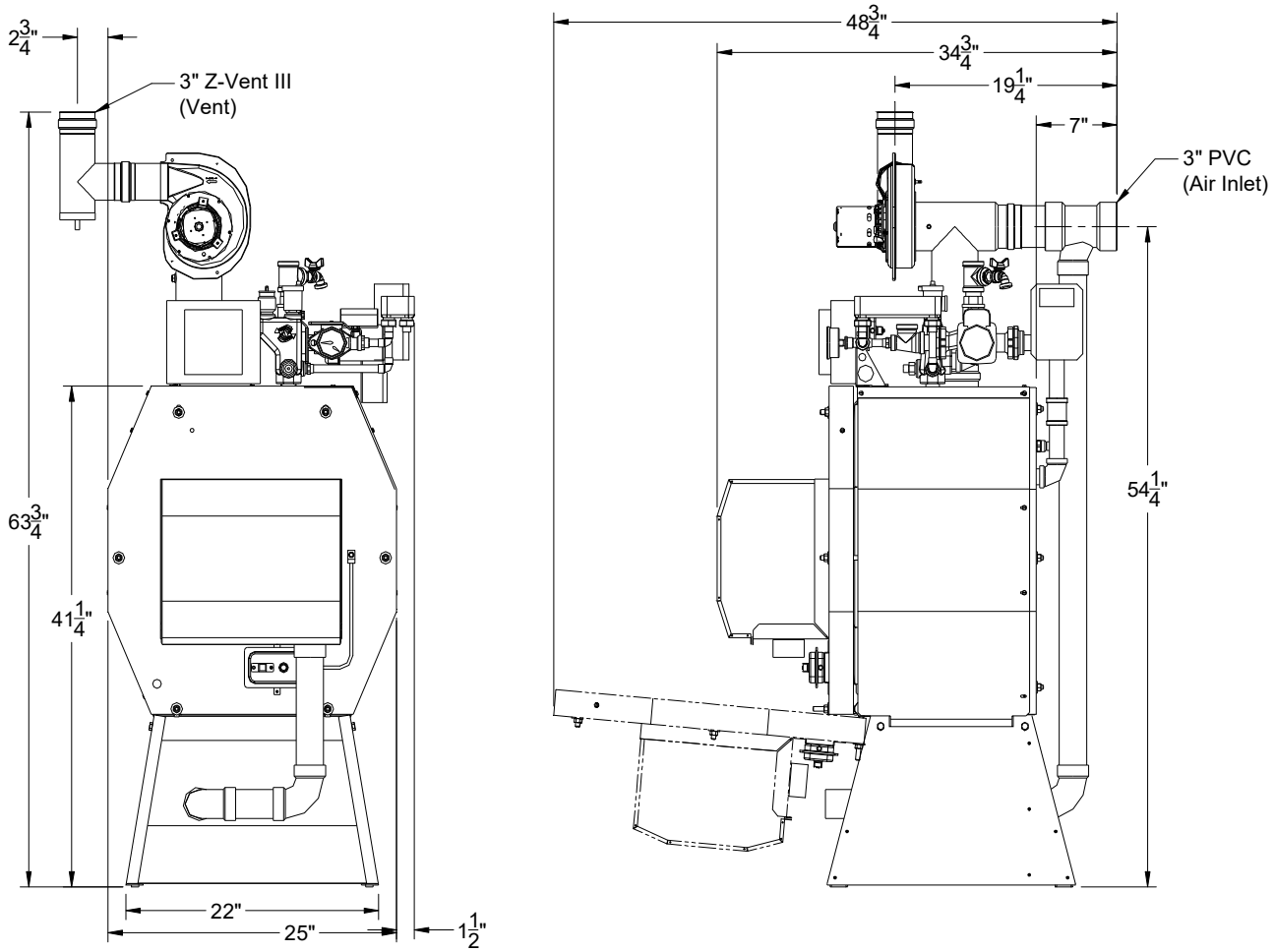


Figure 1B* - Boiler Clearance for Installation and Service

Burner	Dim "A"	
	W/O Air box*	With Air box
Beckett AFG	8"	9-5/8"
Carlin EZ1	9"	9-5/8"

* Note: Air box is required for Smart Vent operation.

SMART VENT SYSTEM

The Smart Vent with Dilution Air System is a complete vent system that has been specifically designed for use with Energy Kinetics' Resolute boiler. It uses a standard EK1 forced draft inducer fan and requires outside air for combustion air. Each part of this system works together and must be installed properly to work correctly.

Starting with combustion air, outside air must be piped directly to the factory supplied pvc air inlet tee. The air inlet tee is connected to the stainless steel dilution tee rated for positive pressure. The branch on the inlet tee is connected to the sealed air box and provides combustion air using pvc pipe and elbows supplied.

The EK1 forced draft inducer fan is factory mounted directly to the dilution tee, which is mounted directly on the boiler breech. The boiler pressure vessel is maintained at negative pressure by the forced draft fan. A fan proving safety switch is wired in series with the burner motor. Power to the burner motor is interrupted if operation of the forced draft fan is not proven. The system requires no draft adjustment when installed as recommended and is designed for use without any draft damper.

Combustion air is piped from the branch of the dilution air tee to the PVC male adapter on the sealed air box frame. Piping of outside air directly to the boiler is required to ensure that adequate fresh air is available for combustion and proper dilution of flue gasses. It completely isolates the boiler from the home environment, as well as greatly reducing operating noise from the boiler. A blocked air intake safety switch is wired in series with the standard System 2000 blocked vent switch. Burner operation will be prevented if the air inlet is blocked or if the boiler flue passage is blocked.

The Resolute boiler Smart Vent with dilution air system includes the System 2000 sidewall vent termination. The Smart Vent system for the Resolute boiler must be installed according to the Smart Vent with Dilution Air installation manual.

WARNING: Sidewall venting and combustion air piping from outside the building is required. The Energy Kinetics Smart Vent kit contains specific instructions for installation that must be followed. For length of run for intake air and for the vent connection, refer to the Smart Vent with Dilution Air installation manual. Combustion air may be supplied through PVC pipe. An unglued or Tek-screw joint allows the door to swing down when the air inlet pipe is disconnected. Intake PVC, CPVC, or ABS components must be securely fastened together with cement (or a minimum of one screw per connection joint).

FUEL SYSTEMS

NOTICE: Inspect and if needed, replace oil lines according to local codes. Oil lines must be absolutely airtight. Use only flared joints on all copper tubing and use thread sealant suitable for oil on all iron pipe threaded joints. Do not use Teflon tape on fuel system joints. Check all joints and connections for leaks after installation. A high quality fuel filter should be installed in the fuel line. A high quality UL Listed 10-micron fuel filter is recommended. When changing the fuel filter, be sure to *lubricate cartridge gasket with motor oil*, not heating oil. Fuel filter must be compatible with blends of equal or greater biodiesel content than the fuel in use.

Resolute boilers must be equipped with a fuel filter and a flexible fuel line. Call Energy Kinetics to obtain optional UL Listed fuel filter and optional UL Listed flexible fuel line. The flexible fuel line allows the door to open without disconnecting the fuel supply. The flexible line connects the fuel pump to the Smart Filter. The fuel filter can be mounted on the left-hand side of the base. Flexible fuel line must be compatible with blends of equal or greater biodiesel content than the fuel in use. A fusible link shutoff valve should be installed at the inlet of the fuel filter or as required by the authority having jurisdiction. If the oil supply is three (3) feet higher than the burner, then an anti-siphon valve (OSV) should be installed.

All piping systems should conform with pump manufacturer's specifications that are attached to each new pump. The boiler is capable of burning No. 1 or No. 2 heating oil, or biodiesel blends up to B100 (100%) when equipped with a listed burner rated for blends of equal or greater biodiesel content than the fuel in use. The burner will not operate unless an adequate supply of fuel in a liquid state is supplied from the tank through the burner nozzle.

CAUTION: DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR ANY OIL CONTAINING GASOLINE.

NOTICE: Order an additional flexible fuel line for two-pipe systems. A two-stage pump is required if lift from oil tank exceeds approximately six (6) feet. Follow instructions provided by pump manufacturer on single and two pipe connections for bypass plug usage and other specific installation requirements.

CAUTION: ALWAYS KEEP THE OIL SUPPLY VALVE SHUT OFF IF THE BURNER IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.

OIL BURNER SETTINGS

EK1 Resolute Boilers are shipped from the factory preset for 0.85 GPH firing rate. The following table lists approximate settings for oil burners based on testing performed at Energy Kinetics.

CAUTION: Final settings for each burner and firing rate for a particular installation **must** be determined by using combustion test equipment and following the instructions given under "Start Up Procedure".
CAUTION: Because the energy converter removes heat from the combustion flue gas so efficiently, flue gas temperatures will not be high enough for proper draft in a chimney.

Model	Input GPH	Chimney	Sidewall Vent	Beckett AFG[1]				Carlin EZ-1				
				Nozzle Delavan	Pump Pressure	Air Band	Air Shutter	Nozzle Delavan	Pump Pressure	Head Setting**	Air Band	Air Shutter
EK1	.68†	N	Y	.60 70°A	130 psi	0	4	.60 60°A	130 psi	0.50	0.65	EZ-1
	.74	N	Y	.65 70°A	130 psi	0	5.5	.65 60°A	130 psi	0.60/0.65	0.75	EZ-1
	.85*	Y	Y	.75 70°A	130 psi	0	7	.75 60°A	130 psi	0.75	0.80	EZ-1
	1.0	Y	Y	.85 70°A	136 psi	1	8	.85 60°A	135 psi	0.85/1.00	0.90	EZ-1

† The Beckett AFG at 0.68 gph firing rate can be retrofitted with the Beckett Low Firing Rate Baffle. If used, set air band: 0, shutter: 8.5.

* Factory Setting

**Head Setting on Carlin EZ-1 set by using supplied Head Bars

OIL BURNER MOUNTING

Resolute Boilers are shipped from the factory with the oil burner pre-mounted. The burner flange is designed to insert the burner head 2-3/8" into the boiler. Energy Kinetics installs a ceramic sleeve (the amulet), to protect the burner head from the heat of combustion, and then seals the air tube flange joint with a high grade retort cement.

NOTICE: Oil burners for field installation or for field replacement should be installed according to burner manufacturer instructions, according to installation instructions below, and with consultation with Energy Kinetics for any special considerations or adjustments.

Follow these instructions for field installation of Energy Kinetics supplied burners. Start by checking nozzle and electrode position per manufacturer's specifications prior to assembly to unit. Test fit the amulet by inserting the amulet into the boiler opening. If the amulet doesn't easily slide into the boiler, then gently sand the outside diameter of the amulet until it will fit into the boiler opening. Test fit the amulet onto the burner head. Note that the amulet designed for the Beckett AFG burner has interior slots to accept the screws on the sides of the head. The amulet for the Beckett AFG has a small drain hole in the front face, which must be mounted at the bottom (at 6 o'clock position). If the amulet is a tight fit on the burner head, then slightly moisten inside the amulet with water.

Place a 3/8" bead of retort cement onto the burner head at the flange to air tube joint, and slide the (moistened) amulet over the burner head and against the flange. Ensure proper seating of the amulet by pressing the amulet onto the burner with a flat object. Leave the excess retort cement at the amulet to flange joint and the cement will provide an airtight seal of the air tube flange to the boiler face.

The Beckett amulet has an inside edge that will cover the edge of the Beckett burner head. The Beckett retention head air slots must not be blocked or obstructed by the amulet. If needed, trim a 45 degree chamfer on the inside of the amulet using a sharp utility knife and maintain a 1/8" clearance to retention head air slots.

Once the amulet has been seated and trimmed, then install the burner into the boiler by carefully inserting the air tube with amulet into the boiler opening while aligning the burner flange holes with the boiler studs. Install flat washers and nuts onto the boiler studs and tighten all nuts evenly.

GENERAL ASSEMBLY

Assembly of various packaged units is illustrated throughout this manual. The use of non-Energy Kinetics supplied pump, controls and accessories should follow good practices. The diagrams and locations presented in the manual are recommended.

BOILER MOUNTING

PIPING SO THE DOOR CAN OPEN: To avoid conflicts with the door opening, piping should be in accordance with **FIG. 2A, 2B** or dimension D in **Fig. 1B.** The door opens and drops down to the front of the boiler. The burner and air box also need clearance when the door opens. Do not locate any piping in front of the boiler unless clearance from the door is verified. This also applies to the oil line piping and the combustion air piping. **NOTICE:** Air inlet pipe must be disconnected to allow door to swing down.

BOILER MOUNTING on BASE, FIG. 2B: The boiler comes on a factory mounted base.

BOILER PITCH: The Resolute pressure vessel is manufactured level with the base. Install the boiler so it is level to slightly higher at the rear.

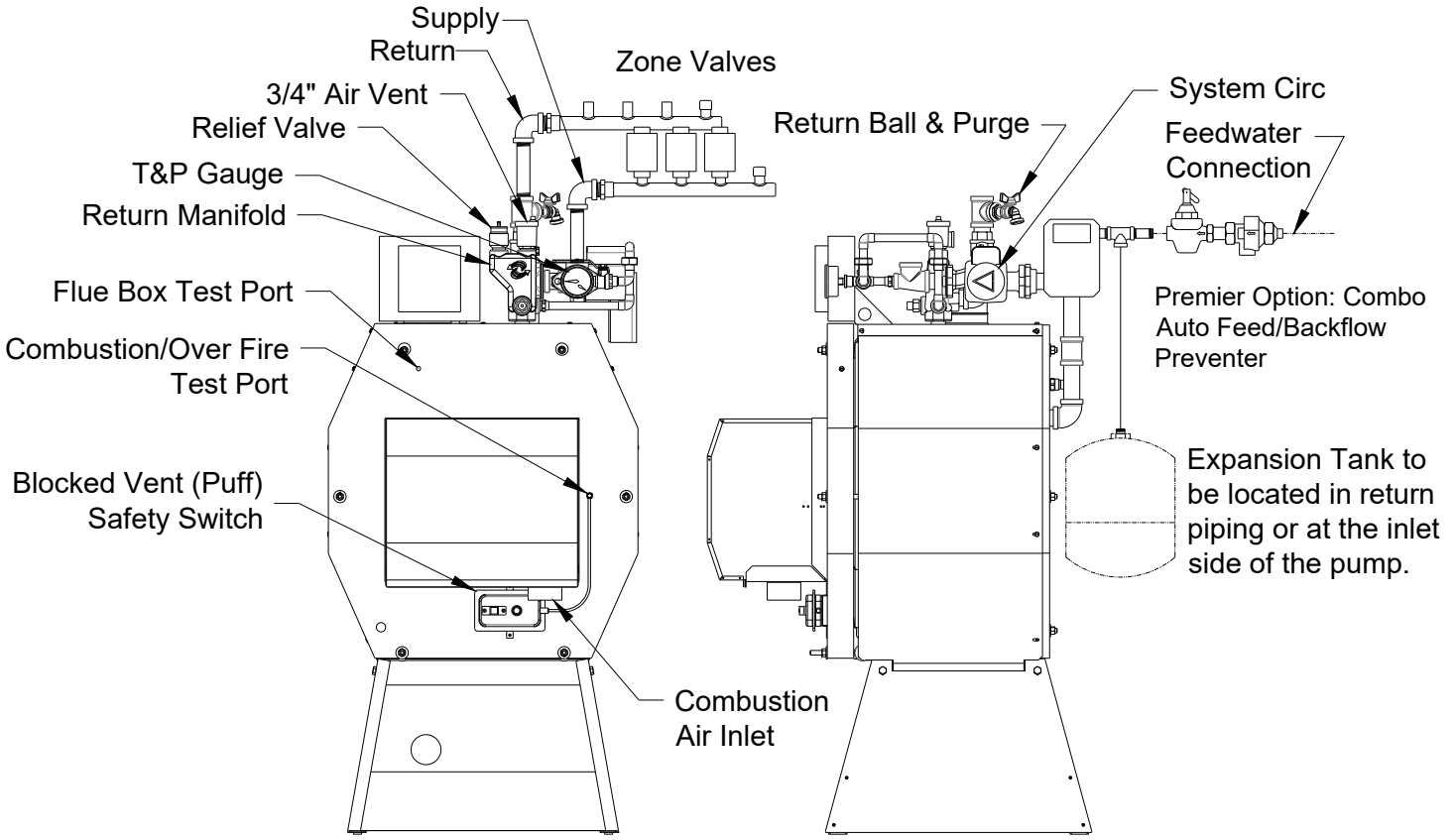


Figure 2B

PIPING

All piping and accessory connections should follow good practice using approved joint sealants.

Figure 2C

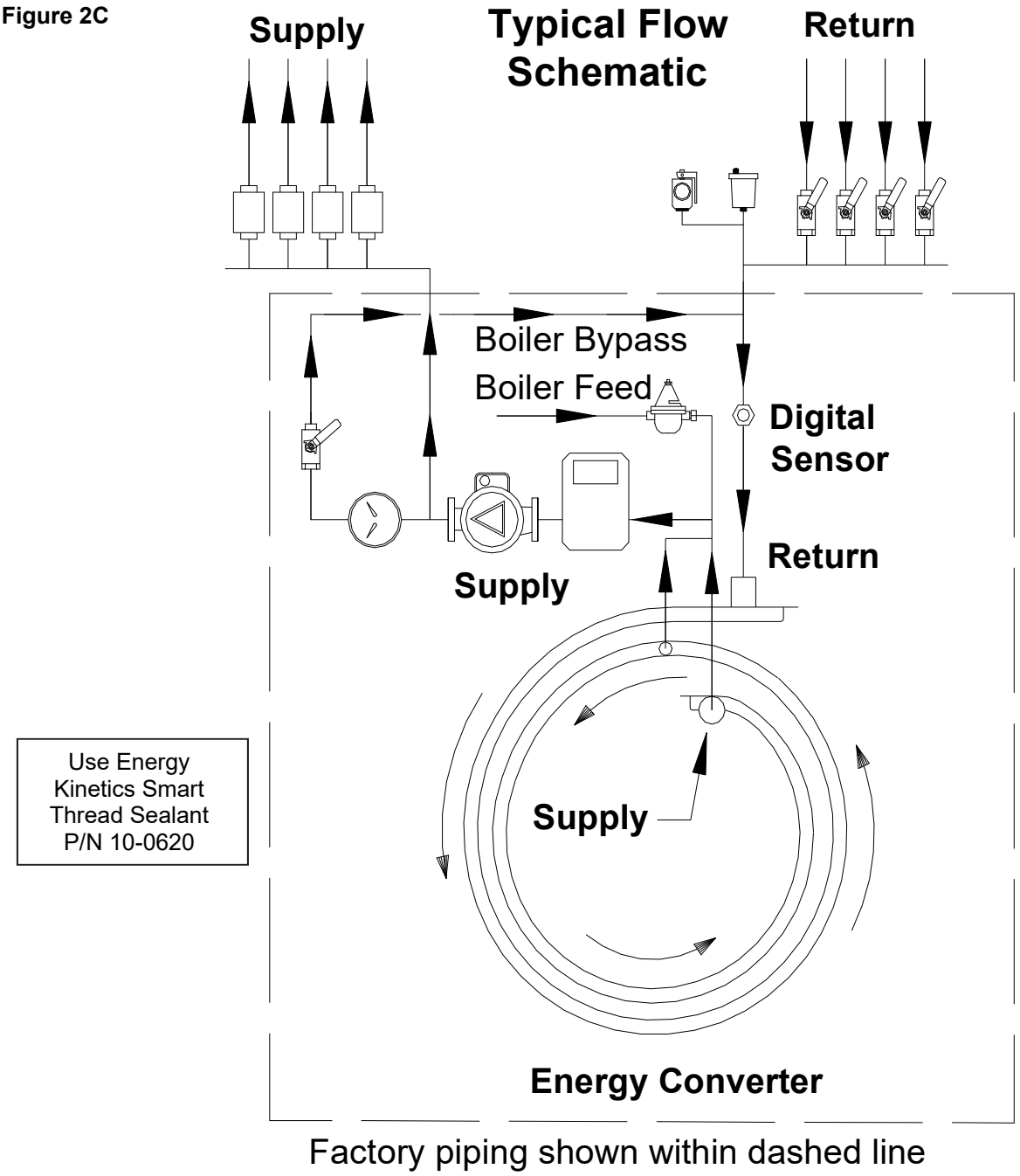


Figure 2C indicates a typical flow schematic for boiler water feeding multiple zones. Each system will vary according to job location.

Supply and return connections are 1”NPT on the Resolute.

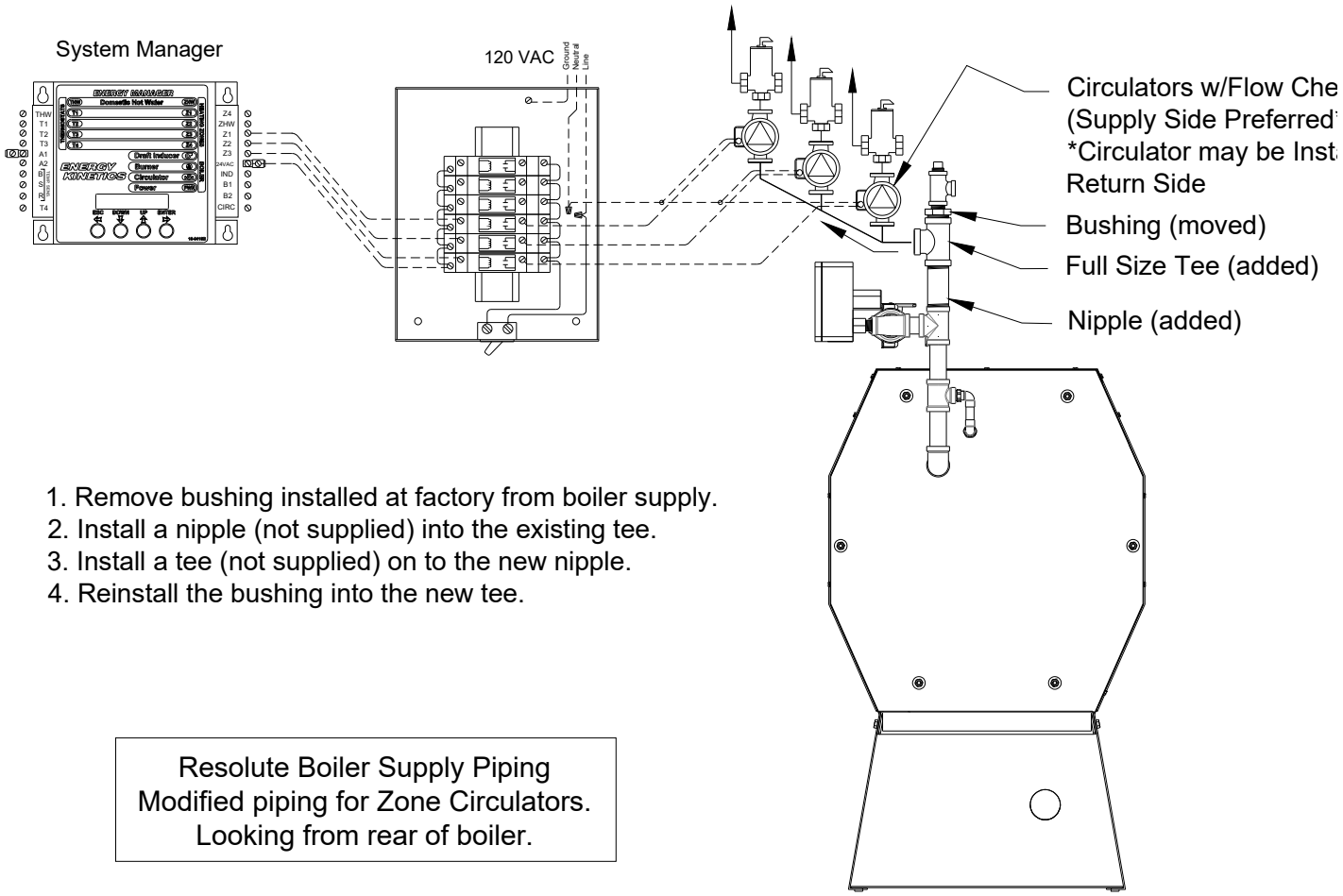
Call Energy Kinetics to obtain piping and wiring instructions for alternate applications, such as hydronic heating, radiant heating, domestic hot water, swimming pool heating, multiple boilers, injection loops, etc.
Figures 2A and 2B indicate general system piping arrangement and options. Piping of individual systems may vary from Figures.

ZONE CONTROL

ZONE CONTROL BY VALVE: The SYSTEM 2000 Boiler is designed to provide multi-zone control of the heating system and optionally can supply domestic hot water. Energy Kinetics recommends and supplies two wire, full port, 24-volt zone valves for control of each heating zone. A system with a single heating zone still requires a zone valve to provide control for preheat of unit and to maintain minimum temperature during operation.

ZONE CONTROL BY CIRCULATOR:

Zone control by circulators requires a flow valve, circulator and 24-volt relay (EK# 10-0412-RIB or equiv) for each zone. The main circulator and boiler bypass line are still used in these cases.
NOTICE: An additional tee must be installed into the supply **on the inlet side** of the main circulator. This tee is the supply for circulators with returns for these zones into normal return location. Call Energy Kinetics and request "Zoning with Circulators" diagram.



1. Remove bushing installed at factory from boiler supply.
2. Install a nipple (not supplied) into the existing tee.
3. Install a tee (not supplied) on to the new nipple.
4. Reinstall the bushing into the new tee.

Resolute Boiler Supply Piping
Modified piping for Zone Circulators.
Looking from rear of boiler.

ZONE PURGING: Valves to isolate and purge individual zones should be installed according to good piping practices.

EXPANSION TANK SIZING: The type and size of expansion tank depends on the total system water volume. The EK1 Resolute contains 2-1/2 gallons of water. **NOTICE:** Sizing must consider **cold start** and **hot operation** due to system concepts of energy recovery and rapid heat up.

BOILER BYPASS LINE AND VALVE

NOTICE: Systems are piped at the factory with the boiler bypass line and bypass ball valve. The bypass valve must be at least partially open for the boiler to operate properly.

FILLING WITH WATER, VENTING, and PURGING

When piping is completed and all accessories installed the Converter and piping should be filled with water. The Converter purges itself of air when properly installed. **NOTICE: AIR VENT CAP MUST REMAIN OPEN.** Vent cap should be removed and kept in a safe location. Each zone should be purged until a steady stream of water without air passes out of purge hose. Vent all radiation.

NOTICE: DO NOT START BURNER UNTIL CONVERTER AND SYSTEM ARE FULL OF WATER. Fill to normal cold system pressure, 10 to 12 psi on pressure gauge. Before placing system in operation, carefully check for leaks throughout system. Tighten pipe joints, circulator flanges; check gaskets, etc., as needed.

BOILER WATER TREATMENT

Addition of boiler water treatment is recommended to reduce lime buildup inside the boiler. Energy Kinetics recommends addition of one quart of 8-Way Boiler Treatment per 30 gallons system water. 8-Way Boiler Treatment is recommended to treat water up to medium hardness. Call Energy Kinetics for more details about boiler water treatment and about hard water conditions.

ANTI-FREEZE

Only non-toxic antifreeze (such as Propylene Glycol) should be used if adding anti-freeze to a system that produces domestic hot water. Hard water should not be used in combination with generic antifreeze. Energy Kinetics supplies a quality inhibited Propylene Glycol anti-freeze with orange dye and an antifoam agent. 8-Way Boiler Treatment can be added to Energy Kinetics anti-freeze and is recommended in areas of medium water hardness. **NOTICE: Thoroughly clean system prior to adding antifreeze.** TSP is recommended for removing flux and other oil based compounds. Once system has been cleaned and flushed, then add antifreeze to obtain approximately a 30% by volume mixture of antifreeze in water. Call Energy Kinetics for assistance in calculating how much anti-freeze to add to system.

WINTERIZING

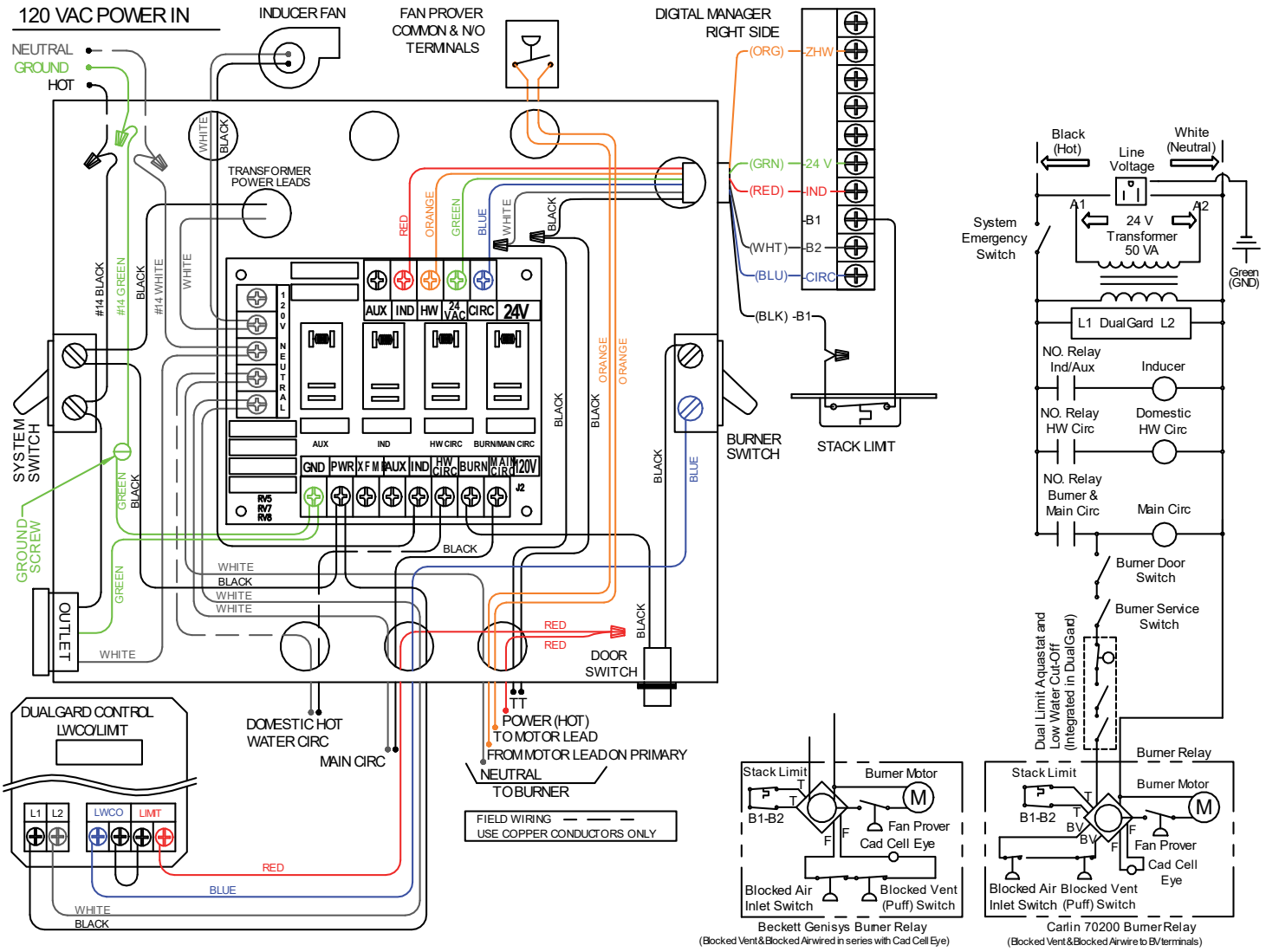
NOTICE: If the SYSTEM 2000 Boiler may be exposed to freezing temperatures, such as a vacation home shut down for the winter, then anti-freeze should be added. When a home is winterized by draining all domestic water piping, then the SYSTEM 2000 Boiler must be protected. It is not recommended to drain the SYSTEM 2000 Boiler, because introducing air into the boiler can cause rusting inside the boiler shell and also because the Energy Converter has a spiral water passage that cannot be completely drained of water. When draining the domestic water piping system, be sure to drain the domestic side of the plate heat exchanger. If the hydronic system will not be drained, then add enough anti-freeze to protect the entire hydronic system including the boiler, piping, radiation, circulators, etc. If the hydronic system will be drained, then add shut off valves to isolate the boiler and add anti-freeze to the boiler only, as follows. Drain water from the boiler and then add anti-freeze to the boiler. Refill boiler with water and run boiler circulator through the bypass to distribute antifreeze within boiler. Propylene Glycol in water will provide the following freeze protection: 30% down to +8F, 40% to -8F, 50% to -27F. Energy Kinetics recommends using 30% anti-freeze to obtain the best boiler performance. Use over 30% anti-freeze only if lower temperature freeze protection is mandatory.

Caution: Always keep the fuel supply valve shutoff if the burner is shut down for an extended period of time.

LINE VOLTAGE WIRING DIAGRAMS
WIRING and CONTROLS

The Resolute Heating System is furnished with controls and basic accessories as illustrated and described in this manual. Control, burner and accessory instruction sheets and system wiring diagrams should be attached to this manual for future reference.

DANGER: All wiring for installations in the United States must comply with the NEC, and any local codes. All wiring for installations in Canada must be done in accordance with the Canadian Electrical Code, Part I.

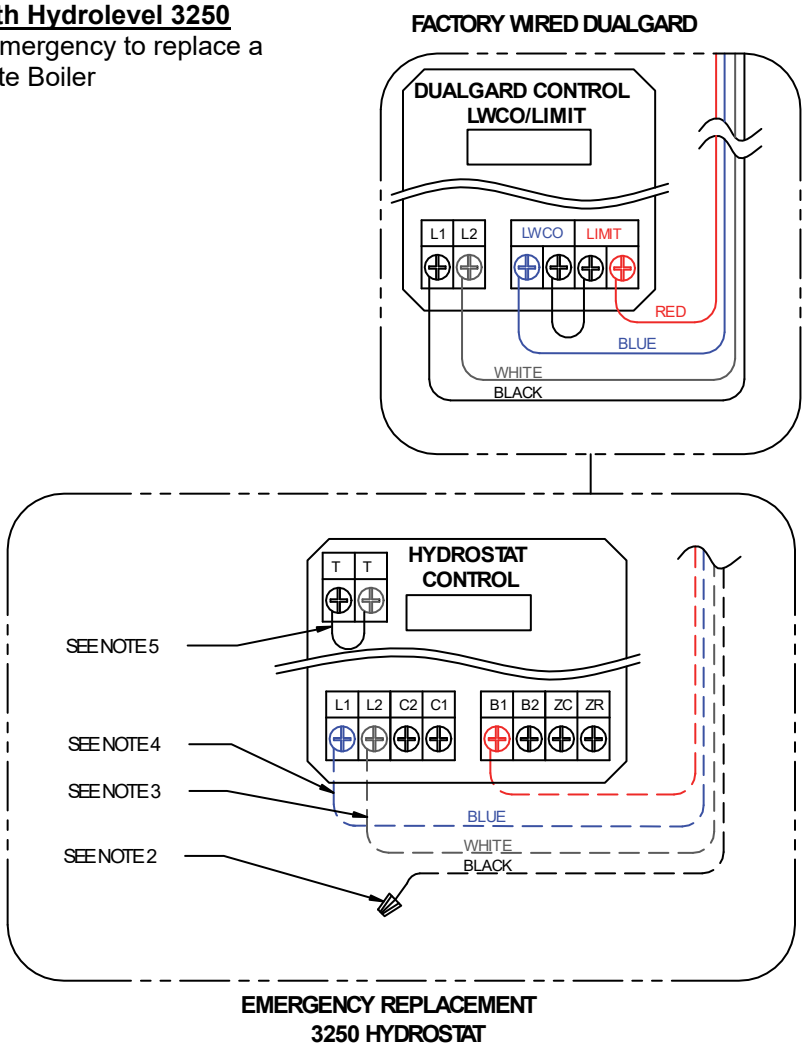


Alternative replacement of DualGard control with Hydrolevel 3250

Instructions for Installing a 3250 Hydrostat in an Emergency to replace a factory installed DualGard on a Frontier or Resolute Boiler

1. Disconnect wiring and remove DualGard and Install Hydrostat in its place.
2. Cap the Black wire
3. Connect the white wire to L2 on Hydrostat
3. Connect the Blue wire to L1 on Hydrostat
4. Connect the Red wire to B1 on Hydrostat
5. Install the jumper to TT on Hydrostat

Settings:
Economy OFF, Low Limit OFF, High Limit ~215°
FOR ODR ONLY (Com + OD terminals):
Low Limit ~200°, WWSD OFF, ECO to 0.75



EMERGENCY REPLACEMENT
3250 HYDROSTAT

ELECTRICAL CONNECTION - LINE VOLTAGE

POWER SUPPLY: 120 VOLT 60 HZ, 7.5 Amperes

System 2000 requires 120 VAC. The supply voltage must be within 108 VAC min / 132 VAC max for reliable operation of the boiler and the Manager. An easy way to check the supply voltage is to plug a voltmeter in at the service outlet located on the side of the system junction box.

DANGER: Make All Connections with *Power Off* at Main Circuit Box

Figure 3A: Connect power from a separate 15 AMP fused circuit. Install 3rd wire grounding for proper bond between all electrical accessories. The system switch is included so power can be shut off at the unit for servicing.

Pigtails are provided for the line voltage power connection. Connect black pigtail to hot, white pigtail to neutral, and the green pigtail to ground.

WARNING: The junction box is wired at the factory with the service outlet always powered, even with the System Emergency Switch turned off. To have the service outlet controlled by the System Emergency Switch, move the service outlet black lead to top lug of system switch. A low water cut-off may be field installed if required by local codes and is available from Energy Kinetics.

LOW VOLTAGE WIRING

ENERGY MANAGER OPERATES ONLY ON 24 VOLTS 60 HZ POWER

WARNING: Make All Connections with Power Off at Main Circuit Box

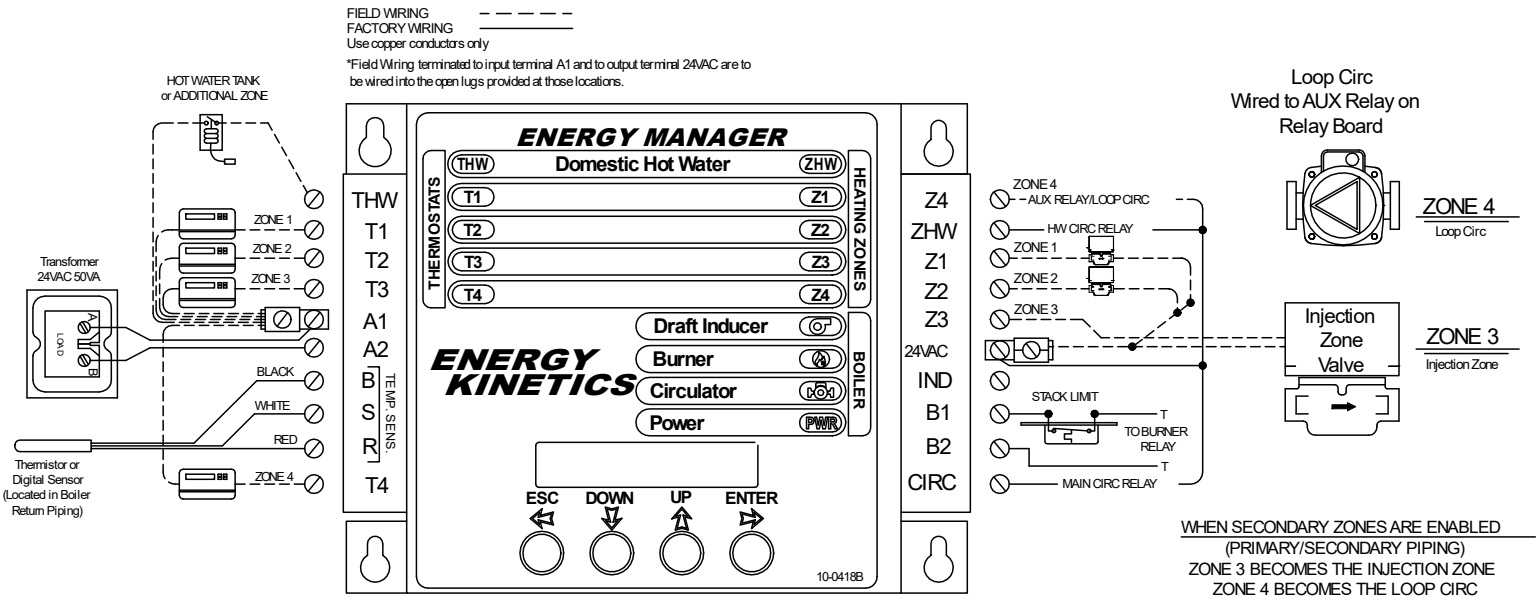
A typical low voltage wiring diagram for the Energy Manager is shown in **Figure 4A**. Thermostats must be located on inside walls away from cold drafts, windows or heat from fireplaces, appliances or sunlight. Set thermostat heat anticipators to 0.1 amps or *Hydronic* option. Call Energy Kinetics to request alternate low voltage wiring diagrams to handle special situations such as air handler wiring, heat pump wiring, isolation relays for thermostats, and isolation relays for heat motor style zone valves or circulators, etc.

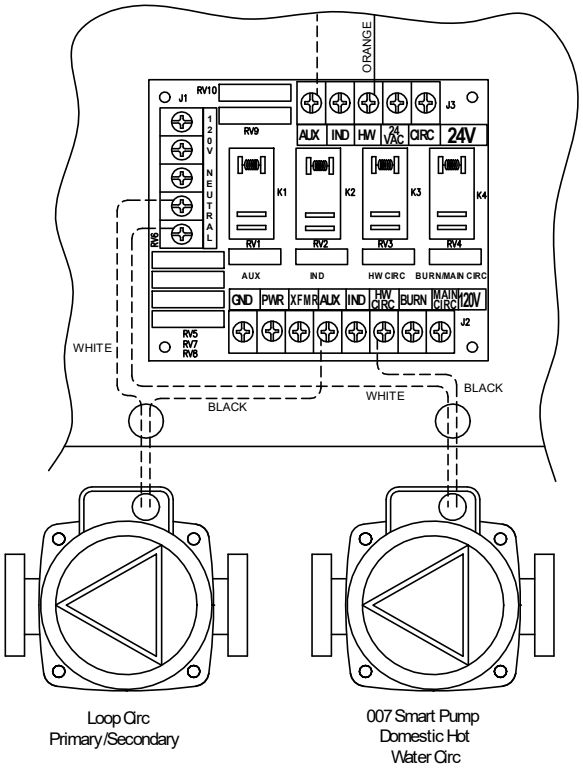
The single 24-volt/50VA transformer is suitable for the Energy Manager and five zone outputs (zone valves or relays). **NOTICE:** Additional load such as extra valves may require greater transformer capacity. To add transformers,

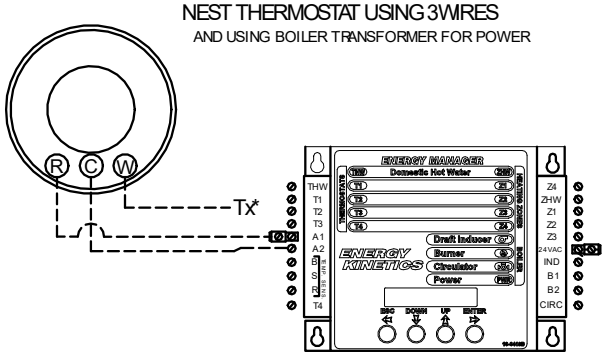
wire in parallel as follows: wire terminal “A” on one transformer to “A” on the other. Repeat with other low voltage terminal “B”. Be sure to verify 24VAC output from all transformers.

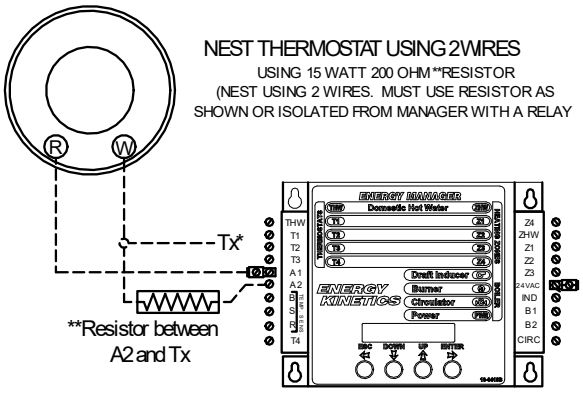
The Energy Manager is designed to heat domestic water and up to four (4) heating zones. Use Energy Kinetics supplied zone valves with two wire connections. For more than four heating zones, use Energy Kinetics expanded 10 or 15 zone Energy Manager, or call Energy Kinetics for alternatives.

LOW VOLTAGE WIRING DIAGRAM

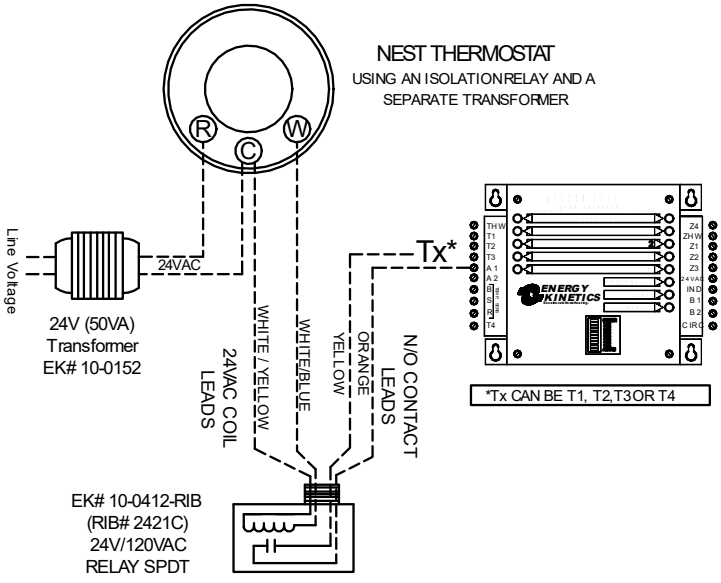


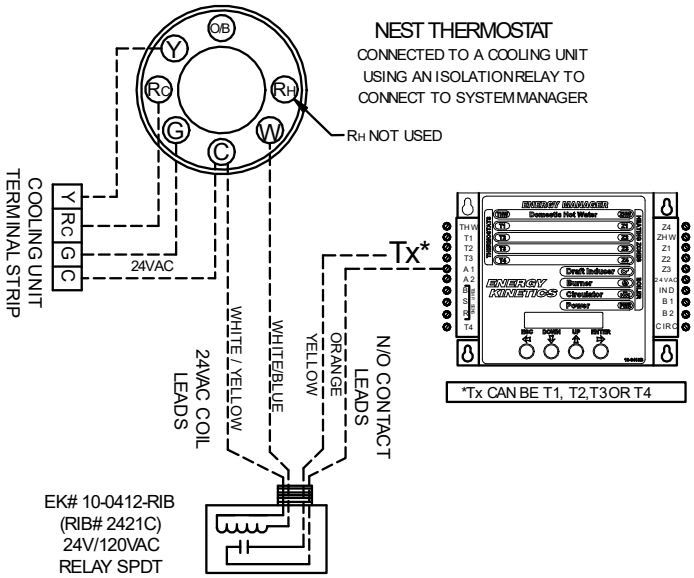






*Tx CAN BE T1, T2, T3 OR T4
**RESISTOR: 200 OHMS, 15 WATTS
MOUSER PART#: 280-CR15-200-RC MANUFACTURER: XICON
MOUSER PART#: 588-TUW15J200E MANUFACTURER: OHMITE





Note: Many WiFi thermostats require a common (c) wire, including some Nest models. C on the thermostat can be wired to A2 on the Energy Manager. This, in addition to R on the thermostat being wired to A1 on the Energy Manager will provide the 24 volts needed for the thermostat to operate.

INSTALL ENERGY MANAGER

The Energy Manager is shipped in its own protective shipping box. **NOTICE:** The option switches can be set very easily before the Manager is installed. Locate the pre-wired quick connectors fastened to the front of the junction box by two cable ties. Cut the two cable ties and discard. Fasten the Energy Manager to the junction box with the four corner screws. Slide the two quick connectors onto the Energy Manager. Label each zone on the manager, using the adhesive labels supplied.

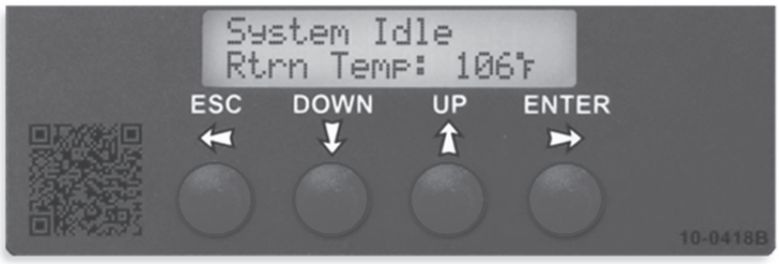
FIVE ZONE DISPLAY MANAGER

The **Display Manager** is an **Energy Manager** that is equipped with an *LCD display*, and four *pushbutton keys*. With the exception of the Fuel Type (oil/gas) and Venting (chimney/inducer) options, all setup options are selected through *option screens* via the *display* and *keys*. The Fuel Type and Venting options can be viewed, but not set, in the *option screens*. These two options can only be set using the physical dip switches on the bottom of the Manager board.

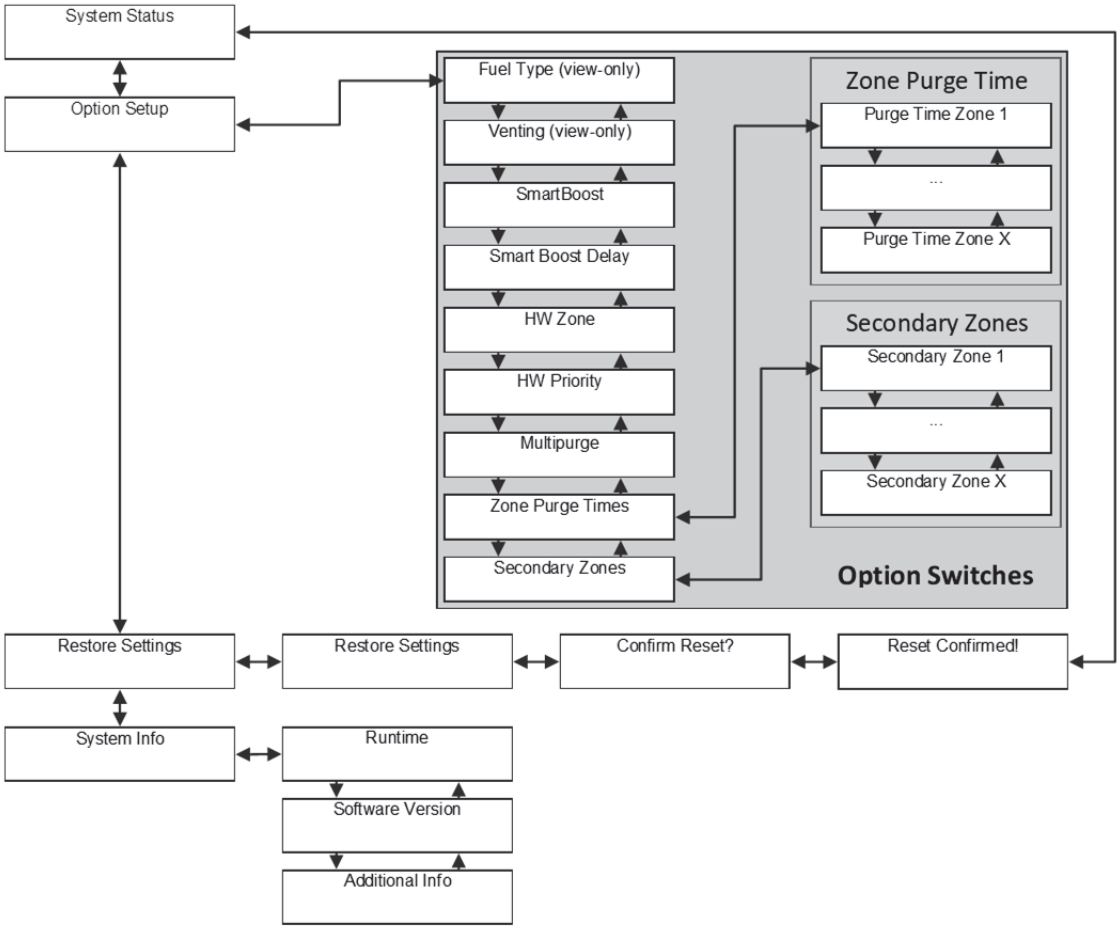
- To access the *option screens*, you must first ensure the manager is powered; if the manager is powered, the blue "PWR" LED will be on. If the blue LED is on, but the screen is not illuminated, press any *key* to wake the *display*.
- Use the UP/DOWN *keys* to view additional *menu screens*. Use the ENTER/ESC *keys* to enter/exit *submenus*. The ENTER *key* is also used to change *options* from the *option screens*.

How to Use Self-Guided On-Screen Prompts To Edit Options

From the *system status screen*, press the DOWN *key* twice, or until the Option Setup (edit→) *menu screen* is displayed. Press the ENTER *key* to enter into the *option screens*. From there, use the UP/DOWN *keys* to view each option. Use the ENTER *key* to change the selected option.

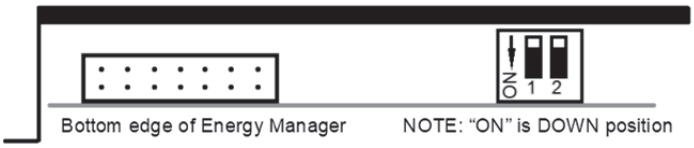


Setting features are self-guided through on-screen prompts



DIP SWITCH SETTINGS

Set dip switches for Fuel type: Oil or Gas and Vent type: Chimney or Inducer



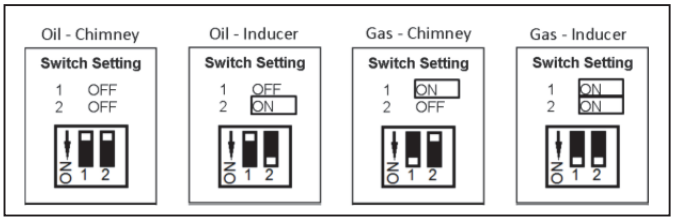


Figure 4B

INSTALLATION TIPS

- **Dip Switches "OFF"**
  Display Managers are shipped with both *dip switches* "OFF" (set for an oil system with a chimney).
- **Burner Restart**
  Thermostat short cycle protection is 25 seconds
- **Manager Reset**
  Shutting the power off momentarily and then back on again resets the manager from the short-cycle delay or a error condition.

DISPLAY MANAGER OPTION MENU DESCRIPTIONS

Fuel Type - VIEW-ONLY. Must be set using physical dip switch on bottom of Manager Board
This menu can be used to **view** the setting of physical dip switch one, which determines the Fuel Type setting.

Venting - VIEW-ONLY. Must be set using physical dip switch on bottom of Manager Board
This menu can be used to **view** the setting of physical dip switch two, which determines the Venting setting.

SmartBoost™ - Default setting is OFF
This option turns the SmartBoost function ON or OFF. While ON, if a zone has been calling for heat for 25 minutes (optionally 45 minutes), then SmartBoost kicks in to help satisfy that zone sooner by boosting the maximum return temperature to be 190°F/175°F from the standard 170°F/155°F. The boosted zone will stay at the 190°F/175°F setting for up to 25 minutes after the call is satisfied.

SmartBoost™ Delay - Default setting is 25 Minutes
This option sets the delay to either 25 minute or 45 minutes before SmartBoost raises the maximum return temperature to be 190°F/175°F. This option only impacts boiler operation if SmartBoost is ON.

HW Zone - Default setting is Hot Water
This option will allow the hot water zone to be turned into a heating zone. While this option is set to Heating, the "Hot Water Zone" will act as a heating zone with 20 minutes of thermal purge. This change will allow the hot water zone to become a fifth heating zone, for those cases where domestic hot water isn't required.

HW Priority - Default setting is NO
This option allows the Hot Water Zone to have priority over heating calls for 20 minutes. While this option is set to YES, the Energy Manager will ignore heating calls to the system for the first 20 minutes of a hot water call. After 20 minutes, or when the hot water call is satisfied, the system will resume providing heat to the rest of the zones.

MultiPurge™ - Default setting is OFF
This option turns the Multipurge function ON or OFF. While ON, any zones finishing in the prior 20 minute period will purge with the last zone satisfied. Setting the Purge Time for a given zone to 5 minutes prevents that zone from multi-purging.

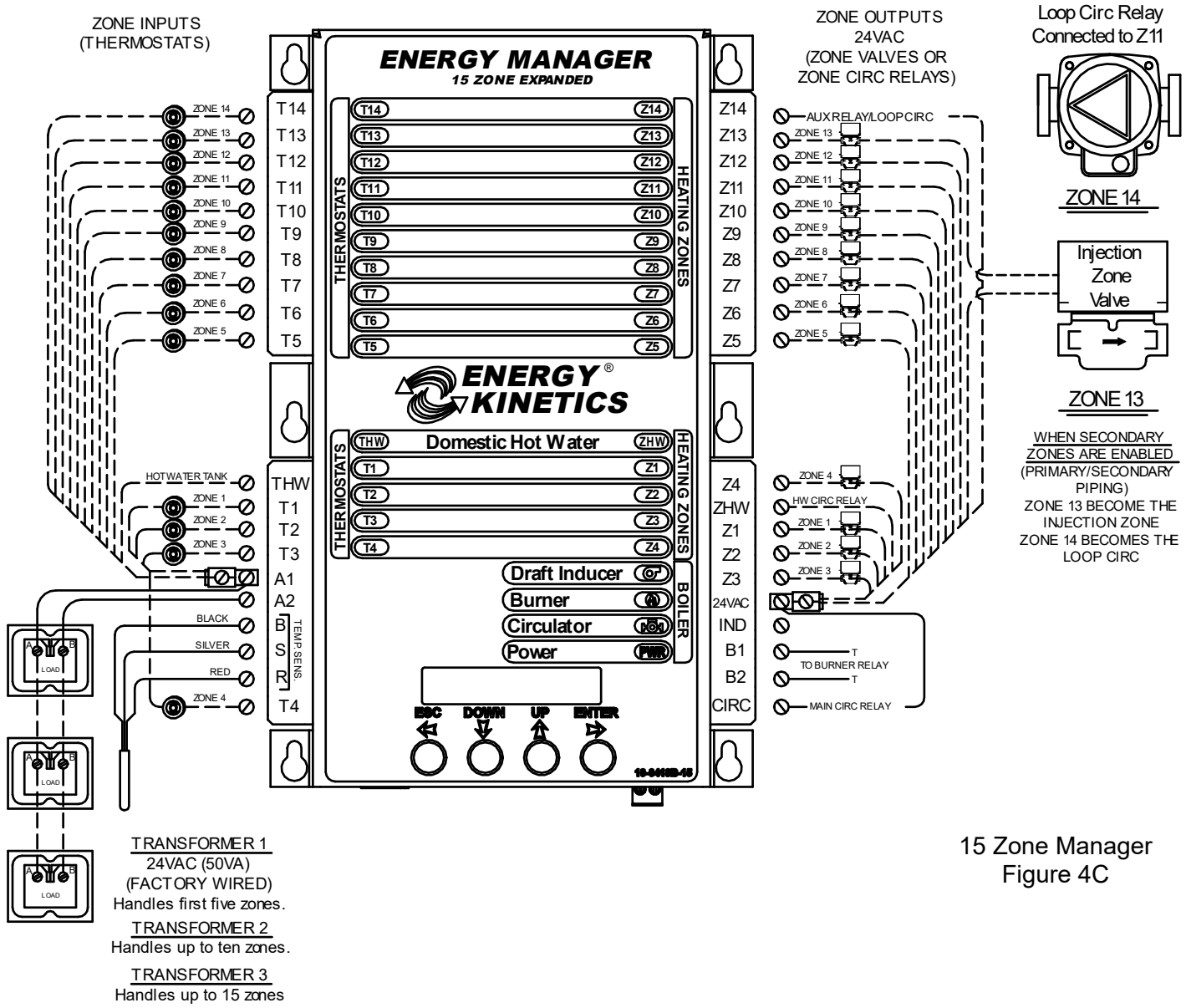
Zone Purge Times - Default setting for each zone is 20 Minutes
This option sets either a 20 minute or 5 minute purge time for heating zones. After all zone calls have been satisfied, there may still be heat remaining in the boiler. Instead of wasting that remaining heat, the Energy Manager will keep the last calling zone (or zones, if Multipurge is ON) open to allow the heat to be purged out of the boiler and into the system. The user is able to choose to let the boiler purge for either 5 minutes or 20 minutes before closing the zone. Any zone set to 5 minutes will also have Multipurge disabled for that zone. Regardless of the selected option, the Energy Manager will always end purging and close the zone when the return temperature has dropped sufficiently.

The following types of zones are recommended to have a 5 minute purge time.

- AIR HANDLER / FAN COIL
- VERY SMALL ZONE (like an individual bathroom)
- RADIANT ZONE with STORAGE TANK

Secondary Zones - Default setting for each zone is OFF
This option allows for primary/secondary operation. If any secondary zone is enabled, the manager will assume that zone 3 controls the injection zone (IZ) and zone 4 controls the loop circulator (LC). Any zone that gets a call while set as a secondary zone will also activate the IZ and LC, when needed. Thermostats connect to zone 1 (T1) and zone 2 (T2). If the hot water zone is set as a heating zone, the HWZ will also be displayed under the Secondary Zones options.

EXPANDED ENERGY MANAGER



15 Zone Manager
Figure 4C

15 ZONE MANAGER INSTALLATION INSTRUCTIONS

1. Remove cover from junction box.
   Use a free knockout on the top of the junction box to mount a second or third transformer, wire black lead to “XFMR” and white lead to “NEUTRAL” on relay board in box. (Use sections marked “120 VOLTS” only.) A second junction box is not needed for the expanded Energy Manager. Wire additional transformer(s) in parallel with first transformer. To wire in parallel, wire terminal “A” on one transformer to “A” on the other. Repeat with other low voltage terminal “B”. Verify 24VAC output from all transformers BEFORE reconnecting the Manager.
2. Mount long panel on top of box cover with long screws provided in lower 4 holes with spacers down.
3. Mount expanded Energy Manager to cover plate over 4 long screws and 2 wide bolts (top 2 holes).
4. Wire the bottom half of expanded manager as 5 zones Energy Manager. For top half, attach one thermostat lead to a zone and the other to A1 on lower half of manager. Attach one lead from zone valve or relay to corresponding zone output and the other lead to 24VAC on lower half.
5. Option switches set fuel type (oil or gas) and venting (chimney or power vented).
   See Location of Switches: **Figure. 4B**.
6. **NOTE:** When using secondary zones with 15-zone manager, zone 13 controls injection zone, and zone 14 controls loop circulator.

NOTICE: When operating without an expanded manager, *use a 5 zone service board for the lower half*. If you do not have a service board, refer to “Operation of Boilers without Energy Manager” in the Tech Manual.

HYDRONIC CONTROL SETTINGS

Configuration	Control	Model No.	Normal Setting
Frontier Boiler	**Auto Reset High Limit** **Auto Reset LWCO** **Manual Reset Lock Out Temp**	DualGard Model: 2450-1 Energy Kinetics PN: 10-0596	215° F Auto Reset High Limit 10° F Differential (215°/205° F)***** 250° F Manual Reset Fixed Max
Frontier Boiler w/Commercial Kit	**Auto Reset High Limit Aquastat** **Manual Reset LWCO** **Manual Reset Lock Out Temp**	DualGard Model: 2450-2 Energy Kinetics PN: 10-0596-M	215° F Auto Reset High Limit 10° F Differential (215°/205° F)***** 250° F Manual Reset Fixed Max
Domestic Hot Water Tank	**Tank Aquastat** *(On Tank)*	Energy Kinetics PN: 10-0414	'Hot', pointer points to 6 pm. *(To suit individual installation)*

For legacy controls, contact Energy Kinetics

***** Factory Setting

PREPARE FOR START UP

DANGER: **MAKE CERTAIN THE FOLLOWING REQUIREMENTS HAVE BEEN SATISFIED BEFORE START UP:**

1. The boiler and piping are completely filled with water.
2. Re-check wiring to ensure that it is correct and in accordance with appropriate wiring diagrams and codes.
3. Verify that proper nozzle is used and installed correctly.
4. Verify electrode settings.
5. Verify the burner settings for air band position and head position *(See "Oil Burner Settings" Table)*.
6. Oil supply is connected to burner. Oil supply lines and shut-off valves are open.
7. **CAUTION:** DO NOT USE GASOLINE, CRANKCASE DRAININGS, OR ANY OIL CONTAINING GASOLINE.
8. Fuel pump and fuel lines are purged.
9. Verify operating oil pressure at gauge port.
10. Adjust bypass valve on boiler side to heat exchanger ½ way open (*See #4 under "Oil Burner Operation").*
11. Flue pipe properly connected from unit to sidewall vent hood. All joints are secured and sealed.
12. Combustion air supply is available and sufficient (*See "Combustion Air").*
13. Adjust valve in domestic hot water circuit under circulator approximately ¾ of the way open.
14. Loosen 1/8" NPT hex plug in front jacket (to right of burner) for the over fire sampling location and above burner for flue box sampling port. Do not punch a hole in the flue pipe.
15. **CAUTION:** All covers, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.
16. **CAUTION:** Do not start burner unless the front door is closed and the nuts have been properly tightened.

START UP PROCEDURE

1. Turn on system supply switch and burner supply switch. The Energy Manager lights should come on briefly, the circulator relay should close briefly, and then the Energy Manager should only show one blue light next to 'power'.
2. The hot water tank aquastat should call for heat, if not, adjust any thermostat to call for heat. Burner and main circulator should come on at the same time. If not, check primary control and reset it if necessary.
3. Check for burner light off. On an oil supply system with one pipe, it will be necessary to bleed air from fuel pump. On a two pipe system, several starts may be required to clear air from fuel pump, or bleed air from pump.
4. On light off, water temperature and flue gas temperature will start to rise. A slight odor is common on initial light off as combustion chamber and converter surfaces warm for the first time.
5. **NOTICE:** Perform smoke test immediately after light off. Smoke test should show yellow after initial one minute of operation due to the combustion chamber sizing heating up. If the smoke test shows dark grey or black after one minute of operation, shut off boiler immediately and repeat "Prepare for Start Up" checklist.
6. As Unit reaches temperature, Energy Manager "Heating" light will signal heat distribution to zone(s) calling for heat. (On first start up, this will usually be the hot water storage tank zone.) Once boiler water temperature reaches 160° – 180° F., adjust hot water temperature flowing to storage tank. With hot water flowing fully from a domestic faucet, adjust valve under domestic circulator pump so water temperature going into tank is approximately 140° F. (Hand can be held on pipe just briefly.) Water must be flowing fully from a household hot water tap to accurately adjust flow and temperature entering tank.
7. Allow system to run about 15 minutes before testing and recording burner operation. (*See "Oil Burner Operation")*
8. **CAUTION:** Do not attempt to start the burner when excess oil has accumulated, when the unit is full of vapor, or when the combustion chamber is very hot.
9. **CAUTION:** NEVER BURN GARBAGE OR PAPER IN THE UNIT, AND NEVER LEAVE COMBUSTIBLE MATERIAL AROUND IT.

BOILER OPERATION AND SAFETY CHECKS

Check for proper boiler operation and proper safety operation. Correct any deficiency.

1. ***DANGER:*** Verify proper operation of high limit aquastat.
   a. Remove all heat and hot water calls (No input lights on left side of manager).
   b. Turn System switch off, then remove red return sensor lead from the left side quick connect.
   c. Restore power. The E100 error will flash on the manager's temperature display, and the burner should start shortly, in less than a minute.
   d. At approximately 205° F to 215° F, the high limit aquastat should shut off burner.
   e. Turn off power and reconnect the red sensor lead.
2. ***DANGER:*** Test Low Water Cut-Off: Press and hold the Test/Reset button for 5 seconds (30 seconds for manual reset). The display will read LCO. The red Low Water light should illuminate and the burner circuit (B1 and B2) should de-energize.
3. ***DANGER:*** Verify proper operation of boiler pressure relief valve by following instructions on pressure relief valve, which calls for a 'try lever test'. Make sure discharge pipe is properly placed to safely contain discharge and open relief valve using the try lever.
4. ***DANGER:*** Verify proper operation of the draft inducer fan proving switch:
   a. With burner running, turn off option switch 2 on the Energy Manager, which will turn off the inducer.
   b. The fan prover switch will open, removing power from the burner motor. The burner motor must shut off as soon as the inducer fan stops. Safety lockout should occur after the primary control recycles operation.
   c. Turn on option switch 2 on the Energy Manager, to restore operation.
5. ***DANGER:*** Verify proper operation of the blocked air intake detection switch:
   a. Block air inlet to burner
   b. Attempt to start the burner.
   c. Safety lockout should occur in approximately 1 minute.
   d. Unblock air inlet to burner.
6. **NOTICE:** Check that each thermostat operates proper zone.
7. **NOTICE:** The Energy Manager provides condensing protection by closing the zone valves when the return drops below 120° F (130° F when Option switch #1 is on). The following adjustments will help minimize zone cycling. Bypass valve must be adjusted to raise return water temperature to approximately 120° F. on start up after any zone valve opens. This will help prevent condensation from occurring in boiler passages.
   a. On copper baseboard systems, bypass valve normally should be about ½ open.
   b. On large water volume systems or high heat load systems, where the return temperature from the system is below 120° F, open bypass completely and throttle zone returns to increase bypass flow. If returns are still below 120° F, set option switch 1 to on.

OIL BURNER OPERATION

NOTICE: For reliable operation, set Air-Fuel mixture conservatively based on installation conditions. CO_2/O_2 and draft readings should be taken through the over fire test port in front jacket opening at right of burner (see FIG. 6). A 1/4" O.D. sample tube must extend at least eight (8) inches into front cover to obtain accurate readings. Smoke test and stack temperature should be taken at flue outlet. A test port in the flue box is provided to measure draft loss and smoke.

NOTICE: For accurate efficiency calculations, measure flue gas temperature in flue box sample port.

Installation Conditions	Target CO_2 Setting	Target O_2 Setting
Normal Conditions	**11.5% to 12.0%**	**3.5% to 4.0%**

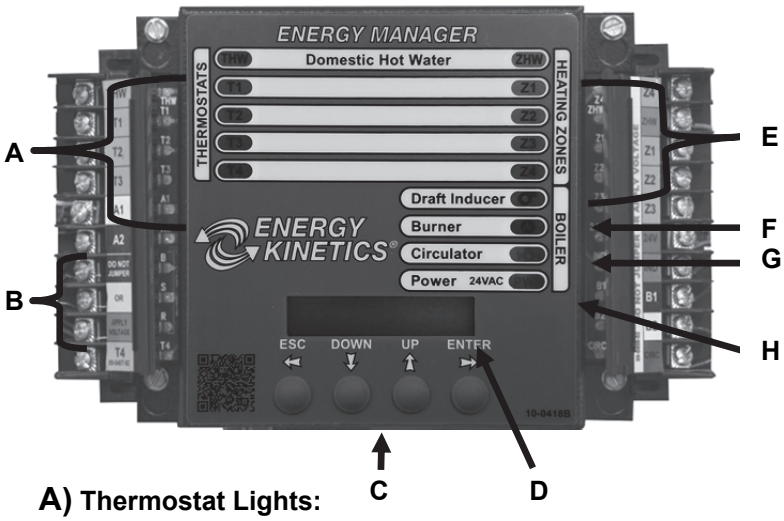
Note 1: When Air Box is used, all combustion tests must be checked with **air box cover in place**.
Note 2: Burner operating range is from 10% to 14% CO2 with no or a minimal smoke trace. Burner should be adjusted for clean and safe combustion operation. Site specific conditions may require lower CO_2 setting, with 11% as a minimum overall. For biofuels blends of B40 (40% blend) through B100 (100% blend) a 12% minimum CO_2 and a burner primary control post purge of 15 seconds is recommended for the best operation. Running with very low levels of excess air may reduce burner head long term durability without noticeable benefits in annual efficiency.

AFTER 15 MINUTES OF CONTINUOUS BURNER OPERATION, CHECK AND RECORD:

1. DRAFT AT OVER FIRE…… -0.05" to –0.25" w.c.
2. CO_2 …… See table above
3. STACK TEMPERATURE …… 190° to 290° F
4. SMOKE TEST …….. Verify 0 smoke

Draft over fire with Smart Vent should be -0.05" to -0.25" w.c.
If not, check if power vent fan is turning, or for vent/fan blockage.

ENERGY MANAGER OPERATION



WARNING: ***Do Not Jump!***

If you apply 24VAC to any Energy sensor lead with the sensor connected to the Manager, you will burn out both the sensor and the Manager in less than a second.

NOTE: The Manager cannot lockout the primary control on the burner. The E140 error code will usually indicate that a burner lockout has occurred.

Testing Manager Lights: To confirm operation of the Manager lights, turn power off briefly and power up the Manager. On startup, all output lights will turn on for a brief moment and LCD back light is turned on.

A) Thermostat Lights:

Indicate a thermostat calling for heat. If all lights are OFF, the burner will not run because there is no call for heat. T_4 is located on the bottom. SET HEAT ANTICIPATORS FOR 0.1 AMPS. There is a 25 second delay to prevent thermostat short cycling.

B) Return Temperature Thermistor:

Senses return temperature and is required for manager to work properly. If the thermistor has failed, the E100 error code is displayed for the first ten minutes. After ten minutes, the manger switches to and displays E190 error code (Classic Mode). Disconnecting the RED lead will cause the manager to run in these modes also.

C) Option Switches:

*Set option switch 1 to **ON** for systems with a gas burner. Set option switch 2 to **ON** for sidewall vent systems.*

D) LCD Display:

Displays boiler RETURN temperature, not supply temperature.

- The Manager is the **operating aquastat** and will turn off the burner if **return** temperature reaches 170°F (operating limit).
- The zone outputs will open when the return temperature is above 140°F and close zone outputs when the return temperature drops below 120°F. If a new zone calls when the returns are below 140°F the new zone will not open until the temperature exceeds 140°F (even if other zones are open).
- The boiler will typically take about 2 minutes to reach 140°F from a cold start.

When the Manager is working properly and has found a condition that needs service, the E100, E130, E140, E150 or E190 error codes will be displayed along with a description of what the error code means. See page 27.

E) Heating or Zone Lights:

Indicate 24-volt power from 24VAC to Z_X (Z_{HW}, Z_1, Z_2, Z_3, and Z_4). This provides power to 24-volt zone valves or zone circulator relays. NEVER JUMPER THIS CONNECTION!

F) Inducer Light On:

Indicates 24 volts from IND to 24VAC. This pulls in the 24-volt coil on the inducer relay, providing 120-volts to the power vent. *This will only operate with option switch 2 ON.*

G) Burner Light On:

Indicates a closed contact between B_1 to B_2. This is wired to T-T on the burner primary control.

H) Circulator Light:

On indicates 24 volts from manager CIRC to manager 24VAC. This pulls in the 24-volt coil on the Burner/Main circulator relay, providing 120-volt power to both the main circulator and the burner.

ENERGY MANAGER CHECK

Troubleshooting

The burner will not run unless there is a call for heat (thermostat call) or a call for domestic hot water (tank aquastat).

Note: Do *NOT* Jumper Connections or Apply Voltage to Test the Manager.

Follow these simple steps:

1. **Look at the Manager**
2. **See what it is telling you is supposed to be happening.**
3. **See if it is happening, and if it is not, find out why (see below).**
4. **If you do not find the problem, perform the 2 Minute Energy Manager Diagnostic to check all Manager functions.**

These are zone output lights.

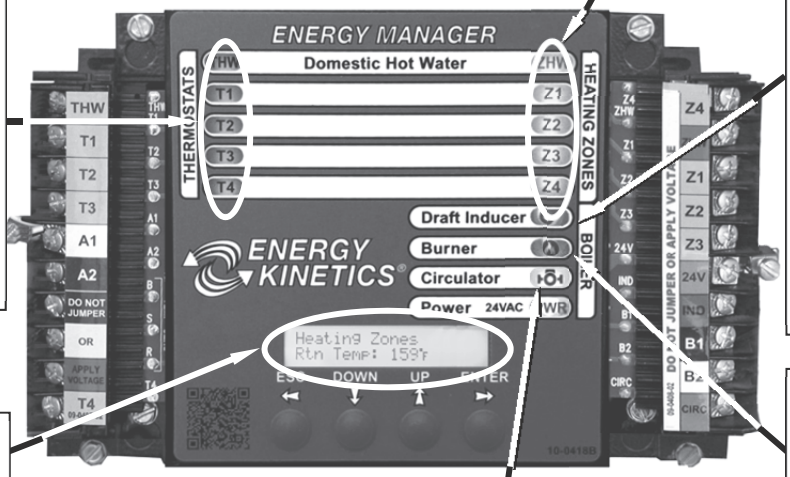
- If the light is ON, the zone valve should be open. For hot water, the bronze circulator should be running.
- If zone valve is not open with the light on, check the zone valve and zone valve wiring. For hot water, check the hot water relay, wiring, and the bronze circulator.

These are the thermostat input lights. These lights indicate when a thermostat is calling and only come on when there is an external connection.

- If the light is not ON, check the thermostat and thermostat wiring.
- If the light is ON, the thermostat is calling.

This is the power vent inducer output. This light should only operate if dip switch 2 is on.

- If the light is ON, the inducer should be running.
- If the light is on and the inducer is not running, check the inducer, wiring, and inducer relay and wiring.



This is the LCD display.

- If no alerts are present, the display will show the *operation mode* and the *return temperature*.
- If an alert is detected, it will be displayed here, along with brief diagnostic or informational details.

This is the burner output. This light indicates T-T is made on the burner.

- If the light is ON, the burner should be running.
- If the light is on and the burner is not running, check the burner, limit aquastat, wiring, burner/main circulator relay, and burner service switch.

INPUT SIDE (Thermostats)

OUTPUT SIDE (Heating Zones)

This is the burner/main circulator output. This light indicates 24 volts is applied to the burner/main circulator relay coil.

- If the light is ON, the main circulator will be running, and the burner primary control should have line voltage.
- If the light is on and the circulator is not running, check the burner/main circulator relay, the circulator, and associated wiring.

Remember:

1) **Most 'no heat' problems are *not* caused by the Manager.**
2) **The Manager *cannot* cause a burner lockout.**

2-MINUTE ENERGY MANAGER DIAGNOSTIC

Most no-heat problems are not caused by the manager. Perform this test to prove proper manager function. Do *NOT* replace the manager if it functions properly in these tests.

The manager cannot cause a burner lockout.

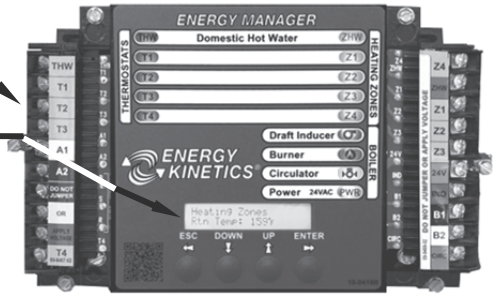
Step 1:

Make sure you have no thermostat calls (turn thermostats down or disconnect after labeling zones).

Step 2:

Turn Service Switch OFF for 5 seconds.
Turn Service Switch ON while carefully observing the display.
The display should briefly show “Startup Selftest”, before changing to show the manager mode and return temperature.
The BLUE power light will remain ON whenever the board is powered.*
This proves the following:

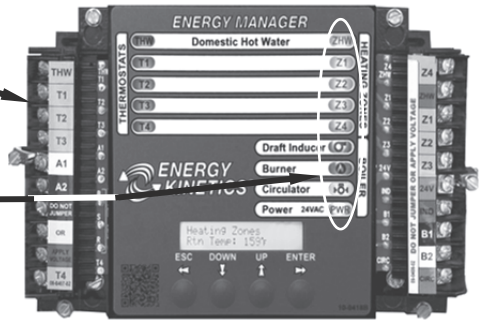
- The display works
- The board is able to detect the board type and mode
- The processor is functioning properly



Step 3:

Turn Service Switch OFF for 5 seconds.
Turn Service Switch ON while carefully observing the output lights. The output lights should all turn on for about a second, and then turn OFF.
The BLUE power light will remain ON whenever the board is powered.*
This proves the following:

- All the output lights work
- 24 VAC should be present
- The processor is functioning properly (second verification)



*If you observe problems in step 2 or step 3, turn Burner Service Switch OFF, disconnect the right hand (output) quick-connector and repeat steps 1, 2, and 3. If problem persists, call technical support or replace manager. Note malfunction on warranty tag and return manager to Energy Kinetics. If problem goes away, there is a problem with the output wiring – check all wiring, re-connect quick-connector and repeat steps 1, 2 and 3 until problem is resolved.

You’re done. The manager is functioning properly. Remember to reset thermostats to original set point, to re-connect wiring connections, connect the quick-connector and to turn the Service Switch ON

ADDITIONAL MANAGER TESTS

Perform the following tests ONLY if you have any of the following:

Case 1) Zones heating intermittently

Case 2) E140 or E150 displayed WITHOUT a burner lockout

Case 3) E100 or E190 displayed

If you have a burner lockout, troubleshoot as any conventional burner lockout.

Case 1: Zones heating intermittently

Step 1: Have all connected thermostats including hot water aquastat call continuously for at least 10 minutes. Service Switch must be ON. Turn burner switch off to prevent zone overheating and to maintain thermostat calls continuously.

Step 2: Observe thermostat Lights.

- If any thermostat input lights (left side) are not ON, check wiring and thermostats.
- If thermostat input light (left side) is OFF within 10 minutes, and with thermostat call present, thermostat input LED is bad. **Solution:** Move thermostat wire lead and zone valve wire lead to a different zone or replace manager.

Case 2: E140 or E150 alert without burner lockout

Step 1: Turn service switch OFF and disconnect right hand (output) quick-connector.

Step 2: Using a multi-meter, check the resistance from B1 to B2 on the manager solder strips. This will be an open circuit (infinite resistance).

Step 3: Turn service switch ON and start a thermostat call while observing the resistance from B1 to B2. Burner light should come on.

- If resistance is less than 3 ohms, manager is functioning properly. Look elsewhere for a problem.
- If resistance is greater than 3 ohms after 3 seconds of operation, B1-B2 contact is bad. Solution: Replace manager.

Case 3: E100 or E190 alert without burner lockout

Step 1: Check the sensor wiring and quick-connectors to ensure proper contact. To improve contact, remove and squeeze the plastic quick connect at all terminals with flat pliers so the gap just closes.

Step 2: Replace sensor if no wiring or quick-connector issues are identified.

DISPLAY MANAGER RETURN SENSOR (Thermistor) TESTING

The temperature sensor in the return line allows better boiler control, and virtually eliminates condensation caused by cold returns.

The temperature sensor is a thermistor sealed with epoxy inside a stainless steel well. The thermistor communicates continuously with the Manager thousands of times a minute.

The Display Manager is the tester of the display manager thermistor. It verifies that it is connected and working properly, if not, will either say "Sensor Fault, Replace Soon", indicating that one pair is bad or display the E100 or E190 error code.

- *The thermistor can be tested with an ohm meter, at room temp (approx. 77F) it should read ~10K Ohms between the black and red wires and between the white and red wires. As long as one pair is good, the manager will read the correct return temperature but display the "Sensor Fault, Replace Soon" message.*
- *Never connect 24 volts to the black, white or red sensor terminals (labeled B, S, or R.)*
- *A caution: T4 thermostat input is adjacent to R, the red sensor terminal. When making thermostat connections, never do so with power on.*
- *Once firm proper connections have been made, power up.*

WARNING: Do Not Jump!

To test the functioning of each output zone, never apply a jumper to the Energy Manager output terminals. The easiest way to test each zone output is to remove the red sensor lead. The Manager should go into Service Board Mode (E100) for 10 minutes, followed by Classic Manager Mode (E190). Adjust each thermostat to call for heat and the corresponding zone should come on if working properly.

Rule #1: Never use a jumper to test the function of the Energy Manager.
Rule #2: Never use a jumper to test the function of the Return Sensor.
Rule #3: Never use a jumper to test the zones outputs.
Rule #4: Only use a jumper from A1 to the thermostat inputs, if you can't reach the thermostats.
Rule #5: Always carry a Service Board with you.

LINE VOLTAGE RELAYS

Remember that behind the Manager is the junction box with the line voltage relays. The line voltage relays are controlled by the Manager.

The burner and circulator power is controlled by one line voltage relay. If both burner and circulator are without power, check the relay.

If the domestic hot water circulator does not have power, check the hot water relay.

If equipped with an inducer and the inducer does not have power, check the inducer relay. Also check to be sure dip switch #2 is turned "on".

LINE VOLTAGE

System 2000 requires 120 VAC. The supply voltage must be within 108 VAC min / 132 VAC max for reliable operation of the boiler and the Manager. An easy way to check the supply voltage is to plug a volt meter in at the service outlet located on the system junction box.

SURGE SUPPRESSION

The Relay Board located in the system junction box is equipped with built-in surge suppression on the 120VAC circuit. Older systems can be retrofitted using a plug-in surge suppressor.

TROUBLESHOOTING WITH THE ENERGY MANAGER

Display Manager Error Codes and Faults

An error code on the display indicates that Display Manager has detected a problem.

E100: Temperature sensor is not working properly. This indicates that the Manager is in service board mode. **Circulator and inducer run constantly**, burner runs off the high limit aquastat. All inputs turn on respective outputs. If the sensor is not detected within ten minutes, the Manager will change to E190 mode.

E190: After ten minutes in E100 mode the Display Manager switches to E190 mode. This indicates that the Manager is operating in Classic Manager Mode. The boiler will operate as **cold start** instead of maintaining temperature as when in service board mode. When a thermostat calls, the system will **pre-heat** for two minutes before opening the zone output and will **post purge** for whatever the zones max purge time is set.

Check Sensor wiring. *Check sensor leads for loose connections or damage. If connections and wiring look good, **replace the sensor**.*
If Manager is left in this mode, set Dual Guard high limit to "Service Mode".

E130: Excessive temperature condition. Zones could not extract heat from boiler. *Check zone valves, heat exchanger and boiler circulation. High limit aquastat may not be functioning.*

E140: Boiler is in Freeze Protection Mode, Burner light off, Circulator light on, Heating zone outputs on. This means that the boiler return temperature did not increase enough to open zones within 27 minutes.

Does Primary Control need to be reset?

YES: Troubleshoot as standard burner lockout.

NO: Did homeowner reset control?

YES: Troubleshoot as standard burner lockout.

NO: Reset Manager. Run through standard heat cycle.

Does boiler return heat up properly?

NO: Check circulator. Possible closed or blocked bypass. Look for a zone valve not holding.

YES: Intermittent problem. Check low voltage wiring for tightness from Manager through relay board and cad cell relay to TT. Check line voltage at burner, in and out of cad cell relay. Check LWCO, Check limit aquastat for proper operation. See if burner/main circulator relay is properly plugged in and working properly.

E150: The return temperature did not reach 100°F after seven minutes. The manager will pulse the output of the calling zone for one minute on and one minute off. If the return increases within 20 minutes, the system will continue to run and supply heat while displaying the E150 code, indicating a boiler side blockage and that the manager is operating in Classic Manager Mode. When a thermostat calls, the system will pre-heat for two minutes before opening the zone output and will post purge for whatever the zone max purge time is set. If after 20 minutes the return does not heat up, the Manager will change to E140 mode.

Sensor Fault: On power-up, or display wake-up, the display will briefly show the message: "**Sensor Fault; Replace Soon**". This indicates that one of the two dual thermistors is giving an invalid reading. Check to ensure that all thermistor leads are securely connected and tightened on the left-hand side quick-connect. If the connections are secure, and the message is still displayed on power-up or display wake-up, the thermistor should be replaced.

TO RESET MANAGER

The Manager can be reset to normal operation by turning the system switch off and back on.

WARNING: **Do Not Jump! If you apply 24VAC to any temperature sensor lead with the sensor connected to the Manager, you will burn out both the sensor and the Manager in less than a second.**

OPERATION WITHOUT THE ENERGY MANAGER

SERVICE BOARD MODE:

The Display Manager can be placed into "E100 (SERVICE BOARD)/E190 (CLASSIC MANAGER MODE)" by turning off the system switch and removing the RED temperature sensor lead from the left side input connector, and turning power back on. Removing the RED lead is similar to inserting the traditional green "Service Board". The traditional service board may still be used if desired. E100 (SERVICE BOARD) allows the boiler to run like a conventional boiler for the first ten minutes. After which, it will switch to the E190 (CLASSIC MANAGER MODE). In CLASSIC MANAGER MODE, instead of maintaining temperature, the system will operate as the original "Classic" manager did. The burner will only run during a call for heat and will post purge to the last zone(s) calling based on time instead of temperature and time.

TEMPORARY OPERATION WITH JUMPERS

(With partially functional Manager still in place and without service board)

If a particular function of the Manager fails, use appropriate jumper action below *with Manager in place*.

BURNER: Jumper BB or TT on burner control. Burner will run on limit whenever Manager calls circulator. The boiler may overheat slightly during energy recovery. Temporarily reset limit aquastat to 165°/180° F.

MAIN CIRCULATOR: Remove blue CIRC lead from right side and connect to A2 on the left side, using an extension lead. The circulator will run constantly and the burner runs on Manager call.

ZONE/HOT WATER CONTROL: Remove zone valve and thermostat leads for zone. Connect a thermostat lead to A1. Connect a zone valve lead to A2. Wire the remaining thermostat and zone valve leads together. Zone valves will open whenever the Thermostat calls but it will not activate manager. If system is active, zone will receive heat when another calls or run system with high limit aquastat set to 165°/180° F and zone will get heat on call.

IF A PLUG-IN RELAY FAILS: Replace with spare relay. If spare is not available, temporarily install a relay with 24VAC coil and 120VAC contacts. Contact Energy Kinetics for connection details.

EMERGENCY HEAT WITHOUT ENERGY MANAGER or RELAY BOARD

(Temporary Operation Only – 5 minute wiring change)

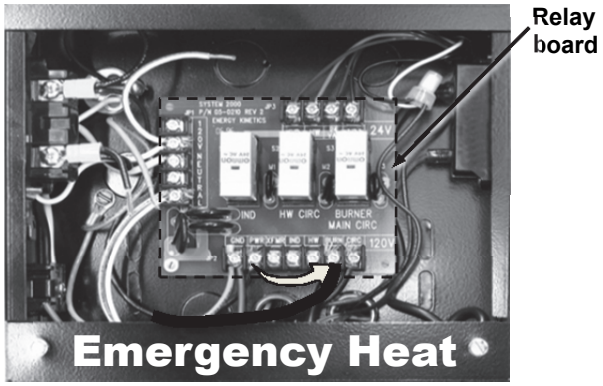
Method A (Heat and Hot Water):

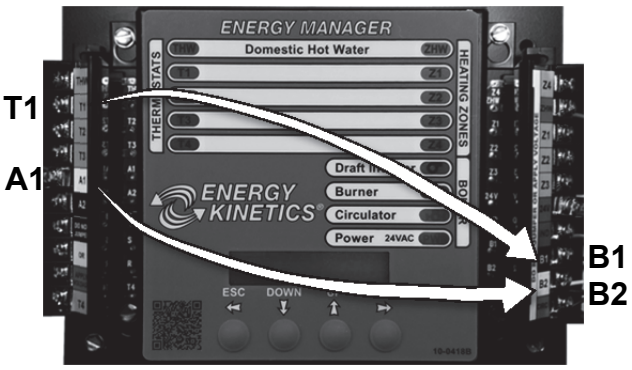
If the relay board is functioning properly, install a service board or follow the wiring instructions in the Owner and Installation Manual to run without a manager.

Method B (Heat Only) – Temporarily relocate (3) wires shown by arrows:

1) Move the black 120VAC wire from PWR to BURN (shown below).

This will apply power continuously to the main circulator which will circulate water throughout all of the open heating zone valves. The stairway switch may be used to stop the circulator (and inducer if sidewall vented) if desired.



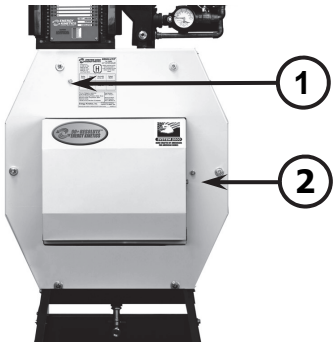


2) Select **one** thermostat that will control when the boiler runs to add heat to the house. Move that representative thermostat (T1, T2, T3, or T4) from the left side of the manager to B1. Move the other wire from that thermostat from A1 to B2. *B1 and B2 connect internally to TT on the burner.*
3) Turn down the high limit aquastat to 165°F/180°F and test and confirm proper and safe function. *When returning to service, reset high limit to 205°F/215°F.
4) Manually open all desired zone valves and close return valve a bit.

There will not be any condensing protection without the manager; closing the return a bit will help limit condensing of flue gases.

NOTE for sidewall vent systems: Add a 120VAC jumper from BURN to IND. This will run the inducer continuously, so caution should be used in systems without antifreeze.

ANNUAL TUNE UP & INSPECTION



Step 1 Initial Test (Draft Loss & CO_2)

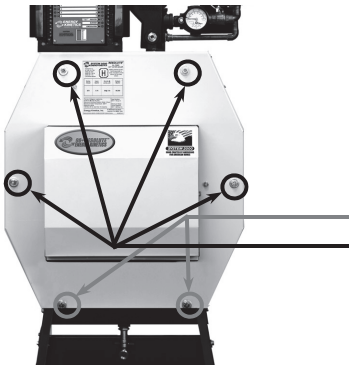
Make sure air box cover is in place before testing

1. Remove 1/8" brass plug from the "over fire" test port (2) next to the burner and the flue box (1) next to the puff switch. Check draft through the "over fire" test port (2) and at the flue box (1). Use a 12" long piece of ¼" O.D. steel or copper tubing and insert it approximately 8" into the boiler. Connect this tube to your test probe using a piece of hose.

   Clean boiler flue passage if the draft difference between the flue box (1) and "over fire" test port (2) is greater than .06" w.c.

2. Check CO_2 through the "over fire" test port (2). Insert the 12" long steel or copper tube approximately 8" in through the test port.

   Refer to the section 'Burner Operation' for acceptable combustion readings.



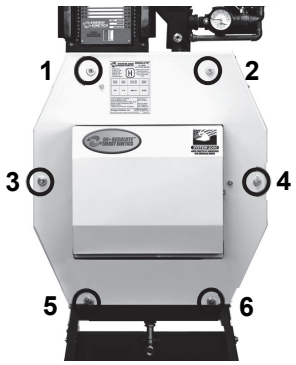
Step 2 Open Front Cover

1. Loosen, but **DO NOT REMOVE** (2) lower nylock nuts on hinge bolts.
2. Remove (4) upper nuts and support cover while opening.
3. Inspect burner head/end cone condition

DO NOT remove or touch combustion chamber for inspection or when cleaning boiler!

Step 3 Inspect Flue Passage

If passage is clean, no scale, then close cover and tighten all hardware evenly. **Clean ONLY if dirty.**



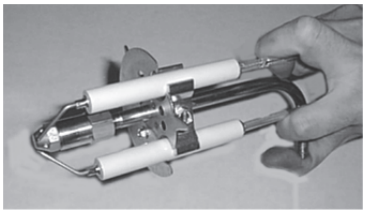
Step 4 Clean Boiler

Do Not Touch, Vacuum or Remove Chamber!
Note: If there is **heavy scale** in last pass:

1. Check for cold returns.
2. Open by-pass valve fully.
3. Set Energy Manager Option Switch 1 to "ON".
4. Check zone valve operation.

Step 5 Close Front Cover

1. Clean stud threads, and then install (4) upper nuts and washers.
2. Tighten (6) nuts uniformly.
3. Check Vent Pipe.
4. Check Vent hood.



Step 6 Remove Drawer Assembly

1. Check Electrode Setting.
2. Check Porcelain Condition.
3. Check Nozzle for coking/heat.
4. Replace nozzle if necessary. *See installation manual for nozzle selection.*

ANNUAL TUNE UP & INSPECTION

Step 7 Check Burner

1. Check end cone through air tube opening with drawer assembly removed.
2. Check Fan/Air Inlet for dirt or lint.
3. Install drawer assembly and check ignitor.
4. Check Filter condition. Replace annually or if vacuum exceeds 7" for single pipe systems.
5. Check flexible oil line for leaks or corrosion. Gently bend hose along its length to check for hardening. Replace immediately if any of these conditions are present.

Note: All burners require "Amulet" retention head protector.

Step 8 Check Zone Valves

Open/Close zone valves several times to see that they move freely.

Step 9 Backflush Plate Heat Exchanger

1. Close the valve underneath the domestic hot water circulator.
2. Open drain valve to backflush the heat exchanger.
3. If domestic water supply is "hard" (lime), consider installing Scale Stopper (Item no. 10-0650).
4. Set temperature feeding hot water tank (above heat exchanger) by adjusting the ball valve below the bronze circulator. Adjust the ball valve with the burner running and a continuous flow of hot water from a fixture. You should just be able to hold your hand on the pipe.

Step 10 Start Burner & Check Safety Functions.

Check & Record: Make sure air box cover is in place before testing.

1. Draft Loss: A difference of 0.06" or *less* between flue box (1) and "over fire" test port (2).
   Smart Vent: Draft over fire of -0.05" to -0.25"wc after 15 minutes of continuous burner operation.
2. Check CO_2 at "over fire" test port (2)
   Refer to the section 'Burner Operation' for acceptable combustion readings
1. Smoke Test: Must be zero smoke. A trace is not acceptable.
2. Stack Temp: 190º-290º F. (at flue box port)
3. Verify DualGard 205º/215º F.
4. Test Safety High Limit operation:
   A. Remove all heat and hot water calls (No input lights on left side of manager).
   B. Turn System switch off, then remove red sensor lead from the left side quick connect.
   C. Restore power. The 100° light will flash on the manager's temperature display, and the burner should start momentarily.
   D. At approximately 205° F to 215° F, the high limit should shut off burner.
5. Test Low Water Cut-Off: Press and hold the Test/Reset button for 5 seconds (30 seconds for manual reset). The display will read LCO. The red Low Water light should illuminate and the LWC circuit will de-energize.
6. Check safety lockout: Shut off fuel supply and operate burner to verify safety lockout.
7. Check draft inducer fan proving switch:
   a. With burner running, turn off option switch 2 on the Energy Manager, which will turn off the inducer.
   b. The fan proving switch will open, removing power from the burner motor. Safety lockout should occur after the primary control recycles operation.
   c. Turn on option switch 2 on the Energy Manager, to restore operation.
8. Check proper operation of the blocked air intake detection switch:
   a. Block air inlet to burner
   b. Attempt to start the burner. Safety lockout should occur in approximately 1 minute.
   c. Unblock air inlet to burner.

Safety High Limit
205º/215º F

REPLACEMENT PARTS

To order replacement parts, specify serial number stamped onto nameplate, part description and part number from parts list and assembly drawing on the next page.

AMULET REPLACEMENT

It is recommended that a new ceramic sleeve "amulet" be installed each time the air tube is removed from unit. See instructions that come with each amulet. The Resolute amulet is larger than the standard amulet, so be sure to order the proper part number shown in the Assembly Drawing. Using a standard amulet will allow excessive heat back to the front jacket and may damage burner tube.

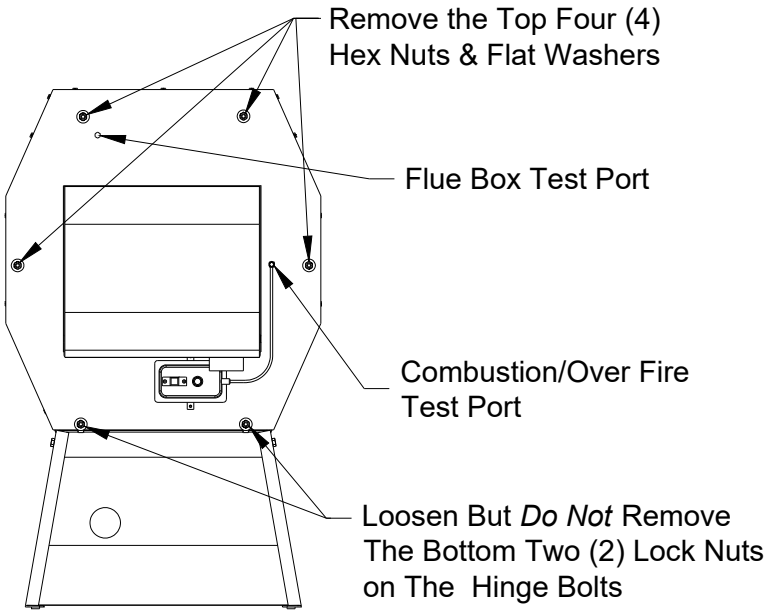


Figure 6

COMBUSTION CHAMBER REPLACEMENT

The combustion chamber is of high quality refractory ceramic fiber material and will normally not need to be replaced.

A replacement chamber, if required, is available from Energy Kinetics.

The proper part number for the Resolute chamber must be specified when ordering. For interim operation, the unit may be run without a combustion chamber if necessary. Ensure that the burner head is protected by the amulet, wet pack or a similar material.

To install the replacement. **CAUTION: A dust mask must be worn during procedure**:

1. Open boiler by removing the four nuts, two on the top, and one on the middle left and middle right of the boiler. Note: Loosen, but do not remove, the two 3/8" nuts on the bottom of the front jacket, the door is hinged upon these bolts. While supporting the door, lower door slowly to the down position.
2. Spray chamber with a water mist to minimize disturbance and breakage of chamber material.
3. Remove chamber by tilting upward and rotating to loosen.
4. Locate and inspect the square dimple in the rear insulation board. The lower side of the chamber will insert into this dimple.
5. Locate the 4"x2" support molded on the backside of the chamber and coat the 2" sides with refractory cement.
6. Insert chamber into the boiler with the exhaust opening in the 3 o'clock position. Chamber outlet must fit behind or alongside the metal tab (supply nipple) in the top rear of the boiler.
7. With chamber fully inserted, slightly move the chamber until the chamber outlet is snug against the right side of the boiler. The 4"x2" support on the back of the chamber should fit securely into the dimple on the rear insulation board.
8. Verify that the chamber is centered and ensure that the burner is centered with the chamber when closing the front door. Secure and tighten the three nuts. Also check the two 3/8" nuts on the lower hinge bolts and ensure that they are tight. Do not over tighten; tighten snugly enough to compress the door insulation.
9. Confirm proper setup and operation of burner (see "Oil Burner Operation").

WARNING: Ceramic fiber or fiberglass materials, may contain carcinogenic particles (cristobalite) after exposure to heat. Airborne particles from fiberglass or ceramic fiber components have been listed as having potential health effects. Take the following precautions when removing, replacing and handling these items.

Precautionary procedures:

Avoid breathing dust and avoid contact with skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves and eye protection. Use a properly fitted NIOSH certified respirator for dusty activities and where exposure levels are unknown.

Use hand tools whenever possible if cutting or trimming is required. Power tools generate significantly more airborne dust.

Use vacuums with HEPA-filters for cleanup. If HEPA-filter vacuum are not feasible, lightly spray fiber materials and work area with a water mist before sweeping or bagging of debris.

Wash exposed skin with soap and water after handling.

Do not use compressed air to clean work clothes or work area.

Wash work clothes separately from other clothing. Rinse washer thoroughly afterwards.

Avoid smoking, eating or drinking while dust is present in the work area.

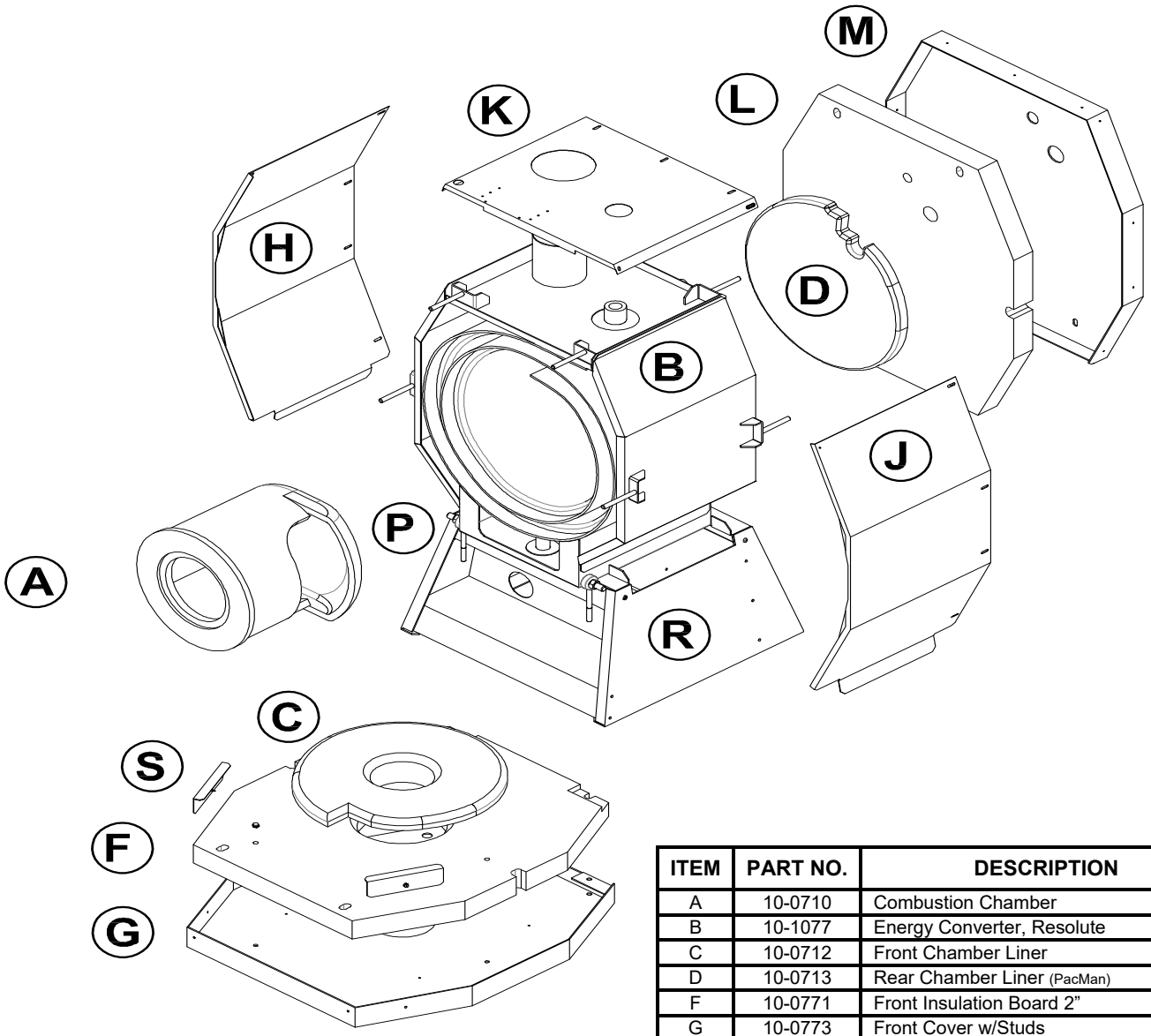
RATINGS

Boiler Model: 90+ Resolute Oil	Burner Input GPH [2]	AFUE %	Heating Capacity MBH [1]
EK1R-95	.68 GPH	91.0	76[3]
EK1R	.74 GPH	90.7	85[3]
EK1R-119	.85 GPH	90.4	102[4]
EK1R-140	1.00 GPH	89.8	125[4]

Notes:
1. MBH refers to thousands of Btu per hour.
2. Based on 138,700 Btu per gallon
3. Based on standard test procedures prescribed by the United States Department of Energy at combustion condition of 13.7% CO_2.
4. Based on standard test procedures prescribed by the United States Department of Energy at combustion condition of 13.8% CO_2

AFUE Test Conditions: Room Conditions: 95-99°F; Return Water Temperature 120-120.5°F; Flow adjusted to achieve 19.0-19.5° dT; Fuel Adjusted after refractory burn-off for 30 minutes

REPLACEMENT PARTS



ITEM	PART NO.	DESCRIPTION
A	10-0710	Combustion Chamber
B	10-1077	Energy Converter, Resolute
C	10-0712	Front Chamber Liner
D	10-0713	Rear Chamber Liner (PacMan)
F	10-0771	Front Insulation Board 2”
G	10-0773	Front Cover w/Studs
H	10-0774	Left Jacket
J	10-0775	Right Jacket
K	10-0776	Top Jacket
L	10-0772	Rear Insulation Board 2”
M	10-0777	Rear Cover
P	10-0726	Door Hinge Assembly (ea.)
R	10-0780	Base Kit
S	10-0779	Front Insulation Board Clip (Set)
---	10-0537R	Air Box Cover, Resolute
---	10-0330-R	EK1R 90+ Resolute Inducer Only

COMMON ITEMS AVAILABLE BUT NOT SHOWN

PART NO.	DESCRIPTION
10-0418D	Energy Manager
10-0434	Air Vent
10-0412A	Plug-In Relay
10-0681	Puff Switch, Gas
10-0682	Puff Switch, Blocked In-Let Air
10-0412B	Relay Board inside Junction Box
10-0717	Amulet ceramic sleeve

PART NO.	DESCRIPTION
10-0417F	EK-1 Digital Temperature Sensor
10-0516	Boiler Pressure Relief Valve 30 psi
10-0420	T&P Gauge
10-0150	¾ Two Wire Zone Valve (Std.)
10-0151	¾” Four wire Zone Valve (w/End Switch)
10-0415	High Limit Aquastat
10-0416F	Plate Heat Exchanger

NOTES:

LIFETIME LIMITED WARRANTY
For Residential Water Boilers

By this Warranty Statement, Energy Kinetics, Inc. of Clinton Township, New Jersey, issues limited warranties subject to terms, conditions, exceptions and exclusions listed below.

These Warranties are issued only to the person or entity which owns the building in which the boiler is installed at the time of original installation and only for such portion of the warranty periods as such person or entity owns such building (hereinafter, the "End User").

I. THREE YEAR – LIMITED WARRANTY FOR RESIDENTIAL WATER BOILERS

Energy Kinetics warrants that its residential heating System 2000, with residential water boiler, Models EK1 and EK2, is free from defects in material and workmanship for three years from the date of installation. If any parts are found to be defective in manufacture, Energy Kinetics will repair or replace the defective parts. Exception: Honeywell Zone Valves

II. ADDITIONAL COMPONENT LIMITED WARRANTIES

1. Energy Kinetics warrants that its Digital Energy Manager is free from defects in material and workmanship for a period of five years from the date of installation. The warranty is extended to the End User for the lifetime of the unit by a manufacturer sponsored rebuild program offered at nominal cost.
2. Energy Kinetics hereby assigns to the End User limited warranties of the original manufacture of components supplied by Energy Kinetics to the extent or duration assignable.
3. If any such component is found defective, Energy Kinetics' responsibility is solely to repair or replace the defective part at its or the original manufacturer's option.

LIFETIME LIMITED WARRANTY FOR THE PRESSURE VESSEL

During the lifetime of the original owner in the original place of installation, Energy Kinetics warrants that those parts, which comprise the pressure vessel of the residential hot water boiler, remain free of defects in material or workmanship under normal usage.

In the event that such pressure vessel is found to be defective in material or workmanship during the first 10 years, Energy Kinetics will repair or replace the pressure vessel at its option and include a labor allowance per the published schedule. After 10 years, there will be a proportionate charge based upon the time the defective assembly was in service. The proportionate charge will be equal to the appropriate percentage of the trade list price of such pressure vessel at the time the warranty claim is made as determined in the following:

YEAR:	**1st**	**11th**	**12th**	**13th**	**14th**	**15th**	**16th**	**17th**
				Percent of Trade list Price:				
	0%	**5%**	**10%**	**15%**	**20%**	**25%**	**30%**	**35%**
YEAR:	**18th**	**19th**	**20th**	**21st**	**22nd**	**23rd**	**24th**	**25th**
				Percent of Trade list Price:				
	40%	**45%**	**50%**	**55%**	**60%**	**65%**	**70%**	**75%**

YEAR: 25TH and Above: 75% of Trade list Price

IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESS WARRANTY-ENERGY KINETICS EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY.

This Warranty gives you specific legal rights and you may have, also, other rights which vary from state to state.

EXCEPTIONS AND EXCLUSIONS

1. The warranty is subject to the condition that the residential boiler must have been installed and serviced in accordance with Energy Kinetics instructions, the basic BOCA Building Code, local statutes and ordinances and accepted good industry practice.
2. This warranty does not cover components that are part of the heating system but which were not furnished by Energy Kinetics.
3. This warranty does not cover the workmanship of any installer of Energy Kinetics residential water boiler. In addition, it does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
4. This warranty does not cover improper burner adjustments, control settings, care or maintenance.
5. This warranty does not cover any labor for removal or reinstallation of the alleged defective part, transportation to Energy Kinetics if necessary and other materials necessary to perform the exchange.
6. This warranty does not cover failure of the pressure vessel other than defects in material or workmanship and shall specifically exclude any other reason including but not limited to a) lack of water b) freezing c) excessive pressure d) floods e) fire f) acts of God g) corrosion of internal or fireside surfaces h) improper water conditioning I) improper maintenance of external fireside surfaces j) operation with defective fuels or other additives which cause improper burner operation or deposits to collect or corrosion to occur in or on the pressure

SYSTEM 2000 ENERGY KINETICS

LIFETIME LIMITED WARRANTY

(Continued from Previous Page)

7. Systems installed with chimneyless, through the wall venting option may have less than complete or poor combustion which may cause sooty fumes, odors or gradual discoloration of the area near the vent (exhaust) outlet. Poor combustion is generally the result of a burner being out of adjustment for a number of reasons, including but not limited to fuel condition and combustion air supply. Energy Kinetics does not guarantee nor warranty that all times the exhaust contents will be without a trace of soot or odor for reasons described above. Periodic cleaning and repainting of the area around the vent hood may be required if the appearance is objectionable in the view of the end user. Such cleaning or repainting is not the responsibility of the service company, installer or manufacturer.

LIFETIME WARRANTY TRANSFER

By completion of the Warranty Transfer Agreement, the original owner may transfer the warranty to a new owner by payment of a $75 registration fee.

WARRANTY SERVICE

For prompt warranty service, notify the installer who in turn will notify Energy Kinetics that the purchaser believes there is a defect in material or workmanship covered by this warranty statement.

If within 30 days of the discovery, this action does not produce a prompt response, notify Energy Kinetics, Inc. 51 Molasses Hill Road, Lebanon, NJ 08833, in writing with details to support the warranty claim.

The End User is required to make available for inspection by Energy Kinetics or its representative, the parts claimed to be defective and, if requested by Energy Kinetics, to ship said parts prepaid to Energy Kinetics at the above address for inspection or repair. In addition, the homeowner agrees to make all reasonable efforts to settle any disagreement arising in connection with this claim before resorting to legal remedies in courts. If you have any questions about the coverage of this warranty, contact Energy Kinetics at the above address.

Lifetime Warranty Transfer Agreement

(I/We), the undersigned, as the original purchaser of the ***90+ Resolute®*** home heating system, submitted the *Warranty Registration* within three (3) months of installation of (my/our) ***90+ Resolute*** to Energy Kinetics, Inc., and (I/we) hereby transfer our Lifetime Limited Warranty to the new owner(s) of the home located as noted below and understand a thirty (30) day waiting period applies. Warranty coverage begins on the date of original installation.

SYSTEM 2000 **Serial Number:**_____ **Date of Original Installation:**_____

Name of original purchaser of ***SYSTEM 2000***: _____
Print or Type full Name(s)

Located at this street address: _____

City: _____ State: _____ Zip: _____

TRANSFER TITLE of ENERGY KINETICS' WARRANTY TO: _____
Print or Type full Name(s)

New Owner(s) of the ***SYSTEM 2000*** located at the address noted above. Title to be effective, _____ and continues uninterrupted coverage as is left on the original warranty.
Enter Date of Title Transfer

(Example: If the original owner has used 9 years, 3 months and 10 days of the warranty, the new homeowner warranty transfer begins at 9 years, 3 months and 11 days and continues to the end of the warranty as described on the back of this agreement or until the new homeowner sells the residence).

Enclosed is a check for $75.00 to register and maintain the warranty as described on the back of this Warranty Transfer Agreement to the new homeowner named above. Please make check payable to Energy Kinetics, Inc.

Agreed to by the Original Homeowner: _____ Accepted: _____
Original Homeowner Signature — New Homeowner Signature

********** For Office Use Only **********

Energy Kinetics, Inc. Received Transfer Information: _____ $75.00 Received ____ Check No. _____
Date Received and Registered

Confirmation of Transfer mailed to New Homeowner: _____ By: _____
Date — Office Personnel