

Eco[®]Tec

80/110/150/199

**Wall Mount Gas-Fired
Condensing Boilers – Combi and Heating Only Models**

Boiler Manual

- Installation
- Maintenance
- Startup
- Parts



▲WARNING

This manual must only be used by a qualified heating installer/service technician. Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death or substantial property damage.



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⚠ WARNING DO NOT SERVICE THE BOILER WITHOUT AN ECO Tec MAINTENANCE KIT AVAILABLE

The maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler. Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage. See Figure 125, page 137 for part number.

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Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

- ⚠ DANGER** Indicates presence of hazards that will cause severe personal injury, death OR substantial property damage.
- ⚠ WARNING** Indicates presence of hazards that can cause severe personal injury, death or substantial property damage.

- ⚠ CAUTION** Indicates presence of hazards that will or can cause minor personal injury or property damage.
- NOTICE** Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.



The ECO Tec Gas-fired water boilers

1. Stainless steel firetube heat exchanger

The corrosion resistant fire tube heat exchanger is our method of transferring heat from the combustion chamber to the water.

2. Heat exchanger cover plate/burner mounting plate

Note ! : Combi shows cover plate (Item 2) (insulation removed for clarity), Heating Only has insulation covering shown.

3. Blower

The advanced blower design and air inlet silencer on ECO Tec boilers results in very quiet operation. Air enters the boiler enclosure through the air intake adapter (Item 21), flows through the enclosure, enters the air inlet silencer (Item 5), then enters the venturi (Item 6) where it mixes with gas before entering the blower. The blower pulls air through these components and then pushes it through the cover plate (Item 2) to the burner (Item 13- not shown).

4. Gas valve

The automatic gas valve references the pressure in the cabinet and allows gas to flow when the control (Item 18) applies power. (An on/off switch is attached to the gas valve. It allows the shutting off of the gas supply for servicing or shut down).

5. Air inlet silencer

The horn-shaped air inlet silencer significantly reduces fan noise, providing exceptionally quiet operation.

6. Venturi

When air flows through the venturi, a negative pressure is created. This causes gas to flow from the gas valve into the venturi, where it is mixed with the air. The gas/air mixture then continues into the blower.

7. Boiler Circulator

The pump is used to circulate hot water from the boiler, and then pass it into heating system or the brazed plate heat exchanger.

8. Boiler Out water temperature dual sensor

This dual sensor monitors boiler outlet water temperature. The control adjusts boiler firing rate so the outlet water temperature is correct, based on the calculated (if outdoor reset used — see page 149) or fixed target temperature.

9. Boiler In -water temperature sensor

This sensor monitors boiler in water temperature. The Control may reduce boiler input depending on if the boiler in and boiler out water temperature difference is too large.

10. Electronic display

The electronic color touch screen display is used to configure boiler settings and monitor boiler operation. This display allows changing display mode, selecting and adjusting control settings, and resetting the control after lockout.

11. Flue adapter (fits 3" PVC, 3" PP, and 3" SS)

12. Boiler Flue pipe

Internal flue pipe that carries exhaust gasses from heat exchanger to vent/flue adapter.

13. Burner (not shown)

Made with high-grade stainless steel construction, the burner uses pre-mixed air and gas. The burner and control provide modulating firing.

14. Boiler water outlet pipe 1" Male NPT (Boiler Supply)

15. Boiler water inlet pipe 1" Male NPT (Boiler Return)

16. LWCO port/plug 3/4" NPT

This plug can be removed to install a low water cut-off (LWCO).

17. Gas line

This stainless steel flexible gas line connects the incoming gas line to the gas valve. The gas line has a 1/2" Male NPT connection for installation.

18. Circuit board module (see page 72)

19. Air pressure switch

Air pressure switch monitors maximum flue pressure.

20. High voltage junction box – 120VAC field wiring connections.

21. Air intake adapter (fits 3" PVC, 3" PP, and 3" SS)

22a. Electrical entrances (line voltage)

The bottom middle knockouts are designated for line voltage wiring only. Ensure all wiring entrances are sealed.

22b. Electrical entrances (low voltage)

The bottom right side and top right knockouts are designated for low voltage wiring only. Ensure all wiring entrances are sealed.

23. Boiler drain valve (not shown)

Shipped loose for field piping. Pipe drain valve on reducing tee at the lowest point of return piping to boiler. See instructions, page 13 in this manual.

24. Condensate tube

The outlet at the bottom of the boiler to drain condensate. The condensate trap assembly attaches here.

25. Flue gas condensate drain trap assembly (not shown)

The condensate trap assembly is field-installed, condensate drain trap is connected to the condensate tube (Item 24) as shown in this manual.

26. Jacket door

The jacket door is sealed to the boiler assembly around its entire perimeter.

27. Front door latches

Two (2) latches secure the door in place.

28. Ignition electrode/flame sensor (shown on Combi, page 5)

The burner flame is ignited by applying a high voltage to the ignition electrode. This causes a spark (from electrode to ground). After ignition, the electrode measures flame signal.

29. Flame inspection window (shown on Combi, page 5)

The quartz glass window provides a view of the burner surface and the flame.

30. Flue gas dual sensor

This dual sensor monitors the flue gas exit temperature. The control will shut down the boiler if flue gas temperature gets too hot. This protects the flue pipe and the heat exchanger from overheating.

31. Transformer

The 120V/24V transformer provides 24V to low voltage control circuitry. Do NOT splice wiring into transformer.

32. Air baffle

The air baffle protects internal boiler components by diverting any incoming moisture or debris away from critical components.

33. DHW - Brazed plate (Combi Only)

This secondary heat exchanger allows heat to transfer from the boiler to the domestic water.

34. DHW - Outlet water temperature sensor (Combi Only) (not shown)

This sensor monitors domestic hot water leaving the brazed plate. The control reduces or increase boiler input, depending on how close the water is to target set point.

35. DHW - 3-way valve (Combi Only)

This valve will change boiler water flow either through the brazed plate or bypass the braze plate and out to the heating system.

36. DHW - 3-way valve Actuator (Combi Only)

This valve will change boiler water flow either through the brazed plate or bypass the braze plate and out to the heating system.

37. DHW - Flow sensor (Combi Only)

This sensor monitors the DHW (domestic hot water) flow rate. When flows 0.5 GPM or greater are detected, the boiler control will allow the boiler to turn on and modulate accordingly.

38. Water Pipe – Air Elimination/Relief Valve Connection 3/4" Male NPT

Use 3/4" tee and 3/4" street elbow to connect relief valve. It is recommended to connect an automatic air vent to top tee connection.

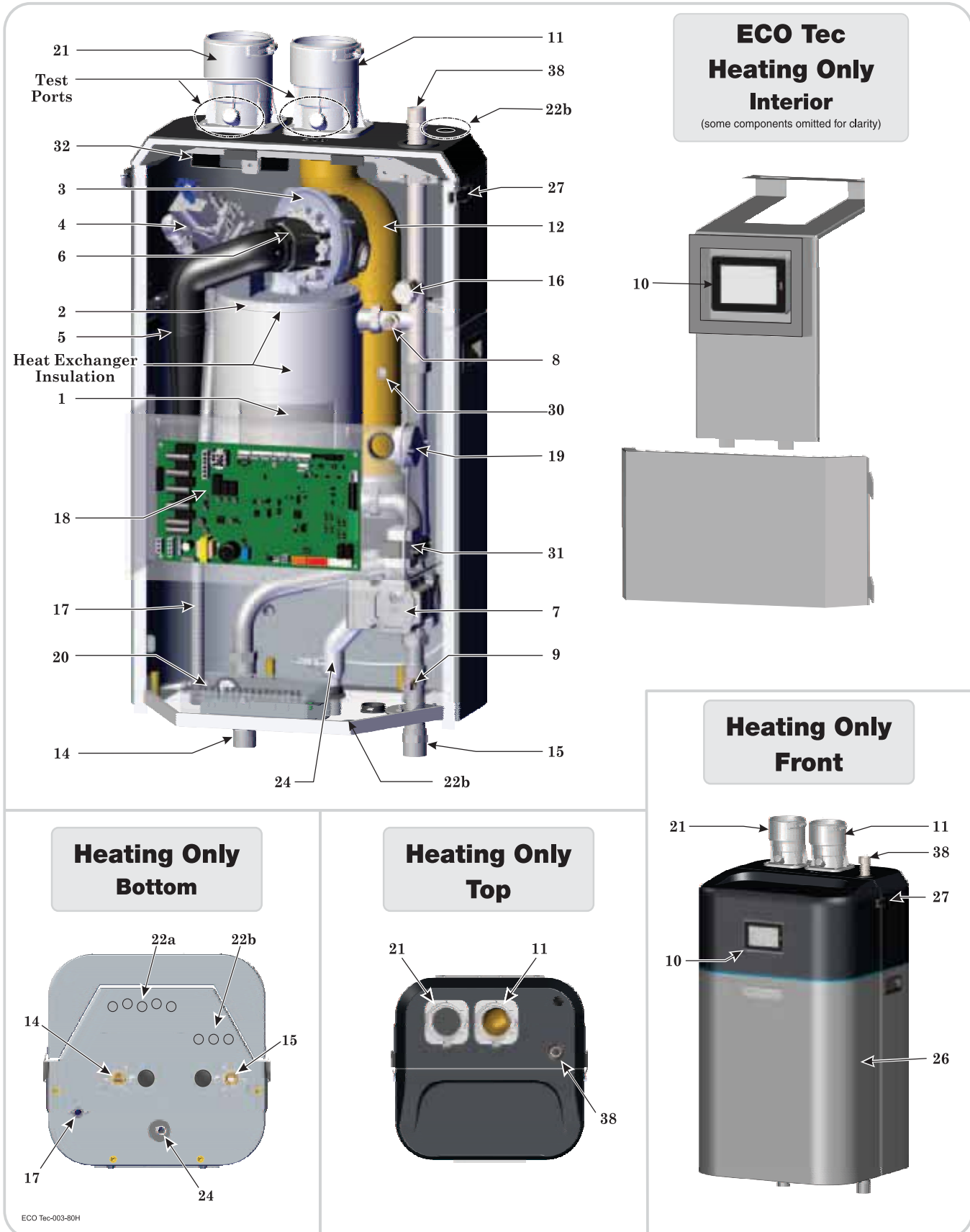
39. DHW Inlet Pipe - 3/4" NPT (Combi Only)

40. DHW Outlet Pipe - 3/4" NPT (Combi Only)



The ECO Tec Heating Only Gas-fired water boilers

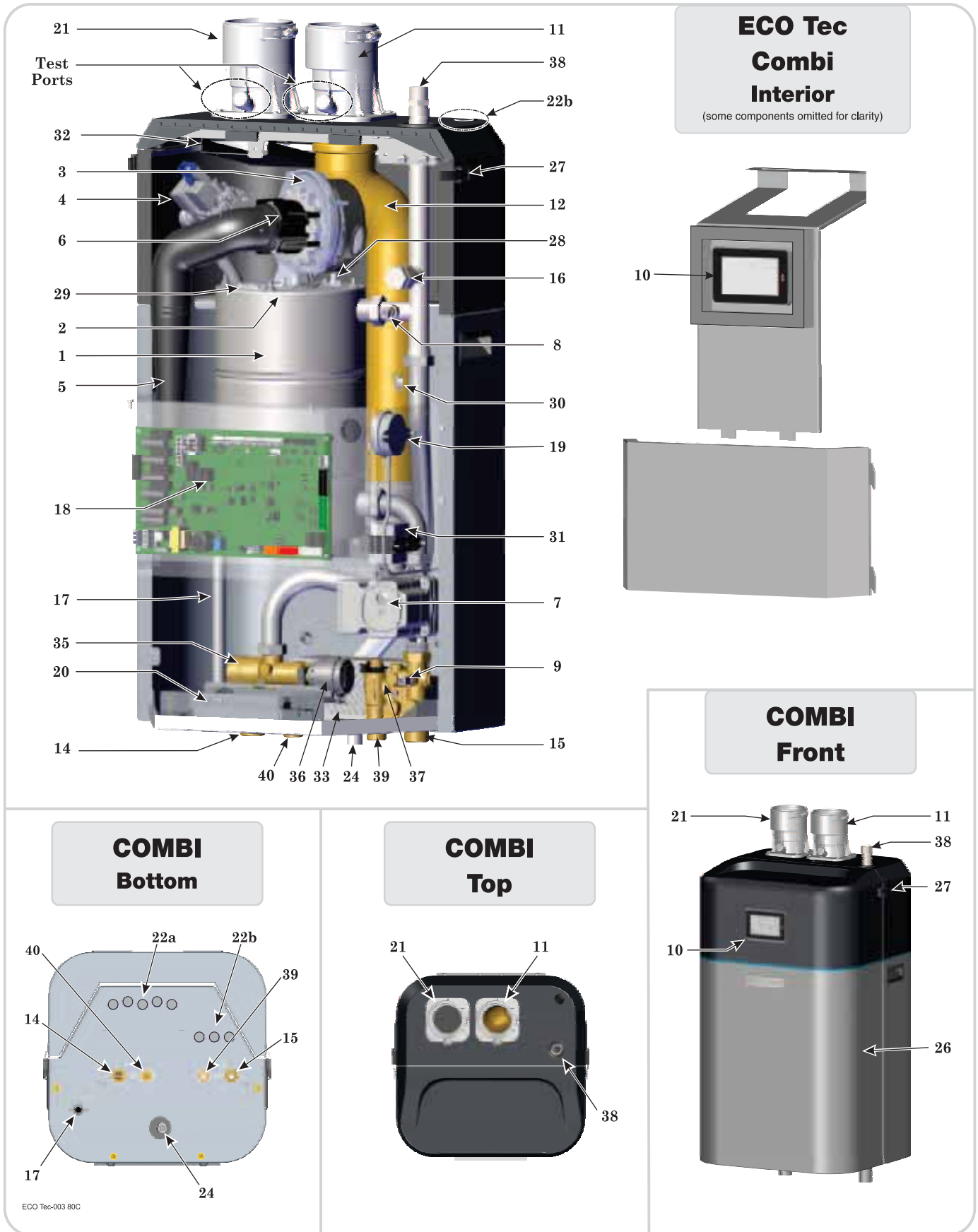
(ECO Tec 80 model shown below)





The ECO Tec Combi Gas-fired water boilers

(ECO Tec 80 model shown below)





Please read before proceeding

▲WARNING

Installer— Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given.

User — This manual is for use only by a qualified heating installer/service technician. Refer to User's Information Manual for your reference.

User — Have this boiler serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE

Write in the Consumer Protection (CP) number in the space provided on the Installation certificate on page 151 if not already shown.

When calling or writing about the boiler— Please have the boiler model number from the boiler rating label and the CP number from the boiler jacket.

Consider piping and installation when determining boiler location.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

▲DANGER

If any part of a boiler, burner or its controls has been sprayed with or submerged under water, either partially or fully, DO NOT attempt to operate the boiler until the boiler has been either replaced or completely repaired, inspected, and you are sure that the boiler and all components are in good condition and fully reliable.

Otherwise, by operating this boiler, you will cause a fire or explosion hazard, and an electrical shock hazard, leading to serious injury, death, or substantial property damage. See the instructions at right.

Saltwater Damage — The exposure of boiler components to saltwater can have both immediate and long-term effects. While the immediate effects of saltwater damage are similar to those of freshwater (shorting out of electrical components, washing out of critical lubricants, etc.), the salt and other contaminants left behind can lead to longer term issues after the water is gone due to the conductive and corrosive nature of the salt residue. Therefore, Weil-McLain equipment contaminated with saltwater or polluted water will no longer be covered under warranty and should be replaced.

Electrical Damage — If any **electrical component** or **wiring** came into contact with water, or was suspected to have come into contact with water, replace the boiler with a new Weil-McLain boiler.

▲WARNING

Failure to adhere to the guidelines below can result in severe personal injury, death or substantial property damage.

EXPANSION TANK

- Relieve pressure from the system before isolating the expansion tank.

When servicing boiler —

- To avoid electric shock, disconnect all electrical supplies to the boiler before performing maintenance.
- To avoid severe burns, allow boiler to cool before performing maintenance.
- This boiler contains ceramic fiber and fiberglass materials. Refer to the WARNING and instructions on page 106.

Boiler operation —

- Do not block flow of combustion or ventilation air to boiler.
- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.

Combustion air —

- DO NOT install combustion air intake where there is a risk of combustion air contamination.

Carbon monoxide detector —

- A carbon monoxide detector that is wired on the same electrical circuit as the boiler is strongly recommended.

SURGE PROTECTOR —

- Provide surge protection in the boiler power supply. This will reduce the possibility of damage to the boiler control.

Boiler water —

- The **ECO Tec** heat exchanger is made of stainless steel, and requires that system water chemistry be within the limits in this manual. **ADDITIONAL CHEMICAL TREATMENT MAY BE NECESSARY.** See page 97 for details.
- Thoroughly flush the system (**BEFORE** connecting boiler) to remove sediment. The high-efficiency heat exchanger can be damaged by build-up or corrosion due to sediment.

- Do not use petroleum-based cleaning or sealing compounds in boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.

- Continual fresh make-up water will reduce boiler life. Mineral buildup in eat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen carried in by make-up water can cause internal corrosion. Leaks in boiler or piping must be repaired at once

to prevent make-up water. Use this boiler **ONLY** in a closed-loop system.

- Do not add cold water to a hot boiler. Thermal shock can cause the heat exchanger to crack.

Freeze protection fluids —

- NEVER use automotive or standard glycol antifreeze. Use only freeze-protection fluids made for hydronic systems. Follow all guidelines given by the antifreeze manufacturer. Thoroughly clean and flush any replacement boiler system that has used glycol before installing the new boiler. Use only the products listed by Weil-McLain for use with this boiler. See page 98 for details.

▲CAUTION

Frozen Water Damage Hazard

Residences or buildings that are unattended in severely cold weather, boiler system components failures, power outages, or other electrical system failures could result in frozen plumbing and water damage in a matter of hours. For your protection, take preventative actions such as having a security system installed that operates during power outages, senses low temperature, and initiates an effective action. Consult with your boiler contractor or a home security agency.

Commonwealth of Massachusetts

When the boiler is installed within the Commonwealth of Massachusetts:

- This product must be installed by a licensed plumber or gas fitter.
- If antifreeze is used, a reduced pressure back-flow preventer device shall be used.
- Sidewall vent air installations — see instruction on page 24.



Boiler location

Installations must comply with:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.
- National Electrical Code ANSI/NFPA 70 – latest edition. Electrical installation and grounding must be in accordance with CSA C22.1, Part 1, Canadian Electrical Code, and/or local codes.
- For Canada only: CAN/CSA B149.1, Natural Gas and Propane Installation Code, and any local codes.
- Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

NOTICE

The boiler gas manifold and controls met safe lighting and other performance criteria when boiler underwent tests specified in ANSI Z21.13 – latest edition.

Before locating the boiler, check:

1. The boiler can be floor-standing with optional kit or wall mounted.
2. Wall construction — If the boiler is wall-mounted, make sure the wall construction is suitable to carry the weight of the boiler and components. See page 10 for instructions.
3. The boiler is suitable for INDOOR installation only.
4. Check for nearby connection to:
 - System water piping
 - Venting connections
 - Gas supply piping
 - Electrical power
 - Condensate drain
5. Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

WARNING

Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

6. The boiler must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
7. If new boiler will replace existing boiler, check for and correct system problems, such as:
 - Sediment or corrosion in system piping — clean and flush piping BEFORE connecting the new boiler. See page 97.
 - System leaks causing oxygen corrosion or heat exchanger cracks from hard water deposits.
 - Incorrectly-sized expansion tank.
 - Lack of freeze protection in boiler water causing system and boiler to freeze and leak.

Residential garage installation Precautions

Take the following special precautions when installing the boiler in a residential garage. If the boiler is located in a residential garage:

- Mount the boiler with its burner and igniter are at least 18 inches above the floor. Follow the National Fuel Gas Code, ANSI Z223.1 for U. S. installations, or Natural Gas and Propane Installation Code, CSA B149.1 and B149.2 for Canadian installations.
- Locate or protect the boiler so it cannot be damaged by a moving vehicle.
- Ensure that the installation complies with all applicable codes.
- Prevent boiler water and condensate from freezing.

Combustion air requirements

The ECO Tec boiler is certified as a= Direct Vent appliance. It can be converted to Direct Exhaust by using the Approved Weil-McLain Direct Exhaust kit.

- Direct vent (sealed combustion) where combustion air is ducted from outdoors.
- Direct exhaust where combustion air is obtained directly from the boiler room.

Provide air openings to room ECO Tec boiler alone in boiler room

1. No air ventilation openings into boiler room are needed if Direct vent and clearances around boiler are at least equal to the SERVICE clearances shown in Figure 1, page 8.
2. For spaces that DO NOT supply the minimum service clearances, provide two openings as shown in Figure 2, page 8. Each opening must provide 1 square inch free area per 1,000 Btuh of boiler input.

WARNING

The space must be provided with combustion/ventilation air openings correctly sized for all appliances located in the same space as the ECO Tec boiler.

Reinstall boiler jacket door after servicing. The boiler jacket door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Failure to comply with the above warnings could result in severe personal injury, death or substantial property damage.

ECO Tec boiler in same space with other gas or oil-fired appliances

Follow the sizing requirements shown in Figure 29, page 26.

Vent and air piping

1. The boiler requires a special vent system, designed for pressurized venting. The boilers are rated ANSI Z21.13 Category IV (pressurized vent, likely to condense in the vent). See instructions beginning on page 20.
2. You must also install air piping from outdoors to the boiler air intake adapter. The resultant installation is categorized as direct vent (sealed combustion). Note prevention of combustion air contamination on page 20 when considering vent/air termination.
3. Direct exhaust venting can be done with the approved Weil-McLain Direct Exhaust Kit, please see page 137 for kit information
4. Vent and air must terminate near one another unless otherwise specified in this manual. Vent and air piping may be routed vertically through the roof or out a side wall, following the options given in this manual. You may use any of the vent/air piping methods covered in this manual. Do not attempt to install the boiler using any other means.
5. Be sure to locate the boiler such that the vent and air piping can be routed through the building and properly terminated. The vent/air piping lengths, routing and termination method must all comply with the methods and limits in instructions beginning on page 20.



Boiler location (continued)

Provide clearances for service access — RECOMMENDED

1. See Figure 1 for recommended service clearances.
2. If you do not provide minimum service clearances shown, it might not be possible to service the boiler without removing it from the space.

Closet or small-enclosure installations which do not provide at least these recommended clearances require the specially-sized and placed air openings shown in Figure 2.

Provide clearances from combustible materials — REQUIRED

1. See Figure 2 for REQUIRED minimum clearances. ALL installation must provide at least these minimums.
2. Hot water pipes — at least ½ inches from combustible materials.
3. Vent pipe — at least 3/16 inches from combustible materials.
4. See Figure 1 for service clearance minimums.

⚠ WARNING Closet or small-enclosure installations which do not provide at least the recommended service clearances shown in Figure 1 require the specially-sized and placed air openings shown in Figure 2.

Figure 1 RECOMMENDED service clearances (all dimensions are in inches)

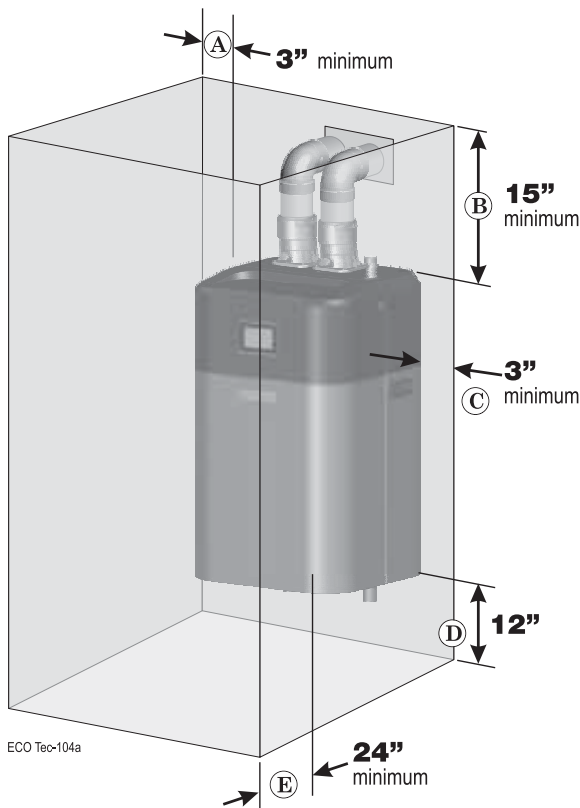
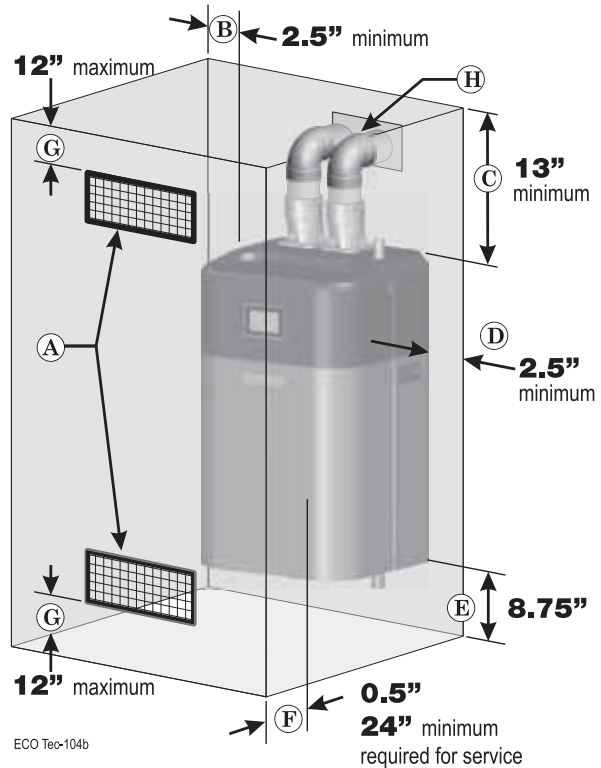


Figure 2 REQUIRED minimum clearances (all dimensions are in inches)



- A. Left side service clearance = 3 inches minimum.
- B. Service clearance above top of boiler = 15 inches minimum.
- C. Right side service clearance = 3 inches minimum.
- D. Service clearance below the boiler = 12 inches minimum for wall hung installation, 0 inches minimum for floor standing installation.
- E. Service clearance in front of the boiler = 24 inches minimum.

NOTICE ADDITIONAL service clearance may be needed, depending on how piping is routed to the boiler.

- A. Provide combustion air/ventilation openings per Figure 29, page 26 or as otherwise directed in this manual or by applicable codes. **NOTICE** If the installation does not provide the minimum clearances in Figure 1, then the enclosure **MUST HAVE** air openings located per Figure 2, above. Each of these air openings must have free area of at least 1 square inch per 1,000 MBH of boiler input.
- B. Left side clearance to combustibles = 2.5 inches minimum.
- C. Top of boiler clearance to combustibles = 13.00 inches minimum.
- D. Right side clearance to combustibles = 2.5 inches minimum.
- E. Bottom of boiler clearance to combustibles = 8.75 inches minimum (must be 18 inches above floor for garage installations) for wall hung installation, 0 inches minimum for floor standing installation.
- F. Clearance in front of the boiler = 0.5 inches, but **24 inches minimum required for service.**
- G. Air openings must be located in the **FRONT** of the enclosure, as shown. They must be no more than 12 inches from the floor or ceiling, as shown.
- H. Vent pipe must be minimum 3/16 inch from combustibles. Opening in combustible wall, floor, ceiling or roof must be 3/8 inches larger than flue pipe diameter, fitted with corrosion resistant steel thimble, or larger if required by codes or as specified by vent pipe manufacturer.



Prepare boiler location

Flooring and foundation (with Kit option only)

Flooring

With the optional floor standing pedestal kit, the boiler is approved for installation on combustible flooring, but must never be installed on carpeting.

⚠WARNING Do not install boiler on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Foundation

1. Provide a solid foundation pad, at least 2 inches above the floor, if any of the following is true:
 - floor can become flooded,
 - the floor is dirt, sand, gravel or other loose material,
 - the boiler mounting area is severely uneven or sloped.
2. The minimum foundation size is:
 - **ECO Tec:** 20 inches wide x 20 inches deep.
3. Foundation may be of wood, brick or concrete (minimum 2 inches thick) construction.

If flooding is possible, elevate boiler sufficiently to prevent water from reaching boiler.

Remove boiler from crate

⚠WARNING **The boiler is heavy.** Use caution not to drop the boiler or cause bodily injury while lifting and handling. Verify that the boiler is securely attached to prevent possibility of boiler falling after installation.

⚠WARNING After the boiler is removed from the shipping carton, **DO NOT** allow the boiler to sit on its bottom. This would cause pressure on protruding plastic, resulting in interior damage. Either lay the boiler on its back or leave on the styrofoam protective shipping base.

Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

⚠CAUTION Cold weather handling — If boiler has been stored in a very cold location (below 0°F) before installation, handle with care until the plastic components come to room temperature.

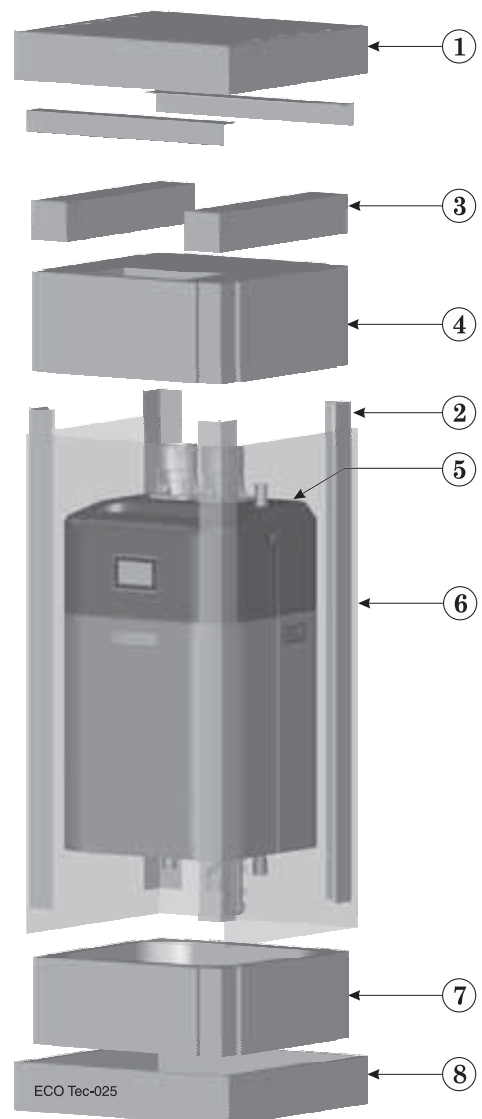
1. The **ECO Tec** boiler is generally easier to handle and maneuver after removing the shipping container.
2. Remove Items 1, 2, 3, 4, and 6 in Figure 3. Remove trim kit and parts from Item 4.
3. **Leave the boiler resting on the styrofoam protective base** (Item 7) and bottom cardboard cap (Item 8), until ready to place on the wall. If removing the boiler from the shipping base, rest the boiler on its back, NOT on its bottom.

⚠WARNING Failure to comply with the procedure given could result in severe personal injury, death or substantial property damage.

Table 1 Boiler operating weights

ECO Tec Boiler Model	Heating Only		Combi	
	Without Pedestal lbs.	With Pedestal lbs.	Without Pedestal lbs.	With Pedestal lbs.
80/110	141	163	152	174
150	162	184	172	194
199	178	200	187	209

Figure 3 Boiler shipping container



- | | |
|----------------------------|-----------------------------|
| 1 Cardboard cap, top | 5 Boiler |
| 2 Cardboard angles | 6 Cardboard sleeve |
| 3 Pad | 7 Styrofoam protective base |
| 4 Styrofoam protective cap | 8 Cardboard cap, bottom |



Wall-mounting the boiler

Wall-mounting requirements

WARNING DO NOT attempt to attach the wall mount bracket using anchors or any means other than directly securing to the wall studs (or equivalent wood structure if studs are not on 16-inch centers).

The wall must be vertically plumb and capable of carrying the weight of the boiler and any attached piping components.

1. This boiler includes a wall template to aid in installation, unfold the template and place it against the wall to aid in locating mounting holes and ensuring proper clearance.
2. Stud spacing: Bracket holes are spaced for studs on 16-inch centers. For other stud spacing, provide secure, solid mounting surface on which to attach the boiler wall-mounting bracket.
3. Wood stud wall: Install bracket with lag screws (3/8" x 3") included in kit, only into the studs.
4. Metal stud wall: Secure bracket and spacer board to studs with the appropriate size bolts and washers that can handle the boiler's operating weight listed on page 9 and any additional weight from venting and gas/water piping to be determined by contractor / installer (hardware not included with kit).

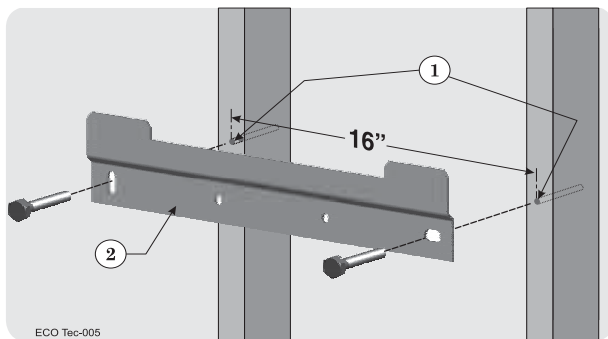
WARNING Verify that the studs are suitable for carrying a wall-mounted load. Some metal studs are not designed for this purpose.

5. If the mounting wall has exposed studs, installer must provide a backer board to mount boiler. Boiler cannot be leveled without a backing surface.
6. Mount the boiler on the wall following these instructions. The boiler mounting bracket must engage with the wall-mount bracket. Make sure the bracket is not just resting on the edge of the boiler mounting bracket. Perform all procedures given in the Boiler Manual on previous pages before mounting the boiler.

Install the wall-mount bracket (by installer)

1. See Figure 4.
2. Locate the studs — must be on 16-inch centers. See previous page instructions if studs are not on 16-inch centers.
3. Place the wall-mount bracket (Figure 4, Item 2) on the wall, using a level to align correctly.
4. Place the wall-mount bracket so the mounting slots are centered over the studs.
5. Level the bracket and trace the outline of the screw slots with a pencil.

Figure 4 Wall-mount bracket and studs



- 1 Studs — Pre-drill through the wall into the studs 1/4 inch diameter x 3 inches deep for 3/8-inch lag screws — Studs must be on 16-inch centers. If studs are any other spacing, provide a secure, solid mounting surface on which to attach the boiler wall-mounting bracket.
- 2 Wall-mount bracket

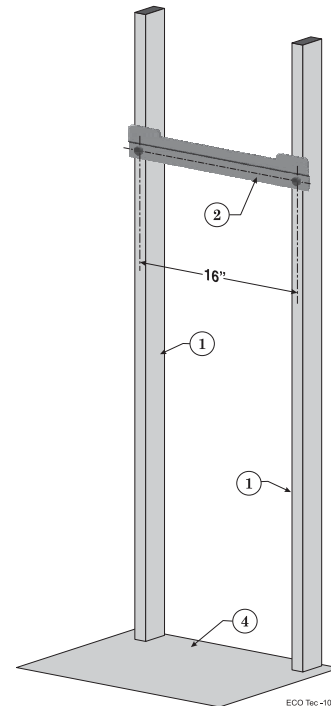
6. Remove the mounting bracket and drill holes 1/4" diameter by 3 inches deep, centered on the screw slot outlines. (For metal stud walls, drill required clearance holes.)
7. Position the wall-mount bracket on the wall. Insert and loosely tighten the two (2) lag screws (or toggle bolts for metal studs).
8. Level the wall-mounting bracket. Then tighten lag screws securely. For drywall or plaster lathe installations, avoid tightening so much that the bracket digs into the wall surface.
9. Once bracket is installed and leveled it is recommended to install additional screws in center holes to fully secure to mounting surface.

Place boiler on bracket

1. See Figure 5. The wall-mount bracket must be installed before mounting the boiler.
2. Measure 17 1/2 inches below the bottom edge of the wall-mount bracket (Item 2). Strike a line or place a piece of masking tape with its top edge even with the 17 1/2-inch mark. (This line, or tape, will indicate whether the boiler has been properly seated onto the wall-mount bracket.)

WARNING The boiler is heavy, and requires two people to lift and place. Wear non-slip leather gloves to prevent possibility of cuts from sheet metal edges.

Figure 5 Place boiler on wall-mount bracket



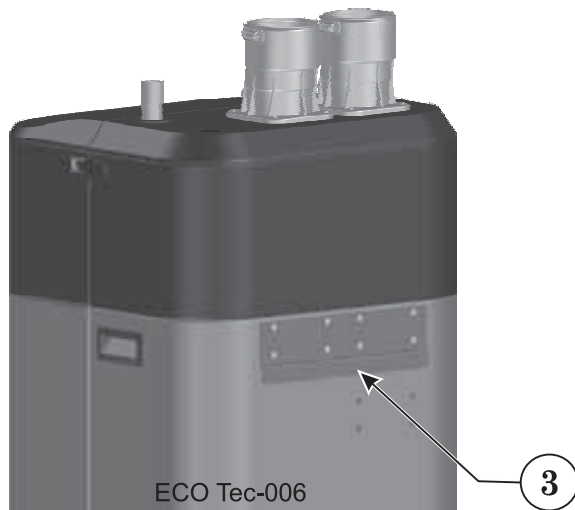
- 1 Studs — Pre-drill through the wall into the studs 1/4 inch diameter x 3 inches deep — Studs must be on 16-inch centers. If studs are any other spacing, provide a secure, solid mounting surface on which to attach the boiler wall-mounting bracket.
- 2 Wall-mount bracket — secure wall mount bracket to wall as instructed on previous page.
- 3 Boiler mounting bracket (Figure 6 back of boiler)
- 4 Floor surface



Wall-mounting the boiler

(continued)

Figure 6 Boiler mounting bracket



WARNING The jacket door can be left in place when handling the boiler, but the boiler must **ONLY** be lifted by the bottom and rear of the sheet metal housing — **NOT** by any pipe or plastic part.

3. **Obtain assistance to lift the boiler into position.**
4. Lift the boiler high enough that its mounting bracket (Figure 6, Item 3) will be above the wall-mount bracket (Figure 5, page 10, Item 2).
5. Let the rear of the boiler slide against the wall bracket as you lower the boiler into place.
6. Adjust the boiler properly until engaged with the wall bracket and the boiler slips into the correct position.
7. When the brackets are engaged correctly, the bottom of the boiler enclosure will be at or near the pencil line, or tape, you applied in step 2.

WARNING When mounting the boiler, use the method described on step 2, page 10 to ensure the boiler bracket and the wall bracket are properly engaged. If not, the boiler could fall. Failure to comply could result in severe personal injury, death or substantial property damage.

8. Ensure boiler is level front-to-back.

WARNING Ensure boiler is **NOT** pitched downward with the front of the boiler lower than the back of the boiler. This can prevent condensate from draining properly. Failure to comply could result in severe personal injury, death or substantial property damage.

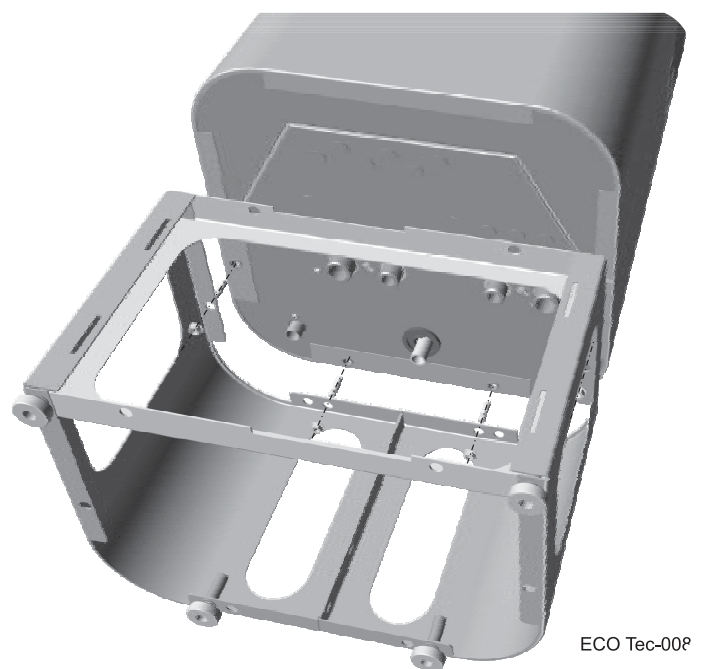
Pedestal floor stand assembly

Pedestal floor stand (w/Kit option only)

WARNING The boiler is heavy, and requires two people to lift and place upright. Use caution not to drop the boiler or cause bodily injury while lifting and handling. Wear non-slip gloves to prevent possibility of cuts from sheet metal edges. After the boiler is removed from the shipping carton, **DO NOT** allow the boiler to sit on its bottom, before stand is installed. Doing so may result in damage to the water pipes.

1. Carefully remove boiler from the styrofoam protective base and set on back. Remove door from front of boiler by unfastening latches on side of cabinet.
2. Remove four (4) 5/16" studs from floor stand hardware trim bag. Install studs by hand in rivet nuts on bottom of boiler. See Figure 7.
3. Remove front access panel from pedestal assembly by sliding it up.
4. Align holes in top of pedestal with studs on bottom of boiler. Slide stand over studs. Remove 5/16" nuts from trim bag. Install nuts on studs using 1/2" socket or wrench. Make sure to align sides of pedestal with cabinet before tightening down nuts. Do not overtighten.
5. Install the condensate trap assembly following instructions on page 56
6. After confirming nuts are tightened, obtain assistance and lift the boiler into upright position.
7. Set boiler in place and level by adjusting leveling legs with flat head screwdriver.

Figure 7 Pedestal floor stand assembly (front access panel removed)





Boiler hydrostatic test

▲WARNING DO NOT install a relief valve with a pressure higher than 50 PSIG. This is the maximum allowable relief valve setting for the boiler. Failure to comply could prevent the relief valve from operating as needed, resulting in possibility of severe personal injury, death or substantial property damage.

▲WARNING Use two wrenches when tightening any pipe connection to the boiler. Failure to prevent the boiler pipes from turning could damage pipes or heat exchanger, resulting in possible severe personal injury, death or substantial property damage.

Hydrostatic pressure test

Pressure test the boiler before permanently attaching water or gas piping or electrical supply.

Install pipe fittings for relief valve and P/T gauge

1. Install the reducer bushings (150/199), reducing tees, and close nipples, shipped loose with the boiler, located and oriented as shown in Figure 8, page 13.

NOTICE Boilers installed in locations with less than the RECOMMENDED service clearances will need to adjust piping layout to meet space requirements.

2. Apply pipe dope to all fittings sparingly.

▲WARNING DO NOT install the relief valve until after the hydrostatic test. Temporarily install a ¾" pipe cap in the boiler top outlet pipe location as directed in these instructions. The cap must be removed after the test.

Failure to comply with the above could prevent the relief valve from operating as needed, resulting in possibility of severe personal injury, death or substantial property damage.

3. Install the pressure/temperature gauge to the reducing tee as shown in Figure 8, page 13.

Install fittings and valves required for hydrostatic testing

1. The following piping components (supplied by installer) are required for the test configuration:
 - a. Two shut-off valves (1" NPT on 80/110, 1¼" NPT on 150/199).
 - b. Two close nipples (1" NPT on 80/110, 1¼" NPT on 150/199).
 - c. ¾" NPT pipe cap.
2. **TEMPORARILY** install a ¾" NPT pipe cap on the boiler top outlet pipe. After the hydrostatic test, this cap must be removed and the relief valve, tee and elbow must be installed.

Fill and pressure test

1. See Figure 9, page 13 for use with the following instructions.
2. CLOSE the boiler drain valve (Item 11). Connect a hose to fresh water supply and to the drain valve.
3. Place a bucket under the ends of the isolation valves (Item 9 and 10) to catch water drippings.
4. CLOSE isolation valve Item 10, then crack open the ¾" cap (Item 3a) slightly. Leave isolation valve Item 9 open.
5. Slowly open the boiler drain valve (Item 11) and fresh water supply to fill boiler with water. The boiler and piping will fill quickly because of the low water content.
6. When water begins to seep from ¾" cap (Item 3a), tighten the cap.
7. Continue filling until water flows from supply isolation valve (Item 9), then close the valve.
8. The test pressure should be 1-1/2 times the pressure setting of the relief valve to be installed on the boiler (45 psig for a 30-psig relief valve; 75 psig for a 50-psig relief valve). Open boiler drain valve until desired pressure is achieved.
9. Hold at test pressure for 10 minutes.

▲WARNING Do not leave boiler unattended. A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

10. Make sure constant gauge pressure has been maintained throughout test. Check for leaks. Repair if found.

▲WARNING Leaks must be repaired at once. Failure to do so can damage boiler, resulting in substantial property damage.

▲WARNING Do not use petroleum-based cleaning or sealing compounds in boiler system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.

Drain and remove fittings

1. Disconnect fill water hose from water source.
2. Drain boiler through drain valve (Item 11).

▲WARNING Use caution when releasing pressure from the boiler. Rapid water flow could cause injury.

3. Remove hose after draining.
4. Remove nipples and valves unless they will remain for use in the system piping.
5. Remove cap and install relief valve, tee and elbow as specified in the following WARNING.
6. If any internal leaks occurred, make sure all water has been cleaned up and electronic components, including the boiler control, is completely dry.

▲WARNING Remove cap from Air Elimination/Relief Valve Connection Water Pipe (1a). Install the relief valve in the ¾" elbow. See page 48 or page 51 to install relief valve discharge piping. Failure to install the boiler relief valve could result in severe personal injury, death or substantial property damage.



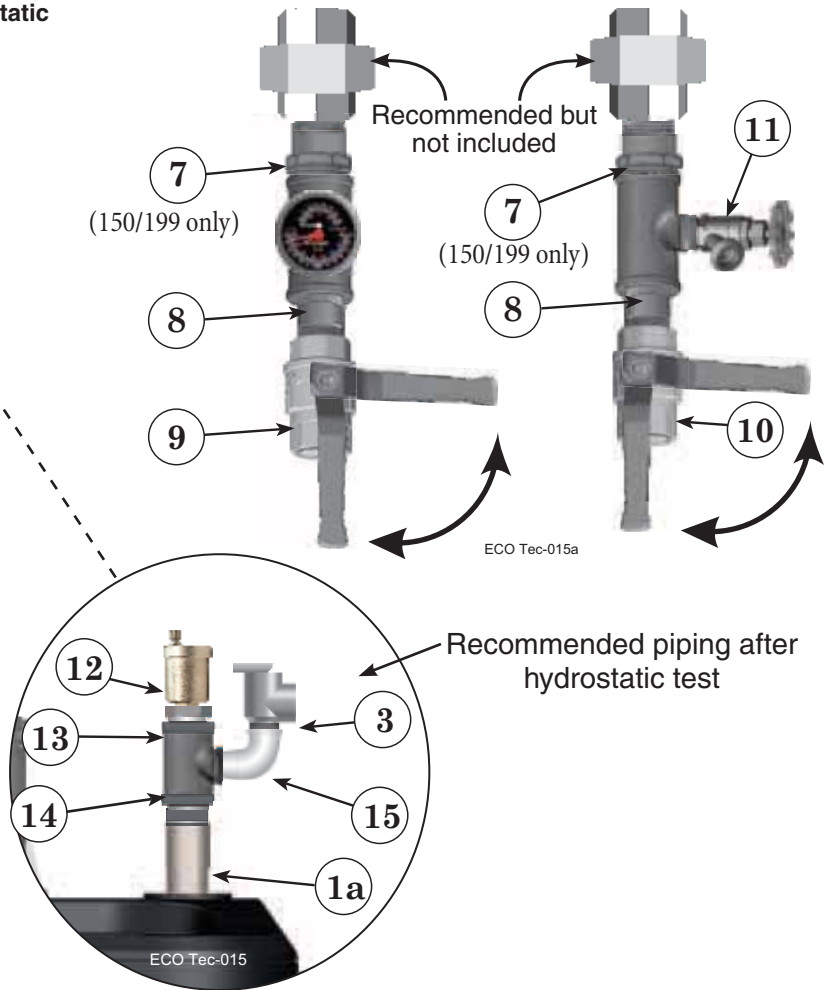
Boiler hydrostatic test

(continued)

Figure 8 Install pipe fittings for relief valve and pressure/temperature gauge — **DO NOT** mount relief valve until **AFTER** hydrostatic testing (see legend below)



Figure 9 Install piping components required for hydrostatic test (see legend below)



Boiler Out

Boiler In

- 1 Boiler Out (Supply) connection, (male, 1" NPT)
- 1a Air Elimination/Relief Valve Connection Water Pipe, (male, 3/4" NPT) use for relief valve and air elimination.
- 2 Boiler In (Return) connection, (male, 1" NPT).
- 3 Boiler relief valve, shipped loose with boiler — **DO NOT** mount relief valve until **AFTER** hydrostatic testing.
- 3a **TEMPORARILY ONLY** — Install a 3/4" NPT cap in the Air Elimination/Relief Valve Connection Water Pipe. **This MUST BE REMOVED after the test and the relief valve mounted here.**
- 4 Pressure/temperature gauge, shipped loose with boiler.
- 5a Reducing tee, NPT, 1 " x 1 " x 1/4" on 80/110, & 1 1/4" x 1 1/4" x 1/4" on 150/199, shipped loose with boiler.
- 5b Reducing tee, NPT, 1 " x 1 " x 3/4" on 80/110, & 1 1/4" x 1 1/4" x 3/4" on 150/199, shipped loose with boiler.
- 7 Bushing, NPT, 1 1/4" x 1", shipped loose with boiler (150/199 only).
- 8 Nipple, NPT 1" x close on 80/110, & 1 1/4" x close on 150/199, by installer .
- 9 Isolation valve on supply connection, by installer (1" NPT on 80/110, 1 1/4" NPT on 150/199).
- 10 Isolation valve on return connection, by installer (1" NPT on 80/110, 1 1/4" NPT on 150/199).
- 11 3/4" NPT boiler drain valve, shipped loose with boiler — after hydrostatic testing, move drain valve to lowest point on the return piping if not already there.
- 12 Auto air vent, by installer.
- 13 Bushing, NPT 3/4", by installer.
- 14 Tee, NPT 3/4" x 3/4" x 3/4", shipped loose with boiler.
- 15 Street elbow, NPT 3/4" x 3/4", shipped loose with boiler.



Gas conversions

Prepare boiler for propane — ECO Tec 80/110/150/199 (if required)

Propane operation

⚠️WARNING ALL boilers must be converted for propane operation.

Converting an existing natural gas-fired boiler for propane — For a boiler already installed, you must turn off gas supply, turn off power and allow boiler to cool before proceeding. You must also completely test the boiler after conversion to adjust gas valve to proper setting, verify performance, and start up the boiler following instructions beginning on page 102 of this manual.

Verify propane gas venturi— See Figure 10, page 15 LP gas venturi will have a black label and will be clearly labeled “LP”.

Must change control settings to proper gas type.

Failure to comply could result in severe personal injury, death or substantial property damage.

⚠️WARNING

This conversion kit shall be installed by a qualified service agency in accordance with the manufacturer’s instructions and all applicable codes and requirements of the authority having jurisdiction. If the information in these instructions are not followed exactly, a fire, an explosion or production of carbon monoxide may result causing property damage, personal injury or loss of life. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer’s instructions.

⚠️WARNING

- Follow all instructions in proper order.
- Do not tamper with venturi. DO NOT change or modify venturi in any way.
- Dispose of an uninstalled venturi; do not leave in the building.
- Caution – the gas supply shall be shut off prior to disconnecting the electrical power, before proceeding with the conversion.
- Whenever the venturi is removed, all gaskets must be replaced with new gaskets.

Natural Gas to Liquefied Petroleum (Propane) conversion kits

ECO Tec 80/110 LP P/N 510-811-415 NG to Propane Gas Conversion Kit contents:

511-050-233	Venturi - Liquefied Petroleum (Propane) Gas	1
562-150-304	Screw Pan Hd. T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-136	O-Ring 3.53mm x 63.50 I.D. mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia. mm	1
550-225-336	Label Gas Conversion	1
560-529-139	Orifice Gas Liquefied Petroleum (Propane) 80/110 ECO TEC	1
550-142-978	Instructions Conversion Nat to LP Gas	1

ECO Tec 150 LP P/N 510-811-416 NG to Propane Gas Conversion Kit contents:

511-050-234	Venturi - Liquefied Petroleum (Propane) Gas	1
562-150-304	Screw Pan Hd. T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-136	O-Ring 3.53mm x 63.50 I. D. mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia. mm	1
550-225-336	Label Gas Conversion	1
560-529-140	Orifice Gas Liquefied Petroleum (Propane) 150/199 ECO TEC	1
550-142-978	Instructions Conversion Nat to LP Gas	1

ECO Tec 199 LP P/N 510-811-417 NG to Propane Gas Conversion Kit contents:

511-050-235	Venturi - Liquefied Petroleum (Propane) Gas	1
562-150-304	Screw Pan Hd. T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-102	O-Ring 3mm x 70mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia. mm	1
550-225-336	Label Gas Conversion	1
560-529-140	Orifice Gas Liquefied Petroleum (Propane) 150/199 ECO TEC	1
550-142-978	Instructions Conversion Nat to LP Gas	1

Pipe sizing for propane gas

Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.

Natural and Propane supply pressure

1. Adjust propane supply regulator provided by gas supplier between the pressure listed below:
2. Pressure required at gas valve inlet pressure port:
 - a. Maximum: 14” (356 mm) w.c. with no flow (lockup).
 - b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire): 3½” (89 mm) w.c.



Gas conversions (continued)

Liquefied Petroleum (Propane) to Natural Gas conversion kits

ECO Tec 80/110 NG P/N 510-814-418 LP to Natural Gas Conversion Kit contents:		
511-050-230	Venturi - Natural Gas	1
562-150-304	Screw Pan Hd T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-136	O-Ring 3.53mm x 63.50 I.D. mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia.mm	1
550-225-336	Label Gas Conversion	1
550-142-979	Instructions Conversion LP to Natural Gas	1

ECO Tec 150 NG P/N 510-814-419 LP to Natural Gas Conversion Kit contents:		
511-050-231	Venturi - Natural Gas	1
562-150-304	Screw Pan Hd T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-136	O-Ring 3.53mm x 63.50 I.D. mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia. mm	1
550-225-336	Label Gas Conversion	1
550-142-979	Instructions Conversion LP to Natural Gas	1

ECO Tec 199 NG P/N 510-814-420 LP to Natural Gas Conversion Kit contents:		
511-050-232	Venturi - Natural Gas	1
562-150-304	Screw Pan Hd T20 M4-.7x12mm w/Sq. Con. Lock Washer	3
562-248-776	Washer .64 I.D. x .93 O.D. Garlock	1
590-318-102	O-Ring 3mm x 70mm Black	1
590-318-018	Gasket 2-Lips EPDM Ring 50 Dia. mm	1
550-225-336	Label Gas Conversion	1
550-142-979	Instructions Conversion LP to Natural Gas	1

Installing propane venturi —

1. Propane venturi will have a black label identifying venturi part number. See Figure 10 for correct part number.
2. Verify that the label on the propane venturi is correct for the model size (see Figure 10 below).
3. Shut off the gas supply prior to disconnecting the electrical power, before proceeding with the conversion.
4. If the jacket front door was not already removed, remove it.
5. Locate the blower and venturi (see Figure 12).

Figure 10 Propane gas venturi label identification (Black label)

Boiler Model	Part Number	Gas Type	Venturi Ø
80/110	511-050-233	LPG	20
150	511-050-234	LPG	26
199	511-050-235	LPG	28

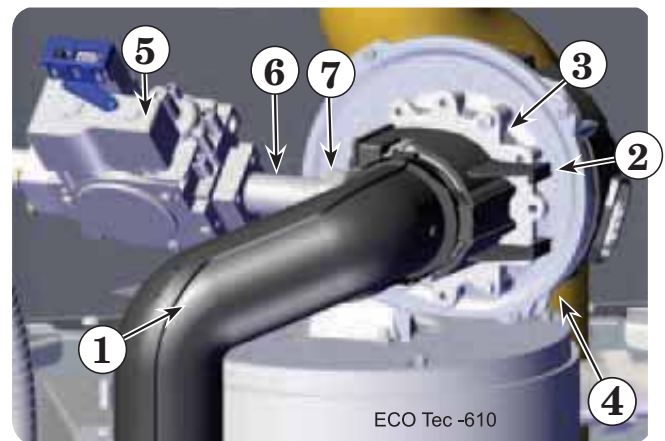
Figure 11 Natural gas venturi label identification (White label)

Boiler Model	Part Number	Gas Type	Venturi Ø
80/110	511-050-230	NG	22
150	511-050-231	NG	26
199	511-050-232	NG	28

LEGEND for Figures 12, 13, 14, 15, 16 and 17

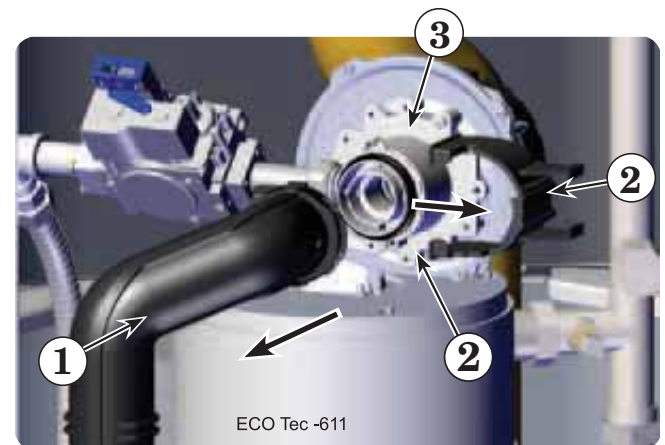
1 Air Silencer	6 Gas pipe
2 Air silencer clip	7 Swivel nut
3 Venturi	8 Fiber Washer
4 Blower	9 O-Ring
5 Gas valve	10 LP Orifice

Figure 12 Blower, gas valve, venturi assembly



6. Gently open up the "U" part of the silencer clip and remove from venturi / silencer assembly, see Figures 12 and 13.

Figure 13 Air silencer removal





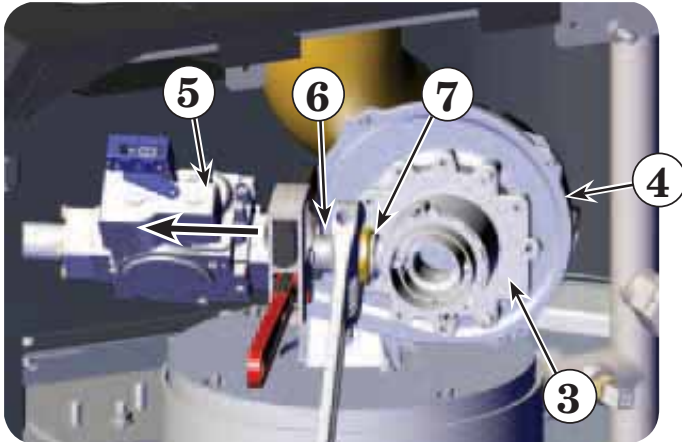
Gas conversions (continued)

Label wires before removing

CAUTION Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

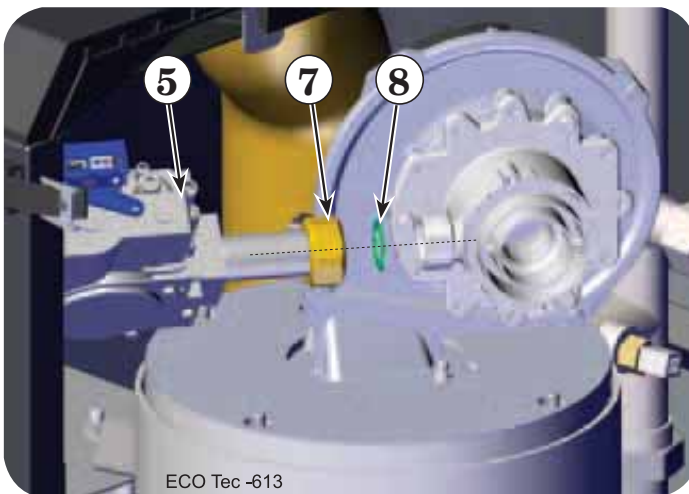
7. Disconnect wire harness from gas valve.
8. Loosen swivel nut (Figure 14, Item 7) on venturi-gas valve connection (Item 6). See Figure 14. Gently set gas valve aside.

Figure 14 Gas pipe swivel nut loosened for propane conversion (silencer removed)



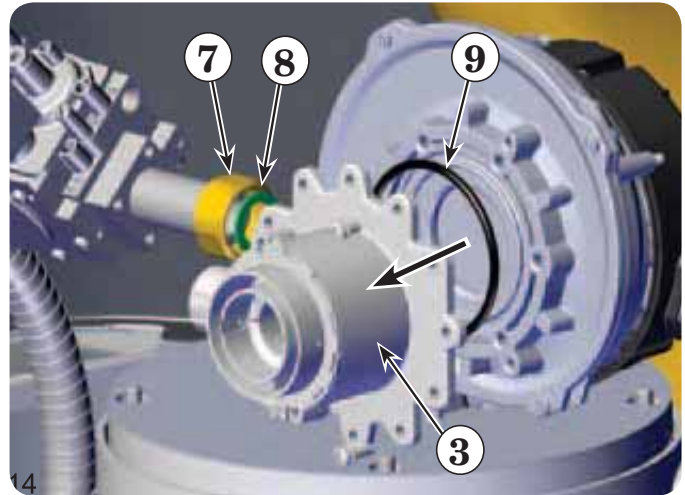
WARNING Use two wrenches when loosening swivel nut at venturi, using pipe wrench on gas pipe (Item 6) to prevent the gas pipe connection from turning. Failure to support the gas connection pipe to prevent it from turning could damage gas line components.

Figure 15 Gas valve separated from venturi (Note - fiber washer location)



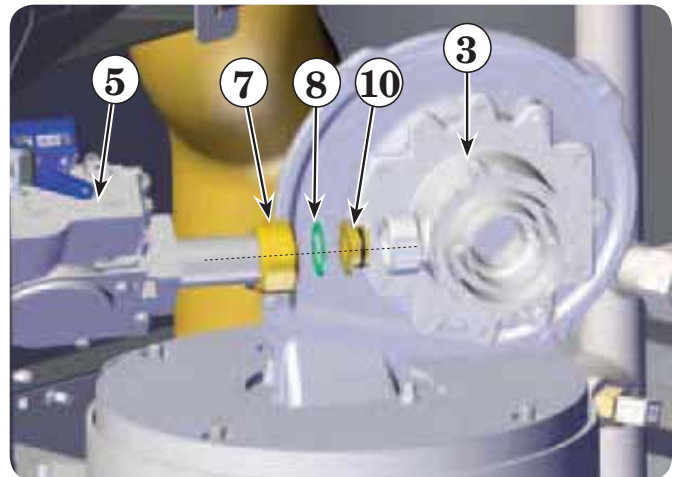
9. Remove three (3) T20 Torx screws holding the venturi, (Item 3) in place. Remove venturi, change o-ring (Item 9), change fiber washer (Item 8) and inspect blower surface. Discard old o-ring and fiber washer, see Figure 16.
10. Install new propane venturi and o-ring from conversion kit.
11. Ensure o-ring (Item 9) is seated properly in groove on blower.

Figure 16 Venturi removed from blower



12. Insert three (3) new Torx screws from conversion kit to hold venturi in place. Torque screws to no more than 23 inch-pounds.
13. Install LP orifice (Item 10) into venturi gas inlet, see Figure 17.
14. Reassemble gas pipe with new fiber washer (Item 8) from conversion kit to the venturi connection, using two wrenches to tighten swivel nut. Change silencer gasket (Item 130, page 143) and re-attach air silencer to venturi. See Figure 13, page 15.

Figure 17 Installing the new propane gas orifice.



15. Replace silencer clip locking silencer to venturi. Ensure silencer clip is seated on the silencer/venturi correctly.

DANGER Inspect the gas pipe fitting connections on the gas valve and new venturi (Item 3, Figure 17, page 16). Check the seal of the connections. Failure to comply will cause a gas leak, resulting in severe personal injury or death.

WARNING Do not check for gas leaks with an open flame — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.



Gas conversions (continued)

Gas Valve Course Adjustments

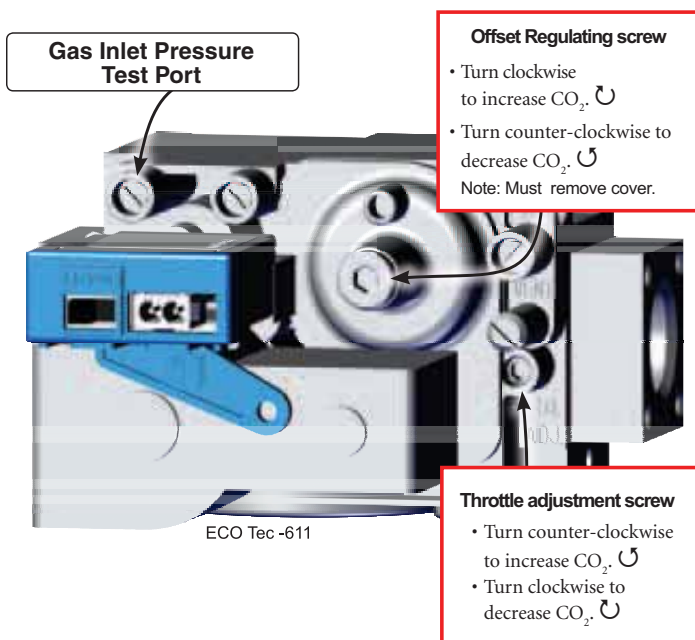
1. Prior to the boiler’s first ignition, adjust the throttle adjustment screw (2.5mm Allen Head) by first turning the screw clockwise (↻) until it bottoms out – do not apply any additional or excess torque. Adjust the throttle screw in a counterclockwise (↺) direction with precisely the number of turns listed in **Table 2**, according to the boiler model/size.

Table 2 Course adjustment settings — Throttle and offset adjustments to be made prior to first ignition, by size.

Boiler Model	Throttle Turns (Counterclockwise ↺ from Bottom-out Position)	Offset Turns (Counterclockwise ↺ Factory NG Position)
80/110 LP	6-3/4	1/8
150 LP	10-3/4	0
199 LP	13	0

2. After the throttle has been adjusted coarsely, the offset regulating screw must be adjusted for the 80 and 110 models. Remove the sealed, Allen (4mm)head cap protecting the offset regulating screw before making adjustments. It is critical to be precise for the adjustment of the offset regulating screw. DO NOT attempt to bottom out the offset regulating screw as was done for the throttle adjustment. Adjustments to the offset regulating screw should be made from the factory-provided natural gas position.
3. Reconnect wire harness to gas valve.
4. Restore electrical power, turn on gas by opening manual gas valve and check for leaks and ensure all calls for heat & DHW have been shut off.

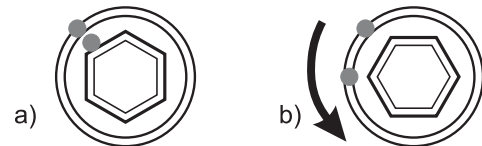
Figure 18 Gas valve adjustment locations—ONLY for use by a qualified technician, using properly working, calibrated combustion test instruments.



Adjust the offset regulating screw using the following steps, referencing Figure 19:

1. After removing cap, insert Allen wrench into offset hex feature (4mm Allen Head) and mark position of wrench on offset housing.
2. Turn the offset regulating screw counterclockwise (↺), according to **Table 2**, ensuring that the Allen wrench is moved accordingly, as shown in Figure 19b.

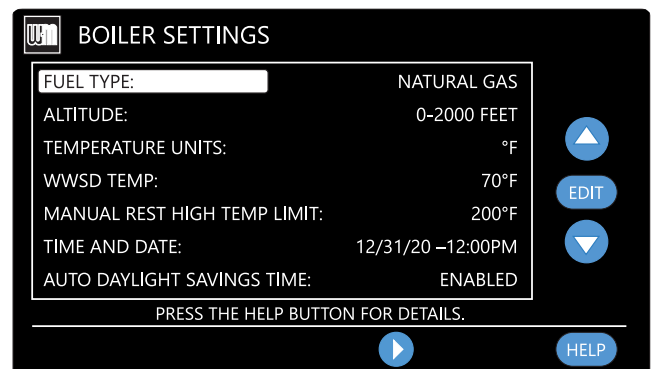
Figure 19 Offset regulating screw adjustment—(a) Marking factory-provided NG position. (b) View after turn CCW adjustment.



Final Conversion Steps

1. When boiler has not been fired, follow instructions on the initial screens to select propane as the gas type and ensure all calls for heat & DHW have been shut off. If natural gas was already selected in the boiler control, the gas type parameter will need to be adjusted. In the contractor menu, under the Boiler Settings menu, adjust the “Fuel Type” setting to “Propane”, see Figure 81, page 88.
2. Before firing, verify that the Boiler Settings are for LP gas, “Max Rate” for the input (priority) used to fire the boiler is set between 96% and 100%. Also verify that the ‘Min Rate’ is set to 10%. Adjust control settings if not at proper rate. Verify that boiler is operating at the expected firing rate at both high- and low-fire during combustion analysis. Refer to Figure 99, page 111 for proper low-fire rate based on altitude settings.

Figure 20 ECO Tec fuel type setting screen



ECO Tec-001a FT



Gas conversions (continued)

- Prior to turning on the boiler, review the procedure and control sequence for the operation of the Manual Test Mode in the section of the Boiler Manual titled “Manual Test Mode” starting on page 112.

⚠ DANGER The use of a flue gas analyzer is required to convert this unit and determine proper gas valve settings. Do not perform this conversion without a flue gas analyzer. Improper gas valve settings can cause severe personal injury, death, or property damage.

- Do NOT allow the boiler to modulate freely until the combustion analysis and adjustment is complete. Turn on and connect properly working, calibrated combustion analyzer to the boiler flue pipe. Fire the boiler and force it to High Fire in Manual Test Mode. Adjust the high fire combustion first, using the throttle adjustment screw, to the CO₂ and CO ranges specified in Figure 94, page 103, by model size. Then, force the boiler to Low Fire and adjust the offset regulating screw to the CO₂ and CO ranges specified in Figure 94, page 103, by model size. Reinstall the cap over the offset adjustment screw. Follow the full startup instructions found in this Boiler Manual including the section titled “Re-check the Maximum and Minimum CO₂ and CO rate” on page 103.
- The coarse adjustment prescribed by this manual should result in combustion settings that allow for ignition and are a starting point for further adjustment. If, after making the coarse adjustments prescribed above, the boiler will not light, turn the throttle screw only counterclockwise (⤴) an additional 1/4 turn and attempt to light again. Repeat for a total of up to one full turn. If, after following the procedure above, the boiler still will not ignite or, during combustion analysis, the analyzer reads less than 1.0% O₂, contact Weil-McLain Technical Services for assistance.
- Check for gas leaks and confirming proper performance.

Perform Boiler Manual start-up

Perform complete start-up sequence (beginning on page 97), including check for gas leaks and checking for proper operation. After placing the boiler in operation, the ignition system safety shutoff device must be tested, page 103.

Install front door

⚠ WARNING Install front door after servicing. The front door must be securely fastened to the boiler frame to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the door securely fastened could result in severe personal injury or death.

Apply installer conversion label

- After installation is complete and boiler is set up for propane gas, fill out and attach the propane conversion label next to the boiler rating label (right side of cabinet).
- Contractor/installer is responsible for completing the information required on label (provided in kit) and attaching installer conversion label next to the boiler rating label.

Figure 21 Installer conversion label

NOTICE THIS BOILER HAS BEEN CONVERTED TO PROPANE.

THIS MODEL _____ BOILER HAS BEEN CONVERTED ON _____ (DATE OF CONVERSION) TO PROPANE GAS WITH A HIGH FIRE % CO₂ OF _____ (% CO₂)

BY _____ (NAME)

_____ (ADDRESS)

WHO ACCEPTS THE RESPONSIBILITY FOR THE CORRECTNESS OF THIS CONVERSION.

NOTICE MINIMUM AND MAXIMUM GAS PRESSURE, MANIFOLD PRESSURE AND INPUT RATINGS DO NOT CHANGE WITH THIS CONVERSION. REFER TO THE RATING LABEL FOR THIS INFORMATION.

⚠ DANGER! DO NOT PERFORM THIS CONVERSION WITHOUT A FLUE GAS ANALYZER. THE PROPER USE OF A FLUE GAS ANALYZER IS REQUIRED TO DETERMINE PROPER GAS VALVE SETTINGS. IMPROPER GAS VALVE SETTINGS CAN CAUSE SEVERE PERSONAL INJURY, DEATH OR PROPERTY DAMAGE. SEE BOILER INSTALLATION MANUAL FOR GAS VALVE ADJUSTMENT INFORMATION.

AFFIX THIS LABEL AS CLOSE AS POSSIBLE TO THE RATING LABEL. 550-225-336 (0309)

LP to Natural gas conversion

- Follow the same instructions as LP conversion, except using the correct Natural gas conversion kit, See page 15 .
- If LP gas was already selected in the boiler control, the gas type parameter will need to be adjusted. In the contractor menu, under the Boiler Settings menu, adjust the “Fuel Type” setting to “Natural Gas”.
- Turn throttle screw clockwise until it stops, and then turn counter-clockwise number of turns per Figure 22. Figure 22 is intended to make rough adjustment to gas valve to allow the boiler to fire. They are NOT intended to replace proper adjustment of combustion valves per instructions on pages 102 and 103 of this manual.
- Natural gas boilers do not require an orifice between the gas pipe and the venturi.

Figure 22 Throttle screw adjustment

Boiler Model	Number of Turns
80/110 NG	9-1/8
150 NG	12
199 NG	14-1/2

⚠ WARNING The door must be in place during operation. DO NOT operate the boiler with the jacket door removed except for inspection and testing as directed in this manual.



Gas piping – sizing gas lines

NOTICE Boiler gas connection is 1/2" NPT. Size gas lines large enough to provide gas to all connected appliances.

Natural Gas:

Pipe sizing for natural gas

1. Size gas piping from meter outlet to entrance of boiler in accordance with Figure 23 and Figure 24.
2. Use total input of all connected appliances. Divide total input in Btuh by 1,000 to obtain cubic feet per hour of natural gas.
 - a. Pipe lengths in Figure 23 are equivalent length of straight pipe. Convert pipe fittings to equivalent lengths using data from Figure 24.
 - b. Figure 23 is only for natural gas with specific gravity 0.60, with a pressure drop through the gas piping as listed in the table.
 - c. For additional gas pipe sizing information, refer to ANSI Z223.1 NFPA 54 – latest edition (or Natural Gas and Propane Installation CAN/CSA B149.1 or B149.2 for Canadian installations).

Natural gas supply pressure

1. Pressure required at gas valve inlet pressure port, see Figure 93, page 102:
 - a. Maximum: 14" (355 mm) w.c. with no flow (lockup).
 - b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire):
 - ECO Tec 80:** 3 1/2" (89 mm) w.c.
 - ECO Tec 110:** 3 1/2" (89 mm) w.c.
 - ECO Tec 150/199:** 3 1/2" (89 mm) w.c.
 - c. Nominal gas pressure: 7.0" (178 mm) w.c.
2. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 14" w.c. at any time. Adjust lockup regulator for 14" w.c. maximum.

Propane Gas:

WARNING You must follow the instructions, beginning on page 14, to operate the boiler on propane. Failure to comply could result in severe personal injury, death or substantial property damage.

Pipe sizing for propane gas

1. Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.

Propane supply pressure

1. Adjust propane supply regulator provided by gas supplier for 14" (355 mm) w.c. maximum pressure.
2. Pressure required at gas valve inlet pressure port, see Figure 93, page 102:
 - a. Maximum: 14" (355 mm) w.c. with no flow (lockup).
 - b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire):
 - ECO Tec 80:** 3 1/2" (89 mm) w.c.
 - ECO Tec 110:** 3 1/2" (89 mm) w.c.
 - ECO Tec 150/199:** 3 1/2" (89 mm) w.c.
 - c. Nominal gas pressure: 11.0" (279 mm) w.c.

Figure 23 Pipe capacity for 0.60 specific gravity natural gas; pipe length is in equivalent feet.

Gas pipe total length, feet	Capacity						
	Cubic feet per hour, natural gas, 0.60 specific gravity Gas pressure 13" (330 mm) w.c. or less Pressure drop 0.3 inches (7.6 mm) w.c.						
	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
10	132	278	520	1050	1600	3050	4800
20	92	190	350	730	1100	2100	3300
30	73	152	285	590	890	1650	2700
40	N/A	130	245	500	760	1450	2300
50	N/A	115	215	440	670	1270	2000
75	N/A	105	175	360	545	1020	1650
100	N/A	96	150	305	460	870	1400
150	N/A	90	120	250	380	710	1130

Figure 24 Equivalent lengths of straight pipe for typical gas line fittings.

Pipe size inches	Equivalent length, feet			
	90° Elbow		Tee	
	short radius	long radius	line flow	branch flow
1/2	3.6	2.2	1.7	4.2
3/4	4.4	2.3	2.4	5.3
1	5.2	2.7	3.2	6.6
1 1/4	6.6	3.2	4.6	8.7
1 1/2	7.4	3.4	5.6	9.9
2	8.5	3.6	7.7	12.0
2 1/2	9.3	4.0	9.3	13.0



Venting/air piping – general

Any improper operation of a common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1. When resizing any portion of a common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.

⚠ DANGER Do not install the **ECO Tec** boiler into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

⚠ WARNING Existing common vent systems may be too large for the appliances remaining connected after the existing boiler is removed.

⚠ WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

When removing a boiler from an existing common vent system

The **ECO Tec** boiler cannot be common vented with any other appliance. When an existing boiler is replaced with an **ECO Tec** boiler, the **ECO Tec** boiler CANNOT use the existing common vent. The boiler requires its own vent and air piping, as specified in this manual. This may cause a problem for the appliances that remain on the old common vent, because the vent may be too large. The following test is intended to check for proper operation of the appliances remaining on the old common vent system.

Vent system verification

Perform the test sequence below for **each** appliance remaining on the original common vent system. Operate each appliance individually, with other appliances turned off. This procedure will test whether the common vent system can properly vent each appliance.

Existing vent test procedure

(The following is intended to test whether the appliances remaining on an existing vent system will operate satisfactorily.)

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
3. Test vent system — Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

Figure 25 Corrosive contaminants and sources

Products to avoid
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
Sodium chloride used for water softening
Refrigerant leaks
Paint or varnish removers
Hydrochloric acid/muriatic acid
Cements and glues
Antistatic fabric softeners used in clothes dryers
Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Adhesives used to fasten building products and other similar products
Excessive dust and dirt
Areas likely to have contaminants
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
Refrigeration repair shops
Photo processing plants
Auto body shops
Plastic manufacturing plants
Furniture refinishing areas and establishments
New building construction
Remodeling areas
Garages with workshops



Venting/air piping – general

⚠ WARNING You must pipe combustion air to the boiler air intake unless using the Weil-McLain Direct Exhaust kit and meeting the Direct Exhaust requirements.

Install air inlet piping for the ECO Tec boiler as described in this manual.

The air termination fitting must be installed with the clearances and geometry relative to the vent outlet depicted in this manual to ensure that flue products do not enter the air intake.

Ensure that the combustion air will not contain any of the contaminants in Figure 25, page 20. Do not pipe combustion air near a swimming pool, for example. Avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

Installing vent and air piping

Polypropylene For polypropylene applications, comply with any additional requirements in the vent system manufacturer’s instructions. 3" PP can be used for vent and air connections. Install a locking collar at every joint.

Provide 3" transitions at the boiler connections if using 2" piping.

Refer to page 137 for a list of compliant adapters.

3" to 2" PP adapter must have smooth, straight section of pipe to insert in to the boiler vent and air connections and must fit and seal tightly. PP adapters with their own seal which would interfere with the internal seal of the boiler vent or air connections must not be used.

Additional vent and air transition pieces at termination may be required if different material and/or size is used for termination.

AL29-4C S.S. For AL29-4C vent pipe applications, comply with any additional requirements in the vent system manufacturer’s instructions.

3" Simpson Duravent can be used at the vent and air connections. All other stainless steel manufacturer's venting will require a transition piece as per manufacturer's recommendation when transitioning from PVC to SS.

Additional vent and air transition pieces at termination may be required if different material and/or size is used for termination.

Provide 3" transitions at the boiler connections if using 2" piping.

Refer to page 137 for a list of compliant adapters.

Venting with flexible polypropylene

For boilers allowed to utilize polypropylene vent systems.

Tests have determined that flex vent has a greater pressure drop than rigid polypropylene vent which changes the maximum allowable length of venting. Below are the equivalent lengths.

Table 3 Supplier and Size of Flex Pipe Vent Length - Equivalent

Flex Pipe Vent Length - Equivalent	
Duravent 2" diameter	1 foot equals 3.3 ft.
Duravent 3" diameter	1 foot equals 1.7 ft.
Centrotherm 2" diameter	1 foot equals 5.0 ft.
Centrotherm 3" diameter	1 foot equals 2.3 ft.
Example: Using 20 feet of Duravent 3": 20' x 1.7 = 34' of equivalent length of straight pipe	

Knowing and identifying the correct equivalent length is essential to ensure the proper operation of our high efficiency boilers. The equivalent vent lengths for each specific size and manufacturer of venting.

Calculated equivalent feet shall not exceed maximum values listed in boiler manual.

All current boiler installations using polypropylene flex venting with concerns/questions should contact Weil-McLain Technical Service for assistance, if our boiler is having operation issues that may be related to excess vent lengths.

Code Compliance

Venting / Combustion air piping – Installations must provide provisions for combustion and ventilation air in accordance with the section “Venting of Equipment”, of the National Fuel Gas Code, ANSI Z223.1 / NFPA 54 – latest edition, or “Venting Systems and Air Supply for appliances” of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.



Venting & air – general (continued)

Figure 26 Venting and air piping – DIRECT VENT ONLY – OPTIONS and PIPING LIMITS

NOTICE The table below lists the acceptable vent/air pipe terminations described in this manual. Follow all instructions provided to install the vent/air system. **NOT SHOWN** below, but also approved, are the polypropylene piping and terminations listed in Figure 27, page 23. For these applications, use **ONLY** the manufacturers’ parts listed and follow all instructions provided by the pipe manufacturer.

ECO Tec Model	Maximum vent and air pipe length (for each) 80/110/150 - 2" & 3" = 100 feet 199 - 3" = 100 feet / 199 - 2" = 50 feet (Minimum length for all applications is 2 feet) (All applications include allowance for the termination fittings plus one elbow in air piping and one elbow in vent piping).										USE SWEEP ELBOWS ONLY		
	See Figure 27, page 23 for material specifications See Figure 125, page 137 for part/kit numbers												
	Vent and air pipe sizes: Maximum vent lengths apply for either 2" or 3" vent and air pipe. If using 2" pipe, provide 3"x 2" tapered reducers at boiler connections and at Weil-McLain vent/air cap or at concentric terminations. Boilers will derate as vent/air pipe length increases — see rating data on Figure 138, page 149 for derate amounts.												
	SIDEWALL termination						VERTICAL termination						
	Separate pipes [Note 1]		PVC or PP Concentric [Note 1 & 2]		3" Weil-McLain PVC vent/air cap [Note 1 & 2]		Separate pipes [Note 1]		PVC or PP Concentric [Note 1 & 2]		Vertical vent, Side Air [Note 1]		
	See page 28		See page 30		See page 32		See page 34		See page 36		See page 38		
	Size, inches	Materials Fig. 27, page 23	Size, inches	Materials Fig. 27, page 23	Size, inches	Materials Fig. 27, page 23	Size, inches	Materials Fig. 27, page 23	Size, inches	Materials Fig. 27, page 23	Size, inches	Materials Fig. 27, page 23	
	80/110	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS
		3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS
150	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	2	PVC/PVC-DWV CPVC, PP, SS	
	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	
199	2	CPVC, PP, SS	2	CPVC, PP, SS	2	CPVC, PP, SS	2	CPVC, PP, SS	2	CPVC, PP, SS	2	CPVC, PP, SS	
	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	3	PVC/PVC-DWV CPVC, PP, SS	

WARNING All elbows in vent and air piping must be sweep elbows ONLY. DO NOT use short-radius elbows. When transitioning to 3-inch to 2-inch, use tapered reducer with 3" PVC nipple (I ≥ 6"). Do not use 3-inch to 2-inch bushing. Bushing will Not seal in boiler adapter.

Equivalent feet for elbows (USE SWEEP ELBOWS ONLY) — deduct from max. equivalent length of piping (does not apply to termination fittings).
PVC • 7 feet per for each additional 90° sweep elbow or 45° elbow — If piping contains more than 1 elbow in air or vent piping, other than termination fittings.
PP & SS • See manufacturers recommendations for equivalent vent length per elbow.




Note 1: ABS may be used for Intake air.
 Material abbreviations: PP = polypropylene, SS = AL29-4C stainless steel
 If using polypropylene or stainless pipe, provide adapters to for 3" boiler connections and for terminations, if required IPEX 3" PVC concentric vent kits can be used with standard PVC pipe, fittings and cement (ANSI/ASTM D1785) except if ULC S636 compliance is required. For ULC S636 compliance, all pipe, fittings and cement must be IPEX System 636. If using IPEX kits, use only IPEX product code 196006 for 3" venting. Contact Weil-McLain for ordering information and availability of Weil-McLain venting kits.

Note 2: Use only Weil-McLain approved termination kits listed in Figure 125, page 137



Venting & air – general (continued)

Figure 27 Vent and air piping materials — Use only the materials listed below, ensuring that all materials meet local codes (see Figure 125, page 137 for part/kit numbers)

Item	Material	Standards for installations in:		
		United States	Canada (Note 2)	
Plastic piping materials		Vent or air piping	Vent piping	Air piping
Vent or air pipe & fittings	PVC schedule 40 (Note 1)	ANSI/ASTM D1785	ULC S636	ABS, PVC, PVC-DWV, CPVC or polypropylene
	PVC-DWV schedule 40 (Note 1)	ANSI/ASTM D2665	N/A	
	CPVC schedule 40 (Note 1)	ANSI/ASTM F441	ULC S636	
	ABS-DWV schedule 40 (Intake Only)	ANSI/ASTM D2661	ULC S636	
PVC & ABS pipe cement & primer	PVC (Note 1)	ANSI/ASTM D2564/F656	ULC S636	Use only cement and primer suitable for piping material used
	CPVC (Note 1)	ANSI/ASTM F493	ULC S636	
	ABS schedule 40 (Note 1)	ANSI/ASTM D2235	ULC S636	
Polypropylene vent pipe, fittings, terminations and cement	Simpson-Duravent — Obtain all materials from M&G Simpson-Duravent Centrotherm Eco Systems InnoFlue® Single-wall — Obtain all materials from Centrotherm Note: See page 137 for correct appliance adapters to be used.	See manufacturer's literature for detailed information MUST USE LOCKING COLLAR ON EVERY JOINT	ULC S636	PVC, PVC-DWV, CPVC or polypropylene
AL29-4C stainless steel piping materials				
Vent pipe AL29-4C stainless steel	Heat Fab, Inc. — Saf-T-Vent® Z-Flex, Inc. — Z-Vent II Dura-Vent — FasNSeal™ Metal-Fab, Inc. — CORR/GUARD <i>See Figure 125, page 137 for Mfg's adapter part numbers.</i>	Certified for Category IV and direct vent appliance venting	Certified for Category IV and direct vent appliance venting	
Weil-McLain stainless steel bird screens, 2" or 3" (purchase separately) — see Figure 125, page 137 for part numbers.				
Note 1:	Weil-McLain concentric vent kits are made from PVC pipe and fittings.	▲WARNING ADAPTERS — The boiler comes with a 3" 3-in-1 adapter as standard. This adapter allows the installation of 3" PVC schedule 40, CPVC schedule 40, PVC-DWV schedule 40, AL29-4C stainless steel (from Simpson-Duravent only) and Polypropylene (from Simpson-Duravent & Centrotherm only) piping without the need for extra adapters. ADAPTERS – It may require additional adapters at the terminations if using different venting materials. (When going from PP to the Weil-McLain side wall plate, for example). ADAPTERS - If using 2" piping, where approved for the application, provide adapters for a 3" pipe material (mentioned above) connections and at the terminations, if required.		
Note 2:	System 636 PVC concentric terminations utilize PVC pipe/fittings certified to ULC S636. If ULC S636 compliance is required, use only System 636 pipe, fittings and cement.			
▲WARNING	DO NOT mix piping from different pipe manufacturers unless using adapters specifically designed for the purpose by the manufacturer.			
▲WARNING	Every joint on polypropylene vent piping must include a locking collar.			
▲WARNING	DO NOT use cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in venting systems.			
▲WARNING	DO NOT cover non-metallic vent pipe and fittings with thermal insulation.			
		▲WARNING	USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.	
	▲WARNING	ALL vent and air pipes require a BIRD SCREEN at each termination . Most kits do not include the bird screens. Purchase bird screens separately from Weil-McLain or vent kit supplier if not included. [Note — bird screening is integral to the 3" PVC Weil-McLain sidewall vent cap, available for purchase from Weil-McLain. No additional screening is required.]		



Commonwealth of Massachusetts installations

Commonwealth of Massachusetts — When the boiler is installed within the Commonwealth of Massachusetts, the boiler must be installed by a licensed plumber or gas fitter. Read and comply with the instructions below.

- (a) For all sidewall horizontally-vented gas-fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:
1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
 - a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
 - b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
 2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
 3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS."
 4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.
- (b) **EXEMPTIONS:** The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:
1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
 2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.
- (c) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM PROVIDED.** When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:
1. Detailed instructions for the installation of the venting system design or the venting system components; and
 2. A complete parts list for the venting system design or venting system.
- (d) **MANUFACTURER REQUIREMENTS — GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:
1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
 2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.
- (e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

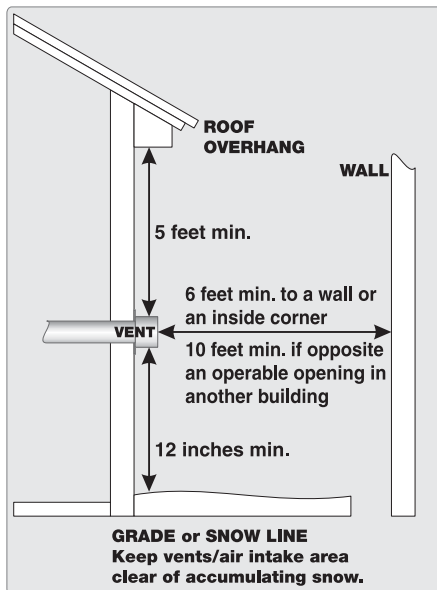
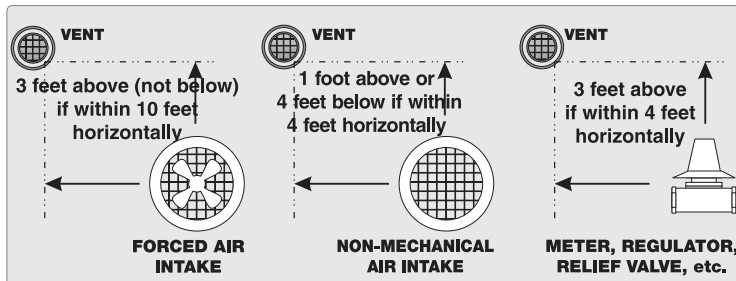
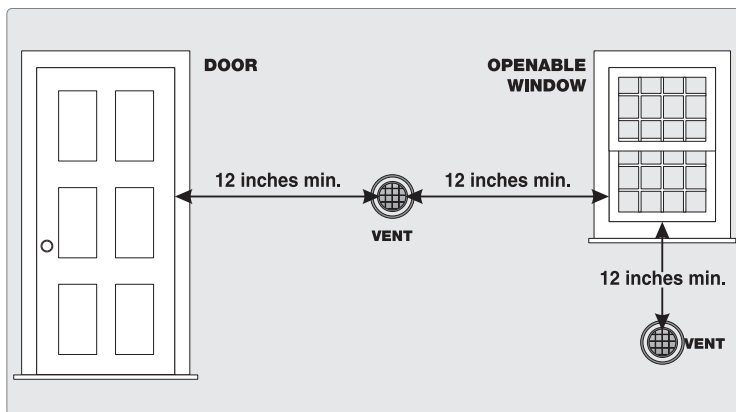


Vent termination requirements

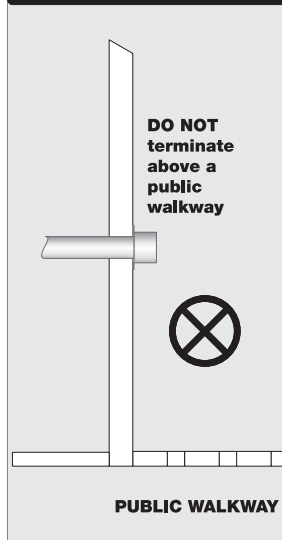
Figure 28 The vent termination must be located to meet all requirements below (also applies to vertical vent terminations). The minimum distance from adjacent public walkways, adjacent buildings, open able windows and building in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1. The vent termination clearances below are for U.S.A., for Canadian vent termination clearances please refer to the requirements of CAN/CSA B149.1 Natural Gas and Propane Installation Code. Consideration should be given to avoid possible damage caused by vent plumes and condensate when choosing a venting configuration and location. Maintain a minimum clearance of 4 ft. (1.22m) horizontally from, and in no case above or below, unless a 4 ft. (1.22m) horizontal distance is maintained, from electrical meters, gas meters, regulators, and relief equipment.



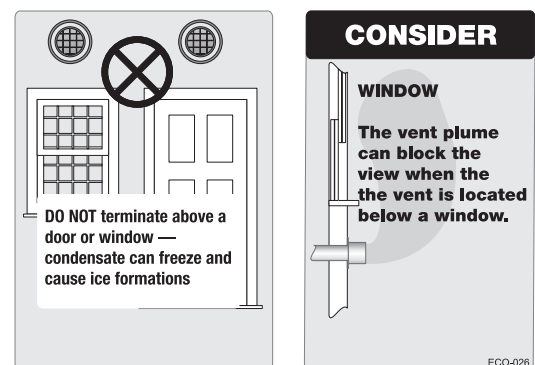
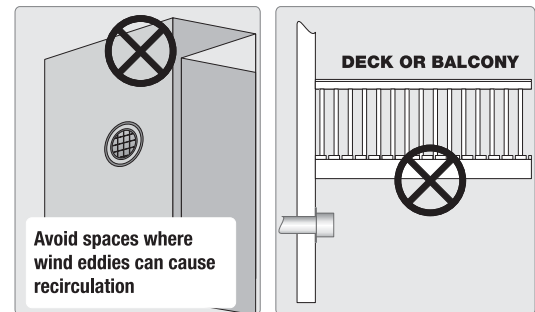
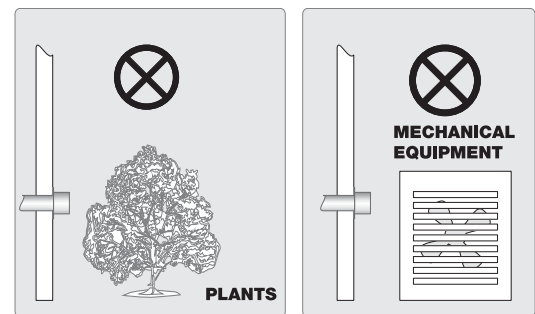
MINIMUM CLEARANCES



DO NOT TERMINATE:



DO NOT TERMINATE:





Boiler room air openings

Figure 29 Combustion and ventilation air openings for Direct Vent installations. Also follow the National Fuel Gas Code, ANSI Z223.1/NFPA 54 - latest edition, and/or Natural Gas and Propane Installation Code, CAN/CSA B149.1 or applicable provisions of the local building codes.



The ECO Tec boiler CANNOT be in the same space with other appliances if clearances around the boiler are less than the recommended service clearances shown in Figure 1, page 8.

<p>Air openings</p> <p>The required air opening sizes below are FREE AREA, after reduction for louver obstruction. Note the exception below for large spaces.</p>	<p>ECO Tec boiler WITH other appliances in room</p>	<p>ECO Tec boiler WITHOUT other appliances in room</p>
<p>a</p>	<p>TWO openings, each at least: 1 square inch per 1,000 Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)</p>	
<p>b</p>	<p>TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)</p>	<p>NO openings are required if the boiler installation provides at least the recommended service clearances shown in Figure 1, page 8.</p>
<p>Outside or ventilated attic</p> <p>c</p>	<p>TWO openings, each at least: 1 square inch per 4,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)</p>	<p>If the space is smaller than Figure 1, page 8, provide openings ONLY as shown in Figure 2, page 8. Each opening must have a free area no less than 1 square inch per 1,000 Btuh input of the boiler.</p>
<p>d</p>	<p>TWO openings, each at least: 1 square inch per 2,000 Btuh of all other appliances in the room — OR — ONE opening **, each at least: 1 square inch per 3,000 Btuh of all other appliances in the room (Unless specified otherwise by appliance manufacturer)</p>	
<p>** NOTICE:</p> <p>Requirements for using the SINGLE air opening option.</p>	<p>A single combustion air opening can be used for cases b, c or d above (ECO Tec with other appliances in room only), sized as listed, provided that:</p> <ul style="list-style-type: none"> • The single opening must communicate directly to the outdoors or to a space that communicates directly with outdoors (NOT to an interior space). • The top of the opening must be within 12 inches of the ceiling. • The free area of the opening must be at least equal to the sum of the areas of all equipment vent connectors in the space. 	
<p>SPECIAL EXCEPTION FOR LARGE SPACES (ECO Tec WITH other appliances in room only):</p>	<p>NO combustion air openings are needed if the boiler (and other appliances) are installed in a space with a volume NO LESS than 50 cubic feet per 1,000 Btuh of all appliances in the space. That is, total the input of all appliances in MBH (1,000's of Btuh), then multiply this total times 50. The building MUST NOT be of tight construction.</p> <p>Example: For a total input of 500 MBH (500,000 Btuh), the minimum volume would be 50 x 500 = 25,000 cubic feet.</p>	



Vent and air piping and boiler connections

Follow termination instructions

1. Read and follow all instructions for the termination type used before proceeding with this page. Follow all instructions provided by vent pipe manufacturer.

▲WARNING Use only materials from the manufacturers listed in Figure 27, page 23.

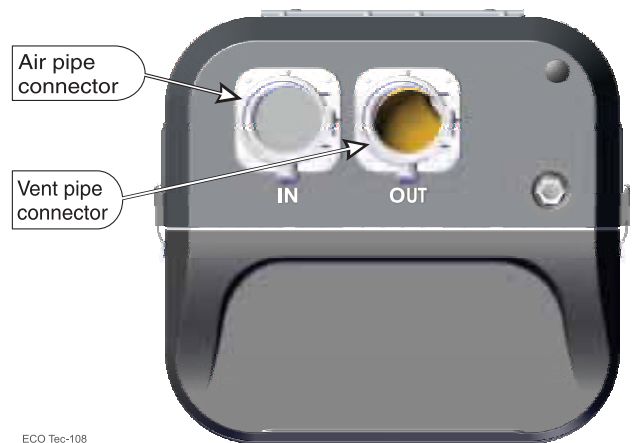
Installing vent and air piping

Polypropylene For polypropylene applications, see venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

1. Work from the boiler to vent or air termination. Do not exceed the lengths given in the previous pages for either the air or vent piping.
2. See Figure 30 for attaching vent (and air) pipes at the boiler. Connections must be 3" PVC or CPVC only — use transitions if needed to adapt to other material or size (2").
3. Cut pipe to required lengths.
4. Dry assemble entire vent or air piping to ensure proper fit before assembling any joint.
5. Maintain minimum clearance of 3/16 inch between vent pipe and any combustible wall or material.
6. Seal wall or floor penetration openings following local code requirements.
7. Assembling PVC or CPVC: (**Polypropylene** **AL29-4C S.S.** — follow pipe manufacturer's instructions for preparation and assembly)
 - a. Deburr inside and outside of pipe ends.
 - b. Chamfer outside of each pipe end to ensure even cement distribution when joining.
 - c. Clean all pipe ends and fittings. Dry thoroughly.
 - d. For each joint:
 - Handle fittings and pipes carefully to prevent contamination of surfaces.
 - Apply primer liberally to both joint surfaces — pipe end and fitting socket.
 - While primer is still damp, lightly apply approved cement to both surfaces in a uniform coating.
 - Apply a second coat to both surfaces. Avoid using too much cement on sockets to prevent cement buildup inside.
 - With cement still wet, insert pipe into fitting, twisting ¼ turn. Make sure pipe is fully inserted.
 - Wipe excess cement from joint. Check joint to be sure a smooth bead of cement shows around the entire joint.

Figure 30 Boiler vent and air connections



ECO Tec-108

▲WARNING **ADAPTERS** — Use Adapters if using other than 3" PVC, CPVC, SS (Simpson-Duravent only) and PP (Simpson-Duravent & Centrotherm).

1. Use only 3" PVC, CPVC, SS(Simpson-Duravent only) and PP (Simpson-Duravent & Centrotherm) pipe at boiler connection.
2. Clean and deburr inside and outside of both ends of air and vent pipes. Chamfer boiler end of vent pipe for ease of insertion.

▲WARNING The vent pipe end must be smooth and chamfered to prevent possible damage to sealing gasket in vent pipe adapter.

3. Inspect vent or air adapter (above) — verify no obstructions or foreign objects inside.
4. Loosen clamp screw.
5. Measure:

PVC or CPVC	= 2-1/4" or
PP	= 3-1/2" or
Duravent SS	= 4-3/4"

 from end of pipe and make a mark with felt-tip pen.
6. Loosen adapter clamp screw.
7. Apply small amount of silicon grease to end of pipe to ease insertion.
8. Insert pipe into adapter.
9. Slide pipe down until the mark is reached.

▲WARNING Do not apply excessive force or bend the adapter or flue/air pipe when inserting. The adapter or seal could be damaged. If any portion of the vent or air system is damaged, it must be replaced.

10. Secure vent or air pipe by tightening the adapter clamp securely. Do not overtighten.
11. The seal is accomplished with the internal gasket. The clamp is only to hold the pipe in place.



▲WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Sidewall with separate pipes

Allowable vent/air pipe materials & lengths

▲WARNING Use only the vent materials and kits listed in Figure 27, page 23. Provide pipe adapters if specified.

Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 26, page 22.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

Determine termination location

1. The air and vent terminations must be installed as shown in Figure 31 and Figure 34, page 29.
2. The terminations must comply with clearances and limitations shown in Figure 28, page 25.
3. Locate the terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

▲WARNING Do not exceed the maximum lengths of the outdoor vent piping shown in Figure 31. Excessive length exposed to the outdoor could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown. In extremely cold climates, install an insulated chase around the vent piping, particularly if using longer lengths. The chase must allow for inspection of the vent pipe, and insulation must be protected from water.

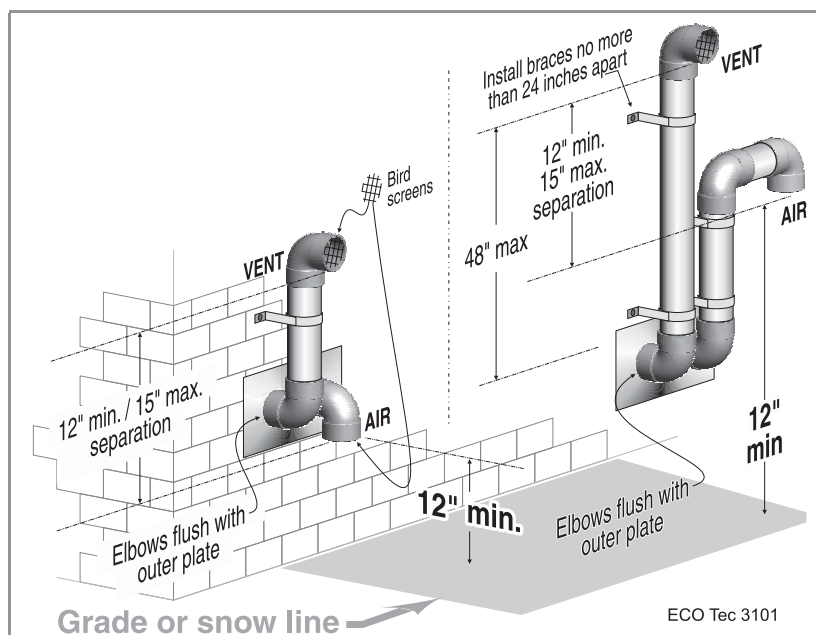
Multiple vent/air terminations

1. When terminating multiple boilers, terminate each vent/air connection as described in this manual.

▲WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearances shown in Figure 32, page 29 for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Figure 31 INSTALLATION SEQUENCE — Separate pipes sidewall



- Step 1** Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.**
Polypropylene AL29-4C S.S. See notices at left and page 21.
- Step 2** Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.
- Step 3** Make sure the selected sidewall termination location complies with Figure 28, page 25. (Multiple boiler sidewall plates must also comply with Figure 32, page 29.)
- Step 4** Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required. Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.
- Step 5** Prepare the sidewall penetrations and secure the sidewall plates as instructed in this section. See “Prepare wall penetrations” on page 29. **Polypropylene AL29-4C S.S.** See notices at left and page 21.
- Step 6** The air piping must terminate in a **down-turned elbow** as shown above. The vent piping must terminate in an **elbow pointed outward or away from the air inlet** as shown above. See illustration above.
- Step 7** Install vent and air piping between the boiler and the sidewall openings. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 27 for general guidelines. **Polypropylene AL29-4C S.S.** See notices at left and page 21.
- Step 8** Install pipe supports every 5 feet on both the horizontal and vertical runs. Install a hanger support within 6 inches of any upturn in the piping, or per vent pipe manufacturer’s instructions. **Polypropylene AL29-4C S.S.** See notices at left and page 21.
- Step 9** Attach the vent termination exterior piping: Use either of the configurations shown above, as needed to ensure clearance above grade or snow line.
- Step 10** The vent and air pipes may run up as high as 4 feet with no enclosure. The vent and air pipes must be secured with braces, and all clearances and lengths must be maintained. Space braces no further than 24 inches apart.
- Step 11** External venting greater than 4 feet requires an insulated enclosure around the vent and air pipes. The vent and air terminations must exit through the enclosure as shown in the illustration above, maintaining all required clearances.

▲WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Sidewall with separate pipes (continued)

Polypropylene AL29-4C S.S. See notices on previous page.

Prepare wall penetrations

1. Air pipe penetration:
 - a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole at least 0.4" larger than the vent pipe diameter.
 - b. Insert a corrosion resistant metal thimble in the vent pipe hole as shown in Figure 34.
3. Use the provided paper template for correct location of hole centers.
4. Use of a sidewall termination plate is REQUIRED.
 - a. Kits for several vent sizes are available from Weil-McLain. See "VENT/AIR PARTS AND KITS" on page 137.
 - b. Plate may be field fabricated from corrosion resistant material of sufficient strength. Plate must allow venting to maintain minimum clearance to combustibles.

WARNING Ensure that the plate material is strong enough to prevent the termination from being pushed inward if struck or pushed from the outside.

5. Follow all local codes for isolation of vent pipe when passing through floors or walls.
6. Seal exterior openings thoroughly with exterior caulk.

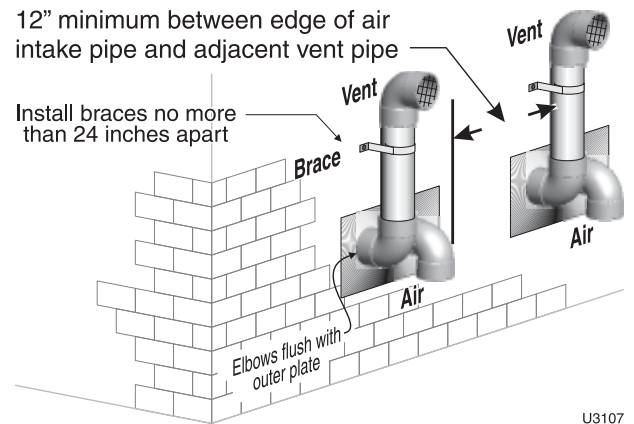
Termination and fittings

1. Prepare the vent termination elbow and the air termination elbow by inserting bird screens. (See Figure 31, page 28.) Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. Secure the elbows so they will butt against the sidewall termination plate.
3. When completed, the air termination coupling must be oriented at least 12 inches below the vent termination and at least 12 inches above grade or snow line as shown in Figure 31, page 28.
4. You can orient the vent termination elbow either directly outward or 90 degrees away from the air inlet elbow as shown in Figure 31, page 28.
5. Maintain the required dimensions of the finished termination piping as shown in Figure 31, page 28.
6. For multiple boiler terminations, see Figure 32.
7. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

NOTICE If extending the vent and air pipes out from the wall, install a coupling on each pipe. Mount the piping with the coupling flush with the outer plate.

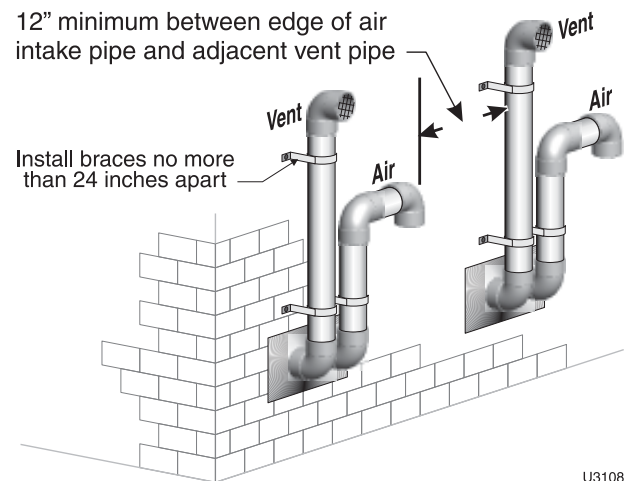
1 Vent piping	4 Corrosion resistant thimbles, by installer
2 Air piping	5 Bird screen, by installer
3 Sidewall termination plates: for 3" PVC, use plates supplied with boiler in W-M vent/air plate kit; for 3" AL29-4C or 2" PVC, purchase optional sidewall separate pipes plate kit	6 Air inlet elbow
	7 Elbow
	8 Nipple
	9 Elbow (vent termination)

Figure 32 Multiple terminations — separate pipes — clearance from vent of one air intake of the next



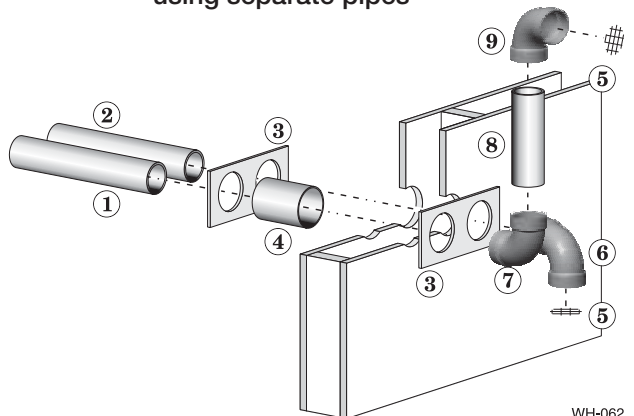
U3107

Figure 33 Multiple terminations — separate pipes — clearance from vent of one air intake of the next — alternate configuration of air and vent terminations.



U3108

Figure 34 Sidewall termination assembly — using separate pipes



WH-062



DIRECT VENT — Sidewall concentric

Allowable vent/air pipe materials & lengths

1. The concentric termination kit must be purchased separately.

WARNING Use only the vent materials and kits listed in Figure 27, page 23. Provide pipe adapters if specified.

2. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 26, page 22.
3. This termination requires a 45-degree elbow that is not supplied with the termination kit. The maximum vent/air pipe lengths include allowance for this elbow.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

Determine termination location

1. The concentric termination kit must be installed as shown in Figure 37, page 31.
2. The termination must comply with clearances and limitations shown in Figure 28, page 25.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

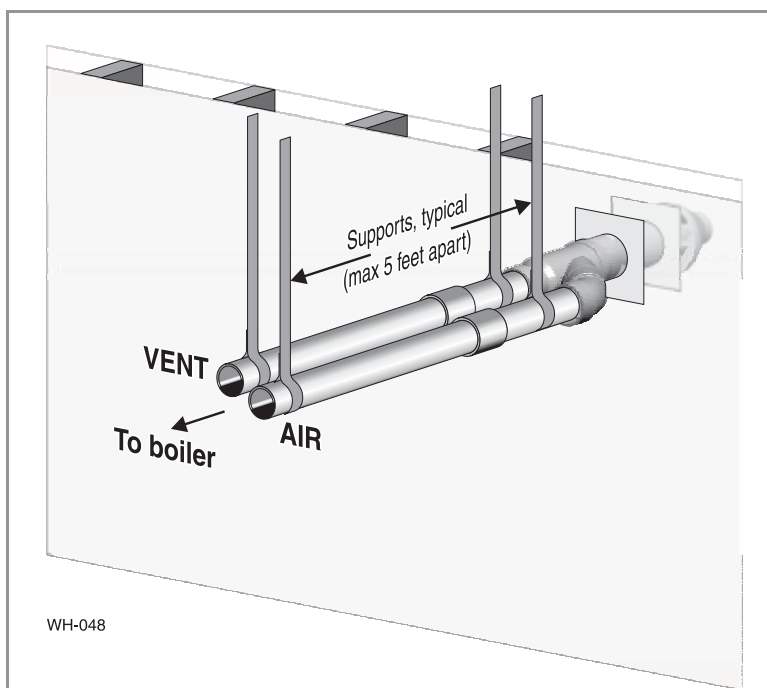
Multiple vent/air terminations

1. When terminating multiple boilers, install each concentric termination as described in this manual.

WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearance as shown in Figure 36, page 31 for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Figure 35 INSTALLATION SEQUENCE — Concentric horizontal



- Step 1** Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.** **Polypropylene** **AL29-4C S.S.** See notices at left.
- Step 2** Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.
- Step 3** Make sure the selected sidewall termination location complies with Figure 28, page 25. (Multiple boiler concentric terminations must also comply with Figure 36, page 31.)
- Step 4** Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required.
- Step 5** Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.
- Step 6** The concentric termination must be assembled and installed before piping from the boiler to the termination.
- Step 7** Prepare the sidewall penetration — assemble the concentric termination kit and secure the cover plates as instructed in this section. Provide the supports indicated and mount the termination assembly. See “Install termination — concentric pipes” on page 31. **Polypropylene** **AL29-4C S.S.** See notices at left.
- Step 8** Install vent and air piping between the boiler and the concentric vent/air termination. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 27 for general guidelines.
- Step 9** Install pipe supports every 5 feet on both the horizontal and vertical runs. **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.
- Step 10** Install a hanger support within 6 inches of any upturn in the piping. **Polypropylene** **AL29-4C S.S.** See notices at left.



WARNING USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Sidewall concentric (continued)

Polypropylene AL29-4C S.S. See notices on previous page.

Install termination — concentric pipes

1. Assemble the vent termination as described for concentric terminations, on page 40.

WARNING If necessary, you can shorten the lengths of the inner and outer pipes for a shorter finished assembly. But you must ensure the pipes butt correctly at both ends. Failure to properly assemble the concentric termination can result in flue gas recirculation, causing possible severe personal injury or death.

2. Wall penetration:
 - a. Preferably, use a thimble with a 4½-inch hole. If not using a thimble, carefully use a hole saw to cut a hole not larger than 4¾ inches in diameter through the wall. The finished hole must provide a solid stop for the rain cap ribs, as shown in the inset to Figure 37.

WARNING Ensure that the wall material is strong enough to prevent the rain cap from being pushed inward if struck or pushed from the outside.

3. Secure the termination in place so the rain cap will butt against the outside wall or outer thimble plate as shown in Figure 37.
4. Before beginning vent and air piping from the boiler to the concentric termination, mount and secure the concentric termination as shown in Figure 37.

WARNING The vent and air piping must be securely supported, and must not rest its weight on the boiler fittings. Failure to properly support the vent and air piping could result in vent piping damage, resulting in possible severe personal injury, death or substantial property damage.

The supports/bracing used must support the termination assembly to prevent slippage or movement. See instructions provided with concentric kit for details.

The clamps used on the outside of the termination pipe must not cut into the pipe or contain sharp edges that could cause a crack to form.

WARNING When inserting the partially-assembled termination kit through the wall penetration, wrap plastic or other protection over the end of the exposed assembly to prevent debris from entering the pipes. If the air passages become blocked, the boiler will not operate. Once the rain cap has been cemented to the assembly, there is no way to correct the problem. The assembly would have to be replaced if it were cut to be removed and cleaned. Altering the assembly in any way could result in severe personal injury or death due to toxic flue product emissions.

WARNING If using AL29-4C stainless vent pipe, use the vent pipe manufacturer's PVC adapter if connecting to a PVC concentric vent attachment.

5. After the assembly has been positioned in the opening and all supports have been attached, install a bird screen (purchased separately if not included with the kit) and rain cap as follows:
 - a. Place the bird screen on the end of the inner pipe as in Figure 50, page 40, or per concentric kit instructions for polypropylene kits.
 - b. Cement the rain cap in place as shown.

Figure 36 Termination location — concentric termination — multiple boilers — clearance from vent of one to air intake of the next

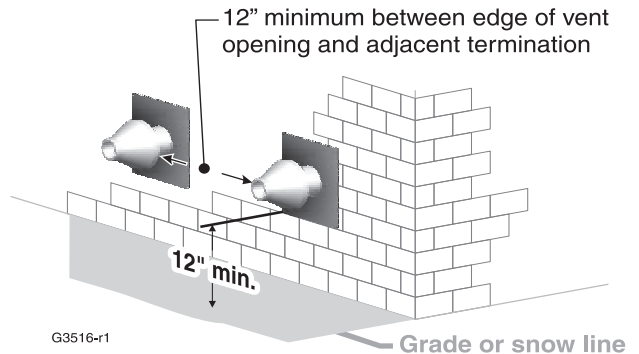
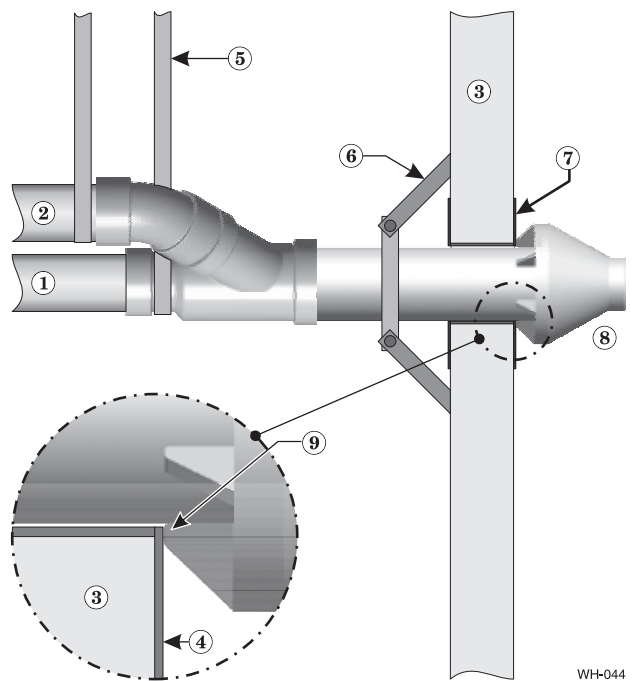


Figure 37 Installing and supporting the concentric sidewall vent assembly



LEGEND	
1	Vent pipe
2	Air pipe
3	Wall
4	Outer thimble plate
5	Supports every 5 feet or per vent pipe mfg's instructions
6	Wall brace, by installer, (or see vent pipe mfg's instructions)
7	Thimble, by installer
8	Rain cap
9	Rain cap ribs must butt against outer thimble plate or wall opening



DIRECT VENT — Sidewall with W-M vent/air plate

Allowable vent/air pipe materials & lengths

⚠ WARNING Use only the vent materials and kits listed in Figure 27, page 23. Provide pipe adapters if specified.

1. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 26, page 22.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

Determine termination location

1. The vent/air cap must be installed as shown in Figure 41, page 33.
2. The termination must comply with clearances and limitations shown in Figure 28, page 25.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

Multiple vent/air terminations or termination adjacent to other appliance terminations

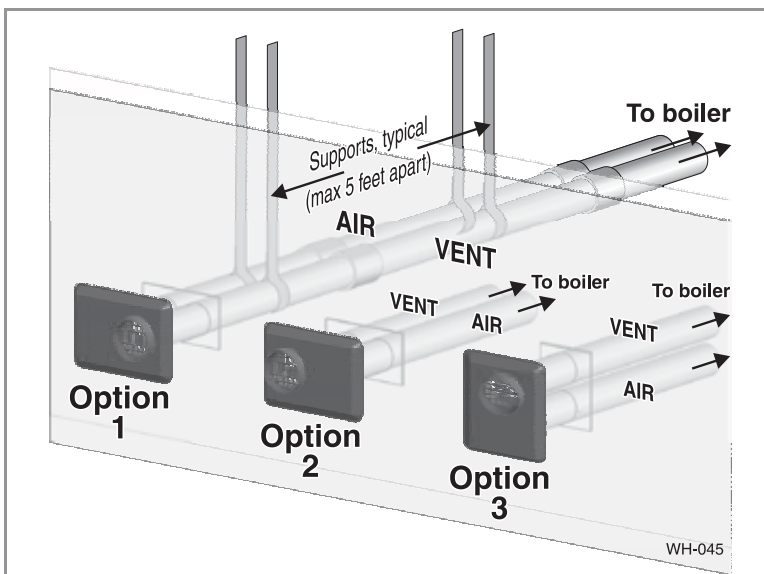
1. When terminating multiple boilers, terminate each vent/air connection as described in this manual.

⚠ WARNING All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place wall penetrations to obtain minimum clearance as shown in for U. S. installations. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

⚠ WARNING For terminations of other appliances, provide at least the clearance shown. The installation must also comply with the manual for the other appliances.

Figure 38 INSTALLATION — W-M sidewall vent/air plate



Vent/air pipes and vent/air can be oriented as option 1, 2, or 3. DO NOT mount with plate vertical and vent outlet down.

- Step 1** Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.** **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.
- Step 2** Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.
- Step 3** Make sure the selected sidewall termination location complies with Figure 28, page 25. (Multiple boiler sidewall plates must also comply with Figure 39, page 33.)
- Step 4** Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required.
- Step 5** Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.
- Step 6** Prepare the sidewall penetrations and secure the sidewall plates as instructed in this section. See “Install Weil-McLain vent/air cap” on page 33.
- Step 7** The Weil-McLain plate termination must be installed before piping from the boiler to the termination.
- Step 8** Install vent and air piping between the boiler and the vent/air termination plate. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 27 for general guidelines.
- Step 9** Install pipe supports every 5 feet on both the horizontal and vertical runs, or per vent pipe manufacturer’s instructions. **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.
- Step 10** Install a hanger support within 6 inches of any upturn in the piping, or per vent pipe manufacturer’s instructions. **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.



⚠ WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Sidewall with W-M vent/air plate (continued)

Install Weil-McLain vent/air cap

WARNING **ADAPTERS** — Use adapters if using other than 3-inch PVC or CPVC. This is required for different materials (polypropylene or AL29-4C stainless steel) or if using 2-inch pipe.

NOTICE The inside and outside cover plates are stamped to identify the exhaust (vent) and intake (air) openings. Make sure to orient the plates correctly.

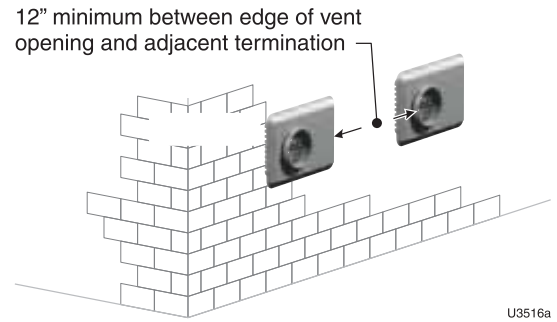
1. Locate termination opening and avoid obstructions:
 - a. Use the template supplied with the termination kit.
 - b. Locate the template on the outside building surface where the penetration is to be made.
 - c. Make sure there will be no obstructions that might prevent proper placement of the termination.
 - d. Use the template to mark the locations for the four mounting holes, flue pipe and air pipe. Level the template with a level.

WARNING For the Weil-McLain plate, the template must be level to ensure the flue and air pipe will be side-to-side, as shown in Figure 40. Failure to comply could result in severe personal injury, death or substantial property damage.

- e. Cut holes in the wall as shown in Figure 40, using the location marks made with the template. For best results, use a small-diameter, long drill bit to drill centering holes for the flue and air pipe openings. Then drill the large openings from both the inside and outside.
 - f. The flue pipe and air pipe may be run through a rectangular cutout (as marked on the template) in lieu of two separate holes if desired.
2. Drill holes for the screws or plastic anchors to secure the outside plate. Install the outside plate and mount the termination on the plate (temporarily).
 - a. Cut the flue pipe so the extension through the wall will cause the vent pipe to fully extend into the termination socket.
 - b. Cut the air pipe so the extension through the wall will butt the air pipe against the stops inside the termination.
 - c. Temporarily slide the flue and air pipes through the opening(s). Slide the inside wall plate over the two pipes and into position on the inside wall.
 - d. Position the inside plate so the flue pipe and air pipe slope downward slightly toward the boiler (1/4" per foot).
 - e. Mark the four (4) mounting holes for the plate.
 - f. Remove the vent and air pipe, drill the four mounting holes, and mount the inside plate.
 3. Test fit the vent/air termination on the vent pipe. Make sure the vent pipe fully penetrates the termination socket and the air pipe butts against the interior stops.
 4. Apply silicon RTV sealant to the interior of the vent termination and slide onto vent pipe. Rotate slightly to spread the silicon to ensure a tight seal around the vent pipe.
 5. Secure the termination in place using the four (4) #10 x 1/2" sheet metal screws and lock washers (see Figure 41).

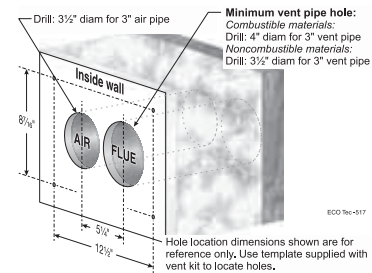
NOTICE Vent/air pipes and W-M vent/air plate can be oriented in any of the configurations shown in Figure 38, page 32.

Figure 39 Adjacent terminations — OUTSIDE VIEW — clearance from air inlet to exhaust from another appliance



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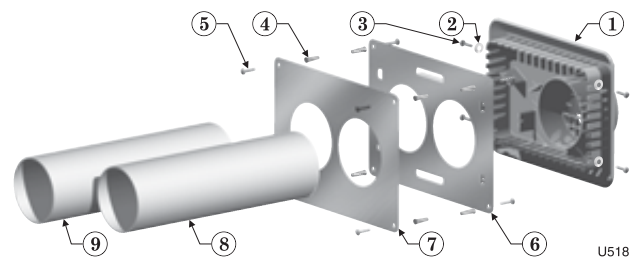
Figure 40 Hole preparation in wall — INSIDE VIEW (use template provided)



ECO 96-617

- 1 Inside wall
- 2 Drill: 3 1/2" diameter for 3" air pipe; locate using template provided
- 3 For combustible materials, drill: 4" diameter for 3" vent pipe
For noncombustible materials, drill 3 1/2" diameter for 3" vent pipe
Locate opening using template provided
- 4 Drill mounting screw holes using template provided

Figure 41 Termination assembly — INSIDE VIEW Weil-McLain vent/air cap and plates



U518

- | | |
|---------------------------------------|---|
| 1 Vent termination (3") | 6 Outer mounting plate |
| 2 Lock washer, #10 (4) | 7 Inner mounting plate |
| 3 Sheet metal screw, #10 x 1/2" (4) | 8 Vent pipe (butt to screen in termination) |
| 4 Plastic wall anchor (8) | 9 Air pipe (butt to stops in termination) |
| 5 Sheet metal screw, #10 x 1 1/4" (8) | |



DIRECT VENT — Vertical with separate pipes

Allowable vent/air pipe materials & lengths

WARNING Use only the vent materials and kits listed in Figure 27, page 23. Provide pipe adapters if specified.

1. Locate the terminations such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 26, page 22.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

Determine termination location

1. The air and vent terminations must be installed as shown in Figure 42.
2. The terminations must comply with clearances and limitations shown in Figure 28, page 25.
3. Locate the terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

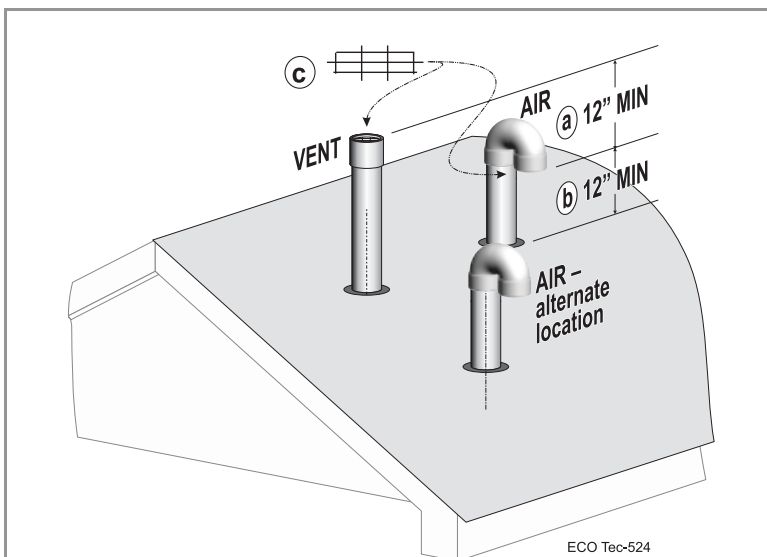
Multiple vent/air terminations

1. When terminating multiple boilers, terminate each vent/air connection as described in this manual.

WARNING Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place roof penetrations to obtain minimum clearance of 12 inches between edge of air intake elbow and adjacent vent pipe of another boiler for U. S. installations (see Figure 43, page 35). For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
3. The air inlet of a boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Figure 42 Separate pipes vertical termination



Terminate vent and air pipes such that:

- a. AIR INTAKE IS AT LEAST 12 inches below vent outlet.
- b. AIR INTAKE IS AT LEAST 12 inches above roof or snow line.
- c. Vent and air terminations are fitted with bird screens.

- Step 1** Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.** **Polypropylene AL29-4C S.S.** See notices at left and page 21.
- Step 2** Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.
- Step 3** Make sure the selected vertical termination location complies with Figure 28, page 25. (Multiple boiler terminations must also comply with Figure 43, page 35.)
- Step 4** Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required. Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.
- Step 5** Prepare the vertical penetrations and secure penetration components as instructed in this section. See “Prepare roof penetrations” on page 35 and “Termination and fittings” on page 35.
- Step 6** The air piping must terminate in a 180-degree return bend or **down-turned elbow** as shown above. The vent piping must terminate in a **coupling pointed upward** as shown above.
- Step 7** Install vent and air piping between the boiler and the vertical terminations. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. Install pipe supports every 5 feet on both the horizontal and vertical runs. Install a hanger support within 6 inches of any upturn in the piping. See page 27 for general guidelines. Also comply with vent pipe manufacturer’s instructions. **Polypropylene AL29-4C S.S.** See notices at left and page 21.
- Step 8** Insert the vent and air piping through the vertical penetrations and secure the termination fittings.
- Step 9** Maintain clearances shown above. Vent and air terminations must be fitted with a bird screen as shown.



WARNING USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Vertical with separate pipes (continued)

Polypropylene AL29-4C S.S. See notices on previous page.

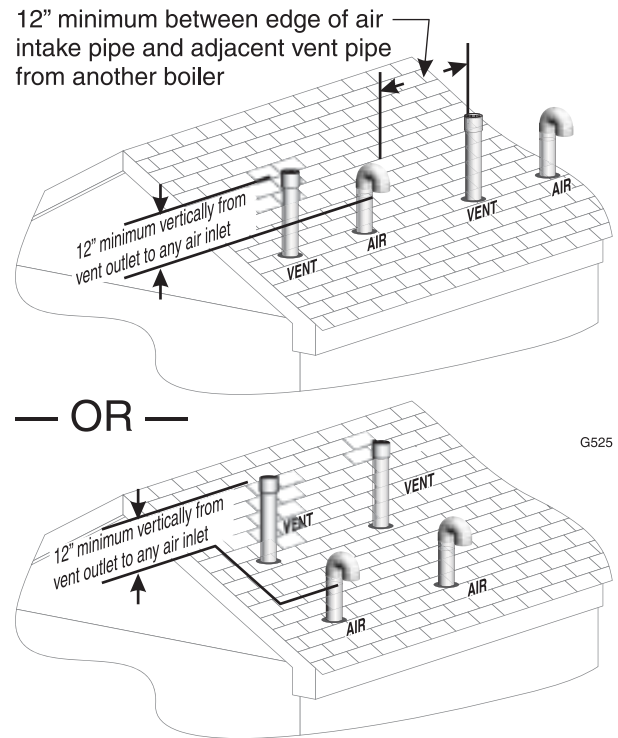
Prepare roof penetrations

1. Air pipe penetration:
 - a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole at least 0.4" larger than the vent pipe diameter.
 - b. Insert a corrosion resistant metal thimble in the vent pipe hole.
3. Space the air and vent holes no closer than the minimum spacings shown in Figure 43.
4. Follow all local codes and vent pipe manufacturer's instructions for isolation of vent pipe when passing through floors, ceilings and roofs.
5. Provide flashing and sealing boots sized for the vent pipe and air pipe. Follow all vent pipe manufacturer's instructions.

Termination and fittings

1. Prepare the vent termination elbow and the air termination elbow (Figure 42, page 34) by inserting bird screens. Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. The air piping must terminate in a down-turned 180-degree return bend as shown in Figure 42, page 34. The edge of the air inlet elbow must be at least 12 inches above the roof or snow line.
3. The vent piping must terminate in an up-turned coupling as shown in Figure 42, page 34. The top of the coupling must be at least 12 inches above the air intake in order to avoid recirculation of flue products into the combustion air stream.
4. Maintain the required dimensions of the finished termination piping as shown in Figure 42, page 34.
5. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

Figure 43 Terminations for multiple boilers



WARNING Also maintain maximum distances between the vent and air pipes for each boiler as shown in Figure 31, page 28.



DIRECT VENT — Vertical concentric

Allowable vent/air pipe materials & lengths

1. The concentric termination kit must be purchased separately.

⚠WARNING Use only the vent materials and kits listed in Figure 27, page 23. Provide pipe adapters if specified.

2. Locate the termination such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 26, page 22.
3. This termination requires a 45-degree elbow that is not supplied with the termination kit. The maximum vent/air pipe lengths include allowance for this elbow.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

Determine termination location

Locate the concentric vent/air termination using the following guidelines:

1. The concentric vent/air assembly must terminate as shown in Figure 46, page 37
2. The termination must comply with the clearances and limitations shown in Figure 28, page 25.
3. Locate the termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.
4. For Canadian installations, follow requirements of CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.

Multiple vent/air terminations

1. When terminating multiple boilers, install the concentric vent/air termination assemblies as described in this manual.

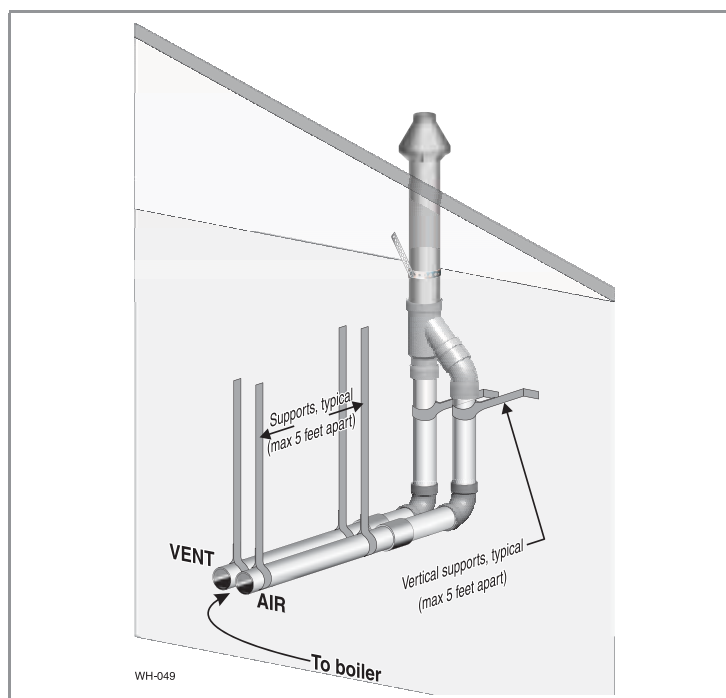
⚠WARNING All vent outlets must terminate at the same height to avoid possibility of severe personal injury, death or substantial property damage.

2. Place roof penetrations to obtain minimum clearance of 12 inches between the edges of adjacent vent pipes of other boilers for U. S. installations (see Figure 45).
3. For Canadian installations, provide clearances required by CSA B149.1 or B149.2 Installation Code and a ULC S636 compliant vent kit.
4. The air inlet of a boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

Prepare roof penetrations

1. Roof penetration hole:
 - a. Cut a clearance hole to clear the termination outside diameter as prescribed in the kit instructions.
 - b. Insert a corrosion resistant metal thimble in the vent pipe hole.

Figure 44 INSTALLATION SEQUENCE — Concentric vertical



Step 1 Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.** **Polypropylene AL29-4C S.S.** See notices at left and page 21.

Step 2 Install the boiler in a location that allows proper routing of all vent and air piping to the selected sidewall location.

Step 3 Make sure the selected vertical termination location complies with Figure 28, page 25. (Multiple boiler concentric terminations must also comply with Figure 45, page 37.)

Step 4 Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required.

Step 5 Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.

Step 6 The concentric termination must be assembled and installed before piping from the boiler to the termination.

Step 7 Prepare the vertical penetration(s) — assemble the concentric termination kit and secure the penetration components as instructed in this section. Provide the supports indicated and mount the termination assembly. See “Prepare roof penetrations” on page 36 and “Mount concentric termination” on page 37. **Polypropylene AL29-4C S.S.** See notices at left and page 21.

Step 8 Install vent and air piping between the boiler and the concentric vent/air termination. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. See page 27 for general guidelines.

Step 9 Install pipe supports every 5 feet on both the horizontal and vertical runs. **Polypropylene AL29-4C S.S.** See notices at left and page 21.

Step 10 Install a hanger support within 6 inches of any upturn in the piping. **Polypropylene AL29-4C S.S.** See notices at left and page 21.



⚠WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Vertical concentric (continued)

Polypropylene AL29-4C S.S. See notices on previous page.

2. Follow all local codes for isolation of vent pipe when passing through floors, ceilings and roofs.
3. Provide flashing and sealing boots sized for the concentric termination outside diameter.

Mount concentric termination

1. Assemble the vent termination as described for concentric terminations, on page 40.
2. Mount the termination as shown in Figure 46.
3. Support the concentric vent/air termination at the roof penetration as shown in Figure 46 or per concentric kit instructions.
 - The supports/bracing used must support the termination assembly to prevent vertical slippage or sideways movement.
 - The clamps used on the outside of the termination pipe must not cut into the pipe or contain sharp edges that could cause a crack to form.

⚠ WARNING The vent and air piping must be securely supported, and must not rest its weight on the boiler fittings. DO NOT drill or screw into either the vent pipe or air pipe. Failure to properly support the vent and air piping could result in vent piping damage, resulting in possible severe personal injury, death or substantial property damage.

⚠ WARNING When inserting the partially-assembled termination kit through the roof penetration, wrap plastic or other protection over the end of the exposed assembly to prevent debris from entering the pipes. If the air passages become blocked, the boiler will not operate. Once the rain cap has been cemented to the assembly, there is no way to correct the problem. The assembly would have to be replaced if it were cut to be removed and cleaned. Altering the assembly in any way could result in severe personal injury or death due to toxic flue product emissions.

⚠ WARNING If using AL29-4C stainless vent pipe, use the vent pipe manufacturer’s PVC adapter if connecting to a PVC concentric vent attachment.

⚠ WARNING Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe.

4. After the assembly has been positioned in the roof opening and all supports have been attached, install a bird screen (purchased separately if not included with the kit) and rain cap as follows:
 - a. Place the bird screen on the end of the inner pipe as in Figure 50, page 40, or per kit instructions for polypropylene kits.
 - b. Cement the rain cap in place.

Figure 45 Vertical termination — 3" PVC concentric — single or multiple boilers

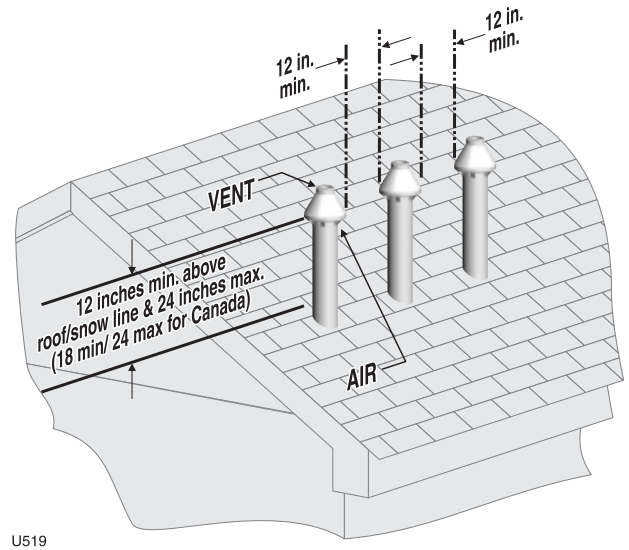
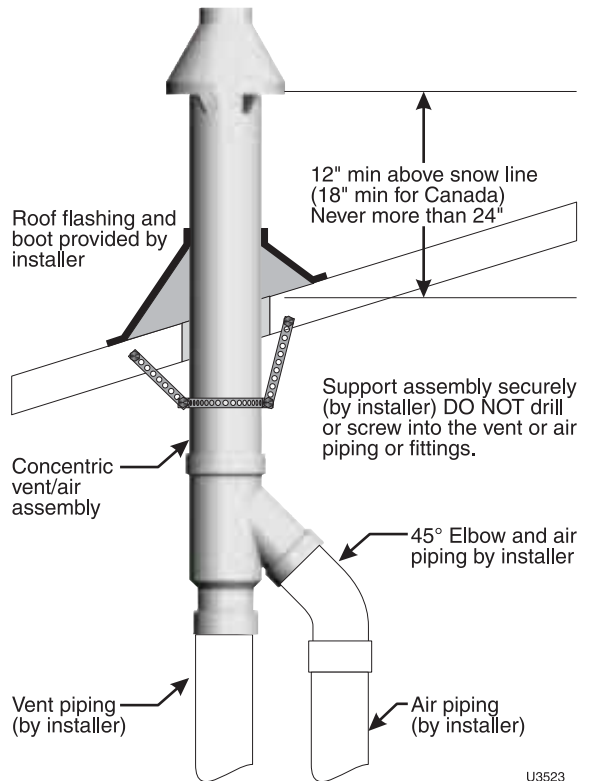


Figure 46 3" PVC concentric termination supports





DIRECT VENT — Vertical vent /sidewall air

Allowable vent/air pipe materials & lengths

WARNING Use only the vent materials and kits listed in Figure 23, page 24. Provide pipe adapters if specified.

1. Locate the terminations such that the total air piping and vent piping from the boiler to the termination will not exceed the maximum length given in Figure 22, page 23.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.

2. For 3” to 2” transitions, must use appropriate vent material. For polypropylene or stainless steel must use approved suppliers transitions.

Prepare roof penetration

1. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole at least 0.4” larger than the vent pipe diameter.
 - b. Insert a galvanized metal thimble in the vent pipe hole.
2. Follow all local codes for isolation of vent pipe when passing through floors, ceilings and roofs.
3. Provide flashing and sealing boots sized for the vent pipe and air pipe.

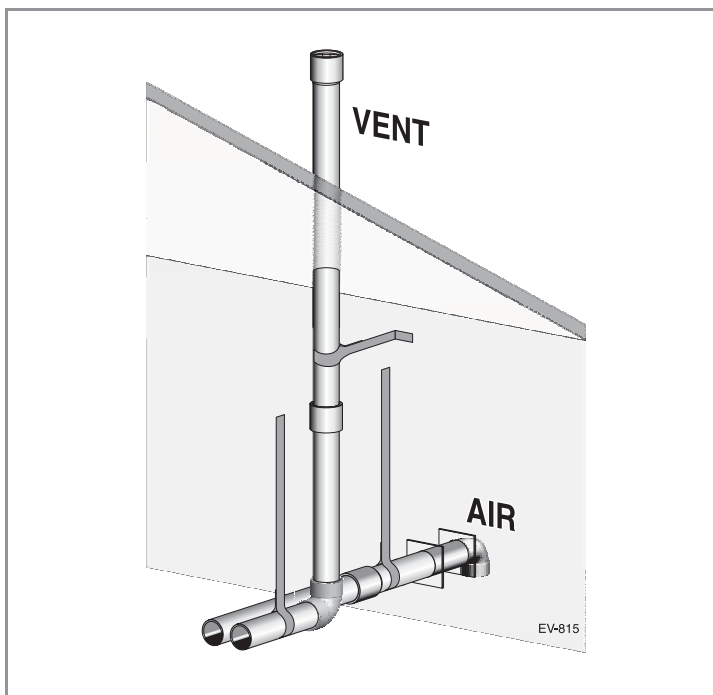
Vent termination and fittings

1. Prepare the vent termination coupling by inserting a bird screen. Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. Maintain the required dimensions of the finished termination piping as shown in Figure 48.

Multiple vent terminations

1. When terminating multiple **ECO Tec** boilers, terminate each vent/air connection as described in this section.
2. Place adjacent terminations at least 6 inches apart.
3. For Canadian installations, provide clearances required by Natural Gas and Propane Installation CAN/CSA B149.1 or B149.2 Installation Code.

Figure 47 INSTALLATION SEQUENCE — Vertical vent/sidewall air



- Step 1** Read and follow all instructions in this manual. **DO NOT proceed with vent/air installation until you have read page 20 through page 26.** **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.
- Step 2** Install the boiler in a location that allows proper routing of all vent and air piping to the selected locations.
- Step 3** Make sure the selected vertical termination location complies with Figure 28, page 25.
- Step 4** Use only the vent materials listed in Figure 27, page 23. Provide pipe adapters where required. Vent piping and air piping lengths must not exceed the values shown in Figure 26, page 22.
- Step 5** Prepare the vertical penetration (vent) and sidewall penetration (air) and secure penetration components as instructed in this section.
- Step 6** The air piping must terminate in a 90-degree **down-turned elbow** as shown above. The vent piping must terminate in a **coupling pointed upward** as shown above.
- Step 7** Install vent and air piping between the boiler and the air and vent terminations. Slope horizontal piping downward toward the boiler at least 1/4 inch per foot. Install pipe supports every 5 feet on both the horizontal and vertical runs. Install a hanger support within 6 inches of any upturn in the piping. See page 39 for general guidelines. Also comply with vent pipe manufacturer’s instructions. **Polypropylene** **AL29-4C S.S.** See notices at left and page 21.
- Step 8** Insert the vent and air piping through the penetrations and secure the termination fittings.
- Step 9** Maintain clearances shown in this section. Vent and air terminations must be fitted with bird screens as shown.



WARNING **USE SWEEP ELBOWS FOR ALL VENT AND AIR PIPING** — DO NOT use short radius elbows for vent or air piping. Boiler performance could be affected.



DIRECT VENT — Vertical vent /sidewall air (continued)

Determine location for air inlet elbow

1. The air inlet of an **ECO Tec** boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent appliance terminations.
2. Locate the air inlet elbow (termination) using the following guidelines.
3. The air piping must terminate in a down-turned elbow as shown in Figure 49.
 - a. Apply the configuration on the left side of Figure 49 unless the terminations would fail to meet minimum clearance to grade or snow line.
 - b. Apply the configuration on the right side of Figure 49 when the terminations need to be raised higher to meet clearance to grade or snow line.
 - c. The air pipe may run up the side of the building, as shown. The vent and air pipes must be secured with braces, and all clearances and lengths must be maintained. Space braces no further than 24 inches apart.
4. You must consider the surroundings when terminating the air connection:
 - a. Make sure there are no obstructions for air flow. **DO NOT** locate the termination where plants could grow and cause obstruction to air flow.
 - b. Do not locate the terminations where wind eddies could affect performance or cause recirculation with exhaust from other appliances, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards or other recessed areas.
 - c. Locate the air inlet termination at least 12 inches below and 12 inches horizontally from any appliance or building vent outlet.
5. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

Multiple air terminations

1. When terminating multiple **ECO Tec** boiler air connections, terminate each air connection as described in this manual.
2. Place wall penetrations to obtain minimum clearances as instructed in this manual.
3. Place adjacent air inlets for multiple **ECO Tec** boilers at least 6 inches apart.
4. For Canadian installations, provide clearances required by Natural Gas and Propane Installation CAN/CSA B149.1 or B149.2 Installation Code.

Prepare wall penetrations

1. Air pipe penetration:
 - a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Seal exterior openings thoroughly with exterior caulk.

Termination and fittings

1. Prepare the air termination elbow (Figure 49) by inserting a bird screen. Bird screens must be purchased separately. See the parts list at the end of this manual for part numbers.
2. Use metal plates (by installer) at inside and outside penetrations using the method shown in Figure 28, page 29.

NOTICE If extending the air pipe out from the wall, install a coupling on each pipe. Mount the piping with the coupling flush with the outer plate.

Figure 48 Vent termination (through the roof) for direct vent: vertical vent / sidewall air

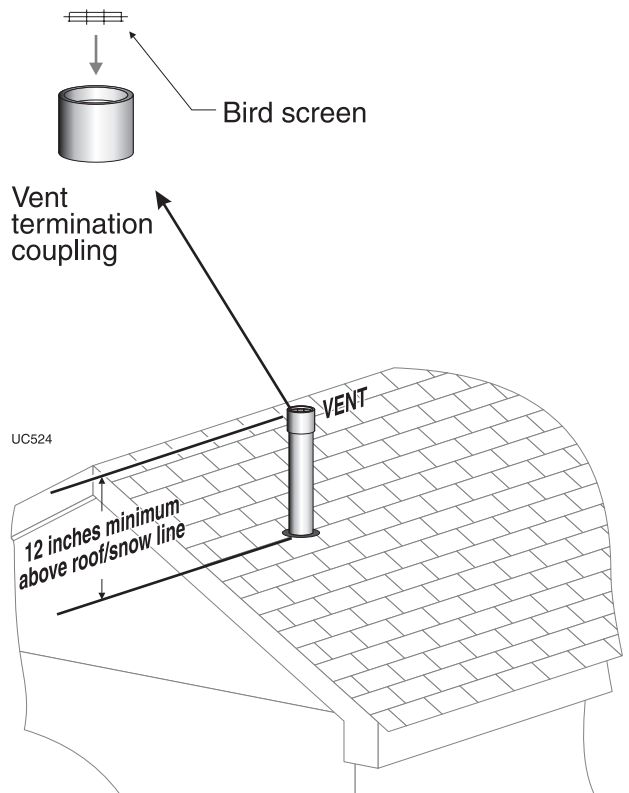
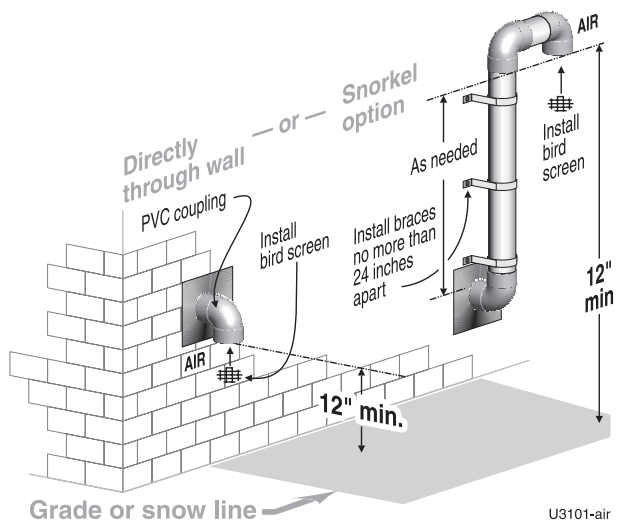


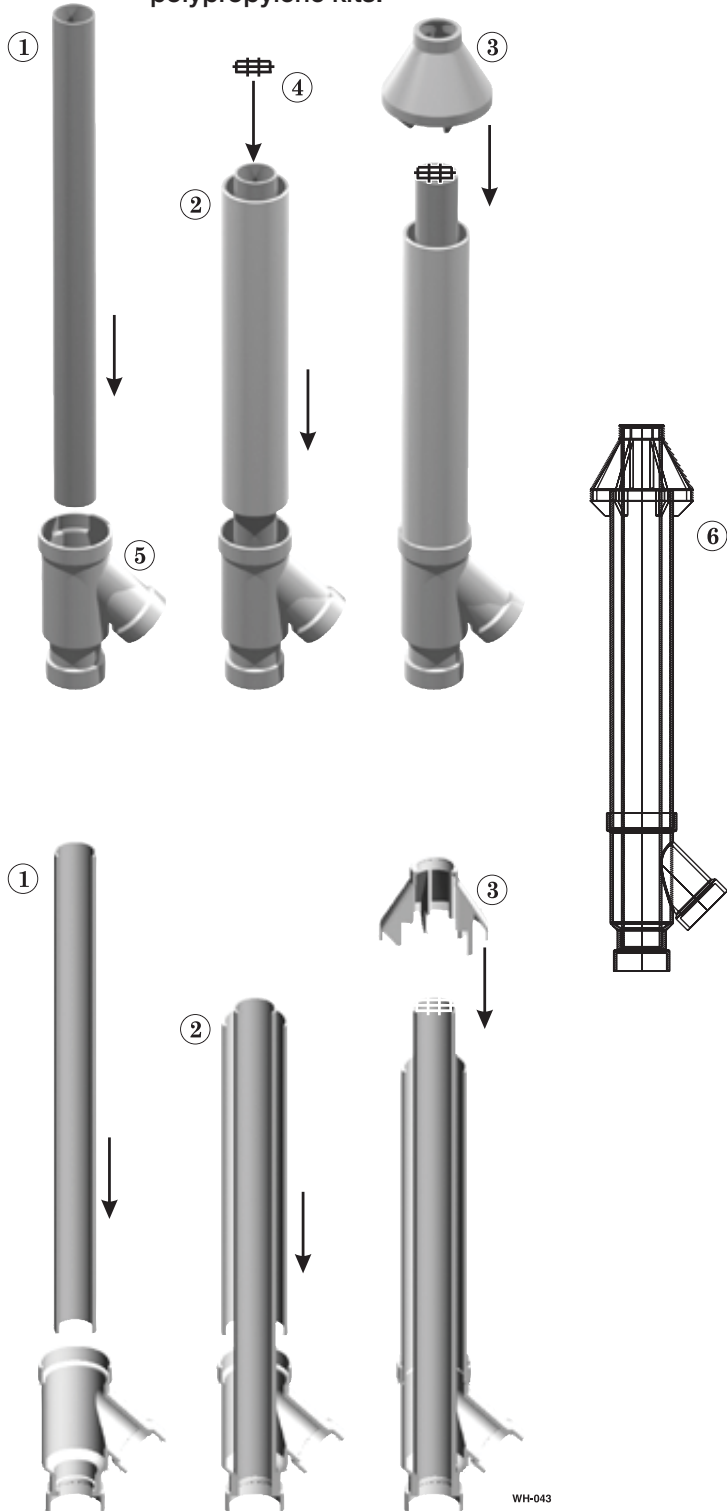
Figure 49 Sidewall air inlet (termination) for direct vent: vertical vent / sidewall air





Concentric termination, typical (sidewall or vertical)

Figure 50 PVC concentric termination assembly – DO NOT attach the rain cap until the termination has been inserted through the roof or wall and all supports have been installed. See LEGEND at right. See kit instructions for details of polypropylene kits.



LEGEND for Figure 50

- 1 — Inner PVC pipe (vent)
- 2 — Outer PVC pipe (air)
- 3 — Rain cap
- 4 — Bird screen
- 5 — Y fitting
- 6 — Finished assembly

Assembling concentric termination

1. Follow all instructions provided with the concentric termination kit. The following are general guidelines for information only
2. See Figure 50 for the typical assembly of a concentric termination assembly.
3. Prepare the bird screen, Item 4 (purchase separately if not included with the kit). Cut the bird screen to size if required. If the bird screen must be trimmed, cut the bird screen to fit the outside diameter of the PVC inner pipe supplied with the termination kit.
4. Partially assemble the vent termination kit in the sequence shown in Figure 50, or per the concentric kit instructions.

WARNING DO NOT install the rain cap and bird screen until the assembly has been inserted through the roof (or sidewall) and all supports have been installed. Follow instructions to cover the end of the assembly with plastic before inserting through the roof penetration to prevent debris from blocking the air passages.

WARNING If necessary, you can shorten the lengths of the inner and outer pipes for a shorter finished assembly. But you must ensure the pipes butt correctly at both ends. Failure to properly assemble the concentric termination can result in flue gas recirculation, causing possible severe personal injury or death.

Polypropylene For polypropylene applications, See venting and air piping notes on page 21.

AL29-4C S.S. For AL29-4C vent pipe applications, See venting and air piping notes on page 21.



Install boiler water piping

General piping information

Use piping unions near boiler

We recommend installing 1" NPT piping unions on boiler outlet and return to facilitate future service. Pipe unions are Not included with the boiler.

Additional controls, if required

NOTICE The control uses temperature sensors to provide both high limit protection and modulating temperature control. **The control's high limit function requires manual reset.** Some codes/jurisdictions may require additional external controls for high limit protection.

Additional limit controls

Some jurisdictions require an additional high temperature limit. Consult local requirements for other codes/standards to determine if needed.

1. If required, install a manual reset high temperature limit constructed to prevent a temperature setting above 200°F in Boiler In piping between boiler and isolation valve. (Note that the control operating limit function shuts the boiler down at 195°F, or lower if set to a lower value.)

WARNING **Multi-temperature systems** — If the heating system includes circuits that require lower temperature water (radiant slab circuits, for example) as well as higher temperature circuits, it is recommended to protect low-temperature circuits with limit controls that are wired to the control external limit circuit terminals. Please note that a combi model installed in a low temperature system is a multi-temperature system.

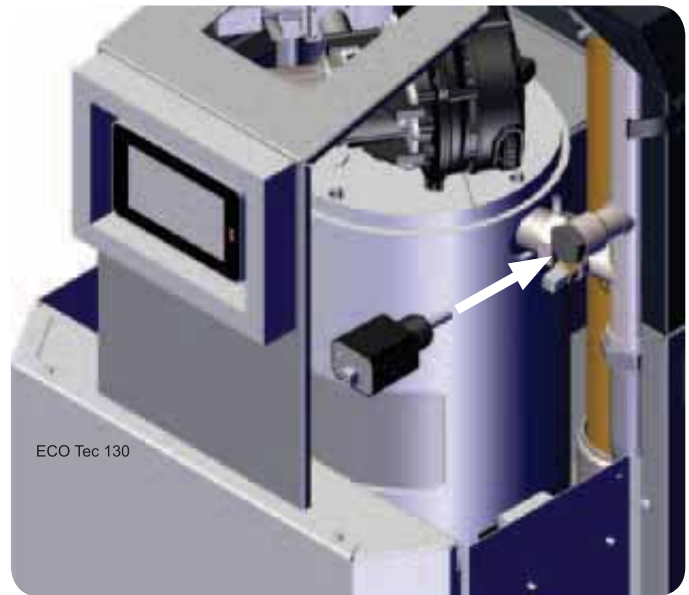
WARNING **Low temperature materials**— If using temperature-limited materials (such as PEX tubing) in system piping, it is recommended to protect the system with limit controls that are wired to the controls external limit circuit.

2. See instructions beginning on page 58 for wiring information.
3. If using a manual reset limit control or wiring in the manual reset circuit, set control boiler limit at least 20°F less than the external manual reset limit (i.e., set control no higher than 180°F for a 200°F external limit, for example).

Separate low water cutoff

1. A separate low water cutoff is required. See NOTICE above regarding the inherent protection provided by the Control module. A low water cut-off is to be supplied by the installer.
2. A 3/4" female NPT port is included within the internal boiler piping and it is recommended you install a low water cut off at this location, see Figure 51.
3. Use a low water cutoff designed for water installations. Electrode probe-type is recommended. See Replacement parts section at the end of this manual for the Weil-McLain low water cut-off kit. When using kit, ensure extra wire length is neatly bundled with zip ties and away from internal components.
4. For additional Limit controls wiring, see Field wiring instructions beginning on page 58.

Figure 51 LWCO 3/4" female NPT port location



Backflow preventer

Use backflow preventer in the cold water supply piping if required by local codes.

System/zone pipe sizing (Baseboard, convectors or cast iron radiators ONLY)

For residential space heating applications (other than radiant heating or unit heaters) ONLY, you can use the sizing suggestions in Figure 52.

Figure 52 Suggested pipe sizing for system headers and zone piping — RESIDENTIAL with baseboard, convectors or cast iron radiators ONLY (20°F temperature rise)

Boiler Models	System header
80/110	1" or larger
150/199	1¼" or larger
Recommendations are based on a 20°F temperature drop through the system.	
Suggested maximum load per zone	
Copper pipe and baseboard size	Maximum recommended feet of baseboard
¾"	67
1"	104
Size zone circulators to handle the required flow and head loss for each zone.	

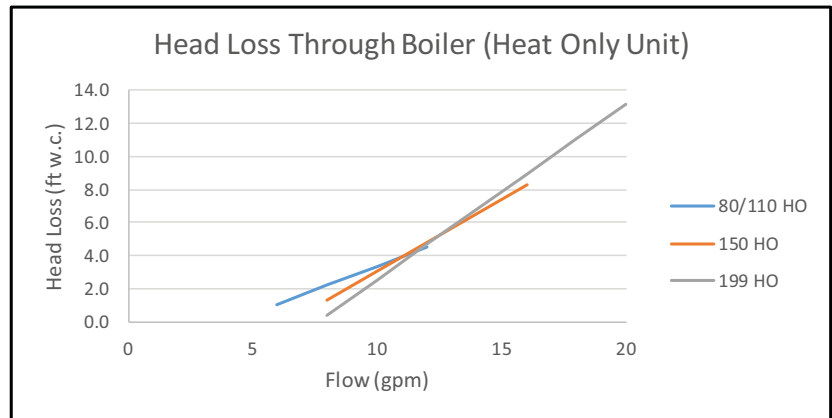


Install boiler water piping (continued)

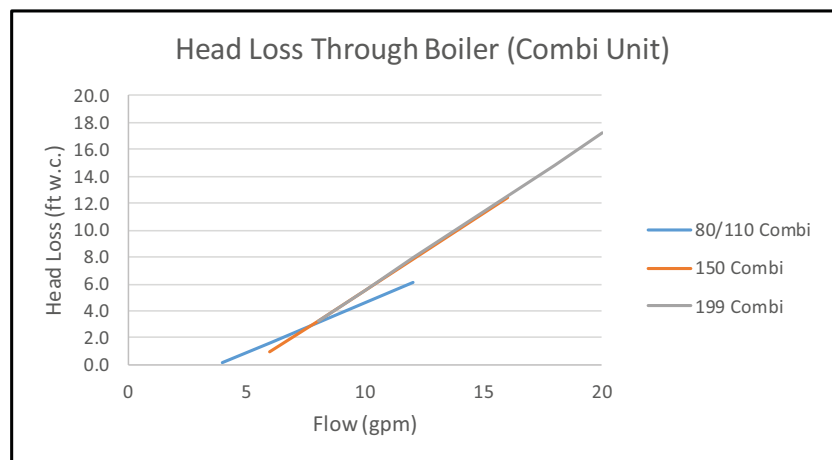
General Piping Information

Figure 53 Head Loss through Boiler – Tables 4 and 5

Flow Rate (GPM)	80/110 HO	150 HO	199 HO
	Head Loss (ft. w.c.)	Head Loss (ft. w.c.)	Head Loss (ft. w.c.)
6	1.0	—	—
8	2.2	1.3	0.4
10	3.4	3.1	2.6
12	4.5	4.8	4.7
14	--	6.6	6.8
16	--	8.3	8.9
18	--	--	11.0
20	--	--	13.1



Flow Rate (GPM)	80/110 C	150 C	199 C
	Head Loss (ft. w.c.)	Head Loss (ft. w.c.)	Head Loss (ft. w.c.)
4	0.2	--	--
6	1.6	1.0	--
8	3.1	3.3	3.3
10	4.6	5.6	5.6
12	6.1	7.8	7.9
14	--	10.1	10.2
16	--	12.4	12.5
18	--	--	14.9
20	--	--	17.2



Internal Circulator

This boiler is equipped with an internally installed Taco 0015e3 boiler circulator. In some piping systems, this circulator will provide enough head for a direct connect system. See instructions starting on page 46 for Direct Connect System Piping. In all other cases, this circulator will provide the proper boiler flow for a primary/secondary system piping. See instructions starting on page 50 for Primary/Secondary System Piping.

The Taco 0015e3 is a variable speed, high-efficiency wet rotor circulator with an ECM permanent magnet motor that has three different positions: **LOW, MEDIUM, and HIGH**. This circulator comes set at **HIGH**. This is the ideal setting for this boiler in most cases. In some installations, the speed can be reduced, if the boiler temperature rise is smaller than the desired rise at the boiler's maximum input.

LED COLOR	STATUS
ORANGE	CIRCULATOR ON
FLASHING WHITE	AIR BOUND OR CAVITATION
RED	BLOCKED
OFF	CIRCULATOR OFF



Install boiler water piping (continued)

Domestic Water Piping – Combi Boiler

▲ DANGER Hot Water Can Scald!

- Consumer Product Safety Commission and some states recommend domestic hot water temperature of 130°F or less.
- When installing an **automatic mixing valve**, selection and installation must comply with valve manufacturer's recommendations and instructions.
- Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scald and cause injury.
- Children, elderly, infirm or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:
 - Install **automatic mixing valve** set according to those standards.
 - Use lowest practical temperature setting.
 - Check water temperature immediately after first heating cycle and after any adjustment.

If the boiler piping system is connected to heating coils located in air handling units where there may be exposed to refrigerated air circulation then it must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

To pipe DHW, see Figure 54, page 44.

1. Size piping for DHW inlet and outlet is 3/4" NPT.
2. In hard water areas – To prevent the formation of scale on the inside of the plate DHW heat exchanger and other components in the domestic hot water system, water with hardness higher than 50 ppm Calcium Carbonate must be treated with a "Water Softener" prior to entering the boiler. Plugging of the domestic system by scaling or accumulation of dirt is not the responsibility of Weil-McLain, and suitable steps must be taken to avoid it.
3. The maximum domestic water pressure rating is 150 PSI for all combi models, on the domestic pipes and internal components.
4. A field supplied pressure relief valve that complies with the standard for relief valves and automatic gas shut-off devices for Hot Water Supply Systems, ANSI Z21.221 CSA4.4 - latest edition, is required to be installed at the supply DHW connection-. This pressure relief valve should be capable of at least the Maximum input of the boiler model * and Maximum pressure Not exceeding 150 PSIG. The pressure relief valve's discharge should be per instructions in the Warning box, page 48. DO NOT

place any other type valve or shut-off device between the relief valve and the boiler. The pressure relief valve must be manually checked once a year to verify correct operation, * 110 MBH, 150 MBH or 199 MBH, depending on the boiler model).

5. **Thermostatic Mixing Valve** - An ASSE 1070 **automatic mixing valve** for regulating domestic heating water **must** be used to regulate the water temperature leaving the plate heat exchanger. **NOTE:** the valve must be set to supply a domestic water temperature of not more than 120 degrees F. It is the responsibility of the installer to set the valve and remove or lock the dial depending on valve capabilities.
6. **Additional anti-scald devices** may be installed at each hot water faucet, bath and shower outlet.
7. **DHW Filter (Installer Supplied):** It is recommend to install a 25 micron or lower domestic water filter in the cold water line which feeds into the combi boiler for domestic hot water production. This filter will protect the DHW flow sensor and prolong the time between cleaning and overall life of the brazed plate heat exchanger and flow sensor. In harsh water conditions a finer filter and/or water softener may be required. Consult your local water quality professional.

NOTICE

Check Valve – A check valve must be field provided and installed on the outlet of the mixing valve to prevent reverse flow. Failure to prevent the backflow will cause water to flow through the flow switch, activating it, when the cold water draw has ended and the water pressure increases.

8. **Drain and Isolation Valves** - Install drain and isolation valves on the inlet and outlet of the DHW connections so that the DHW heat exchanger can be flushed and cleaned from possible build-up caused by dirty or hard water, which is a maintenance requirement. See page 52 for Weil-McLain's DHW Service Valve Kit installation and Figure 125, page 137 for kit part number.
9. **Cleaning** – refer to the installation manual maintenance section for the proper cleaning procedure for the plate DHW heat exchanger, and the required cleaning frequency.

▲ WARNING

Studies have indicated that dangerous bacteria can form in potable water distribution systems if certain minimum water temperatures are not maintained. Contact local health department for more information.

▲ CAUTION

This boiler is **NOT** intended for connection with a refrigeration system.



Install boiler water piping (continued)

Recirculation (if used)

NOTICE Massachusetts code applications require recirculation piping or heat-traced piping if the distance from the water heater to the furthest fixture exceeds 100 feet.

Other jurisdictions may also require. Check local codes.

Maintaining domestic water temperature in the supply piping

1. Recirculation is used to reduce wait time for water use, to minimize hot water and energy waste caused during the waiting period, and to prevent degradation of the Boiler In water temperature. ASPE recommends recirculation when the distance from the water heater to the furthest fixture exceeds 100 feet or the time lag for hot water to reach a fixture(s) exceeds 30 seconds.
2. Consult local codes and American Society of Plumbing Engineers (ASPE) Domestic Water Heating Design Manual - latest edition, for further information.

Recirculation pump (Figure 55, page 45, Item 8)

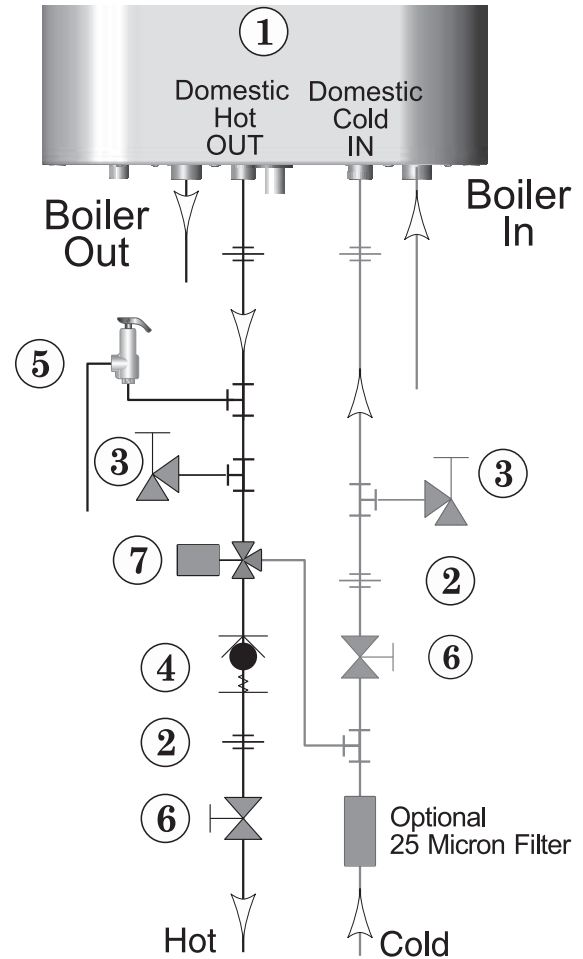
1. Circulator size must achieve a flow rate of 0.5 GPM or greater to activate the boiler, the thermostatic mixing valve will vary the flow rate through the boiler and must be considered when sizing the circulator.
2. Minimum flow rates of the thermostatic mixing valve must be maintained.
3. The circulator cannot run continuously as bypass through the **anti-scald mixing valve** will eventually allow the water temperature in the piping to climb to the water heater temperature during draw periods, (heating performance would be reduced based off of priority switching and priority timers).
4. An aquastat, timer, or occupancy sensor must be used with recirculation pump to prevent continuous flow. Some recirculation pumps may have smart controls that are suitable as well.
5. See Figure 55, page 45 for recommend recirculation pump piping diagram. This piping strategy is for a dedicated DHW return pipe.

Aquastat (Figure 55, page 45, Item 9)

1. An Aquastat is recommended to be used when a recirculation pump is installed. The aquastat is used to control the on-off position of the recirculating circulator. Aquastat is set 5° to 10° lower than mixed water outlet of the **anti-scald mixing valve** (Item 7).
2. A timer may be used in addition to the aquastat to limit the time of day recirculation is used.

WARNING Domestic water supplied to fixtures that could pose an injury hazard due to high temperature, such as showers and faucets, should be equipped with a temperature regulating device, such as an **anti-scald mixing valve**.

Figure 54 Domestic Piping - Brazed Plate Heat Exchanger - Ports 2 and 4



- | | |
|----------------------|---------------------------|
| ① Combi boiler | ⑤ Relief valve (150 PSIG) |
| ② Union | ⑥ Isolation valve |
| ③ Drain/Purge valve | ⑦ Three way mixing valve |
| ④ Spring check valve | |

ECO Tec-042

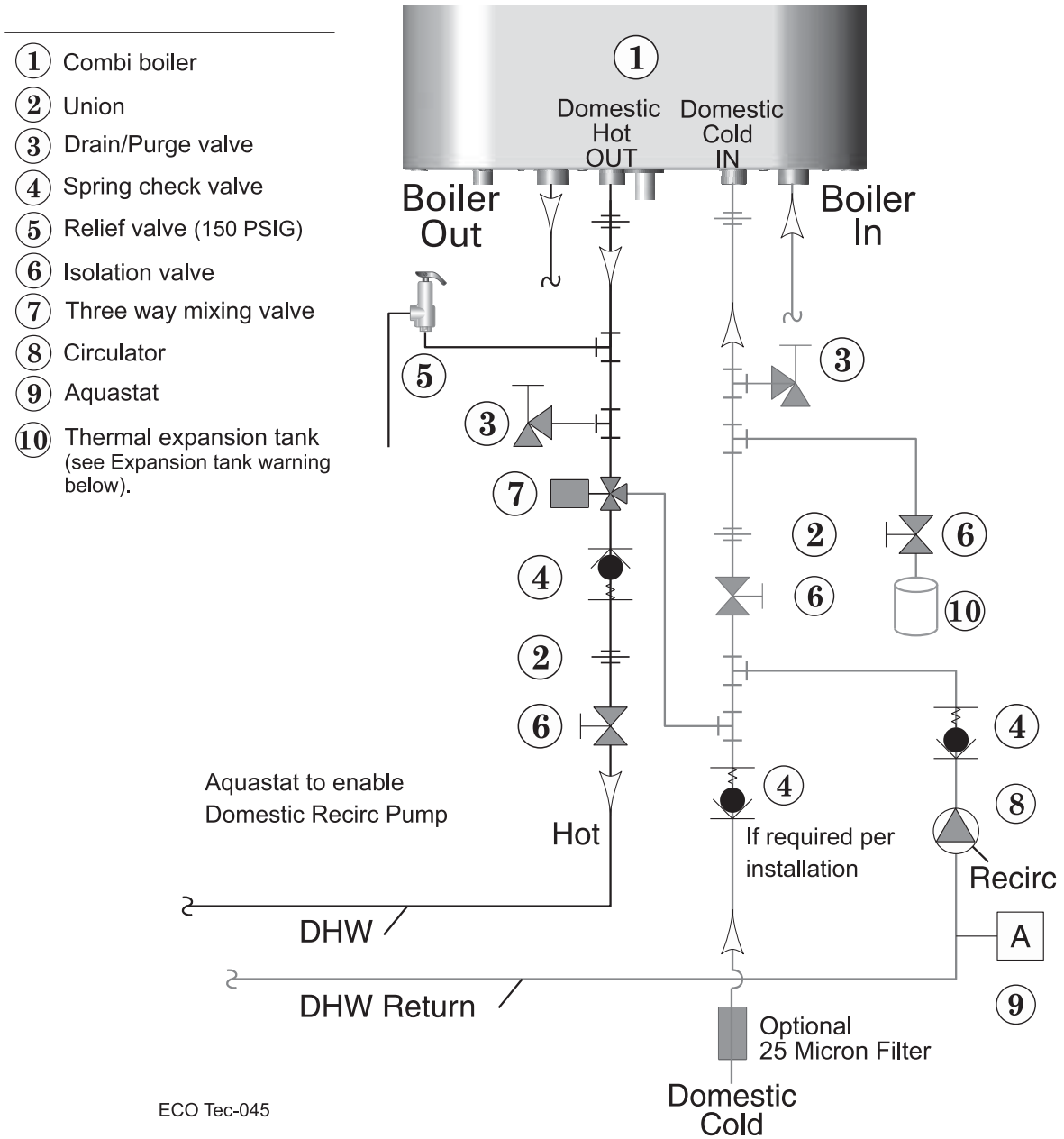
Check valves (Figure 55, page 45, Item 4)

1. Assure the flow of water in one direction.
2. Each check valve functions as follows:
 - a. Prevent bypass in the event of pressure drop.
 - b. Prevents thermal siphoning of hot water to the cold water supply.
 - c. Prevents flow of cold water to the tempered water supply. A draw of tempered water will not result in flow of cold water into the return loop.



Install boiler water piping (continued)

Figure 55 Recirculation piping diagram (if used)



ECO Tec-045

Expansion tank (Figure 55, Item 10)

⚠ WARNING THERMAL EXPANSION TANK — If a backflow preventer, check valve, or pressure reducing valve is piped on cold water inlet of water heater, you must install an expansion tank on cold water supply line to prevent normal thermal expansion from repeatedly forcing open T&P relief valve.

The T&P relief valve is not intended for constant duty, such as relief of pressure due to repeated normal system expansion. Refer to expansion tank manufacturer's instructions for proper sizing.

Failure to comply could result in severe personal injury, death or substantial property damage.



Direct Connect System Piping - Single Boiler System

80/110/150 Boilers only

System water piping methods

Direct connection piping to boiler

NOTICE It is recommended, but not required, to use primary/secondary piping to the boiler. Using primary/secondary piping will provide the most accurate desired system heating temperature.

Installations using direct connection piping layout should:

1. Read the NOTICES and guidelines beginning on page 46 to determine if the system is eligible for this piping strategy.
2. If eligible, reference suggested piping layouts on pages 47 and 48.
3. Use primary/secondary piping if system ineligible.

Primary/secondary piping to boiler

Using primary/secondary piping will provide the most accurate desired system heating temperature. Reference suggested piping layouts on pages 50-55.

NOTICE Some installations can be piped in numerous other ways that will work equally as well as the suggestions here.

Verify the application will work:

NOTICE Direct connect will only work with the ECO Tec 80/110/150 models.

NOTICE The minimum temperature rise across the heat exchanger is 20°F during high fire operation. The factory installed circulator will provide between a 20° and 35°F temperature rise-across the heat exchanger depending on boiler model (System head loss must be less than what is listed in **Table 6 , page 47**). If the temperature drop across the heat exchanger is lower than 20°F during high fire, the flow rate will need to be reduced until 20° is achieved.

NOTICE Systems zoning with circulators must use primary/secondary piping layout using guidelines starting on page 50.

Verify that the internal circulator will provide enough head to the system, see **Table 6 , page 47**.

If the internal circulator will not provide enough head for the system, then direct connect piping can not be used. The system will have to be set up for primary/secondary piping (see page 50).

Check system flow rate

1. To determine whether direct connection will provide suitable flow for the intended application
2. The minimum temperature rise across the heat exchanger is 20°F during high fire operation. Using flow rates higher than the maximum is NOT RECOMMENDED. The factory installed circulator will provide the temperature rise given in Table 2, page 47 during high fire operation if the system head matches the corresponding table value.
3. Design zoning to ensure minimum flow rate is maintained under any call for heat condition that could see full input rate (High Fire).

Use a primary/secondary piping layout if the total flow through the heat exchanger will be higher than the maximum.

NOTICE Any system zoned with zone valves must include a by-pass pressure regulator. Failure to comply may reduce pump life.

Boiler circulators

The boiler circulator is factory-installed in the boiler.

WARNING **DO NOT** remove or relocate the boiler circulator. The boiler circulator is selected to ensure adequate flow through the boiler.

Failure to comply could result in unreliable performance and nuisance shut downs from insufficient flow.

NOTICE If replacing included circulator with a replacement Taco model, replace only with Taco Model 0015e3 circulator. Set to Max.

Expansion tank location

Figure 56 and Figure 58 show typical installation of the system expansion tank. It is highly recommended that you locate the air separator and expansion tank as shown in the suggested piping drawings on page 47 and page 48.

Ensure that the expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions and ratings for details. Additional tanks may be added to the system if needed to handle the expansion. These tanks may be installed by connecting to tees in the system piping.

CAUTION **Undersized expansion tanks** cause system water to be lost from the relief valve and makeup water to be added through the fill valve. Eventual boiler failure can result due to excessive make-up water addition. Always locate the cold-water fill connection at the expansion tank. Never locate this elsewhere.

Diaphragm- or bladder-type tank:

Refer to Figure 56 for suggested piping when using a diaphragm- or bladder-type expansion tank.

Install an automatic air vent on top of the air separator, per separator manufacturer's instructions.

NOTICE **Diaphragm- or bladder-type expansion tank—** Calculated cold fill pressure should equal tank air charge pressure. Always check pressure and charge tank with tank removed from system to be sure reading is accurate. Boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.



Direct Connect System Piping - Single Boiler System

80/110/150 Boilers only

Closed-type expansion tank:

CAUTION DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent or if an automatic air vent is incorporated into the system piping.

Figure 56 shows suggested piping when using a closed-type expansion tank, in which the air is directly in contact with tank water.

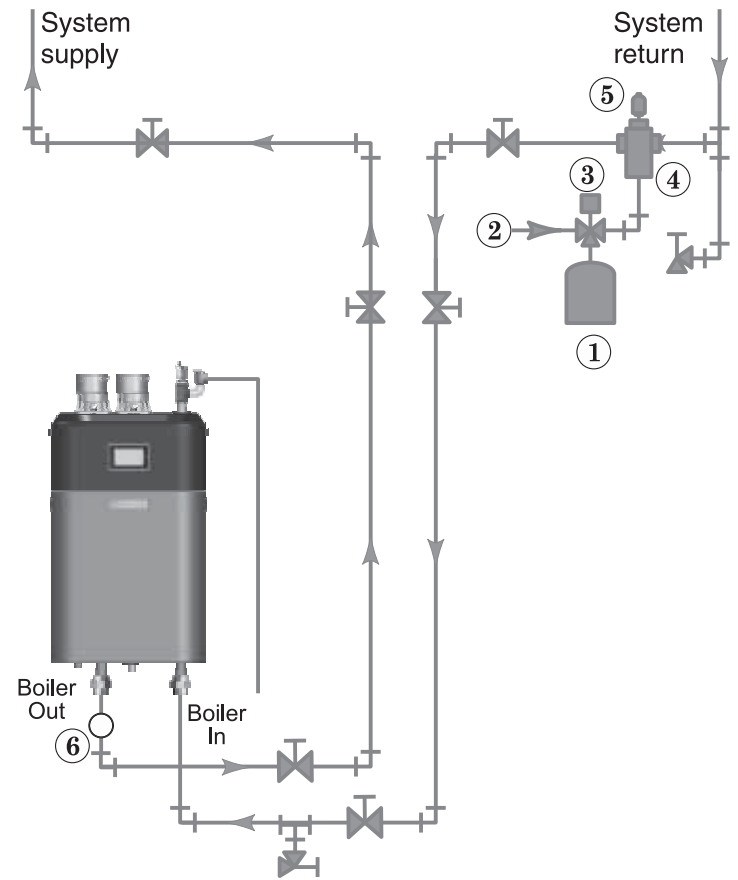
Connect piping (1/2" or 3/4") from the air separator outlet to the tank fitting. Slope any horizontal piping a minimum of 1 inch per 5 feet of horizontal pipe.

Always use a **tank fitting** such as the B&G Tank-trol or Taco Taco-trol (shown). The fitting reduces gravity flow of water in the piping to the tank, avoids air bubbling through the tank water, and provides the proper fill height in the tank

CAUTION Correct all leaks in the system or tank piping. Leaks allow air to escape from the system and will cause water-logging of the tank. This will result in water loss through the boiler relief valve due to over-pressurization. **NEVER** use an automatic air vent in a system equipped with a closed-type expansion tank. The air removed from the system will cause water-logging of the expansion tank.

NOTICE Closed-type expansion tank—Follow tank manufacturer’s instructions for filling the tank. Typical tank sizing provides for approximately 12 PSIG when the tank is filled to the normal level and system water is cold. Note that boiler relief valve is set for 30 PSIG. Operation pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relieve valve.

Figure 56 Piping to diaphragm- (or bladder-) type expansion tank



- ① Diaphragm-type expansion tank
- ② Make-up water supply
- ③ Fill valve, typical
- ④ Air separator
- ⑤ Automatic air vent
- ⑥ Press. & Temp. gauge

ECOTec-040

Figure 57 Boiler Pump Head available to system

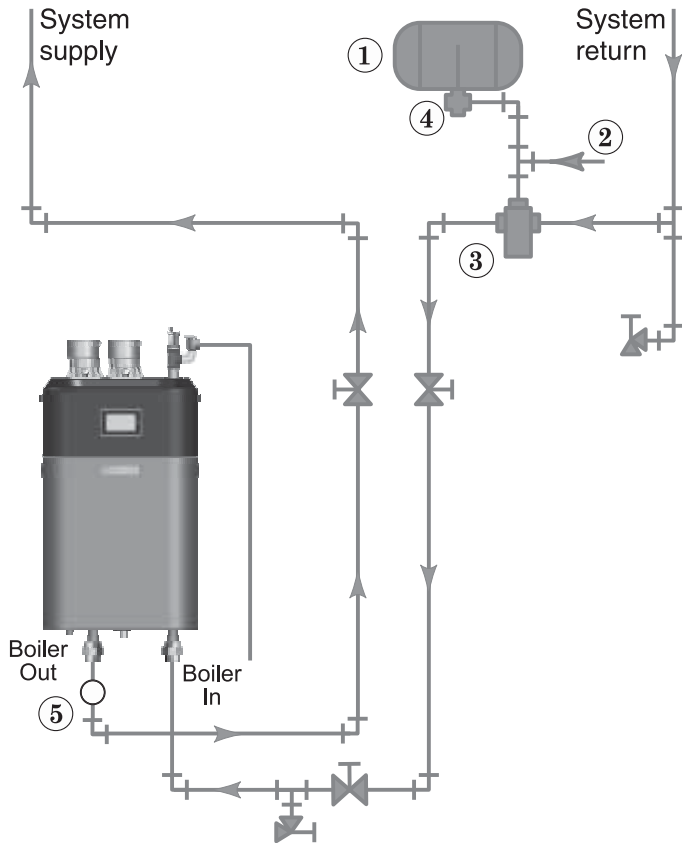
Table 6	Boiler Pump Head available to system			
	ECO Tec			
	80-H	80-H	110-H (110-C)	150-H (150-C)
	20°	30°		
Ft. w.c.	6.6	12.7	9.1(4.6)	3.9(1.4)
GPM	7.2	4.8	6.5	9.0



Direct Connect System Piping - Single Boiler System (continued)

80/110/150 Boilers only

Figure 58 Piping to closed-type expansion tank



- ① Closed-type expansion tank
 - ② Make-up water supply
 - ③ Air separator
 - ④ Tank fitting
 - ⑤ Press. & Temp. gauge
- ECOTec-041

Install relief valve

1. Install relief valve in a 3/4" street elbow along with a 3/4" tee onto the top water pipe – Air elimination/relief valve (Figure 8, page 13).

WARNING Connect the relief valve **ONLY** on the top boiler pipe, **NOT** the boiler out. Connect the relief valve only as shown in this manual. Ensure relief valve is located above heat exchanger.

2. Pipe the relief valve only as shown, in the location shown.
3. Connect discharge piping to safe disposal location, following guidelines in the WARNING below.

WARNING To avoid water damage or scalding due to relief valve operation, as per local or state codes:

Install relief valve **ONLY** with the spindle vertical, as shown in illustrations in this manual.

Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge. Locate away from the top of the boiler.

Discharge line must be as short as possible and be the same size as the valve discharge connection throughout its entire length.

Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.

The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375 °F or greater.

Do not pipe the discharge to any place where freezing could occur.

No shutoff valve shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.

Test the operation of the valve after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.



Direct Connect System Piping - Single Boiler System (continued)

80/110/150 Boilers only

ZONE VALVE zoning – direct connection (Shown with optional DHW piping)

See Figure 59.

1. This configuration is for zone valve systems that qualify to use direct connection piping based on the criteria on page 46 only. If system does not qualify, pipe using primary/secondary piping. See pages 51-55 for piping suggestions and guidelines.
2. Systems zoned with zone valves **MUST** use a by-pass pressure regulator (Taco 3196 or equivalent – Item 21) unless using modulating type of circulator that has protection against dead heading.

Expansion Tank required

1. Provide a system expansion tank following the guidelines on page 46 or page 48.
2. **DO NOT** use a closed-type tank if connecting to a water heater that is equipped with an automatic vent.

Domestic Hot Water (DHW) tank, if used

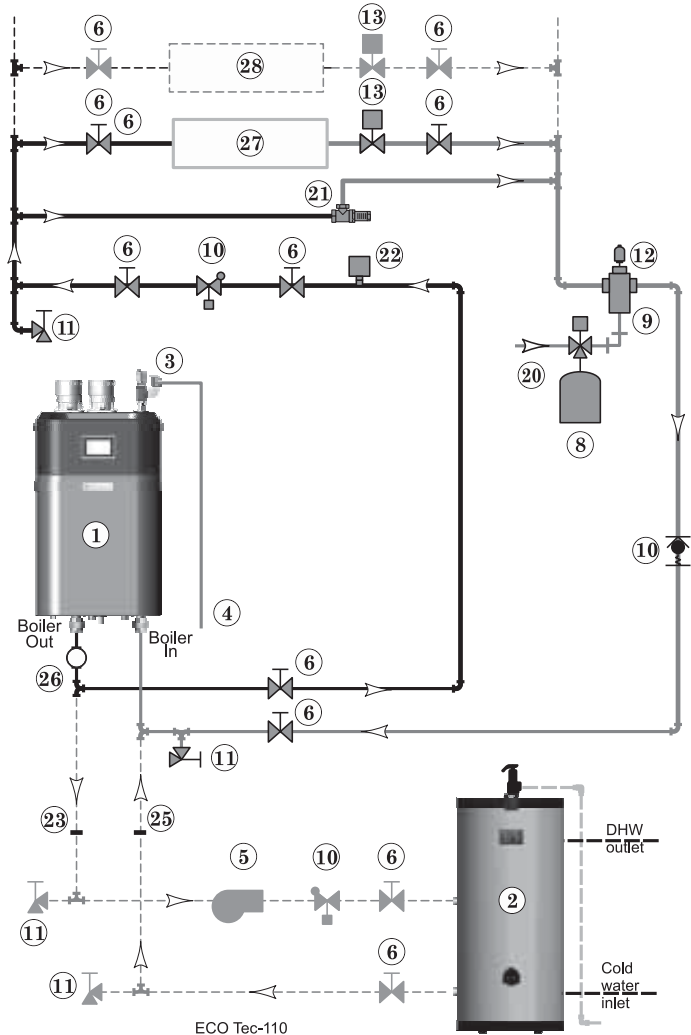
1. DHW direct connection—Pipe from the near-boiler piping to the DHW tank's boiler connections as shown.
2. DHW as zone— A DHW tank can be connected as a zone if a DHW tank is **NOT** already connected to the boiler. See notices on page 149 to ensure compliance with the 2007 Energy Act. See Control section in this manual, page 84 to change TARGET MODULATION SENSOR to System Supply when system sensors are installed.
3. DHW Priority operation— Using Priority 1 for DHW (default) will turn off lower priorities during DHW calls. The MAX ON TIME setting can be adjusted to limit how long this occurs. Use Priority 2 or 3 for DHW if DHW priority is not desired.

NOTICE Overriding the Outdoor Reset function by setting control to DHW mode when system is intended for space heating may violate **Section 303 of the 2007 Energy Act**. See page 149 for compliance information and exemptions.

Controlling the circulators (Direct Connect only)

1. In a direct connect set-up, by default the internal circulator will turn on for any configured heating call or DHW call.
2. If an Indirect tank is used, as in Figure 59, a secondary circulator will have to be configured to turn on when the indirect tank input is active.

Figure 59 ECO Tec 80/110/150 Zone valve zoning direct connection (internal boiler circulator provides flow for system)



NOTICE Connect zone valve end switches to Priority 2 input.

CAUTION Use isolation relays if connecting 3-wire zone valve end switches to the input.

LEGEND for Figure 59.

Note: This is a common legend for all piping diagrams. Not all Items listed appear in every figure.

1 ECOTec boiler	12 Auto air vent	21 By-pass pressure regulator, REQUIRED for zone valve systems unless other provision is made
2 Indirect Water Heater, if used	13 Zone valves	22 High limit temperature control
3 Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see page 13 for information	14 Primary/secondary connection (tees no more than 12 inches apart)	23 DHW tank boiler water supply connection, when used
4 Relief valve piping to drain — see page 48	15 Expansion tank, closed type, if used (some chiller systems may use a diaphragm-type expansion tank)	24 Zone circulator
5 DHW circulator	16 Water chiller	25 DHW tank boiler water return connection, when used
6 Isolation valves	17 Check valve	26 Pressure/temperature gauge, supplied with boiler, field piped
7 System circulator	18 Y-strainer	27 Heating circuits
8 Expansion tank, diaphragm type, if used	19 Balancing valve	28 Additional heating circuits, if any
9 Air separator	20 Make-up water supply – Use applicable codes to determine if backflow preventers, pressure reducing valves, and fill valves may be required	
10 Spring check valves		
11 Purge/drain valves (one drain valve shipped loose with boiler)		



Primary/Secondary System Piping - Single Boiler System

Expansion tank location

Figure 60 and Figure 61 show typical installation of the system expansion tank. It is highly recommended that you locate the air separator and expansion tank as shown in the suggested piping drawings on pages 53-55.

Ensure that the expansion tank size will handle boiler and system water volume and temperature. See tank manufacturer's instructions and ratings for details. Additional tanks may be added to the system if needed to handle the expansion. These tanks may be installed by connecting to tees in the system piping.

CAUTION Undersized expansion tanks cause system water to be lost from the relief valve and makeup water to be added through the fill valve. Eventual boiler failure can result due to excessive make-up water addition. Always locate the **cold-water fill connection** at the expansion tank. Never locate this elsewhere.

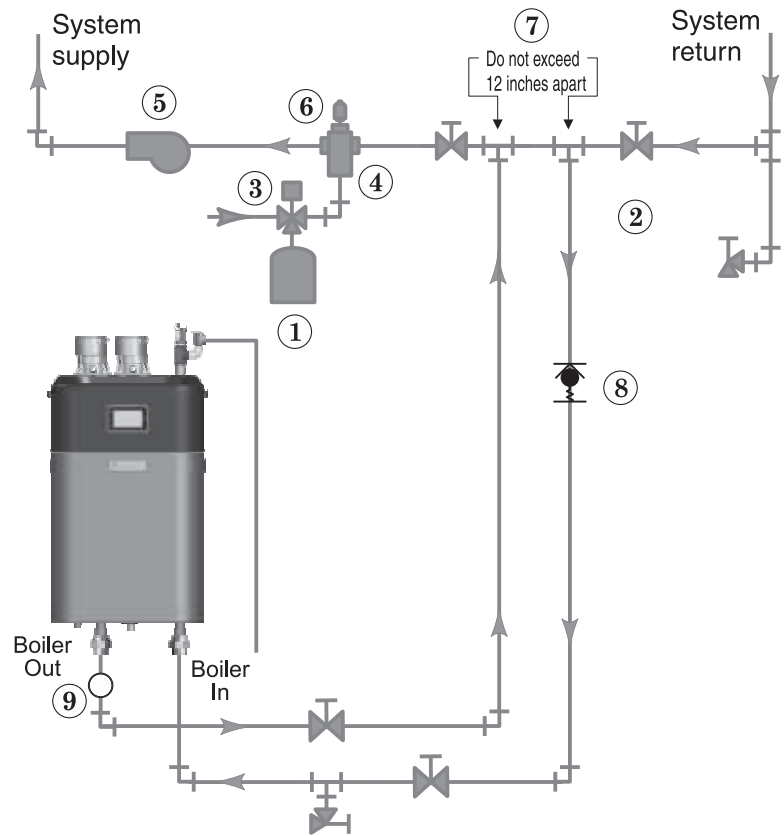
Diaphragm- or bladder-type tank:

Refer to Figure 60 for suggested piping when using a diaphragm- or bladder-type expansion tank.

NOTICE Diaphragm- or bladder-type expansion tank—Calculated cold fill pressure should equal tank air charge pressure. Always check pressure and charge tank with tank removed from system to be sure reading is accurate. Boiler relief valve is set for 30 PSIG. Operating pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relief valve.

Install an automatic air vent on top of the air separator, per separator manufacturer's instructions.

Figure 60 Piping to diaphragm (or bladder) expansion tank



- ① Diaphragm-type expansion tank
- ② Make-up water supply
- ③ Fill valve, typical
- ④ Air separator
- ⑤ System circulator ECO Tec-040a
- ⑥ Automatic air vent
- ⑦ Primary/secondary connection
- ⑧ Spring check valve
- ⑨ Press. & Temp. gauge

Closed-type expansion tank

CAUTION DO NOT use a closed-type tank if connecting to a water heater that is equipped with an automatic air vent or if an automatic air vent is incorporated into the system piping.

Figure 61, page 51 shows suggested piping when using a closed-type expansion tank, in which the air is directly in contact with tank water.

Connect piping (1/2" or 3/4") from the air separator outlet to the tank fitting. Slope any horizontal piping a minimum of 1 inch per 5 feet of horizontal pipe.

Always use a tank fitting such as the B&G Tank-trol or Taco Taco-trol. The fitting reduces gravity flow of water in the piping to the tank, avoids air bubbling through the tank water, and provides the proper fill height in the tank. Continued on next page.



Primary/Secondary System Piping - Single Boiler System (continued)

CAUTION Correct all leaks in the system or tank piping. Leaks allow air to escape from the system and will cause water-logging of the tank. This will result in water loss through the boiler relief valve due to over-pressurization. **NEVER** use an automatic air vent in a system equipped with a closed-type expansion tank. The air removed from the system will cause water-logging of the expansion tank.

NOTICE Closed-type expansion tank—Follow tank manufacturer’s instructions for filling the tank. Typical tank sizing provides for approximately 12 PSIG when the tank is filled to the normal level and system water is cold. Note that boiler relief valve is set for 30 PSIG. Operation pressure of system, after temperature expansion above cold fill pressure, should not exceed 24 PSIG to avoid weeping of relieve valve.

Install relief valve

1. Install relief valve in a 3/4" street elbow along with a 3/4" tee onto the top water pipe – Air elimination/relief valve (Figure 8, page 13).

WARNING Connect the relief valve **ONLY** on the top boiler pipe, **NOT** the boiler out. Connect the relief valve only as shown in this manual. Ensure relief valve is located above heat exchanger.

2. Pipe the relief valve only as shown, in the location shown.
3. Connect discharge piping to safe disposal location, following guidelines in the **WARNING** below.

WARNING To avoid water damage or scalding due to relief valve operation, as per local or state codes:

Install relief valve **ONLY** with the spindle vertical, as shown in illustrations in this manual.

Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge. Locate away from the top of the boiler.

Discharge line must be as short as possible and be the same size as the valve discharge connection throughout its entire length.

Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain where any discharge will be clearly visible.

The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater.

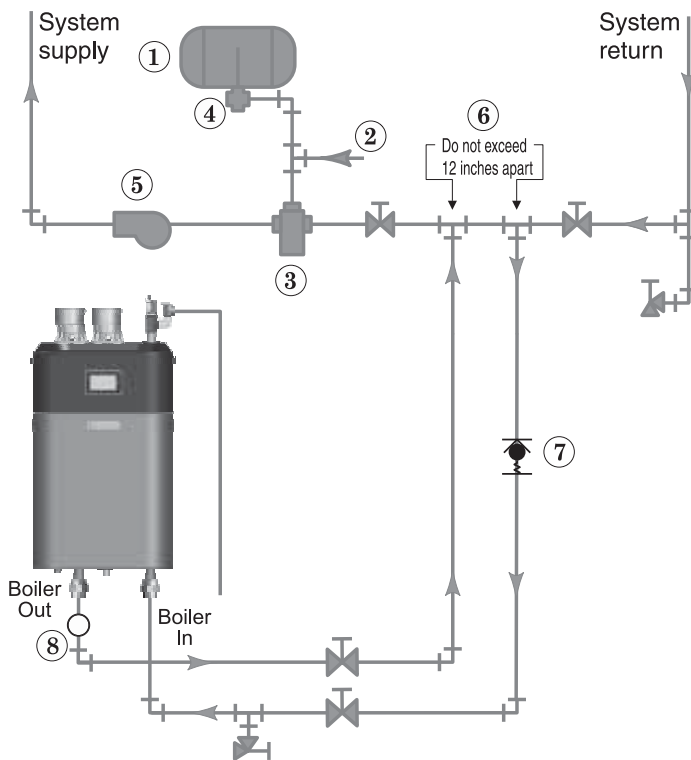
Do not pipe the discharge to any place where freezing could occur.

No shutoff valve shall be installed between the relief valve and boiler, or in the discharge line. Do not plug or place any obstruction in the discharge line.

Test the operation of the valve after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.

Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

Figure 61 Piping to closed-type expansion tank



- | | |
|------------------------------|--------------------------------|
| ① Closed-type expansion tank | ⑤ System circulator |
| ② Make-up water supply | ⑥ Primary/secondary connection |
| ③ Air separator | ⑦ Spring check valve |
| ④ Tank fitting | ⑧ Press. & Temp. gauge |

ECO Tec-041a



Primary/Secondary System Piping - Single Boiler System (continued)

System water piping methods

Near boiler piping

Connect boiler to system only as shown in Figure 60, page 50 and Figure 61, page 51. The primary/secondary piping shown ensures the boiler loop will have sufficient flow.

Boiler circulator

The boiler circulator is factory-installed in the boiler as shown in this manual. The boiler circulator is selected to ensure adequate flow through the boiler loop.

WARNING DO NOT relocate or use the boiler circulator in any way other than the ones shown in this manual.

Failure to comply could result in unreliable performance and nuisance shut downs from insufficient flow.

System circulators and zone circulators

Install a system circulator or zone circulators as shown in the piping diagrams in the Primary/Secondary System Piping section in this manual. These circulators must be supplied by the installer.

System or zone circulators flow rates

Size circulators based on the flow rate required to achieve the temperature change you needed. You can closely estimate temperature rise (or drop) through a circuit by using the following formula, where TD is temperature rise (or drop), FLOW is flow rate (in gpm), and BTUH is the heat load for the circuit:

$$\text{FLOW} = \frac{\text{BTUH}}{\text{TD} \times 500}$$

Examples:

1. Consider a system loop for a system with total heating load equal to 210,000 Btuh. The desired temperature drop through the system piping is 20°F. Then the required flow rate is:

$$\text{FLOW} = \frac{199,000}{20 \times 500} = 20 \text{ gpm}$$

SIMPLIFIED:

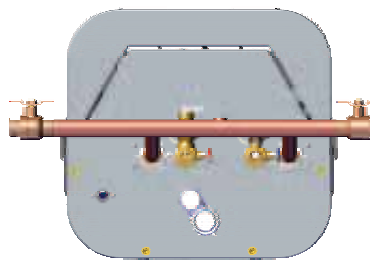
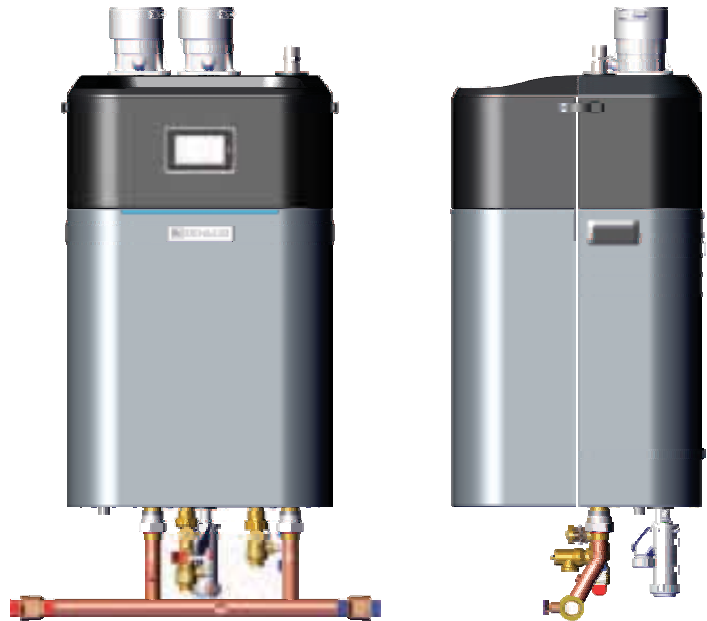
For 20° temperature drop, FLOW = MBH / 10.

System or zone circulator head requirement

1. The circulator must be capable of delivering the required flow against the head loss that will occur in the piping.
2. Determine the pipe size needed and the resultant head loss using accepted engineering methods.

Figure 62 Easy Up Manifold and DHW Service Valves options

1. The **ECO Tec Easy Up Manifold** comes as a separate kit. See **Miscellaneous service parts and kits** section at the end of this manual for ordering information.
2. See separate instructions for the **ECO Tec Easy Up Manifold** Weil-McLain website for suggested guidelines to determine how to use and setup.



ECO Tec -044

1. The **ECOTec DHW Service Valves** comes as a separate kit, as well. See **Miscellaneous service parts and kits** section at the end of this manual for ordering information.
2. See separate instructions for the **ECO Tec DHW Service Valves** Weil-McLain website for suggested guidelines to determine how to use and setup.



Primary/Secondary System Piping - Single Boiler System (continued)

ZONE VALVE zoning – primary/secondary (Shown with optional DHW piping) See Figure 63.

1. This configuration is for zone valve systems using a boiler loop connected as a secondary circuit off of a primary system loop. Systems whose flow characteristics do not comply with those listed in Direct Connect System Piping must pipe the boiler loop as a secondary circuit as shown.
2. Systems zoned with zone valves **MUST** use a by-pass pressure regulator (Taco 3196 or equivalent – Item 21) unless using modulating type of circulator that has protection against dead heading.
3. Install a system circulator (supplied by installer) capable of delivering the proper flow and head as shown.

Expansion Tank required

1. Provide a system expansion tank following the guidelines on page 50 or 51.
2. **DO NOT** use a closed-type tank if connecting to a water heater that is equipped with an automatic vent.

Domestic Hot Water (DHW) tank, if used

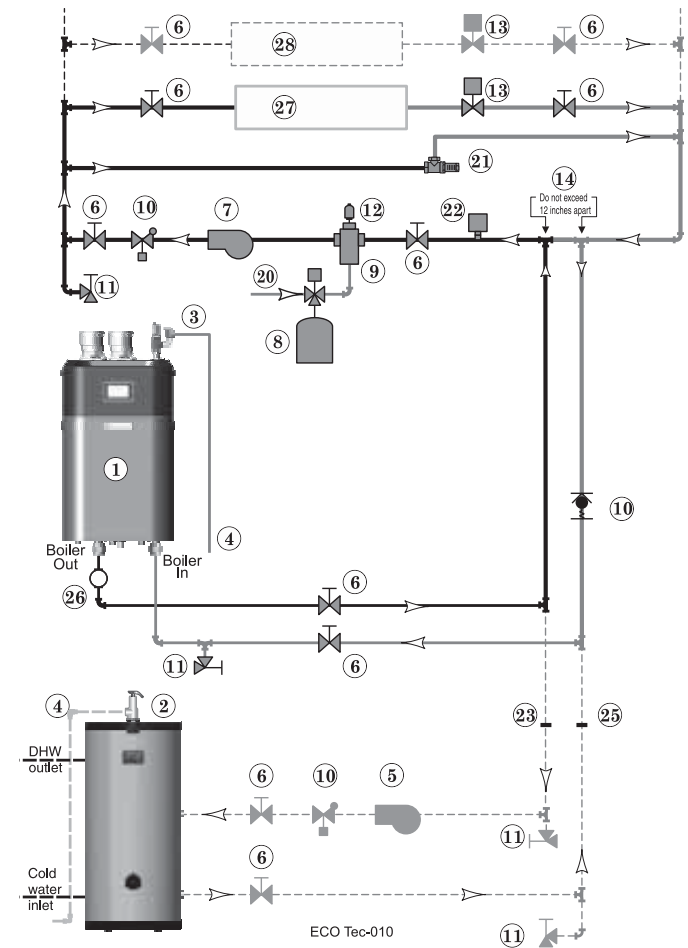
1. DHW direct connection—Pipe from the near-boiler piping to the DHW tank's boiler connections as shown.
2. DHW as zone— A DHW tank can be connected as a zone if a DHW tank is **NOT** already connected to the boiler. See notices on page 149 to ensure compliance with the 2007 Energy Act. See Control section in this manual, page 84 to change TARGET MODULATION SENSOR to System Supply when system sensors are installed.
3. DHW Priority operation— Using Priority 1 for DHW (default) will turn off lower priorities during DHW calls. The MAX ON TIME setting can be adjusted to limit how long this occurs. Use Priority 2 or 3 for DHW if DHW priority is not desired. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.

NOTICE Overriding the Outdoor Reset function by setting control to DHW mode when system is intended for space heating may violate **Section 303 of the 2007 Energy Act**. See page 149 for compliance information and exemptions.

Controlling the circulators

1. The Control, for Heat only models, can control up to five circulators (boiler circulator and four others.) For Combi models, the control can control up to three circulators (boiler circulator and two others.) Refer to Field wiring, beginning on page 58, for instructions on wiring to circulators.
2. The factory default settings are not configured. Each input correlates to its respective circulator output. For DHW Priority applications, wire aquastat to Input 1 and assign to Priority 1.

Figure 63 Zone valve zoning – primary/secondary connection – a system circulator is required



See Field wiring instructions, beginning on page 58, for details. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.

3. The boiler and zone valves can also be operated by an external zone valve controller or an equivalent wiring strategy.

NOTICE Connect zone valve end switches to Priority 2 input. Connect system circulator to Circ. 2 output.

CAUTION Use isolation relays if connecting 3-wire zone valve end switches to the input.

LEGEND for Figure 63.

Note: This is a common legend for all piping diagrams. Not all Items listed appear in every figure.

1 ECOTec boiler	12 Auto air vent	21 By-pass pressure regulator, REQUIRED for zone valve systems unless other provision is made
2 Indirect Water Heater, if used	13 Zone valves	22 High limit temperature control (if used)
3 Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see page 13 for information	14 Primary/secondary connection (tees no more than 12 inches apart)	23 DHW tank boiler water supply connection, when used
4 Relief valve piping to drain — see page 51	15 Expansion tank, closed type, if used (some chiller systems may use a diaphragm-type expansion tank)	24 Zone circulator
5 DHW circulator	16 Water chiller	25 DHW tank boiler water return connection, when used
6 Isolation valves	17 Check valve	26 Pressure/temperature gauge, supplied with boiler, field piped
7 System circulator	18 Y-strainer	27 Heating circuits
8 Expansion tank, diaphragm type, if used	19 Balancing valve	28 Additional heating circuits, if any
9 Air separator	20 Make-up water supply – Use applicable codes to determine if backflow preventers, pressure reducing valves, and fill valves may be required	
10 Spring check valves		
11 Purge/drain valves (one drain valve shipped loose with boiler)		



Primary/Secondary System piping (continued)

Circulator zoning – primary/secondary (Shown with optional DHW piping)

See Figure 64.

1. This configuration is for circulator-zoned systems using a boiler loop connected as a secondary circuit off of a primary system loop. Systems zoned with circulators must pipe the boiler loop as a secondary circuit as show.
2. Install a separate circulator (supplied by installer) for each zone capable of delivering the proper flow and head as shown.

Expansion Tank required

1. Provide a system expansion tank following the guidelines on page 50 or 51.
2. **DO NOT** use a closed-type tank if connecting to a water heater that is equipped with an automatic vent.

Domestic Hot Water (DHW) tank, if used

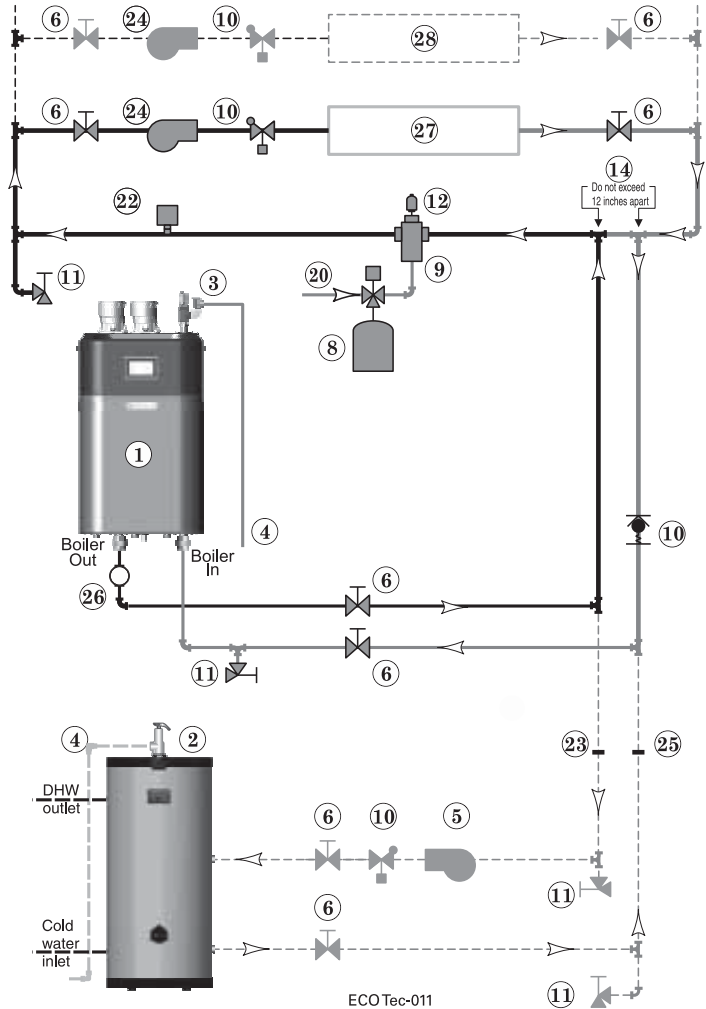
1. DHW direct connection—Pipe from the near-boiler piping to the DHW tank's boiler connections as shown.
2. DHW as zone— A DHW tank can be connected as a zone if a DHW tank is **NOT** already connected to the boiler. See notices on page 149 to ensure compliance with the 2007 Energy Act. See Control section in this manual, page 84 to change TARGET MODULATION SENSOR to System Supply when system sensors are installed.
3. DHW Priority operation— Using Priority 1 for DHW (default) will turn off lower priorities during DHW calls. The MAX ON TIME setting can be adjusted to limit how long this occurs. Use Priority 2 or 3 for DHW if DHW priority is not desired. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.

NOTICE Overriding the Outdoor Reset function by setting control to DHW mode when system is intended for space heating may violate Section 303 of the 2007 Energy Act. See page 149 for compliance information and exemptions.

Controlling the circulators

1. The Control, for Heat only models, can control up to five circulators (boiler circulator and four others.) For Combi models, the control can control up to three circulators (boiler circulator and two others.) Refer to Field wiring, beginning on page 58, for instructions on wiring to circulators.
2. The factory default settings are not configured. Each input correlates to its respective circulator output. For DHW

Figure 64 Circulator zoning plus optional DHW piping



3. For more than 4-zones (Heat only models) or 2-zones (Combi only models), use an external zone controller.
- Priority applications, wire aquastat to Input 1 and assign to Priority 1. See Field wiring instructions, beginning on page 58, for details. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.

LEGEND for Figure 64 and Figure 65.

Note: This is a common legend for all piping diagrams. Not all items listed appear in every figure.

- 1 ECOtec boiler
- 2 Indirect Water Heater, if used
- 3 Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see page 13 for information
- 4 Relief valve piping to drain — see page 51
- 5 DHW circulator
- 6 Isolation valves
- 7 System circulator
- 8 Expansion tank, diaphragm type, if used
- 9 Air separator
- 10 Spring check valves
- 11 Purge/drain valves (one drain valve shipped loose with boiler)

- 12 Auto air vent
- 13 Zone valves
- 14 Primary/secondary connection (tees no more than 12 inches apart)
- 15 Expansion tank, closed type, if used (some chiller systems may use a diaphragm-type expansion tank)
- 16 Water chiller
- 17 Check valve
- 18 Y-strainer
- 19 Balancing valve
- 20 Make-up water supply – Use applicable codes to determine if backflow preventers, pressure reducing valves, and fill valves may be required

- 21 By-pass pressure regulator, REQUIRED for zone valve systems unless other provision is made
- 22 High limit temperature control (If used)
- 23 DHW tank boiler water supply connection, when used
- 24 Zone circulator
- 25 DHW tank boiler water return connection, when used
- 26 Pressure/temperature gauge, supplied with boiler, field piped
- 27 Heating circuits
- 28 Additional heating circuits, if any



Primary/Secondary System piping (continued)

Circulator zoning – Multiple temperature zones with primary/secondary

(Shown with optional DHW piping)

See Figure 65.

1. This configuration is for circulator-zoned systems with **high- and low-temperature heating zones** using a boiler loop connected as a secondary circuit off of a primary system loop. Systems zoned with circulators must pipe the boiler loop as a secondary circuit as shown.
2. Install a separate circulator (supplied by installer) for each zone capable of delivering the proper flow and head as shown.

Expansion Tank required

1. Provide a system expansion tank following the guidelines on page 50 or 51.
2. **DO NOT** use a closed-type tank if connecting to a water heater that is equipped with an automatic vent.

System setup and settings

1. Hi-temp emitters may be baseboards, radiators, fan coils, or heat exchangers.
2. Add a mixing device (Figure 65, Item 30) to help ensure supply water temperature will not exceed the maximum allowable for the radiant system.
3. Heating zone supply water temperature settings should be selected for the hi-temp zones. The mixing device regulates supply temperature to the lower-temp zones.

Domestic Hot Water (DHW) tank, if used

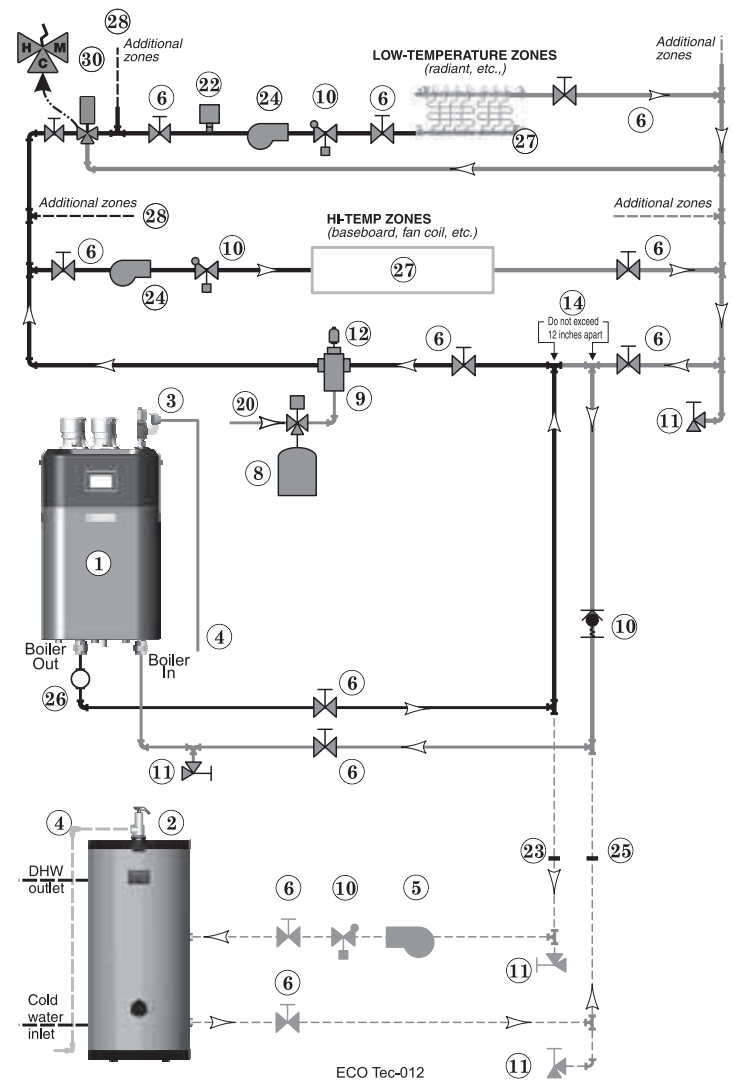
1. DHW direct connection—Pipe from the near-boiler piping to the DHW tank's boiler connections as shown.
2. DHW as zone—A DHW tank can be connected as a zone if a DHW tank is **NOT** already connected to the boiler. See notices on page 149 to ensure compliance with the 2007 Energy Act. See Control section in this manual, page 84 to change TARGET MODULATION SENSOR to System Supply when system sensors are installed.
3. DHW Priority operation— Using Priority 1 for DHW (default) will turn off lower priorities during DHW calls. The MAX ON TIME setting can be adjusted to limit how long this occurs. Use Priority 2 or 3 for DHW if DHW priority is not desired. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.

NOTICE Overriding the Outdoor Reset function by setting control to DHW mode when system is intended for space heating may violate **Section 303 of the 2007 Energy Act**. See page 149 for compliance information and exemptions.

Controlling the circulators

1. The Control, for Heat only models, can control up to five circulators (boiler circulator and four others.) For Combi models, the control can control up to three circulators (boiler circulator and two others.) Refer to Field wiring, beginning on page 58, for instructions on wiring to circulators.
2. The factory default settings are not configured. Each input correlates to its respective circulator output. For DHW

Figure 65 Circulator zoning with high- and low-temperature heating zones



- Priority applications, wire aquastat to Input 1 and assign to Priority 1. See Field wiring instructions, beginning on page 58, for details. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.
- For more than 4-zones (Heat only models) or 2-zones (Combi only models), use an external zone controller. For Combi models use INPUT2/PRIORITY 2 for the Indirect DHW systems.



Install condensate drain line & trap assembly

Prepare condensate drain line assembly

1. Remove the condensate trap kit from the bag assembly.
2. Remove the flexible drain nut (Item 2) and tube gasket ring (Item 3) from the trap kit bag assembly.
3. Slide nut (Item 2) onto end of flexible tube (Item 1).
4. Push the flexible tube gasket ring (Item 3) onto the end of the flexible tube (Item 1) as shown in Figure 66. The tube should extend through the gasket about 1/4 inch.
5. Insert the flexible tube and gasket into the drain fitting. When in position, the offset edge of the gasket ring will rest on the shoulder of the drain fitting as shown in Figure 66, detail 4.
6. Secure the flexible tube in place by screwing on the nut, Item 2. Finger tighten securely.

WARNING

The condensate trap, hose clamp, and condensate drain line must be in place during all operation. Make sure condensate trap is securely attached to the condensate tube outlet and that the condensate drain line is securely attached to the condensate trap outlet. Ensure all components are in good conditioned and installed per this manual. Failure to comply could result in server personal injury, death or substantial property damage

Install the condensate trap assembly

1. Remove pedestal front access panel (if installed as a floor standing boiler), see Figure 67.
2. Slide hose clamp onto condensate outlet tube and hold in place.
3. Slide the trap assembly into the boiler condensate outlet tube. Tighten the hose clamp to secure the condensate trap in place.
4. If floor standing boiler, route hose through slot in side of boiler pedestal.

Condensate drain system

1. **Install condensate drain by connecting tubing or PVC pipe to the flexible drain line. Run the drain tubing or piping to a floor drain or condensate pump.** The flexible drain line will fit in a 3/4" PVC coupling. Run minimum 1/2" PVC for the piping to drain or condensate pump.

NOTICE Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785, F441 or D2665. Cement and primer must comply with ASTM D2564 or F493. For Canada, use CSA or ULC certified PVC or CPVC pipe, fittings and cement.

2. Select a condensate pump (if used) that is approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage. The pump should have a minimum capacity of 2 GPH for the **ECO Tec** 80, 3 GPH for the **ECO Tec** 110, 4 GPH for the **ECO Tec** 150 or 5 GPH for **ECO Tec** 199.
3. When sizing condensate pumps, make sure to include the total load of all appliances connected to it.

CAUTION The condensate line must remain unobstructed, allowing free flow of condensate. If condensate is allowed to freeze in the line or if the line is obstructed in any other manor, condensate can exit from the boiler tee, resulting in potential water damage to property.

NOTICE Condensate from the boiler will be slightly acidic (typically with a pH from 3.2 to 4.5). Install a neutralizing filter when draining into metal pipe and if required by local codes. See Replacement parts section at the end of this manual for the Weil-McLain kit.

Figure 66 Prepare condensate drain line assembly

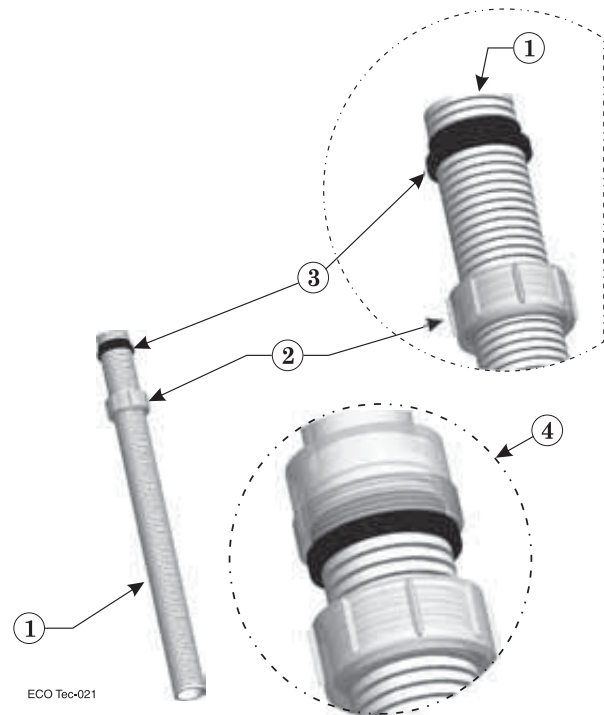
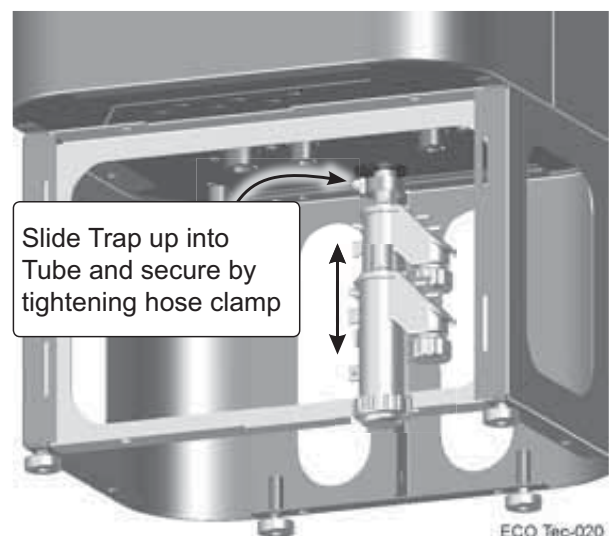


Figure 67 Condensate outlet tube and condensate trap connection (front access panel removed)





Gas piping

▲WARNING Boilers are shipped ready to operate on natural gas ONLY. You must install the propane mixer (venturi) and orifice if the boiler will be connected to propane. See page 14. Failure to comply could result in severe personal injury, death or substantial property damage.

▲WARNING Use two wrenches when tightening gas piping at boiler, using one wrench to prevent the boiler gas line connection from turning. Failure to support the boiler gas connection pipe to prevent it from turning could damage gas line components.

Connecting gas supply piping

1. Remove jacket door and refer to Figure 68 to pipe gas to boiler.
 - a. Place a pipe wrench on the gas line inside the jacket when tightening the gas line assembly to the boiler gas connection (Item 1).
 - b. Install steel pipe fittings and factory-supplied manual gas shut off valve as shown in Figure 68. All pipe fittings and gas shut-off valve are supplied by the installer.
 - c. In Canada — The manual gas shut off valve (Item 2) must be identified by the installer.
2. Use pipe dope compatible with propane gases. Apply sparingly only to male threads of pipe joints so that pipe dope does not block gas flow.

▲WARNING Failure to apply pipe dope as detailed above can result in severe personal injury, death or substantial property damage.

3. Connect gas supply piping to the ½" NPT manual gas shut off valve (Item 2).
4. Support gas piping with hangers, not by boiler or its accessories.
5. Purge all air from gas supply piping.
6. Before placing boiler in operation, check boiler and its gas connection for leaks.
 - a. During any pressure testing at less than 14" (355 mm) w.c., close the gas shutoff valve and disconnect system gas piping. At higher test pressures, disconnect boiler and gas valve from gas supply piping.

▲WARNING Do not check for gas leaks with an open flame — use bubble test. Failure to use bubble test or check for gas leaks can cause severe personal injury, death or substantial property damage.

▲WARNING DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

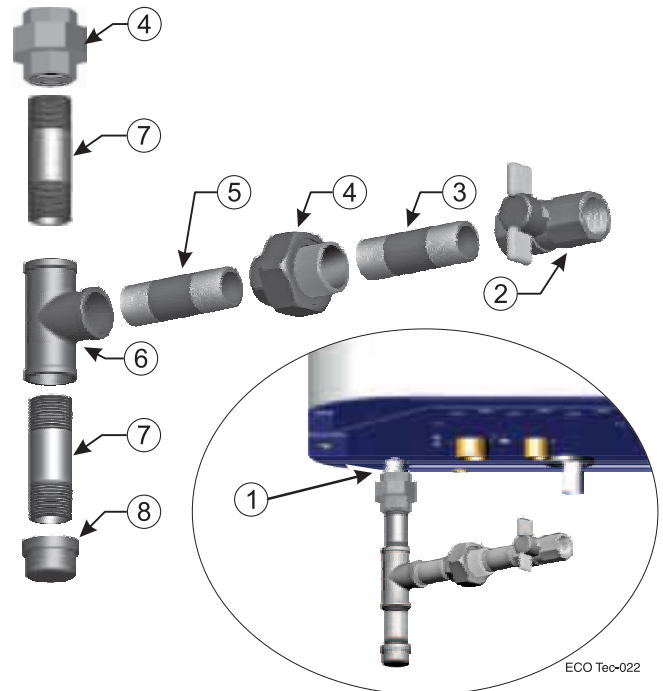
Gas pipe sizing

See page 19 for gas line sizing information.

Check gas pressure at inlet to boiler

1. See Figure 93, page 102 for location of the gas inlet pressure test port.
2. For natural gas or propane, the pressure required at gas valve inlet pressure port (verify minimum gas pressure when all gas appliances are in operation):

Figure 68 Connect gas supply piping



- 1 Boiler gas supply connection, ½" NPT male
- ALL OF THE FOLLOWING ARE SUPPLIED BY THE INSTALLER:**
- 2 Manual gas shut off valve, ½" NPT
- 3 Nipple, ½" NPT
- 4 Union, ½" NPT
- 5 Nipple, ½" NPT
- 6 Tee, ½" NPT
- 7 Nipple, ½" NPT x 4", for drip leg
- 8 Cap, ½" NPT

- a. Maximum: 14" (355 mm) w.c. with no flow (lockup) or with boiler on.
 - b. Minimum gas pressure, with gas flowing (verify during boiler startup, while boiler is at high fire) : 3½" (89 mm) w.c.
 - c. Nominal propane gas pressure: 11.0" (279 mm) w.c.
 - d. Nominal natural gas pressure: 7.0" (178 mm) w.c.
3. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 14" (355 mm) w.c. at any time. Adjust lockup regulator for 14" (355 mm) w.c. maximum.



Field wiring

⚠ WARNING ELECTRICAL SHOCK HAZARD — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

NOTICE Wiring must be NEC Class 1. If original wiring as supplied with boiler must be replaced, use only type 105 °C wire or equivalent. Boiler must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition, and/or the Canadian Electrical Code Part I, CSA C22.1, Electrical Code.

NOTICE The installation must comply with: National Electrical Code and any other national, state, provincial or local codes or regulations. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

NOTICE The boiler when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code, ANSI/NFPA 70 – latest edition, and/or the Canadian Electrical Code Part I, CSA C22.1, Electrical Code.

Boiler wiring

Connecting terminals

All low voltage field wiring is made directly to the corresponding terminal blocks on the circuit board.

Low voltage, 24VAC, terminals are on the right side and right bottom of the circuit board.

Line voltage, pump, and /or AUX, 120VAC, terminal strips are on the bottom of boiler inside the High voltage junction box.

Wiring overview

See details on the following pages for the wiring connections outlined below:

Required wiring connections

- 120VAC power to boiler; 120VAC power out to boiler circulator and outdoor temperature sensor (unless exempt as described in this manual).
- Low water cut-off

Connections as needed by systems

- Thermostat, end switch or other inputs for call for heat.
- System zone circulators, valves, relays, etc. • System circulator, when required.
- System supply and return temperature sensors (strongly recommended for primary/secondary piping systems).

Optional wiring connections

- External limits; proof-of-closure interlocks (combustion air damper, flow switch, etc.); 0–10VDC for target or modulation control; remote alarm; additional heat demand contact; and communication cables for building management system interface (MODBUS -sold separately).

Wire entrances (see next page)

Wire entrance knockouts are provided on the top right, the bottom middle and the bottom right of the boiler cabinet:

1. Line voltage— five (5) knockouts on the bottom middle of the cabinet (Line In, Output 1, 2, 3, 4). Outputs 1&4 not used for combi models

2. Low voltage— three (3) knockouts on the bottom right side of the cabinet and 1 knockout on the top right, (Use one of these knockouts for BMS communication wiring).

⚠ WARNING Installer MUST use a strain relief through jacket knockouts. Failure to do so can cause severe personal injury, death or substantial property damage.

⚠ WARNING Installer MUST SEAL all electrical entrances using a sealed strain relief or a strain relief sealed with duct seal putty or silicone. Sealing the entrances prevents the boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other gas appliances. Failure to seal entrances could result in severe personal injury, death or substantial property damage.

Wire routing in the cabinet (see next page)

Line voltage: (120VAC in, circulator outputs)

1. Line voltage should be wired from the bottom middle electrical entrances going into the High voltage junction box.
2. Strip end of wire no more than 1/4" to avoid exposing uninsulated wire.
3. It is recommended to install an On/Off service switch in a junction box mounted near the boiler. Installation must meet all National and local electrical codes.

Low voltage:

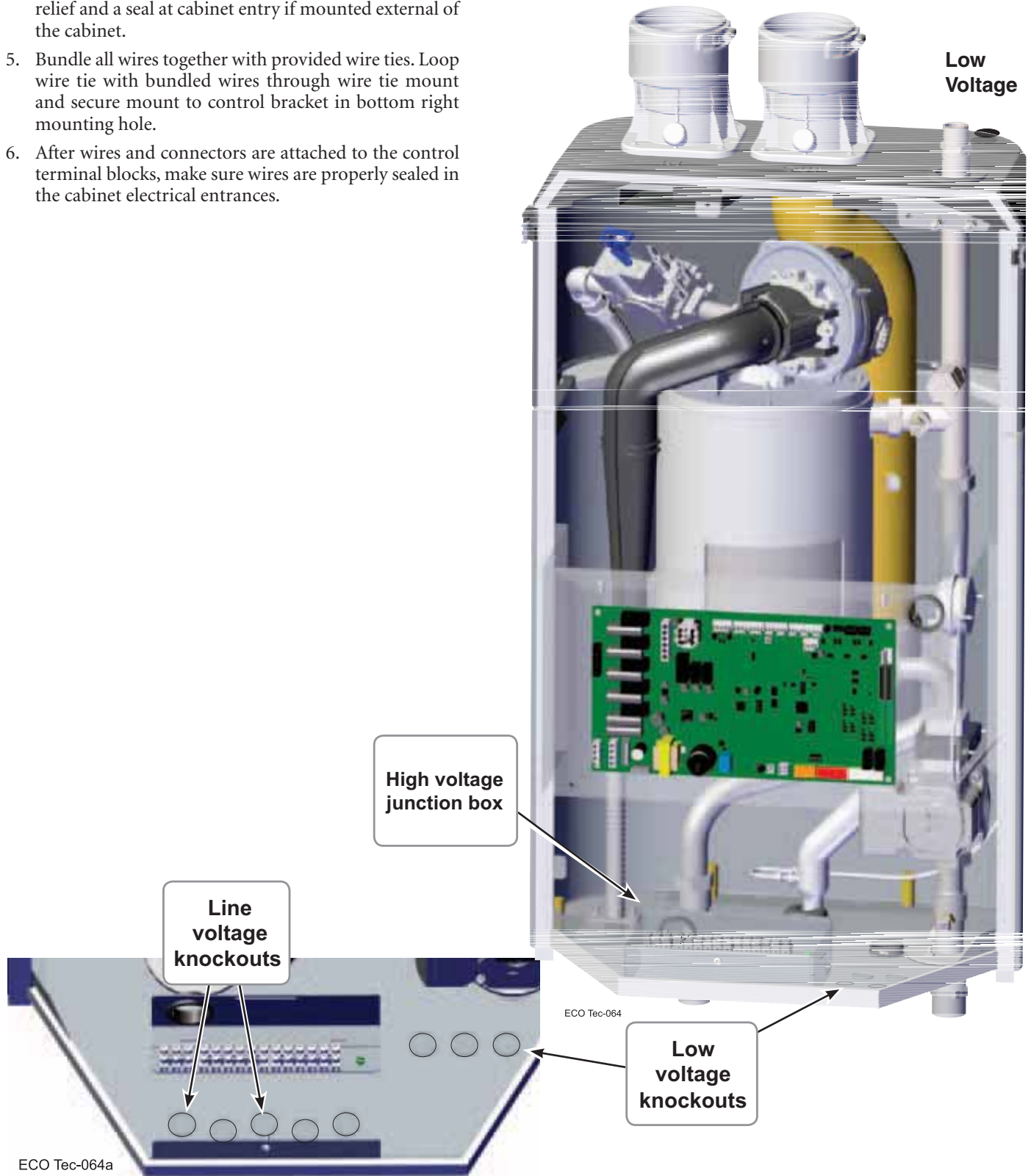
1. Mount low voltage wire grommet(s) to desired low voltage knockout(s).
2. Thermostat, aquastat, limit devices, system sensors, 0-10VDC input and outdoor temperature sensor wire pairs should be routed through the grommet(s)/knockout(s).
3. Wires should be connected directly into the corresponding terminal block.



Field wiring (continued)

4. Low water cutoff harness should be routed from location shown in Figure 51, page 41 to control module connection shown in Section G, page 63. Provide strain relief and a seal at cabinet entry if mounted external of the cabinet.
5. Bundle all wires together with provided wire ties. Loop wire tie with bundled wires through wire tie mount and secure mount to control bracket in bottom right mounting hole.
6. After wires and connectors are attached to the control terminal blocks, make sure wires are properly sealed in the cabinet electrical entrances.

Figure 69 Field wiring overview - Line and low voltage entrances





Field wiring (see wiring diagram, Figure 70, page 66) (continued)

NOTICE

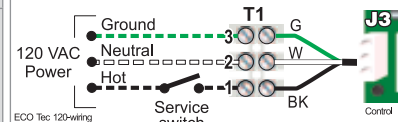
Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

A. 120VAC Power Supply – REQUIRED

Terminal Strip T1

- Provide and install a properly-sized, fused disconnect or service switch as required by applicable codes. (15-amp for most cases.)
 - Use table at right to determine total load.
- Connect properly sized 120VAC power wiring to **ECO Tec** boiler line voltage terminal block T1 as shown at right.
- If possible, provide a surge suppressor in the supply power line. This will reduce the possibilities of control damage due to line surges.
- Must wire ground to this terminal to provide boiler grounding. Failure to properly ground the boiler can lead to abnormal operation and potential hazards.

Determine total load	
Boiler & boiler pump (combined load)	2.5 amps
Output 1	___ amps
Output 2	___ amps
Output 3	___ amps
Output 4	___ amps
TOTAL	



See Figure 70, page 66 for details

B. 120VAC Outputs 1, 2, 3 & 4 – As needed for systems

Terminal Strip T2 & T3

Note: Input/Output 1 & 4 are unassigned/ not available in Combi models.

- Output 1: (Heat Only) T2: 4, 5, & 6
- Output 2: T2: 7, 8, & 9
- Output 3: T3: 10, 11, & 12
- Output 4: (Heat Only) T3: 13, 14, & 15.
- Maximum load: 2.2 amps (use relay if circulator load is higher). See WARNING below.
- These four outputs (Output 1, Output 2, Output 3, and Output 4) can provide 120VAC to the following listed below:
 - A zone circulator.
 - A system circulator.
 - A DHW circulator (used to circulate through an indirect tank).
 - An auxiliary Item that must be energized during an input call, such as an air damper.
- When using inputs/outputs for heat/Indirect DHW demands, each input (Input 1, Input 2, Input 3, and Input 4) controls its respective 120VAC output (Output 1, Output 2, Output 3, and Output 4). Outputs are energized only when BOTH conditions below are met:
 - The corresponding input indicates a call for heat/ Indirect DHW (i.e. contact closure).
 - The PRIORITY assigned to the Input/Output pair is ACTIVE (i.e. the zone may be calling but the pump won't activate unless the boiler is currently running on that system/priority).

NOTICE

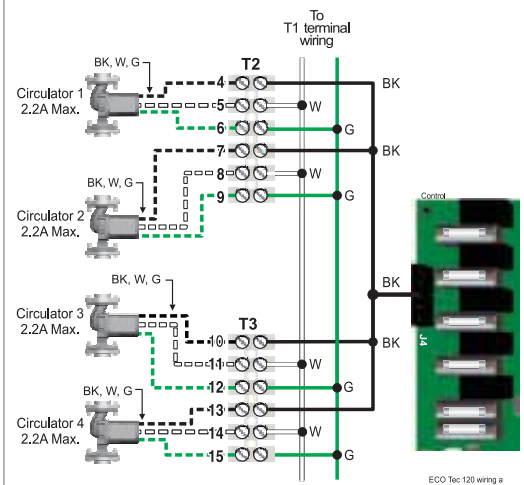
The 3-way valve will operate for Combi models, activating Output 1 for Combi DHW calls, and activating Output 4 for any Space Heating calls.

- When using the inputs/outputs for the AUX PUMP/OUTPUT function, the output is controlled by selectable conditions set up in the control.
 - Use the AUX PUMP/OUTPUT function for devices such as system pumps, combustion air dampers, and other auxiliary equipment to activate when the selected condition is met.
 - See page 91 and page 93 for more information on the setup and selection of operating conditions.

NOTICE

For Priority Indirect DHW Application:

The DHW aquastat can be connected to any one of the four (4) input/output pairs for Heat Only models and Inputs 2 or 3 for Combi models. The selected input should be assigned to PRIORITY 1 during the WIZARD setup or manually in the System Settings menu for Heat Only models or Priority 2 for Combi models.



See Figure 70, page 66 for details.

WARNING

Output circuits are 120VAC. If an output is to operate a low voltage circuit or must be an isolated contact, use an isolation relay.

WARNING

CIRCULATOR POWER — The maximum allowable current for each circulator is 2.2 amps at 120VAC.

For circulators with higher amp ratings, install a circulator relay or starter. Connect only the 120VAC coil to the circulator terminals.



Field wiring (see wiring diagram, Figure 70, page 66) (continued)

NOTICE Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

C. Inputs 1, 2, 3 and 4 (demands) – As needed for systems

Connector J17 (Input 1, 2, &3) & Connector J16 (Input 4, 0-10VDC Input)

1. Input 1 – Connector J17 – 1, 2 & 3 (common)
2. Input 2 – Connector J17 – 4, 5 & 6 (common)
3. Input 3 – Connector J17 – 7, 8 & 9 (common)
4. Input 4 – Connector J16 – 1, 2 & 3 (common)
5. These four (4) inputs on each boiler can indicate a call for heat to the control by means of a dry contact closure (thermostat, aquastat, or switch). (See right and Figure 70, page 66).
6. The control provides inputs for up to four demands and up to three systems (priorities).
7. **For Priority Indirect DHW Application:**
The DHW aquastat can be connected to any one of the four (4) input/output pairs for Heating Only models and Inputs 2 or 3 for Combi models. The selected input should be assigned to PRIORITY 1 during the WIZARD setup or manually in the System Settings menu for Heating Only models or Priority 2 for Combi models
8. The default control setting uses each input (INPUT 1, INPUT 2, INPUT 3 and INPUT 4) to control its respective 120VAC output (OUTPUT 1, OUTPUT 2, OUTPUT 3 and OUTPUT 4). For Combi models, input 1 and 4 and output 1 and 4 are reserved for Combi calls for heat and 3-way valve operation.

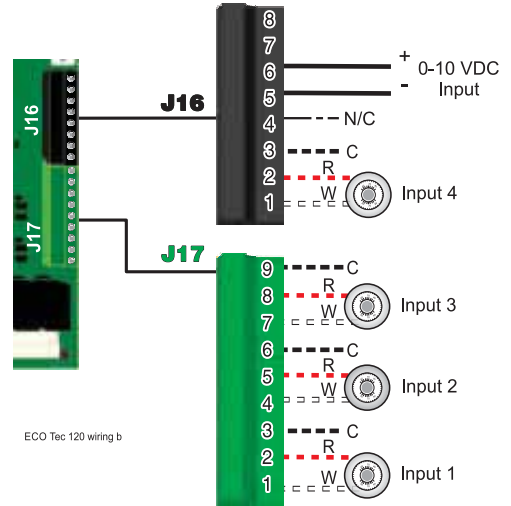
NOTICE Use of 0–10VDC input for modulation disables Input 2 T/T input from creating calls for heat. See page 65 for instructions.

An input can be assigned to an AUX PUMP/OUTPUT function to operate a system pump or interlock with a combustion air damper. Inputs assigned for this function cannot be used for heat demand operation. See page 91 and page 93 for more information on the setup and selection of operating conditions.

WARNING **Thermostats** — **DO NOT** supply 24-volt power to the thermostat circuits (Input 1, Input 2, Input 3 and Input 4 in Figure 70, page 66) or attempt to supply 24 volts for any other application.

For thermostats that require a continuous 24-volt power source, connect the common wire (“C”) (see Figure 70, page 66). Do NOT exceed total amp draw per thermostat.

TT or end switch inputs
(INPUTS 1, 2, 3 and 4)
With External 0-10VDC inputs



See Figure 70, page 66 for details.

Zone valves — If using 3-wire zone valves, use relays to provide dry contacts to the Control thermostat connections. The zone valve end switches of 3-wire valves carry 24VAC from the valve.

Thermostat anticipator setting — 0.1 amps.



Field wiring (see wiring diagram, Figure 70, page 66) (continued)

NOTICE

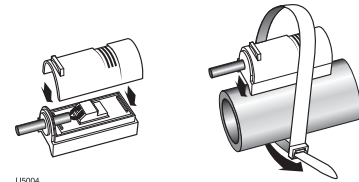
Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

D. System supply and return temperature sensors – Recommended when using primary secondary piping design. Connector J19

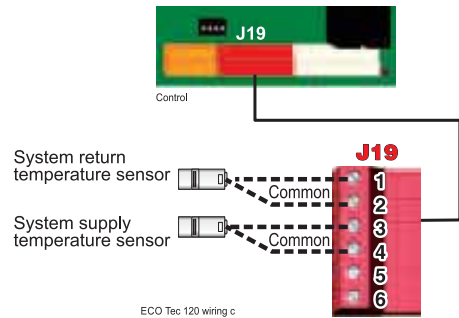
1. It is recommended to use two (2) strap-on temperature sensors (separate kit option). Attach one to the system supply piping and the other to the system return piping. For piping larger than 5 inch diameter or nonmetallic piping, using immersion sensors will provide faster response.
2. Locate the supply sensor at least six pipe diameters, but no further than 3 feet, downstream from the boiler connection to the main to ensure adequate mixing.
3. Return sensor – wire between J19 #1 and #2.
4. Supply sensor – wire between J19 #3 and #4.
5. Thermostat wire can be used to connect these sensors.
6. The Control compares the system return temperature with the system supply temperature.

NOTICE

It is recommended for all primary/secondary heating systems shown in this manual that the System Supply and Return sensors to be installed for proper control function. System may not properly provide desired temperature if sensors are not installed according to these instructions.



Strap to supply & return piping

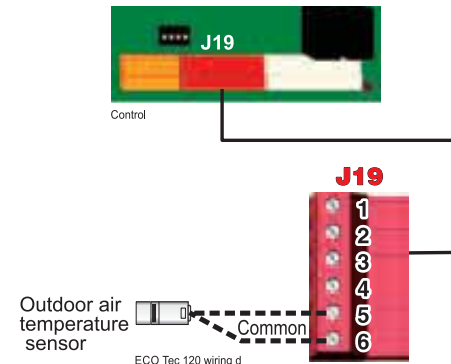


See Figure 70, page 66 for details

E. Outdoor temperature sensor – REQUIRED unless exempted

Connector J19

1. The control provides programmable options if using an outdoor temperature sensor. This sensor is supplied with the boiler.
2. **The outdoor sensor must be installed unless specifically exempted in the Energy Act statement on page 149.**
3. Mount the outdoor sensor on an exterior wall, shielded from direct sunlight or flow of heat or cooling from other sources.
4. The wire outlet on the sensor must be oriented DOWN to prevent water entry.
5. Connect the sensor leads to the terminal shown at right and in the wiring diagrams (see Figure 70, page 66). Thermostat wire can be used to connect the sensor.



See Figure 70, page 66 for details

F. External limits – OPTIONAL

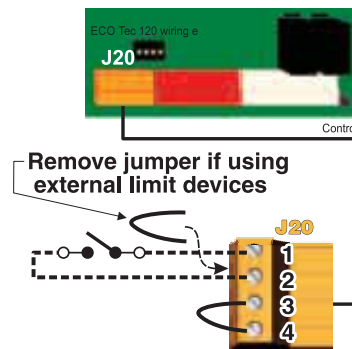
To cause MANUAL reset: Connector J20 #1 & #2

The control will require manual reset after circuit is interrupted.

1. Remove factory-installed jumper and connect isolated contacts of external limits across J20 pins 1 and 2 to cause the control to enter manual reset lockout if the limit circuit opens. The limit must close and the control must be manually reset using the procedure given in this manual. See drawing at right and wiring diagram Figure 70, page 66.

NOTICE

The control will lockout when a limit in its manual reset circuit opens (J20 pins 1 & 2). The control activates its alarm terminals and shuts the boiler down. An operator (user or technician) must manually reset the control to restart the boiler.



See Figure 70, page 66 for details.



Field wiring (see wiring diagram, Figure 70, page 66) (continued)

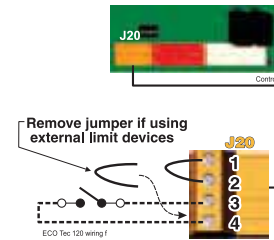
NOTICE

Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

To cause AUTOMATIC reset: Connector J20 #3 & #4

The control will reset automatically after circuit is interrupted.

1. Remove factory-installed jumper and connect isolated contacts of external limits across J20 pins 3 and 4 to cause the control to shut down the boiler on limit opening, then automatically restart 150 seconds after the limit closes.
2. See drawing at right and wiring diagram (Figure 70, page 66).

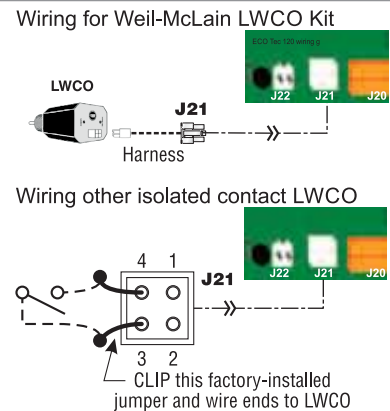


See Figure 70, page 66 for details.

G. Low water cutoff (LWCO) – Required (Installer Supplied)

Connector J21

1. Install a low water cut-off (required) (see Figure 51, page 41).
2. Wiring Weil-McLain LWCO Kit:
 - a. When possible, use the Weil-McLain Low water cut-off kit listed in the back of this manual. It includes a probe-type low water cut-off and provides a simple harness connection for the wiring.
 - b. Connect as shown at bottom center in the control wiring diagram (Figure 70, page 66).
3. Wiring another LWCO — must have isolated contact:
 - a. Other low water cut-offs can be used with the **ECO Tec** only if the device uses an isolated contact for the LWCO function.
 - b. Connect as shown at bottom right.

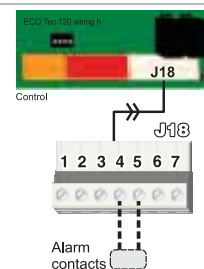


See Figure 70, page 66 for details.

H. Alarm contacts – OPTIONAL

Connector J18 #4 & #5

1. The control's alarm dry contact (J18, terminals 4 and 5) closes when the boiler enters manual lockout only.
2. Connect these terminals for remote alarm notification.
3. Contact electrical ratings: 24VAC or less; 0.5 amp or less.

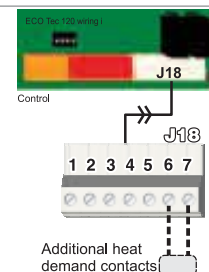


See Figure 70, page 66 for details.

I. Additional heat demand contacts – OPTIONAL

Terminal Block J18 #6 & #7

1. The circuit board can be set to activate another heat source using its additional heat demand dry contacts through terminal block J18 pins 6 & 7.
2. Connect these terminals to call for heat from the other heat source.
3. Contact electrical ratings: 24VAC or less; 0.5 amp or less.
4. Set the control to activate the heat demand contacts as needed.
5. For Additional Heat Demand, refer to setup in Control section for more information.



See Figure 70, page 66 for details.



Field wiring (see wiring diagram, Figure 70, page 66) (continued)

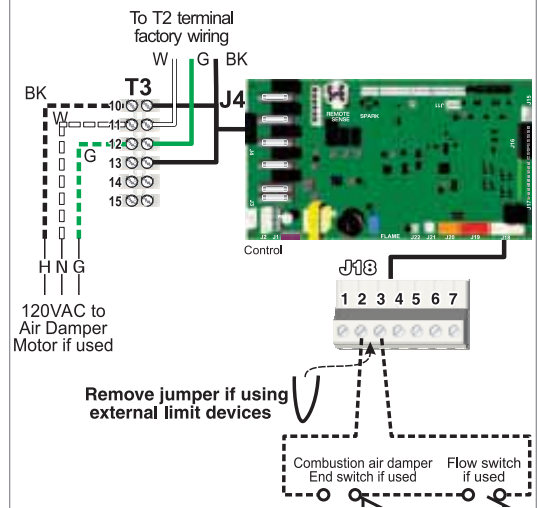
NOTICE Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

J. Proof of closure (flow switch and/or CAD)

Jumper on Connector J18

1. A flow switch or combustion air damper (CAD) interlock can be configured by removing the jumper on connector J18 and wiring components as shown at right and in the wiring diagram (Figure 70, page 66).
2. No control settings are required when using a flow switch.
3. Recommended configuration of the control for a CAD interlock:
 - a. Assign **INPUT 3** as a **AUX PUMP/OUTPUT** function.
 - b. For the **AUX PUMP/OUTPUT** operating mode, select local or **System Damper** for use with CAD Interlock. This ensures the damper will be activated any time the boiler is called on to fire.
 - c. **OUTPUT 3** will provide 120VAC to the damper motor. Use an isolation relay if damper motor requires another voltage or more than 2.2 amp if using 120VAC.

NOTICE * The devices used must provide electrically isolated contacts, because the J18 jumper circuit carries 5 VDC.



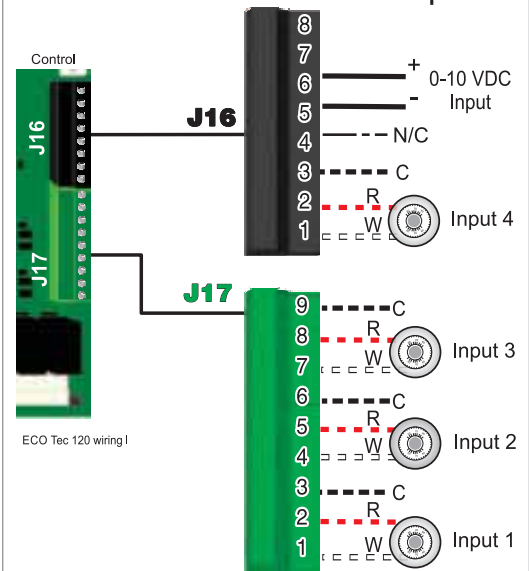
See Figure 70, page 66 for details.

K. 0–10 VDC Remote TARGET input – OPTIONAL

Connector J16 #5 & #6

1. See illustration at right and Figure 70, page 66 (wiring diagram) for details.
2. Remote target using 0–10VDC input requires a 0–10VDC input signal at J16-5/6 as shown at right.
3. This illustration also shows how to connect TT or end switch contacts at INPUT 1, INPUT 2, INPUT 3 and INPUT 4.
 - a. If a Heat/Indirect DHW demand is required, connect the demand’s dry contact to an unused input on the control and its pump/valve to the respective output. Then assign and setup a priority to the input using the Wizard or manually through the contractor menu.
 - b. A dry contact heat demand must be applied to one of the inputs in order to initiate a call for heat.
4. The 0–10VDC signal is used to adjust the supply target temperature, using the TARGET ADJUST setting. Set TARGET ADJUST during the WIZARD or manually in the PRIORITY SETTINGS menu for the desired system/ priority.
 - a. Many options are available for configuring the control. The following is a suggested setup that uses factory default settings as much as possible.
 - b. Use PRIORITY 1 for the Indirect DHW heating system when used. This priority’s default values are set for Indirect DHW, direct-piped to the boiler. Verify that settings are suitable for the application, change if needed. Use Priority 2 for Combi models.
 - c. Use PRIORITY 2 for the heating systems. Use PRIORITY 3 for Combi models.
 - The factory default settings for PRIORITY 2 or 3 make either priority a good choice for space heating applications. Set PRIORITY 2/3 values to the following:
 - Set TARGET ADJUST value to 0–10V.
 - Set VOLTS FOR MAX TARGET at the voltage that will call for the highest target temperature. Set MAX TARGET TEMP at this temperature.
 - Set VOLTS FOR MIN TARGET at the voltage that will call for the lowest target temperature. Set MIN TARGET TEMP at this temperature.
 - For voltages between VOLTS FOR MAX and VOLTS FOR MIN, the target temperature will range proportionately between MAX TARGET TEMP and MIN TARGET TEMP. NOTE: The 0–10VDC signal replaces the Outdoor Temp sensor as the target temperature modifier (TARGET ADJUST setting). The control does not control target.

TT or end switch inputs (INPUTS 1, 2, 3 and 4) With External 0-10VDC inputs



See Figure 70, page 66 for details.



Field wiring (see wiring diagram, Figure 70, page 66) (continued)

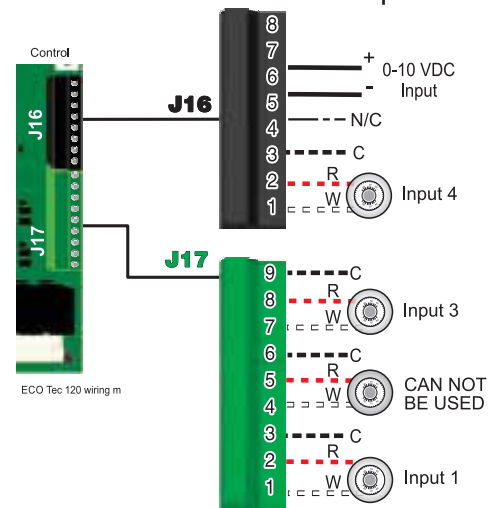
NOTICE Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW (if needed) and Input 3 for Space Heating applications.

L. 0–10 VDC Remote MODULATION input – OPTIONAL

Connector J16 #5 & #6

1. See illustration at right and Figure 70, page 66 for details.
 2. This illustration also shows how to connect TT or end switch contacts at INPUT 3 and INPUT 4 for other uses.
 3. Note that using 0–10VDC input replaces INPUT 2 for generating a heat demand. Do NOT wire any input to INPUT 2 as shown at right.
 4. Remote modulation requires a 0–10VDC input signal at J16-5/6 as shown at right.
 - a. The 0–10VDC input positive connection must be at terminal 6 and common connection at terminal 5.
 5. Control setup:
 - a. Many options are available for configuring the control. The following is a suggested setup that uses factory default settings as much as possible.
 - b. If Indirect DHW is required, use PRIORITY 1 to minimize setup steps.
 - Connect the DHW aquastat to INPUT 3, or INPUT 4 and assign the input used to PRIORITY 2.
 - Verify that control settings are suitable for the application, change if necessary.
 - c. Use PRIORITY 3 for the system to be remote modulated.
 - The factory default settings for this priority are best suited for space heating.
 - Assign INPUT 2 to the priority chosen. Accept all defaults for INPUT 2 — no changes should be necessary during the WIZARD.
 - After the WIZARD has been completed, go to the SYSTEM SETTINGS – INPUT USAGE menu for INPUT 2. Change SOURCE to 0–10V (default setting is TT1). See page 92 for System Settings menu information.
 6. Operation:
 - a. The boiler comes on at 0.9VDC and turns off at 0.8VDC. 1 VDC = 10% input. 10 VDC = 100% input. These voltage settings are not adjustable.
 - b. OUTPUT 2 (120VAC) is activated and deactivated as the heat demand is turned on and off. This output is a good choice to operate the system pump.
- NOTE: The control can be configured to use either 0–10VDC for target operation (see previous section) or modulation, **but not both**.

TT or end switch inputs (INPUTS 2, 3 and 4) With External 0-10VDC inputs

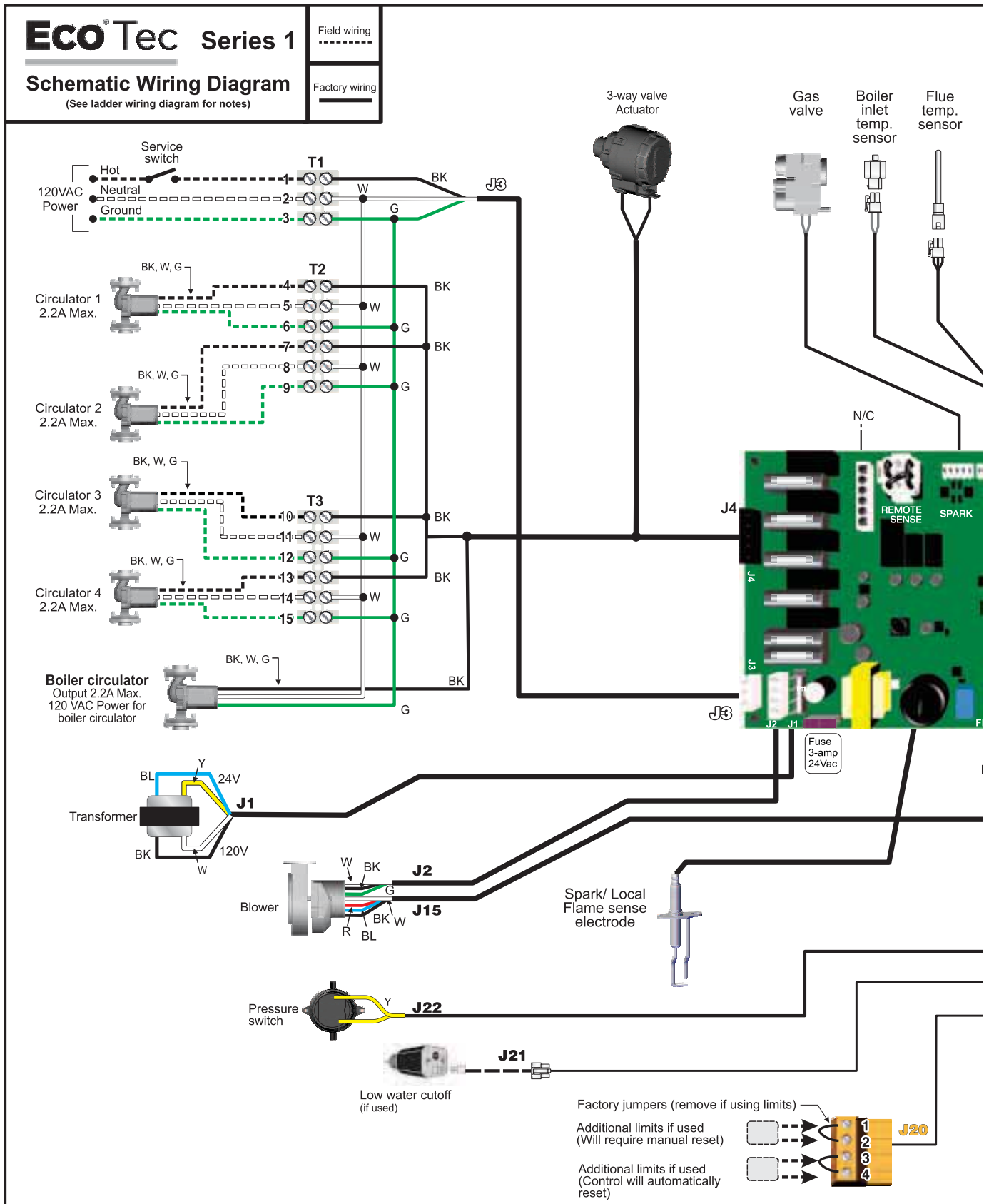


See Figure 70, page 66 for details.



Wiring diagram – schematic

Figure 70 Schematic wiring diagram (see Figure 71, page 68 for legend and notes)



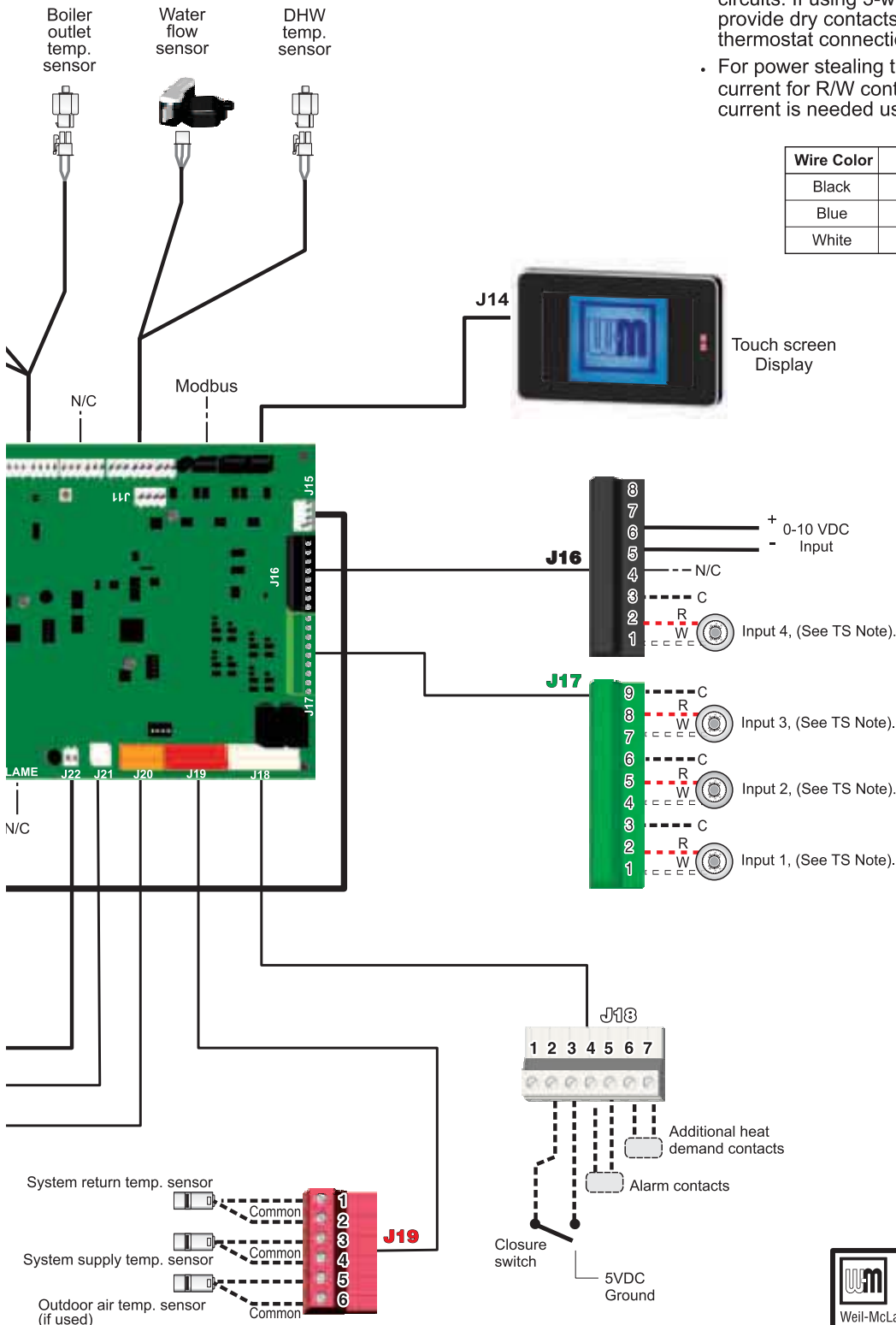


Wiring diagram – schematic (continued)

TS NOTE

- DO NOT supply 24-volt power to the thermostat circuits. If using 3-wire zone valves, use relays to provide dry contacts to the Control Module thermostat connections.
- For power stealing thermostats: Maximum current for R/W contacts is 87mA. If higher current is needed use C terminal with thermostat.

Wire Color	Symbol	Wire Color	Symbol
Black	BK	Red	R
Blue	BL	Yellow	Y
White	W	Green	G

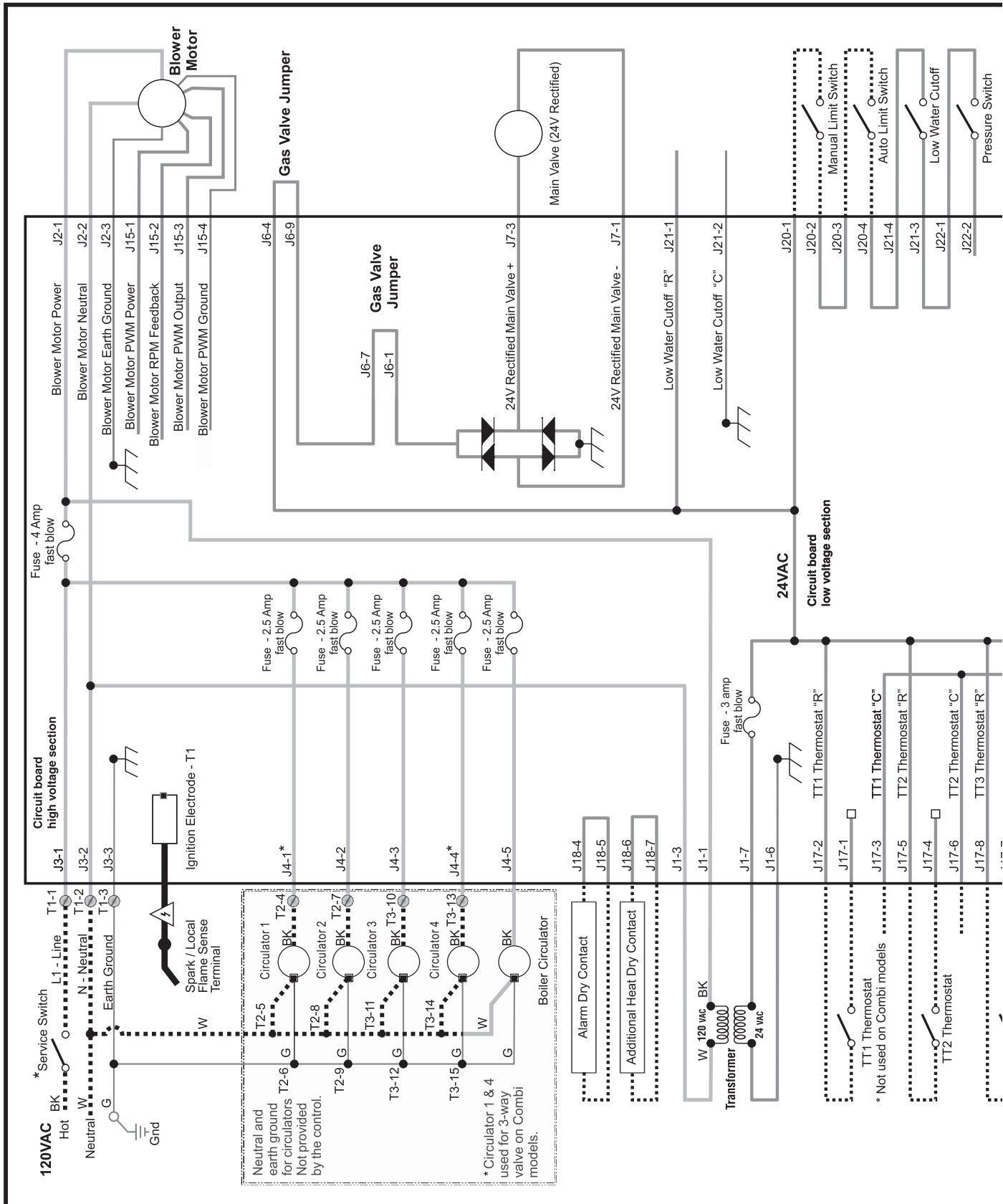


WEIL-McLAIN
 Weil-McLain • 500 Blaine St. • Michigan City, IN 46360-2388
 Part Number 550-225-230_0520



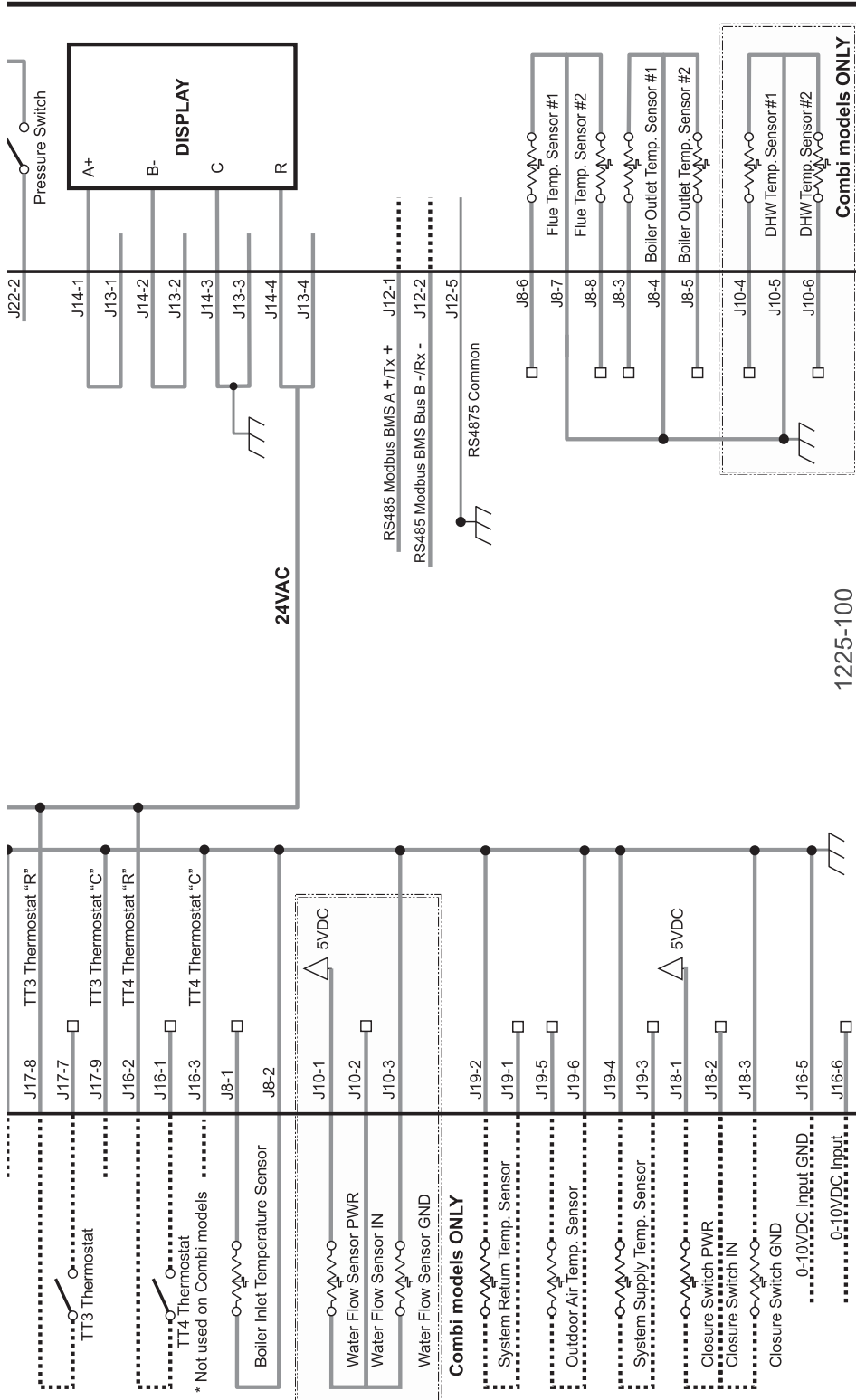
Wiring diagram – ladder

Figure 71 Ladder wiring diagram (see Figure 70, page 66 for schematic wiring diagram)





Wiring diagram – ladder (continued)



ECO[®] Tec Series 1 Ladder Wiring Diagram

WARNING

Electrical shock hazard — can cause severe injury or death. Disconnect power before installing or servicing.

NOTICE

- All contacts shown without power applied.
- Items not provided.**

NOTES (for Schematic and Ladder Diagrams)

- All wiring must be installed in accordance with:
U.S.A. — N.E.C. And any other national, state, or local code requirements.
Canada — C.S.A. C22.1 C.E.C. Part 1 and any other national, provincial, or local code requirements.
- Connect additional limits (if used) between terminals J20-1 and J20-2 if the boiler circuit board is to manual reset on limit action. Connect between terminals J20-3 and J20-4 for automatic reset. Remove jumper across terminals used.
- If any of the original wire as supplied with the appliance must be replaced, use minimum 105° C wire or equivalent. Exceptions: Ignition lead wire, ignition ground wire, and flame sense wire must be replaced only with Weil-McLain parts.
- Thermostat anticipator setting (single zone) — set anticipator for 0.1 amps.
- For multiple zoning, use either zone valves or circulators. Refer to the component manufacturer's instructions and the manual for application and wiring suggestions. Boiler circulator must remain with boiler, and cannot be used for system circulation in any way.
- Refer to control component instructions packed with the boiler for application information.
- Preferably, use the provided Weil-McLain LWCO Kit, part number 511-100-005, with LWCO, Molex plug and wire harness. Remove the factory Molex, and plug the LWCO harness ends into the low water cutoff receptacle and J21 on the circuit board. To field wire a non-powered (isolated contact) low water cutoff, clip the factory jumper in the factory-installed Molex plug, strip the wires, and connect to the low water cutoff limit terminals.

Legend for ladder wiring diagram only

- 120VAC field wiring
- Low voltage field wiring
- Field ground connectors
- 120VAC factory wiring
- Low voltage factory wiring
- High voltage spark ignition wiring
- Ground connectors



Part Number 550-225-231_0320



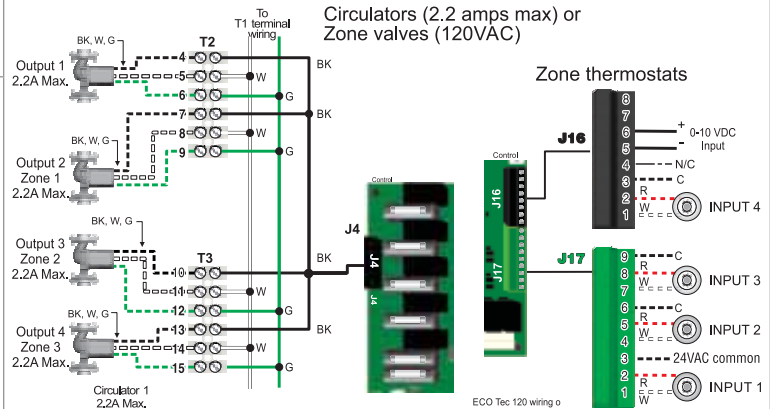
Zoning with the ECO Tec Control

NOTICE Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW and Input 3 for Spacing Heating applications.

A. Zoning with CIRCULATORS, suggested applications

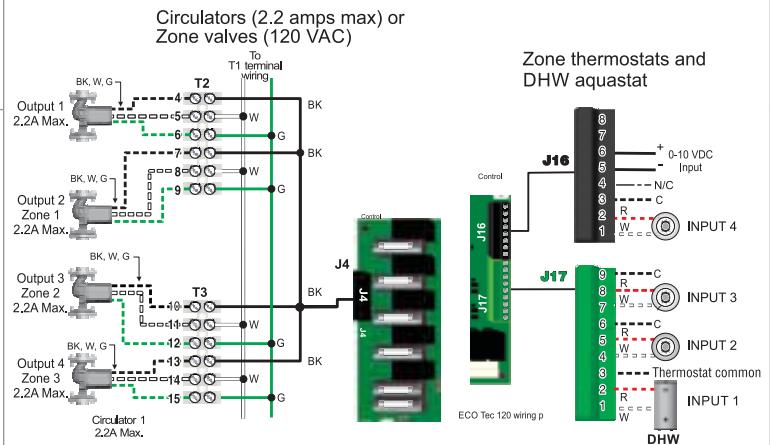
Four space heating zones (no Indirect DHW) (Heating Only models shown)

1. Review wiring information on page 60 (120VAC outputs) and page 61 (24VAC inputs).
2. The configuration at right uses the four input/output pairs to receive thermostat inputs on J17-1/2, J17-4/5, J17-7/8 and J16-1/2; and circulator outputs as shown.
3. Choose the space heating system type that matches the heating system during the WIZARD setup or manually in the PRIORITY 2 menu in the System Settings menu.
4. Use the factory default settings for the system type chosen, or change if needed.



Three space heating zones plus Indirect DHW piped directly to boiler (Heating Only models shown)

1. Review wiring information on page 60 (120VAC outputs) and page 61 (24VAC inputs).
2. The configuration at right uses INPUT 3 and 4 for space heating thermostats. INPUT 1 uses the input from a DHW aquastat.
3. System Settings 2, 3 and 4 to PRIORITY 2. To set up PRIORITY 2, choose the space heating system type that matches the heating system during the WIZARD setup or manually in the PRIORITY 2 menu in the System Settings menu.
4. Assign INPUT 1 to PRIORITY 1, or use INPUT 2 PRIORITY 2 for Combi models.
5. Use the factory default settings for DHW and for the heating system type chosen, or change if needed.





Zoning with the ECO Tec Control (continued)

NOTICE

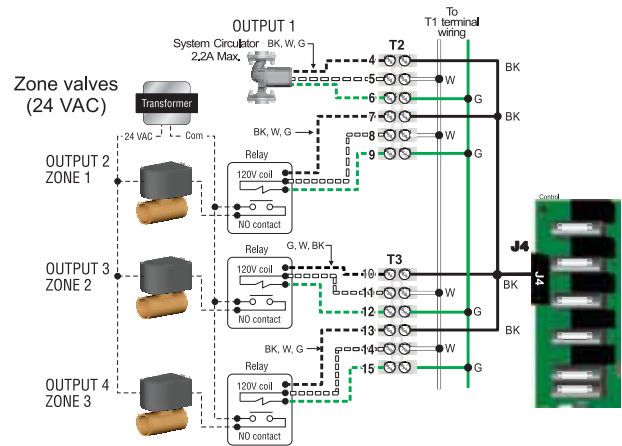
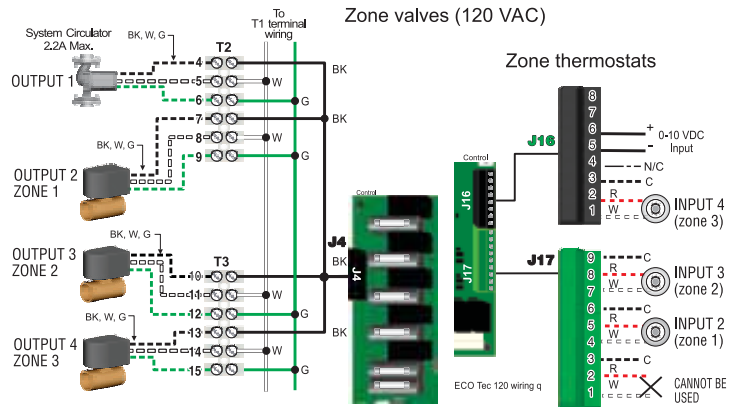
Combi models use Input/Output pairs 1 and 4 for 3-way valve operation and cannot be used for any other purpose. Use Input 2 for Indirect DHW and Input 3 for Spacing Heating applications.

B. Zoning with ZONE VALVES, suggested applications

Two space heating zones (no Indirect DHW) (Heating Only models shown)

1. Review wiring information on page 60 (120VAC outputs) and page 61 (24VAC inputs).
2. The configuration at right uses INPUT 2, 3, and 4 for space heating thermostats. INPUT 1 is reserved here for configuring the operation of the system circulator.
3. System Settings 2, 3 and 4 to PRIORITY 2. To set up PRIORITY 2, choose the space heating system type that matches the heating system during the WIZARD setup or manually in the PRIORITY 2 menu in the System Settings menu.
4. Use the factory default settings for the heating system type chosen, or change if needed.
5. Assign INPUT 1 (Input 2 for Combi models) to AUX PUMP/OUTPUT. Then select INPUTS PRIORITY SETTING when prompted for when to activate the output. This will cause the system pump to run when either of the zones calls for heat. Confirm that Priority 2 RUN AUX PUMP/OUT is set to YES.
6. INPUT 1, J17-1/2, (Input 2, J17-4/5 for Combi models) cannot be used for a wired connection because it is being used in the control setup to run the system circulator.

WARNING The system must be equipped with a by-pass pressure regulating valve. Flow can occur with zone valves closed.





ECO Tec control operation

ECO Tec control overview

- Control inputs and outputs allow operation of multiple heating circuits (space heating and DHW, for example).
- Up to three priority levels can be set, providing automatic switch-over on demand.
- This manual provides quick set-up information for boiler installations.

ECO Tec control operation

- The control responds to signals from the room thermostats, DHW aquastats (if used), boiler sensors (Boiler out, Boiler In, flue temperature), outdoor temperature and system sensors, if used.
- The control automatically adjusts blower speed (and gas flow rate) to match boiler output to space heating and/or DHW heating demand.
- The default control settings provides up to four (4) space heating zones. The control can be easily set up for operation with a DHW zone, with or without domestic priority.

ECO Tec control WIZARD

- The Wizard leads through a step-by-step setup procedure designed for the application chosen.
- Context-sensitive help is available to explain the purpose of key setup Items.

ECO Tec control setup

1. Set control parameters using the WIZARD option provided on initial start-up or manually enter parameters using control menus (see Figure 80, page 87 and following pages for information.)
2. See **Express setup** instructions beginning on page 78 for basic systems and minimum settings required.



Boiler Model, Altitude and Fuel Type are critical settings.

Failure to set correctly could result in severe personal injury, death or substantial property damage.

Temperature settings — You must ensure that the control is set for the proper water temperatures for the system. Excessive water temperature can cause significant property damage in some applications.

Multi-temperature systems — If the heating system includes circuits that require lower temperature water (radiant slab circuits, for example) as well as higher temperature circuits (DHW, finned tube baseboard, etc.), it is recommended to protect low-temperature circuits with limit controls that are wired to an control external limit circuit. Failure to provide regulation can result in substantial property damage.

Control features

- Color touch-screen display for ease of operation monitoring and troubleshooting.
- Three programmable priority assignments for up to four heat inputs.
- Preset operating parameters for typical heating systems, including target temperatures, reset curves and circulator assignments.
- Integral outdoor reset option, with reset curves matched to the system type selected.
- ModBus communications for external communication and monitoring.
- 0-10VDC input modulation or remote target input.
- Five (5) pump outputs, including 1 internal boiler circulator output.
- Additional heat demand operation to call a second heat source to help supply the energy required for heating.
- Advanced PI response to anticipate system needs.
- Flue temperature modifier to target temperature.
- Modulation based on flue sensor, Boiler In/Boiler out, and DHW sensors.

Figure 72 Control sequence of operation

Display status text	Control action <i>(also see Figure 76, page 76)</i>
POWER UP	<ul style="list-style-type: none"> • Check the boiler model listed on the power-up screen. If it is not correct, turn off the boiler. See page 88 for instructions to change setting. • When power is turned on, the screen lists sensors that are detected. If any sensor is not listed, make sure it is connected correctly. Turn off power and restart.
Standby	<ul style="list-style-type: none"> • Standby - no calls for heat. • Toggles through no dots, 1 dot, 2 dots, then 3 dots while in standby (wrench symbol will show instead if maintenance is needed).
Blower ON	<ul style="list-style-type: none"> • Call for heat detected. • Display on with BLUE banner (space heating) or PURPLE banner (DHW). • Start min/max timers if more than one system is calling - highest priority starts first. • Start circulators for this priority setup based upon settings. • Calculate target temp — If sensor temp is below target temp, begin firing sequence. • Blower to ignition speed for prepurge.
Ignition	<ul style="list-style-type: none"> • After prepurge times out, begin ignition cycle. • Activate gas valve and ignition spark. • Continue ignition spark for ignition period. • Turn off spark and use electrode to check for flame signal.
Space Heating	<ul style="list-style-type: none"> • Flame detected. • Release boiler to modulation. • NOTE: If flame is not detected, the gas valve is turned off, blower turns on (postpurge), and control starts cycle again. After 5 failures, the control waits 60 minutes, then tries again. • If priority timer times out, switch to next priority and start priority timer. • If demand satisfied, go to postpurge.
DHW Heating	<ul style="list-style-type: none"> • Flame detected. • Release boiler to modulation. • NOTE: If flame is not detected, the gas valve is turned off, blower turns on (postpurge), and control starts cycle again. After 5 failures, the control waits 60 minutes, then tries again. • If priority timer times out, switch to next priority and start priority timer. • If demand satisfied, go to postpurge.
Blower OFF	<ul style="list-style-type: none"> • Demand satisfied (temperature reaches target temperature or limit setting). • Gas valve off. • Blower to ignition speed for postpurge. • Return to standby after purge.
Maintenance	<ul style="list-style-type: none"> • Display banner turns BLUE, toggling between graphic screen and maintenance screen (occurs if maintenance schedule timer times out). • Will show during standby only. • Boiler operates as normal.
Error/fault	<ul style="list-style-type: none"> • Display banner turns RED due to error or limit event.
WWSO	<ul style="list-style-type: none"> • Warm weather shut down - the boiler will not be allowed to fire on space heating if the outdoor temperature is greater than the WWSO setting. • DHW operation is not affected by WWSO.



ECO Tec control operation (continued)

- ❑ Dual temperature sensors on boiler outlet, DHW outlet and flue, providing redundant protection.
- ❑ Boiler is shipped with an outdoor sensor.
- ❑ Blower speed modulation to control boiler firing rate.
- ❑ Alarm relay on error/fault for use with an audible safety.
- ❑ Optional PREHEAT mode – Automatically maintains boiler water temperature to reduce boiler reaction time on Combi domestic hot water (DHW) draws.
- ❑ Select the mode of PREHEAT, between Off, Economy and High Performance.
- ❑ ECO BOOST – Reacts to homeowner use to recharge boiler water temperature once, if needed to reduce boiler reaction time on subsequent Combi domestic hot water (DHW) draws.
- ❑ Select whether or not to use the ECO BOOST feature. If conditions are met, the burner will continue to fire after Combi flow ends to recover temperature within the heat exchanger.
- ❑ Blower calibration – allows fine tuning of blower control to reach purge speeds faster, reducing time to heat delivery.

Sequence of operation

Figure 72, page 72 is a summary of the operating sequence for the control.

- The statuses shown appear in the display as the control cycles the boiler. See Figure 76, page 76 for screen shots.
- The display banner will be red if a problem has been detected.

ECO Tec control Priorities & Input/Outputs

- For heating installations with multiple systems, the control uses PRIORITIES to determine the order of operation of the systems. The control's MAX and MIN time settings determine the maximum and minimum times a system will be operated before being turned off to allow another system to operate. A typical example is DHW priority — heat demand from the DHW system is given preference over space heating, if set to use Priority 1.
- The MAX ON TIME setting controls the maximum time a priority will be allowed to run before switching to a lower priority's call for heat. The MIN ON TIME setting controls the minimum time a priority will be operated before switching to a higher priority's call for heat, or the next lower priority.
- Each PRIORITY has its own set of operating parameters. The control prompts the user to select the system type (finned tube baseboard, DHW, etc.) and is factory programmed with parameters suited to each of these system types. The user can also choose CUSTOM to create a system type.
- The 120VAC power output to the boiler circulator is provided by a terminal block located on the boiler's control board. For each of the priorities, the control can be setup to run the boiler pump or to leave it off.
- Each boiler has four input/output pairs (INPUT/OUTPUT 1, 2, 3 and 4). Control setup prompts the user to assign each of these I/O pairs to a PRIORITY. The control then knows which system (priority) to operate when the input receives a call for heat. On a call for heat to an input, the control closes the corresponding output (120VAC) and begins controlling the boilers according to the setup for the assigned priority.
- When multiple inputs are set up on the same priority, they will run at the same time if the priority and inputs are active.
- Temperature units – Select between using °F or °C.
- Manual Reset High Temperature Limits – Set High Limit temperature safety value.
- Daylight Saving Time – Select whether your boiler will obey Daylight Savings Time for your region.

Setting Up the Boiler	
Step 1	<ul style="list-style-type: none"> • DETERMINE input/output needs – • What are the inputs? – Thermostats, remote contacts, end switches, etc. • What does each control's output need to do? – operate a pump, activate an air louver, etc.
Step 2	<ul style="list-style-type: none"> • Install the boiler following all instructions in the ECO Tec Boiler Manual before proceeding further. • Follow instructions in the Boiler Manual to start up and power the boiler.
Step 3	<ul style="list-style-type: none"> • Connect wiring to the control inputs and outputs to accomplish the purposes set in Step 1.
Step 4	<ul style="list-style-type: none"> • Use the WIZARD (below) or enter control parameters manually (skip Wizard).

ECO Tec control WIZARD

- The Wizard is available on initial setup of the boiler. It leads through a step-by-step setup procedure designed for the application chosen.
- Context-sensitive help is available to explain the purpose of key setup items.

WIZARD Sequence	
Boiler Settings	<ul style="list-style-type: none"> • Altitude – ⚠WARNING – must be set correctly for proper operation. • WWSD – set outdoor temperature above which space heating will be deactivated. • Fuel (natural gas or propane) – ⚠WARNING – must be set correctly for proper operation – control will pause until this value is selected. • Set date and time – important for control diagnostic logging.
Inputs/Outputs	<ul style="list-style-type: none"> • Select the usage of inputs 1, 2, 3 and 4. • Determine usage of outputs 1, 2, 3 and 4 (outputs correspond to inputs).
Set Priorities	<ul style="list-style-type: none"> • Assign priorities 1, 2 and 3 to the inputs.
System Settings	<ul style="list-style-type: none"> • Set system settings or leave at their defaults.
System Types	<ul style="list-style-type: none"> • Specify what system type is connected to each of the four outputs; each system type causes the control to preset operating temperatures.
Output Activation	<ul style="list-style-type: none"> • (When applicable) Select when to activate AUX PUMP/OUTPUT – by input, always on, external switch, etc.
Priority Switching	<ul style="list-style-type: none"> • Set maximum and minimum timings for priorities.
Information	<ul style="list-style-type: none"> • Set installer name and contact information. • Enter install date, maintenance date, etc. • Set automatic maintenance notification timing.



ECO Tec control operation (continued)

ECO Tec control operation

The control responds to signals from:

- DHW Flow demand.
- Room thermostats.
- DHW aquastats (if used).
- Temperature sensors Boiler Out, Boiler In, flue temperature and when used, outdoor temperature. **For optimal performance, it is recommended to install System Supply and Return sensors.**
- The control automatically adjusts blower speed (and gas flow rate) to match boiler output to space heating and/or DHW heating demand.
- The control provides four inputs and four outputs (for circulators or auxiliary devices) plus a fifth boiler circulator output.
- Outdoor reset must be used in all applications that are not exempt as described on page 149.
- The outdoor temperature is used for supply temperature reset operation and for the Warm Weather Shut Down (WWSD) option.
- System presets:

The **ECO Tec** control provides presets by system type for complete list, see Figure 79, page 85.

DHW Target

Set DHW target to the required Combi DHW water temperature for the application according to design mixing valve.

OUTDOOR TEMP FOR MIN TARGET

1. OUTDOOR TEMP FOR MIN TARGET means the outdoor temperature at which the target temperature reaches its minimum (Min Target Temp).
2. In the examples of Figure 73, this occurs at 70 °F (the factory default).

OUTDOOR TEMP FOR MAX TARGET

1. OUTDOOR TEMP FOR MAX TARGET means the outdoor temperature at which the target temperature reaches its maximum value (Max Target Temp).
2. In the examples of Figure 73, this occurs at 0°F outdoor (the factory default setting).
3. OUTDOOR TEMP FOR MAX TARGET should equal the Outdoor Temp (outdoor design temperature) for the installation's location.

Outdoor reset operation

4. Set desired temperatures for space heating zones.
5. For an explanation of the target temperatures and associated outdoor temperatures, see Figure 73.
6. The temperature settings discussed below are accessed in the priority menu for the applicable system. For detailed explanations of the priority menus, see Figure 82, page 89.

MAX TARGET TEMP

Set Max Target Temp to the required supply water temperature for the system at design maximum heat loss (typically 180°F for finned tube baseboard on new installations).

MIN TARGET TEMP

1. Min Target Temp should equal the desired minimum supply water temperature for the system.
2. This could be set as low as 60°F, which would supply “zero heat” when outdoor temperature is 70°F, because supply water temperature would equal room temperature. See examples in Figure 73.

Remote target operation (0–10VDC input)

1. This function allows a remote analog input to regulate the supply temperature for control operation/modulation. This can be done for any priority.

Figure 73 Outdoor reset operation

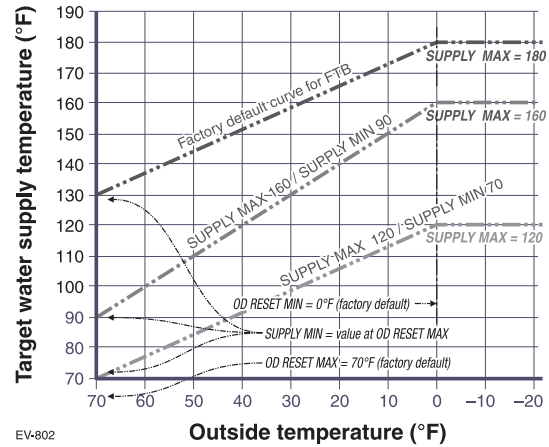
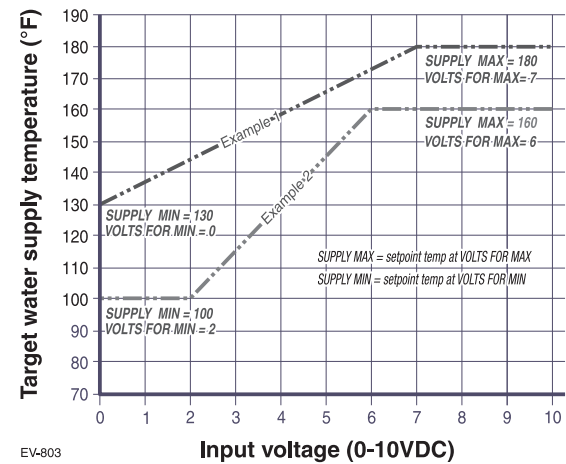


Figure 74 Remote target operation



2. The settings discussed below are accessed in the priority menu for the applicable system. For detailed explanations of the priority menus, see Figure 82, page 89.
3. See Figure 74 for an explanation of target temperature vs voltage when using remote target operation.
4. In the priority menu for the applicable system, select 0-10V for the TARGET ADJUST setting.
5. In the same priority menu, select the VOLTS FOR MIN TARGET and VOLTS FOR MAX TARGET values. VOLTS FOR MIN TARGET sets the voltage value for the desired minimum supply temperature. VOLTS FOR MAX TARGET sets the voltage value for the desired maximum supply temperature.

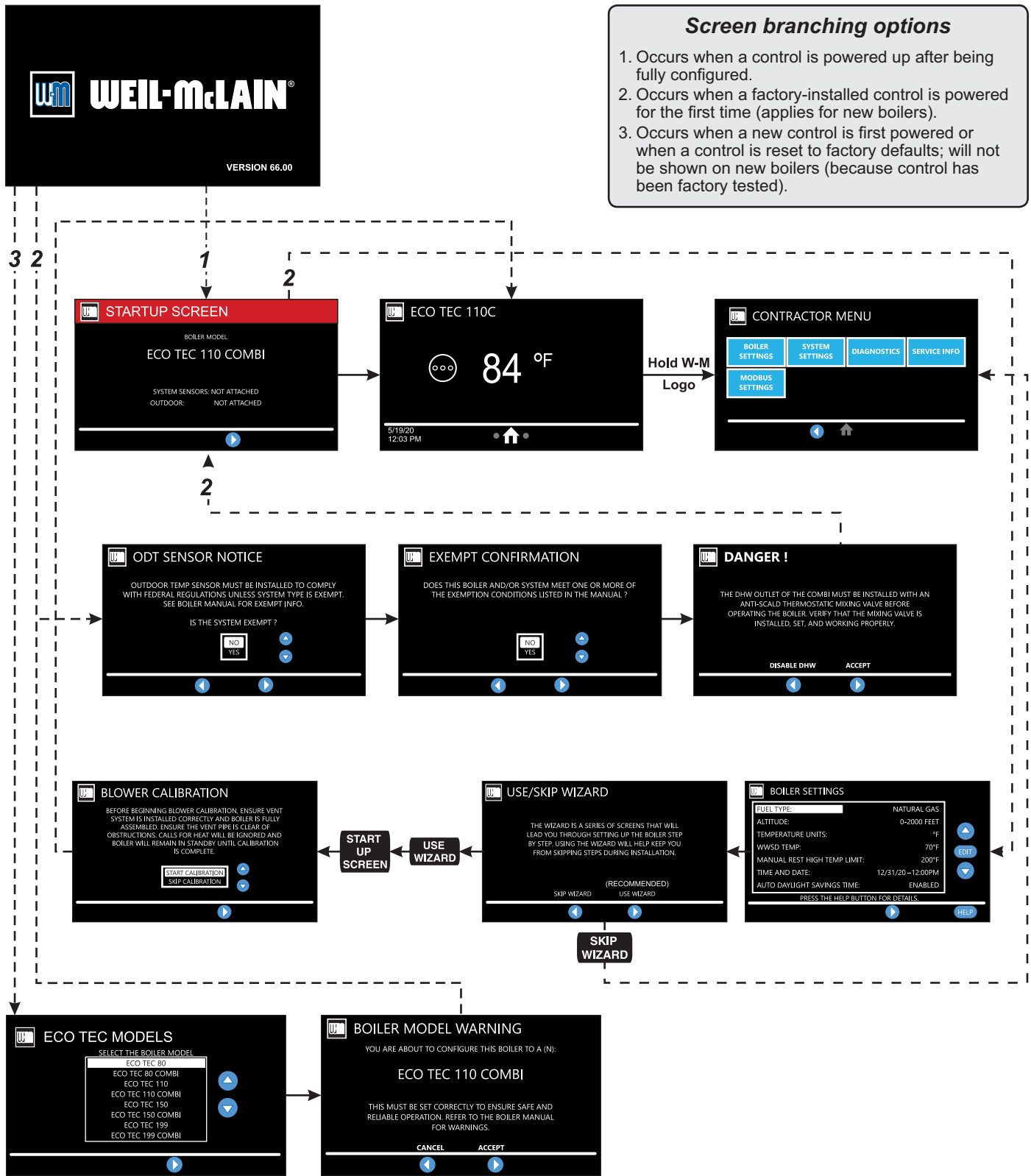
Remote modulation operation (0–10VDC input)

1. To use 0-10VDC for remote modulation, go to Contractor Menu -> System Settings -> select the appropriate priority. Select Input 1 from System Setting menu, then change Input 1's source to 0-10V. The priority that is assigned to Input 1 cannot be used by any other Input.
2. The boiler comes on at 0.9VDC and turns off at 0.6VDC. 1 VDC = 10% input. 10VDC = 100% input. These voltage settings are adjustable.



ECO Tec control operation (continued)

Figure 75 Boiler essential settings (REQUIRED on initial start-up) — see page 84 for explanation

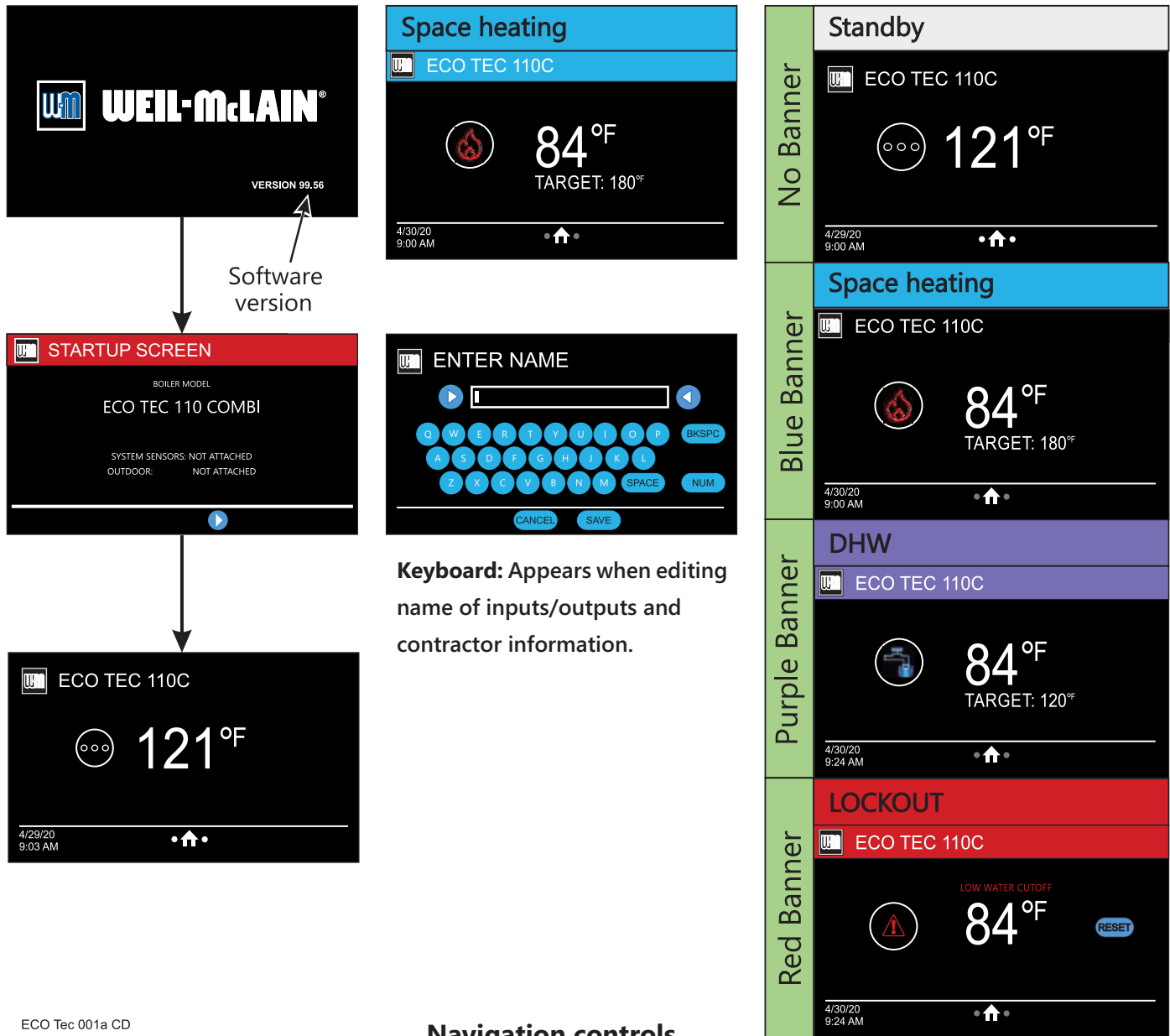


Screens shown above are typical only. Actual screens depend on control settings chosen.



Control settings menus

Figure 76 ECO Tec control display screens and typical navigation



ECO Tec 001a CD

Screens shown above are typical only. Actual screens depend on control settings chosen.



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EXPRESS SETUP – Example A

Multi-zone **SPACE HEATING** (Circulators with circulator relays) | **DHW** (Direct-piped)

⚠ WARNING

Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

Incorrect setup or piping can result in severe personal injury, death or substantial property damage.

Use primary/secondary piping or equivalent unless system meets requirements on page 46.

Verify that the correct system type is selected on the control and that operating temperature settings are suitable for the system. System and structural damage can occur if temperatures are too high.

Purpose

- Space heating with multiple zones.
- Zoning with circulators using circulator relays.
- DHW piped directly to the boiler.
- DHW priority — space heating is disabled during call for heat from water heater.

Control setting notes

- See the table at right for required and optional settings.
- The sequence in the table follows the WIZARD.
- If not using the WIZARD, follow instructions elsewhere in this manual to enter the settings manually.

Circulators and piping

⚠ WARNING

Provide an external relay and external power to any circulator if its load rating exceeds 2.2 amps FLA, 3.6 amps locked rotor, or 16.4 amps in rush.

- Piping must be primary/secondary as shown.
- DHW circulator must be selected to handle the pressure drop through the water heater and piping. DHW circulator supplied by installer.
- For some large indirect water heaters, the required flow rate may require piping the water heater differently.
- The control settings in table at right provide DHW priority — space heating will be discontinued during a call for DHW.
- Zone circulators and relays supplied by installer. For alternate zone wiring using a zone controller, see page 70.

BOILER

- Boiler circulator is installed internally within the boiler.
- Follow all instructions in this manual for piping boiler and system.

Note 1: If DHW is not used, set the USE of INPUT/OUTPUT 1 to NONE. Keep all other wiring as shown at right and follow all settings given above for PRIORITY 2.

Note 2: For Combi models, INPUT/OUTPUT 1 and 4 are NOT used and Priority 1 is assigned to Combi DHW. Use INPUT/OUTPUT 2 and 3 and Priority 2 and 3 for this application.

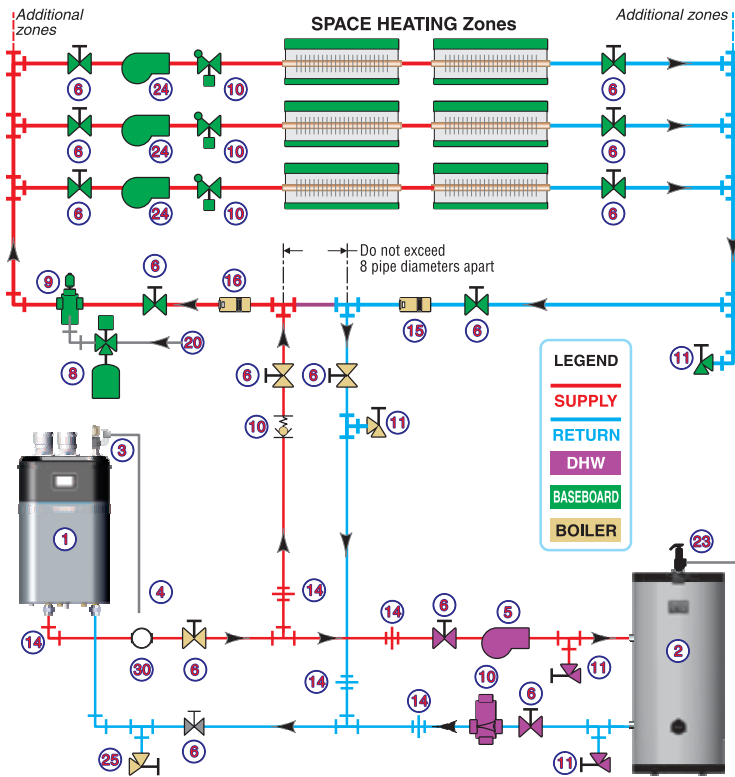
CONTROL SETTINGS (IN ORDER OF WIZARD SEQUENCES)		<i>BLACK OBLIQUE</i> - VALUE MUST BE SET OR VERIFIED D — DEFAULT ACCEPTABLE; CHANGE ONLY IF DESIRED
BOILER SETTINGS		
BOILER MODEL	Verify model number is correct	
WWSD TEMP	Default (70 °F) or as required	
HIGH ALTITUDE	Set to YES if above 5,500 feet	
INPUT/OUTPUT 1 (Assign to PRIORITY 1)		
WHAT IS THE USE OF INPUT/OUTPUT 1?	HEAT/DHW DEMAND	
WHAT PRIORITY IS INPUT #1?	Select PRIORITY 1	
WHAT SYSTEM TYPE IS INPUT/OUTPUT 1?	DHW (D)	
TARGET MODULATION SENSOR	BOILER OUT (D)	
TARGET ADJUST	NONE (D)	
MAX TARGET TEMP	D (or change if desired)	
RUN BOILER PUMP?	Yes (D)	
RUN AUX PUMP/OUTPUT?	D (not applicable)	
INPUT/OUTPUT 2 (Assign to PRIORITY 2)		
WHAT IS THE USE OF INPUT/OUTPUT 2?	HEAT/DHW DEMAND	
WHAT PRIORITY IS INPUT #2?	PRIORITY 2	
WHAT SYSTEM TYPE IS INPUT/OUTPUT 2?	Select correct system type	
TARGET MODULATION SENSOR	Boiler In (D)	
TARGET ADJUST	ODT (D) (Outdoor Temp sensor must be installed)	
MAX TARGET TEMP	D (or change if desired)	
MIN TARGET TEMP	D (or change if desired)	
OUTDOOR TEMP FOR MIN TARGET	D (or change if desired)	
OUTDOOR TEMP FOR MAX TARGET	D (or change if desired)	
TARGET BOOST TIME	D (or change if desired)	
RUN BOILER PUMP?	YES (D)	
RUN AUX PUMP/OUTPUT?	D (not applicable)	
INPUT/OUTPUT 3 (Not used)		
WHAT IS THE USE OF INPUT/OUTPUT 3?	NONE	
PRIORITY SWITCH TIMES:		
P1 MAX ON TIME	D (or change if desired)	
P2 MAX ON TIME	D (or change if desired)	
P2 MIN ON TIME	D (or change if desired)	
P3 MIN ON TIME	D (not applicable)	
INPUT/OUTPUT 4 (Not used)		
WHAT IS THE USE OF INPUT/OUTPUT 4?	NONE	
PRIORITY SWITCH TIMES:		
P1 MAX ON TIME	D (or change if desired)	
P2 MAX ON TIME	D (or change if desired)	
P2 MIN ON TIME	D (or change if desired)	
P3 MIN ON TIME	D (not applicable)	
Finish the WIZARD		
ENTER TIME, DATE AND MAINTENANCE INFORMATION AS PROMPTED		



EXPRESS SETUP – Example A (continued)

Multi-zone **SPACE HEATING** (Circulators with circulator relays) | **DHW** (Direct-piped)

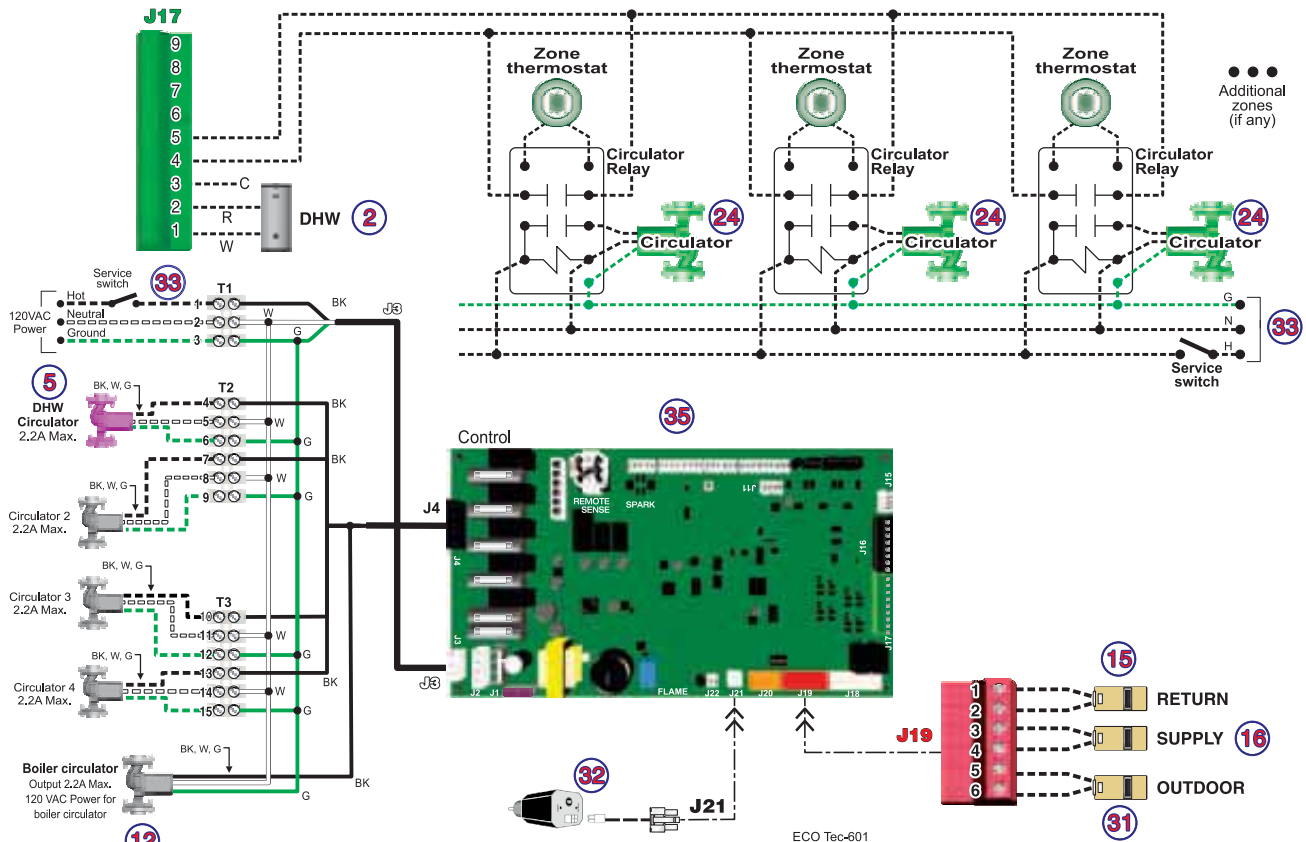
PIPING



LEGEND

- | | |
|---|---|
| 1 ■ ECO Tec boiler. | 14 Unions as needed for service. |
| 2 Indirect water heater, if used (domestic water piping not shown) — MUST be direct piped to boiler to use default control settings. | 15 Return temperature sensor. |
| 3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see Figure 8, page 13 for information. | 16 Supply temperature sensor. |
| 4 Relief valve piping to drain. | 20 Make-up water supply. |
| 5 DHW circulator. | 23 DHW Temperature and Pressure relief valve |
| 6 Isolation valves. | 24 Zone circulators. |
| 8 Expansion tank. | 25 ■ Boiler drain valve, supplied with boiler, field piped. |
| 9 Air separator. | 30 ■ Pressure/temperature gauge, supplied with boiler, field piped. |
| 10 Flow/check or spring check valves. | 31 Outdoor sensor. |
| 11 Purge/drain valves. | 33 120VAC power to boiler — see page 60. |
| | 35 Control module. |
- = Items supplied with boiler — all other items supplied by installer.

FIELD WIRING





EXPRESS SETUP – Example B

2- or 3- Zone **SPACE HEATING** (Circulators without circulator relays) | **DHW** (Direct-piped)

⚠ WARNING

Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

Incorrect setup or piping can result in severe personal injury, death or substantial property damage.

Use primary/secondary piping or equivalent unless system meets requirements on page 46.

Verify that the correct system type is selected on the control and that operating temperature settings are suitable for the system. System and structural damage can occur if temperatures are too high.

Purpose

- Space heating with multiple zones.
- Zoning with circulators using control outputs to operate zone circulators (3 zones if space heating only; or 2 space heating zones plus DHW).
- DHW piped directly to the boiler.
- DHW priority — space heating is disabled during call for heat from water heater.

Control setting notes

- See the table at right for required and optional settings.
- The sequence in the table follows the WIZARD.
- If not using the WIZARD, follow instructions elsewhere in this manual to enter the settings manually.

Circulators and piping

⚠ WARNING

Provide an external relay and external power to any circulator if its load rating exceeds 2.2 amps FLA, 3.6 amps locked rotor, or 16.4 amps in rush.

- Piping must be primary/secondary as shown.
- DHW circulator must be selected to handle the pressure drop through the water heater and piping. DHW circulator supplied by installer.
- For some large indirect water heaters, the required flow rate may require piping the water heater differently.
- The control settings in table at right provide DHW priority — space heating will be discontinued during a call for DHW.
- Zone circulators supplied by installer. For alternate zone wiring using a zone controller, see page 71.

BOILER

- Boiler circulator is installed internally within the boiler.
- Follow all instructions in this manual for piping boiler and system.

CONTROL SETTINGS
(IN ORDER OF WIZARD SEQUENCES)

BLACK OBLIQUE - VALUE MUST BE SET OR VERIFIED
D — DEFAULT ACCEPTABLE; CHANGE ONLY IF DESIRED

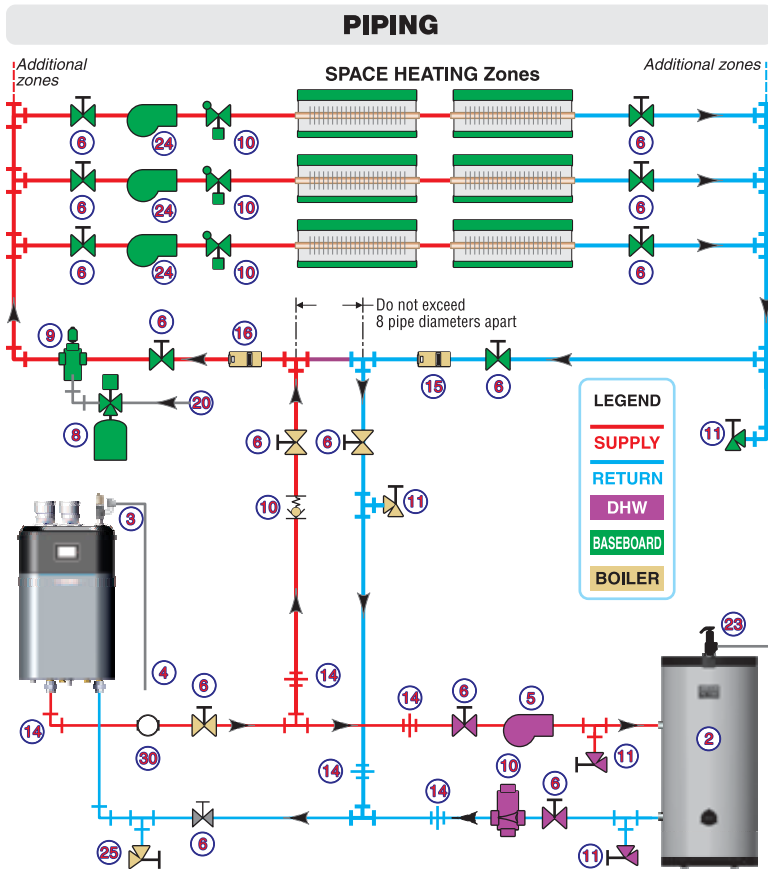
BOILER SETTINGS	
BOILER MODEL	Verify model number is correct
WWSW TEMP	Default (70 °F) or as required
HIGH ALTITUDE	Set to YES if above 5,500 feet
INPUT/OUTPUT 1 (Assign to PRIORITY 1) (Note 1)	
WHAT IS THE USE OF INPUT/OUTPUT 1?	HEAT/DHW DEMAND
WHAT PRIORITY IS INPUT #1?	Select PRIORITY 1
WHAT SYSTEM TYPE IS INPUT/OUTPUT 1?	DHW (D)
TARGET MODULATION SENSOR	BOILER OUT (D)
TARGET ADJUST	NONE (D)
MAX TARGET TEMP	D (or change if desired)
RUN BOILER PUMP?	Yes (D)
RUN AUX PUMP/OUTPUT?	D (not applicable)
INPUT/OUTPUT 2 (Assign to PRIORITY 2)	
WHAT IS THE USE OF INPUT/OUTPUT 2?	HEAT/DHW DEMAND
WHAT PRIORITY IS INPUT #2?	PRIORITY 2
WHAT SYSTEM TYPE IS INPUT/OUTPUT 2?	Select correct system type
TARGET MODULATION SENSOR	Boiler In (D)
TARGET ADJUST	ODT (D) (Outdoor Temp sensor must be installed)
MAX TARGET TEMP	D (or change if desired)
MIN TARGET TEMP	D (or change if desired)
OUTDOOR TEMP FOR MIN TARGET	D (or change if desired)
OUTDOOR TEMP FOR MAX TARGET	D (or change if desired)
TARGET BOOST TIME	D (or change if desired)
RUN BOILER PUMP?	YES (D)
RUN AUX PUMP/OUTPUT?	D (not applicable)
INPUT/OUTPUT 3 (Assign to PRIORITY 2)	
If PRIORITY 2 is assigned, no further steps are required. If PRIORITY 3 is assigned, repeat the steps from INPUT/OUTPUT 2, above.	
PRIORITY SWITCH TIMES:	
P1 MAX ON TIME	D (or change if desired)
P2 MAX ON TIME	D (or change if desired)
P2 MIN ON TIME	D (or change if desired)
P3 MIN ON TIME	D (not applicable)
INPUT/OUTPUT 4 (Assign to PRIORITY 2)	
If PRIORITY 2 is assigned, no further steps are required. If PRIORITY 3 is assigned, repeat the steps from INPUT/OUTPUT 2, above.	
Finish the WIZARD	
ENTER TIME, DATE AND MAINTENANCE INFORMATION AS PROMPTED	

Note 1: If DHW is not used, provide a fourth space heating zone by setting up INPUT/OUTPUT 1 exactly the same as INPUT/OUTPUT 2. Assign INPUT/OUTPUT 1 to PRIORITY 2. Wire the fourth zone thermostat to J17 – 1&2 and its circulator to T2 – 4, 5, 6.



EXPRESS SETUP — EXAMPLE B (continued)

2- or 3- Zone **SPACE HEATING** (Circulators without circulator relays) | **DHW** (Direct-piped)

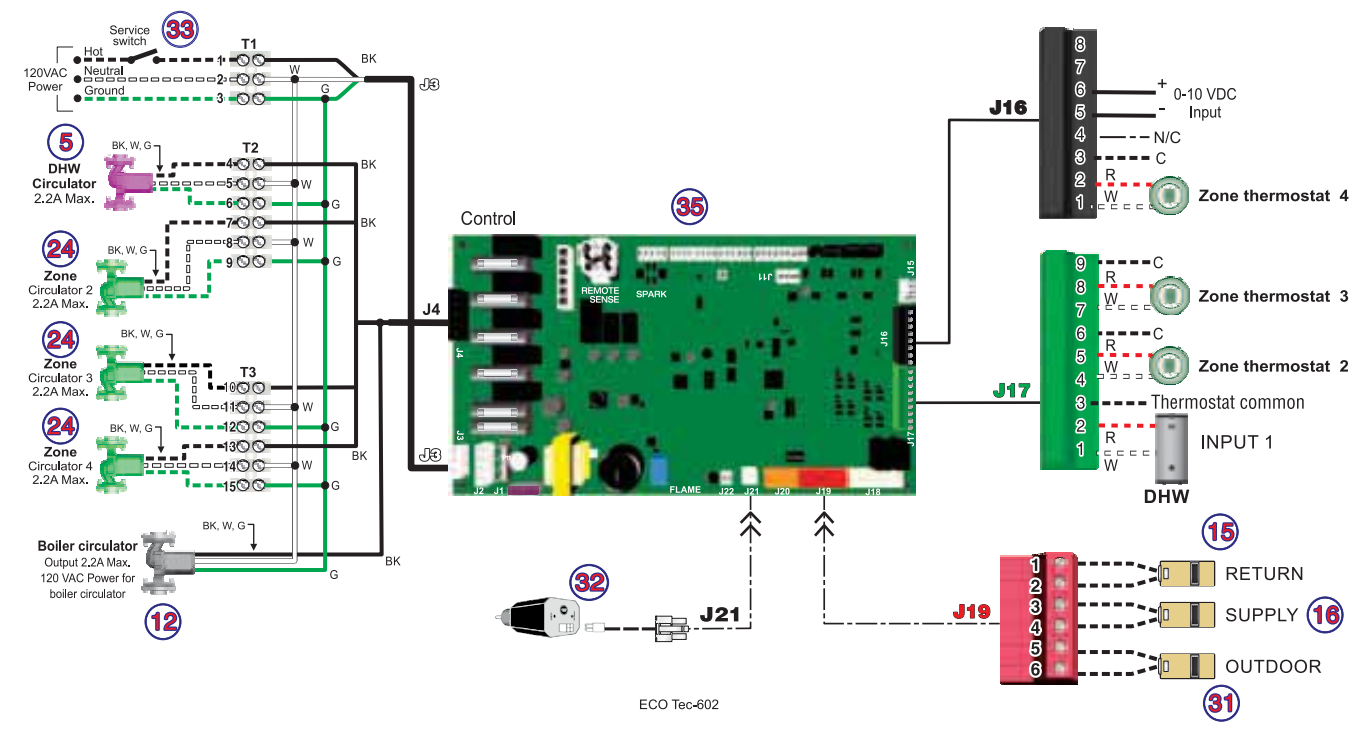


LEGEND

<p>1 ■ ECO Tec boiler.</p> <p>2 Indirect water heater, if used (domestic water piping not shown) — MUST be direct piped to boiler to use default control settings.</p> <p>3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see Figure 8, page 13 for information.</p> <p>4 Relief valve piping to drain.</p> <p>5 DHW circulator.</p> <p>6 Isolation valves.</p> <p>8 Expansion tank.</p> <p>9 Air separator.</p> <p>10 Flow/check or spring check valves.</p> <p>11 Purge/drain valves.</p>	<p>14 Unions as needed for service.</p> <p>15 Return temperature sensor.</p> <p>16 Supply temperature sensor.</p> <p>20 Make-up water supply.</p> <p>23 DHW Temperature and Pressure relief valve</p> <p>24 Zone circulators.</p> <p>25 ■ Boiler drain valve, supplied with boiler, field piped.</p> <p>30 ■ Pressure/temperature gauge, supplied with boiler, field piped.</p> <p>31 Outdoor sensor.</p> <p>33 120VAC power to boiler — see page 60.</p> <p>35 Control board</p>
--	---

■ = Items supplied with boiler — all other items supplied by installer.

FIELD WIRING





EXPRESS SETUP – Example C

Multi-zone SPACE HEATING (Zone valves) | DHW (Direct-piped)

⚠ WARNING

Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage. Incorrect setup or piping can result in severe personal injury, death or substantial property damage.

Use primary/secondary piping or equivalent unless system meets requirements on page 46.

Verify that the correct system type is selected on the control and that operating temperature settings are suitable for the system. System and structural damage can occur if temperatures are too high.

Purpose

- Space heating with multiple zones.
- Zoning with zone valves. **DO NOT** use 3-wire zone valves — the voltage on the valve end switch will damage the control. Use only 4-wire zone valves with isolated end switches.
- DHW piped directly to the boiler.
- DHW priority — space heating is disabled during call for heat from water heater.

Control setting notes

- See the table at right for required and optional settings.
- The sequence in the table follows the WIZARD.
- If not using the WIZARD, follow instructions elsewhere in this manual to enter the settings manually.
- The system circulator is wired to OUTPUT 2. It will be activated on any call for heat from a zone valve end switch.

Circulators and piping

⚠ WARNING Provide an external relay and external power to any circulator if its load rating exceeds 2.2 amps FLA, 3.6 amps locked rotor, or 16.4 amps in rush.

- Piping must be primary/secondary as shown.
- DHW circulator must be selected to handle the pressure drop through the water heater and piping. DHW circulator supplied by installer.
- For some large indirect water heaters, the required flow rate may require piping the water heater differently.
- The control settings in table at right provide DHW priority — space heating will be discontinued during a call for DHW.
- Zone valves and system circulator supplied by installer. For alternate zone wiring using a zone controller, see page 71.
- A by-pass pressure regulator is recommended when used in a zone valve system as shown in this express setup.

BOILER

- Boiler circulator is installed internally within the boiler.
- Follow all instructions in this manual for piping boiler and system.

Note 1: If DHW is not used, set the USE of INPUT/OUTPUT 1 to NONE. Keep all other wiring as shown at right and follow all settings given above for PRIORITY 2.

Note 2: For Combi models, INPUT/OUTPUT 1 and 4 are NOT used and Priority 1 is assigned to Combi DHW. Use INPUT/OUTPUT 2 and 3 and Priority 2 and 3 for this application.

CONTROL SETTINGS
(IN ORDER OF WIZARD SEQUENCES)

BLACK OBLIQUE - VALUE MUST BE SET OR VERIFIED
D — DEFAULT ACCEPTABLE; CHANGE ONLY IF DESIRED

BOILER SETTINGS

BOILER MODEL	Verify model number is correct
WWSW TEMP	Default (70 °F) or as required
HIGH ALTITUDE	Set to YES if above 5,500 feet

INPUT/OUTPUT 1 (Assign to PRIORITY 1)

WHAT IS THE USE OF INPUT/OUTPUT 1?	HEAT/DHW DEMAND
WHAT PRIORITY IS INPUT #1?	Select PRIORITY 1
WHAT SYSTEM TYPE IS INPUT/OUTPUT 1?	DHW (D)
TARGET MODULATION SENSOR	BOILER OUT (D)
TARGET ADJUST	NONE (D)
MAX TARGET TEMP	D (or change if desired)
RUN BOILER PUMP?	Yes (D)
RUN AUX PUMP/OUTPUT?	D (not applicable)

INPUT/OUTPUT 2 (Assign to PRIORITY 2)

WHAT IS THE USE OF INPUT/OUTPUT 2?	HEAT/DHW DEMAND
WHAT PRIORITY IS INPUT #2?	PRIORITY 2
WHAT SYSTEM TYPE IS INPUT/OUTPUT 2?	Select correct system type
TARGET MODULATION SENSOR	Boiler In (D)
TARGET ADJUST	ODT (D) (Outdoor Temp sensor must be installed)
MAX TARGET TEMP	D (or change if desired)
MIN TARGET TEMP	D (or change if desired)
OUTDOOR TEMP FOR MIN TARGET	D (or change if desired)
OUTDOOR TEMP FOR MAX TARGET	D (or change if desired)
TARGET BOOST TIME	D (or change if desired)
RUN BOILER PUMP?	YES (D)
RUN AUX PUMP/OUTPUT?	D (not applicable)

INPUT/OUTPUT 3 (Not used)

WHAT IS THE USE OF INPUT/OUTPUT 3?	NONE
------------------------------------	------

PRIORITY SWITCH TIMES:

P1 MAX ON TIME	D (or change if desired)
P2 MAX ON TIME	D (or change if desired)
P2 MIN ON TIME	D (or change if desired)
P3 MIN ON TIME	D (not applicable)

INPUT/OUTPUT 4 (Not used)

WHAT IS THE USE OF INPUT/OUTPUT 4?	NONE
------------------------------------	------

PRIORITY SWITCH TIMES:

P1 MAX ON TIME	D (or change if desired)
P2 MAX ON TIME	D (or change if desired)
P2 MIN ON TIME	D (or change if desired)
P3 MIN ON TIME	D (not applicable)

Finish the WIZARD

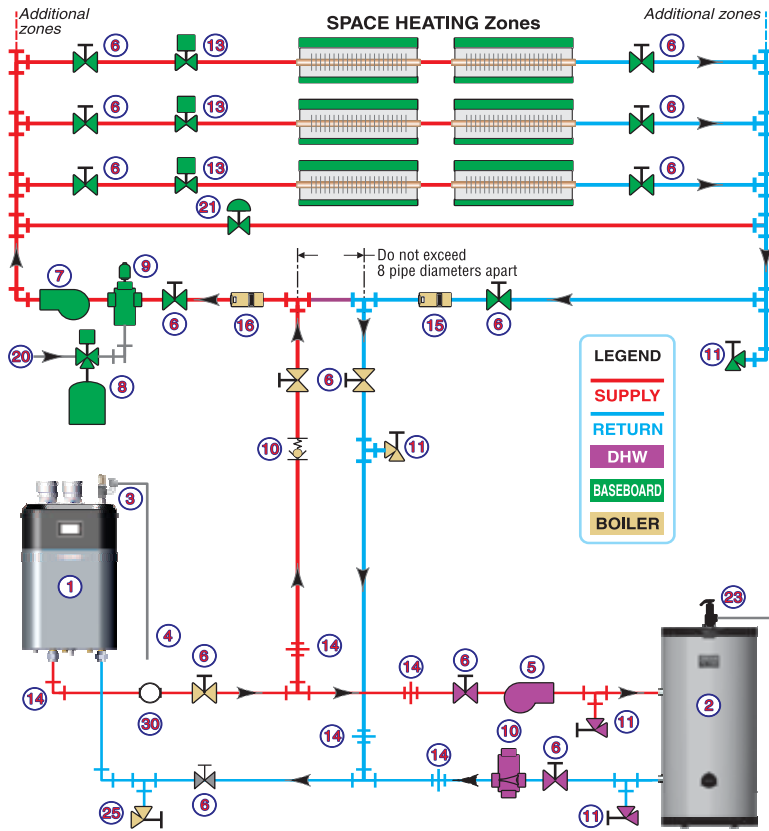
ENTER TIME, DATE AND MAINTENANCE INFORMATION AS PROMPTED



EXPRESS SETUP – EXAMPLE C (continued)

Multi-zone SPACE HEATING (Zone valves) | DHW (Direct-piped)

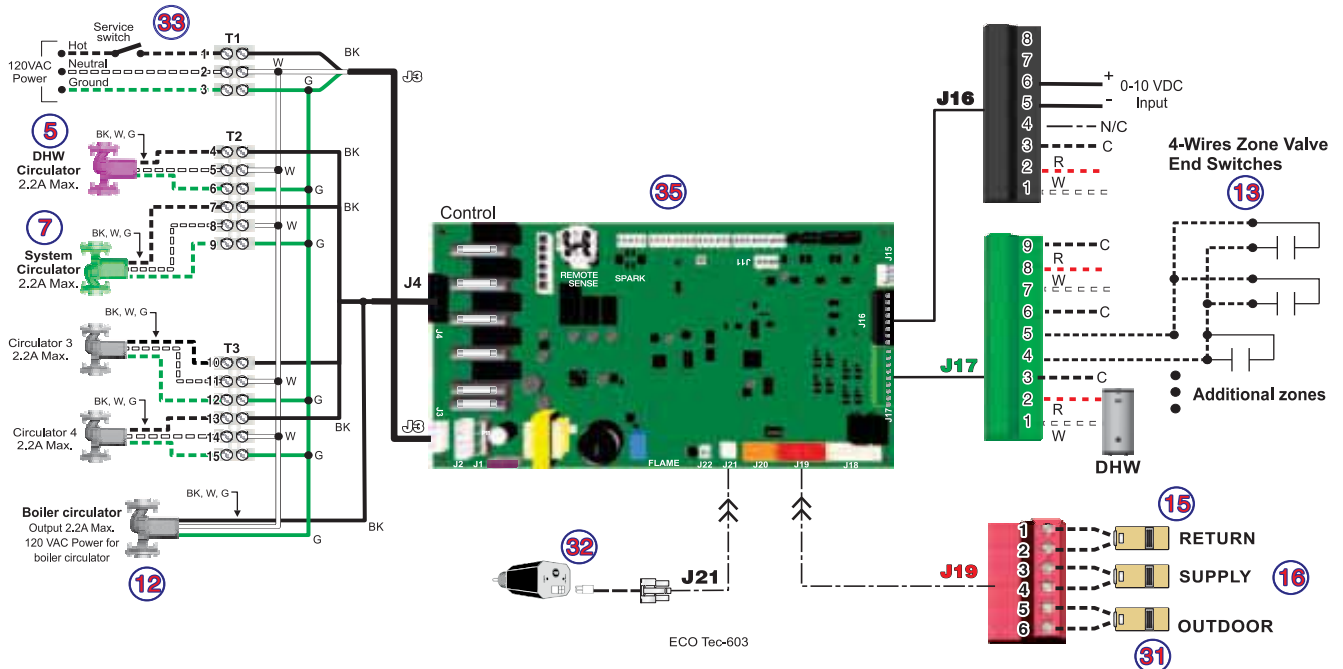
PIPING



LEGEND

- | | |
|---|--|
| 1 ■ ECO Tec boiler. | 14 Unions as needed for service. |
| 2 Indirect water heater, if used (domestic water piping not shown) — MUST be direct piped to boiler to use default control settings. | 15 Return temperature sensor. |
| 3 ■ Relief valve, supplied with boiler, field piped — MUST be piped to Boiler In connection — see Figure 8, page 13 for information. | 16 Supply temperature sensor. |
| 4 Relief valve piping to drain. | 20 Make-up water supply. |
| 5 DHW circulator. | 21 By-pass pressure regulator, REQUIRED for zone valve systems. |
| 6 Isolation valves. | 23 DHW Temperature and Pressure relief valve |
| 7 System circulator. | 25 ■ Boiler drain valve, supplied with boiler, field piped. |
| 8 Expansion tank. | 30 ■ Pressure/temperature gauge, supplied with boiler, field piped. |
| 9 Air separator. | 31 Outdoor sensor. |
| 10 Flow/check or spring check valves. | 32 Low water cut-off. |
| 11 Purge/drain valves. | 33 120VAC power to boiler — see page 60. |
| 12 ■ Boiler circulator, supplied with boiler, field piped. | 35 Control module. |
| 13 Zone valves. | |
- = Items supplied with boiler — all other items supplied by installer.

FIELD WIRING





Available control settings and system presets

Figure 77 ECO Tec Control / Priority settings

PRIORITY SETTINGS				
PARAMETER NAME	Range/ options	Default setting	COMBI default	UNITS
• ASSIGNED INPUTS	1, 2, 3, 4, 0-10V, FLOW	-	FLOW	-
• SYSTEM TYPE	See System Type Presets	OFF	1=COMBI DHW	-
• TARGET MODULATION SENSOR	SYSTEM SUPPLY, BOILER OUT, DHW OUT	SYSTEM SUPPLY if detected, Boiler Out if not	DHW OUT	-
• TARGET ADJUST	Outdoor Temp, 0-10V, none	Outdoor Temp (If attached)	None	-
• MAX TARGET TEMP	See System Type Presets	See System Type Presets	N/A	°F
• HOT WATER TEMP (COMBI ONLY)	See System Type Presets	N/A	120	°F
• MIN TARGET TEMP	See System Type Presets	See System Type Presets	N/A	°F
• COMBI ENABLED (COMBI ONLY)	ON, OFF	N/A	ON	-
• OUTDOOR TEMP FOR MIN TARGET	50 - 100	70	N/A	°F
• OUTDOOR TEMP FOR MAX TARGET	-20 to 49	0	N/A	°F
• VOLTAGE FOR MAX TARGET (TARGET ADJUST)	5.0 - 10.0	10.0	N/A	V
• VOLTAGE FOR MIN TARGET (TARGET ADJUST)	0.0 - 4.9	0.0	N/A	V
• TARGET BOOST TIME	OFF, 1 - 240	OFF	N/A	M
• SYSTEM SUPPLY OFF DIFF	5 - 15	10	N/A	°F
• DHW OFF DIFF	1 - 20	N/A	10	°F
• SYSTEM SUPPLY ON DIFF	5 - 30	10	N/A	°F
• DHW ON DIFF	1 - 20	N/A	1	°F
• MAX BOILER TEMP	See System Type Presets	See System Type Presets	See System Type Presets	°F
• BOILER OUT OFF DIFF	2 - 15	5	5	°F
• BOILER OUT ON DIFF	2 - 30	5	5	°F
• COLD START ERROR	0 - 150	50	50	°F
• MAX ON TIME	OFF, 1 - 240	30	30	M
• MIN ON TIME	OFF, 1 - 240	15	N/A	M
• PREHEAT MODE (COMBI ONLY)	OFF, Economy, High Performance	Economy	OFF	-
• PREHEAT TEMP (COMBI ONLY)	70 - 180	N/A	120 (Econ), 140 (H. Perf)	°F
• PREHEAT CIRC DIFF (COMBI ONLY)	1 - 30	N/A	30 (Econ), 10 (H. Perf)	°F
• PREHEAT ON DIFF (COMBI ONLY)	1 - 30	N/A	10 (Econ), 5 (H. Perf)	°F
• PREHEAT OFF DIFF (COMBI ONLY)	1 - 30	N/A	10	°F
• ECO BOOST (COMBI ONLY)	OFF, ON	N/A	ON	-
• ECO BOOST SETPOINT (COMBI ONLY)	70 - 180	N/A	130	°F
• ECO BOOST ON DIFF (COMBI ONLY)	1 - 30	N/A	10	°F



Available control settings and system presets

Figure 78 ECO Tec Control / Priority settings (continued)

PRIORITY SETTINGS				
PARAMETER NAME	Range/options	Default setting	COMBI default	UNITS
• ECO BOOST OFF DIFF (COMBI ONLY)	1 - 30	N/A	10	°F
• RUN BOILER PUMP	YES, NO	Yes	Yes	-
• RUN AUX/PUMP OUT	YES, NO	No	No	-
• PRE PUMP	OFF, 1 - 240	OFF	OFF	S
• POST PUMP	10	30	OFF	S
• MAXIMUM RATE	11 - 100	100	100	%
• MINIMUM RATE	10 - 99	10	10	%
• ADDITIONAL HEAT DEMAND ACT CONTACT	OFF, 1ST, 2ND, Outdoor Temperature	OFF	OFF	-
• RESPONSE TIME	OFF, 1 - 240	OFF	OFF	M
• TEMP DEPENDENT	YES, NO	NO	N/A	-
• OUTDOOR TEMP SETPOINT	0 - 50	15	N/A	°F
• ACT CONTACT BELOW SETPOINT	1st, 2nd	1st	N/A	-

Figure 79 System Type Presets (each option shown with factory settings)

System Type	8-Character Abbreviation	3-Character Abbreviation	Max Target Temp °F	DHW Target °F	OD Reset Min °F	Min Target Temp °F	OD Reset Max °F	Run Boiler Pump	Run AUX PUMP/ OUTPUT
Fan-coil	FAN-COIL	FCL	180	N/A	0	140	70	YES	YES
Finned Tube Baseboard	FIN BASE	FTB	180	N/A	0	130	70	YES	YES
Cast Iron Baseboard	IRONBASE	CIB	180	N/A	0	120	70	YES	YES
Cast Iron Radiators	RADIATOR	CIR	180	N/A	0	120	70	YES	YES
Radiant - slab on grade	RAD SLAB	RSG	120	N/A	0	80	70	YES	YES
Radiant - thin slab	RAD SLAB	RTS	140	N/A	0	80	70	YES	YES
Radiant - below floor (staple up)	RADFLOOR	RSU	160	N/A	0	90	70	YES	YES
Radiant - above floor (sleeper system)	RADFLOOR	RAF	140	N/A	0	90	70	YES	YES
Domestic Hot Water	DOMESTIC	DHW	180	N/A	N/A	N/A	N/A	YES	NO
Combi DHW	COMBI	DHW	N/A	120	N/A	N/A	N/A	YES	NO
Custom (user defined)	XXXXXXXX (user input)	first three of user input	180	N/A	0	70	70	YES	YES



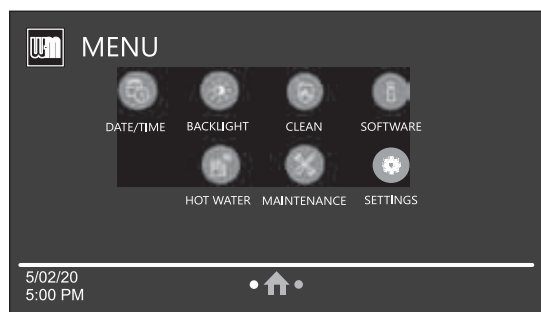
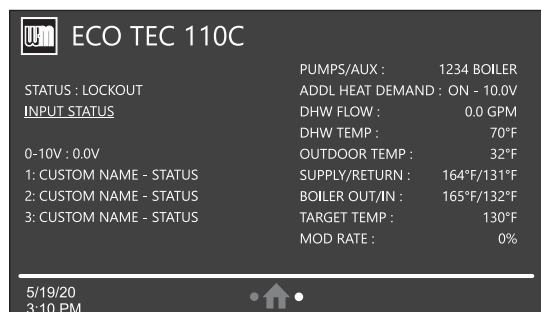
HOMEOWNER NAVIGATION menus

WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.



MENU Item	PURPOSE
HOMEOWNER SCREEN	<ul style="list-style-type: none"> • Banner info • Status image • Fault name and reset button • Time/Date • Navigation buttons – 2 dots and Home • Current temperature • Target Temperature (when a priority is active)
BOILER SETTINGS	<ul style="list-style-type: none"> • Status: Shows the current sequence of operation status with the active priority. • Input Status: Shows the current status of each call for heat. • 0-10v: Shows the current 0-10v input value from external device. • 1-4: Shows inputs 1 through 4, what they are assigned to, their custom names and their status. Input 4 will not show for Combi models. • Pumps/Aux: Shows which aux/pump outputs are currently active. • Additional Heat Demand: Shows whether AHD is off or on. Only appears if a priority is selected to use AHD. • DHW Flow: Shows the current flow rate of the Combi DHW in GPM. Only visible for Combi models. • DHW Temp: Shows the current temperature of the Combi DHW sensor. Only visible for Combi models. • Outdoor Temp: Shows the current outdoor temperature sensor value. Only visible if selected to use. • Supply/Return: Shows the current System Supply and System Return temperature. Only visible if selected to use. • Boiler Out/In: Shows the current Boiler Out and Boiler In temperatures. • Target Temp: Shows the current Target Temperature of the active priority. • Mod Rate: Shows the modulation rate of the boiler's blower motor.
DATE/TIME BUTTON	<ul style="list-style-type: none"> • Allows user to edit the current date and time.
BACKLIGHT	<ul style="list-style-type: none"> • Allows user to edit how bright the screen is during normal operation and when dormant.
CLEAN	<ul style="list-style-type: none"> • Locks the screen so nothing can be pressed for 10 seconds while the user cleans the screen.
SOFTWARE	<ul style="list-style-type: none"> • Displays the current software revisions of the control and display.
HOT WATER	<ul style="list-style-type: none"> • Allows the user to edit the Hot Water Temp of the Combi demand, as well as enable or disable PREHEAT mode or ECO BOOST.
MAINTENANCE INFO	<ul style="list-style-type: none"> • Allows the user to view contractor and maintenance information, as well as reset the maintenance reminder when present.
SETTINGS	<ul style="list-style-type: none"> • Allows the user to edit temperature units, screen timeout, daylight savings time and sound effect of presses.



Screens shown above are typical only. Actual screens depend on control settings chosen.

ECO Tec-002a-HN

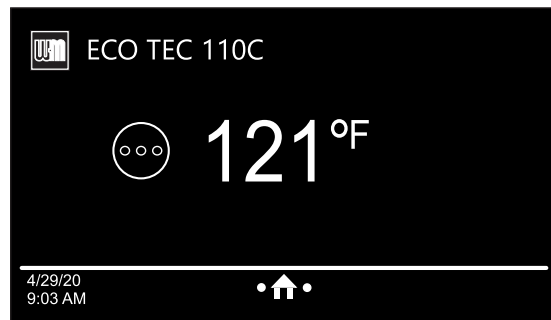


CONTRACTOR menus

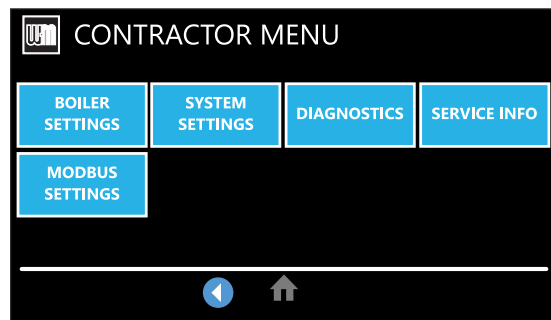
⚠WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 80 ECO Tec control menu access — accessing contractor menus



ECO Tec-001c



MENU Item	PURPOSE	More information
BOILER SETTINGS	<ul style="list-style-type: none"> Set/change boiler model, control type, high altitude setting, Outdoor Temp sensor requirement, manual reset high limit and WWSO temperature settings, outdoor sensor temp adjustment, circulator exercising, freeze protection setup, and restore to factory default option, fuel type and blower calibration. 	See page 88
SYSTEM SETTINGS	<ul style="list-style-type: none"> These settings assign Priority 1, 2 or 3 to each of the four inputs to the control and see an overview of assigned priorities. 	See page 91
DIAGNOSTICS	<ul style="list-style-type: none"> Use to review current and historical information including previous lockouts. 	See page 94
SERVICE INFO	<ul style="list-style-type: none"> Used to set contractor contact information, boiler information and maintenance dates. 	See page 96
MODBUS SETTINGS	<ul style="list-style-type: none"> Used to adjust Modbus related settings such as Baud Rate, Parity and Stop Bits, Modbus Address and turning Modbus on/off. 	

Screens shown above are typical only. Actual screens depend on control settings chosen.

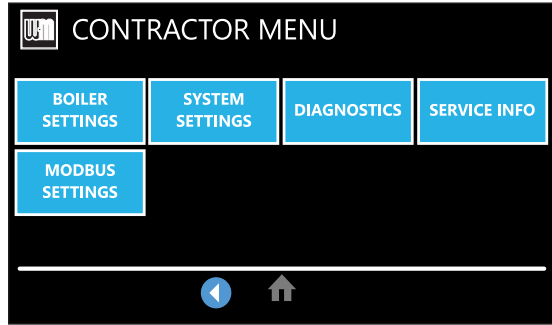


BOILER SETTINGS menu

⚠ WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

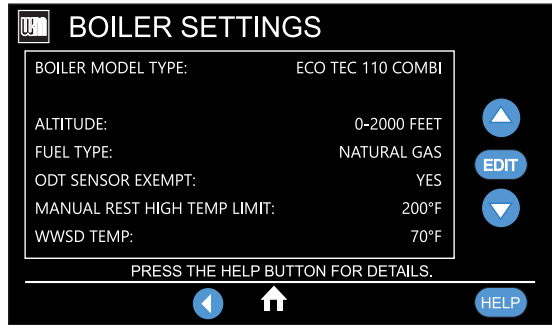
1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 81 ECO Tec BOILER SETTINGS options



MENU Item	DESCRIPTION
BOILER MODEL	<ul style="list-style-type: none"> • ⚠ WARNING MUST be set to correct model. • Check the boiler model against the model listed on the boiler's rating plate. Change the selection to the correct model if not. Also verify the model number on the ECO Tec control display at power-up. Failure to correct would result in severe personal injury, death or substantial property damage.
ALTITUDE	<ul style="list-style-type: none"> • Must be set correctly if altitude is greater than 2,000 feet. Settings in 500 -foot increments
FUEL TYPE	<ul style="list-style-type: none"> • ⚠ WARNING MUST be correct — Select between Propane and Natural gas is used. Follow screen instructions to change if necessary.
OUTDOOR TEMP SENSOR EXEMPT	<ul style="list-style-type: none"> • Select YES only if boiler is exempt from the requirement for outdoor reset operation stipulated in Section 303 of the 2007 Energy Act. See information provided elsewhere in this manual.
MANUAL RESET HIGH TEMP LIMIT	<ul style="list-style-type: none"> • If boiler outlet water temperature exceeds this temperature, the ECO Tec control will shut down the boiler and enter lockout. Changing this setting is NOT recommended.
WWSD TEMP	<ul style="list-style-type: none"> • WWSD stands for warm weather shut down. It means the boiler will not be allowed to fire if the outdoor temperature is greater than the WWSD setting. When the boiler is kept off because the outdoor temperature is above WWSD, the graphic display will show WWSD, and the boiler will remain in standby until the outdoor temperature drops below WWSD temperature. WWSD does not apply to DHW systems. The outdoor sensor must be installed to use this function.
ADJUST OUTDOOR	<ul style="list-style-type: none"> • Use this setting to calibrate the outdoor sensor when needed to compensate for variations in lead length or other factors that could affect total resistance in sensor circuit.
CIRCULATOR EXERCISING	<ul style="list-style-type: none"> • For each circulator, select whether you want the control to automatically start the circulator and run for 10 seconds for each 72-hour period of inactivity.
FREEZE PROTECT CIRCS	<ul style="list-style-type: none"> • This function automatically fires the boiler at low fire and starts the circulators chosen if the heat exchanger sensors detect a temperature less than 45 °F. Burner is turned on if temperature drops below 40 °F. Circulators and burner turn off when the temperature rises above 48 °F.
BLOWER CALIBRATION	<ul style="list-style-type: none"> • Use this function to re-calibrate the blower motor for optimal blower performance. NOTE: All calls for heat must be off and boiler must be in "Standby" to use this function.
RESET FACTORY DEFAULTS	<ul style="list-style-type: none"> • This screen has two options. RESTART WIZARD keeps all contractor information, time and date, run times and errors, and boiler model and allows the user to restart the wizard from the beginning. RESET FACTORY DEFAULTS clears all information from the control including model number and returns the control to a factory received state.

ECO Tec-001b



Screens shown above are typical only. Actual screens depend on control settings chosen.

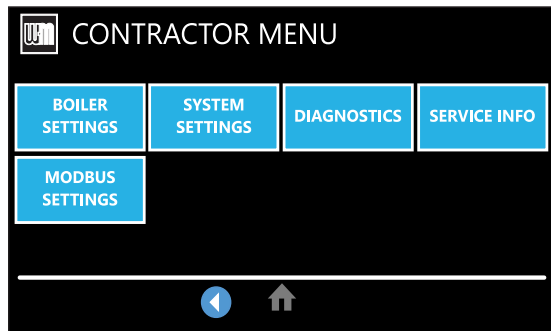


Priority Setting screens

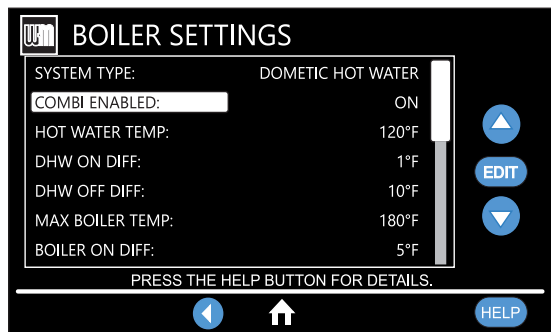
⚠ WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 82 ECO Tec PRIORITY options



ECO Tec-001d



Screens shown above are typical only. Actual screens depend on control settings chosen.

MENU Item	DESCRIPTION
SYSTEM TYPE	<ul style="list-style-type: none"> Select the system type for this PRIORITY, based on the heating terminal units in the system (see Figure 79, page 85). Use the CUSTOM selection to set the control for a different system type. The factory preset values for Max Target Temp, MIN TARGET TEMP, Outdoor Temp for Min Target and OUTDOOR TEMP FOR MAX TARGET are chosen based on the normal best setting for the terminal units.
TARGET MODULATION SENSOR	<ul style="list-style-type: none"> Choose SYSTEM SUPPLY or BOILER OUT to determine which will be the primary temperature sensor. The control will modulate boiler input to reach the TARGET temperature. (Default is SYSTEM SUPPLY only if sensor is attached.) If system sensors are not used, boiler defaults to using boiler outlet sensor in place of system sensor. NOTE: Not adjustable on Combi DHW priority.
TARGET ADJUST	<ul style="list-style-type: none"> Select how target temperature is calculated by control: NONE (no reset, fixed target temperature), 0-10V (target temperature based on analog input from remote source), Outdoor Temp (outdoor reset operation; default setting when an outdoor temperature sensor is attached). NOTE: Not adjustable on Combi DHW priority.
MAX TARGET TEMP	<ul style="list-style-type: none"> Set Max Target Temp to the required supply water temperature for the system at design maximum heat loss (typically 180 °F for finned tube baseboard on new installations.) NOTE: Not adjustable on Combi DHW priority.
MIN TARGET TEMP	<ul style="list-style-type: none"> MIN TARGET TEMP should equal the desired minimum supply water temperature for the system. This line is not shown on priorities configured as DHW system type or Heating system type, if outdoor temperature sensor not used. NOTE: Not adjustable on Combi DHW priority.
OUTDOOR TEMP FOR MIN TARGET	<ul style="list-style-type: none"> OUTDOOR TEMP FOR MIN TARGET is the outdoor temperature at which the target temperature reaches its minimum (MIN TARGET TEMP). This line is not shown on priorities configured as DHW system type or Heating system type, if outdoor temperature sensor not used. NOTE: Not adjustable on Combi DHW priority.
OUTDOOR TEMP FOR MAX TARGET	<ul style="list-style-type: none"> OUTDOOR TEMP FOR MAX TARGET means the outdoor temperature at which the target temperature reaches its maximum value (MAX TARGET TEMP). OUTDOOR TEMP FOR MAX TARGET should equal the Outdoor Temp (outdoor design temperature) for the installation's location. This line is not shown on priorities configured as DHW system type or Heating system type, if outdoor temperature sensor not used. NOTE: Not adjustable on Combi DHW priority.
VOLTAGE FOR MAX TARGET	<ul style="list-style-type: none"> Only appears if Target Adjust or Source for Input 2 is set to 0-10V. For Target Adjust, this sets the voltage at which Max Target Temp temperature is requested. For Source on Input 2, this sets the voltage that corresponds to Max Rate.

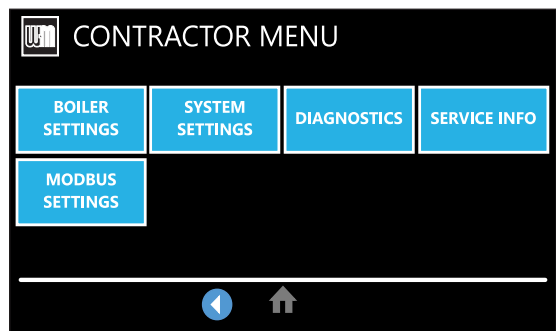


Priority Setting screens (continued)

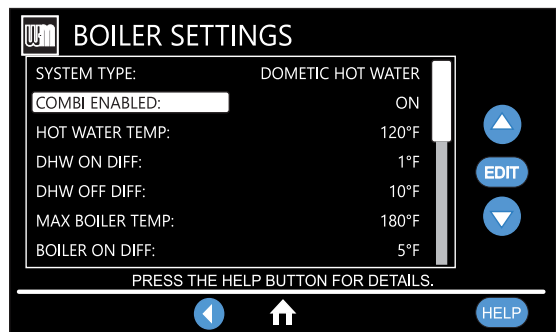
WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 83 ECO Tec PRIORITY options



ECO Tec-001d



MENU Item	DESCRIPTION
Voltage for Min Target	<ul style="list-style-type: none"> • Only appears if Target Adjust or Source for Input 2 is set to 0-10V. For Target Adjust, this sets the voltage at which Min Target Temp temperature is requested. For Source on Input 2, this sets the voltage that corresponds to Min Rate.
Cold Start Error	<ul style="list-style-type: none"> • At ignition, the difference between the Target temperature and the current temperature is compared to this value to decide the starting modulation rate once released to modulation. If the difference is less than or equal to this value the modulation rate will start at Min Rate. If it is greater than this value, the control will calculate a higher modulation starting rate.
Hot Water Temp	<ul style="list-style-type: none"> • Set target temperature to the required Combi water temperature for the application according to design with mixing valve.
Combi Enabled	<ul style="list-style-type: none"> • Select whether to enable or disable Combi functionality. • Disabling Combi functions will ignore DHW flow calls for heat and only allow Central Heat on inputs 2 & 3 to service calls for heat.
DHW On Diff	<ul style="list-style-type: none"> • The DHW Outlet temperature must fall below the Hot Water Temp minus this value in order to proceed to ignition.
DHW Off Diff	<ul style="list-style-type: none"> • If the DHW Outlet temperature exceeds the Hot Water Temp plus this value, the burner will shut off.
PREHEAT Mode	<ul style="list-style-type: none"> • Select the mode of PREHEAT, between Off, Economy and High Performance.
PREHEAT Temp	<ul style="list-style-type: none"> • Select the target temperature of the PREHEAT functionality. The boiler will drive to this temperature until PREHEAT Off Diff is achieved, or is interrupted by a call for heat. • PreHeat will end if Boiler Out and Boiler In exceed this temperature.
PREHEAT Circ Diff	<ul style="list-style-type: none"> • When in Standby, if the Boiler Out temperature falls below the PREHEAT Temp minus the PREHEAT Circ Diff, the boiler will activate the boiler circulator.
PREHEAT On Diff	<ul style="list-style-type: none"> • Temperature differential that is checked when Preheat starts due to temp falling below Circ Diff. Checks water temp to determine whether to stop Preheat or continue to turning on burner.
PREHEAT Off Diff	<ul style="list-style-type: none"> • While modulating on PREHEAT mode, if the Boiler Out temperature exceeds the PREHEAT Temp plus this value, the burner will shut off and PREHEAT mode will exit.
ECO BOOST	<ul style="list-style-type: none"> • Select whether or not to use the ECO BOOST feature. If conditions are met, the burner will continue to fire after Combi flow ends to recover temperature within the heat exchanger. • ECO Boost will end if Boiler Out and Boiler In exceed this temperature.
ECO BOOST Setpoint	<ul style="list-style-type: none"> • This setpoint is the temperature that will be driven to by the ECO BOOST.
ECO BOOST On Diff	<ul style="list-style-type: none"> • If a Combi DHW call for heat ends, the Boiler Out temperature is compared to the ECO BOOST Setpoint minus ECO BOOST On Diff. If below this value, the burner will continue to fire.
ECO BOOST Off Diff	<ul style="list-style-type: none"> • If firing due to ECO BOOST and the Boiler Out temperature exceeds the ECO BOOST Setpoint plus this value, the burner will shut off and ECO BOOST will end.

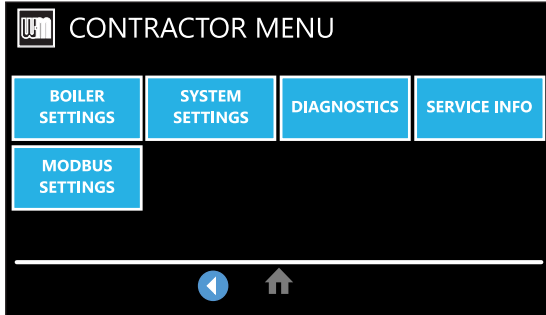


System Settings

WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

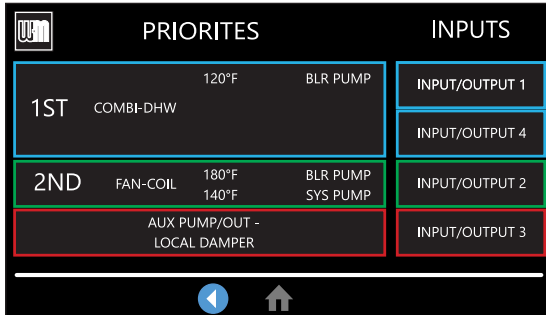
1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 84 ECO Tec Priorities and Inputs



MENU Item	DESCRIPTION
INPUTS	<ul style="list-style-type: none"> • Press on any of the Input squares to navigate to the Input assignment screen. Assign priorities to inputs and the source of Input 2. • Custom name will appear above Input/output # when a name is entered.
PRIORITIES	<ul style="list-style-type: none"> • Press on any of the Priorities buttons to navigate to that priority settings. • Each box displays from left to right: the priority number, system type, Max Target Temp on top of Min Target Temp (when used), and populates BLR Pump and/or SYS PUMP when selected to run these during that priority. The color of the box corresponds to the color of the Input/output #.

ECO Tec-001e



Screens shown above are typical only. Actual screens depend on control settings chosen.

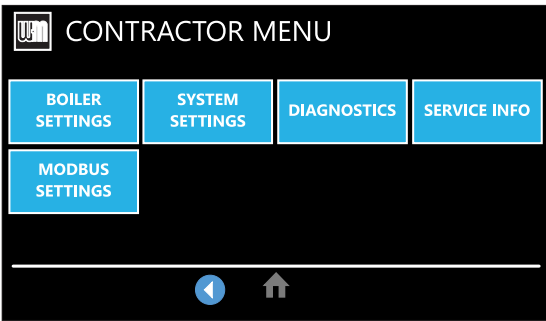


Configure Inputs and Outputs

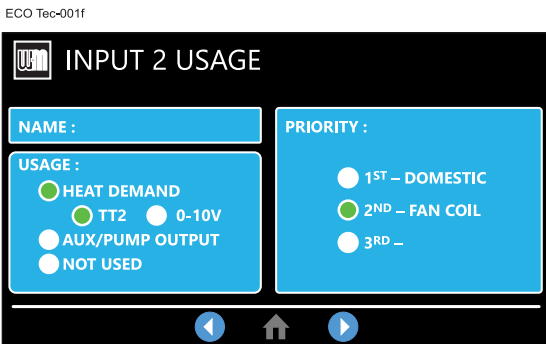
⚠ WARNING Boiler Model, Altitude and Fuel Type are critical settings. Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 85 Usage and Priorities



MENU Item	DESCRIPTION
NAME	<ul style="list-style-type: none"> • Give a name to the input/output you are assigning to help clarify the use of this priority for future reference.
USAGE	<ul style="list-style-type: none"> • Assign whether the input is used for a Heat Demand, Aux/pump output, or not used.
PRIORITIES	<ul style="list-style-type: none"> • Assign which priority this input is linked to.



Screens shown above are typical only. Actual screens depend on control settings chosen.



AUX Pump/Output

⚠WARNING **Boiler Model, Altitude and Fuel Type are critical settings.** Failure to set correctly could result in severe personal injury, death or substantial property damage.

1. Access contractor menus by pressing and holding the WM Logo for 7 seconds from the home screen.
2. See the following pages for explanations of control setting options.

Figure 86 AUX PUMP/OUTPUT operation

Option	Activation conditions	Suggested uses
ALWAYS ON	<ul style="list-style-type: none"> Output is always energized whenever the control is powered. 	<ul style="list-style-type: none"> Hot loop for seasonal boilers that are manually shut down at end of season and started up at start of heating season.
EXTERNAL SWITCH	<ul style="list-style-type: none"> The output is energized on closure of an external switch wired to this input and is de-energized when the external switch opens. 	<ul style="list-style-type: none"> Hot loop for boilers whose CH is manually shut down at end of season and started up at start of heating season, but remain available for local calls (DHW, etc.).
OUTDOOR BELOW WWSD	<ul style="list-style-type: none"> This output is energized only when outdoor temperature is below the WWSD setting (see BOILER SETTINGS menu). This setting is non-selectable if WWSD is set to OFF or Outdoor Temp is not connected at initial boiler power. If Outdoor Below WWSD is already chosen and WWSD is later set to OFF, Outdoor Below WWSD will behave as Always On. 	<ul style="list-style-type: none"> Hot loop for boilers whose CH is automatically shut down based on outdoor temperature (inferred heat loss), but remain on for local calls (DHW, etc.).
ANY INPUT	<ul style="list-style-type: none"> The assigned output is energized if there is an input closure on this boiler. The assigned output will de-energize once there are; no input on this boiler, post-purge has finished and post-pump time has expired. If the closed input is configured for a heat demand, its output will de-energize after post-purge and post-pump. 	<ul style="list-style-type: none"> Energize a system pump relay if pump must run during all heating calls.
INPUT PRIORITY SETTINGS	<ul style="list-style-type: none"> The assigned output is energized: <ul style="list-style-type: none"> If there is an input closure on this boiler. ... and ... RUN AUX PUMP/OUTPUT is set to YES for the priority assigned to the closed input. The assigned output will de-energize once there are no input closures on any of the network boilers, post-purge has finished, and post-pump time has expired. 	<ul style="list-style-type: none"> Energize a system pump relay if pump must run only on some heat calls (such as systems with locally-connected DHW heating).
SYSTEM DAMPER	<ul style="list-style-type: none"> The assigned output is energized when the boiler receives a call for heat and starts to pre-purge. The assigned output is de-energized once the burner is off and post-purge is complete. Activates if either this boiler or Additional Heat Demand is activated. 	<ul style="list-style-type: none"> Use for interlocking with combustion air damper, flow switch, etc.
LOCAL DAMPER	<ul style="list-style-type: none"> The assigned output is de-energized once the burner is off and post-purge is complete. Only activates if this boiler is attempting to fire. 	<ul style="list-style-type: none"> Use for interlocking with combustion air damper, flow switch, etc.

Figure 87 SYSTEM/LOCAL DAMPER operation – start, run and stop, based on boiler status

Option	Standby	TT Closed	Pre-Pump	Pre-Purge	Burner Running	Post-Purge	Post-Pump	Standby	Comments
ANY INPUT OR INPUT PRIORITY SETTINGS	off	ON	→				off	off	<ul style="list-style-type: none"> See Figure 86 for explanation of differences between the ANY TT INPUT options.
SYSTEM/LOCAL DAMPER	off	off	off	ON	→		off	off	



DIAGNOSTIC menu

Figure 88 DIAGNOSTICS menu

Menu/Item	Comment
Temperatures	
Status	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shut down, Trouble
Boiler Out1	Temperature of the first sensing element of the boiler's heat exchanger outlet sensor
Boiler Out2	Temperature of the second sensing element of the boiler's heat exchanger outlet sensor
DHW Out1	Temperature of the first sensing element of the boiler's Combi DHW outlet sensor
DHW Out2	Temperature of the second sensing element of the boiler's Combi DHW outlet sensor
Boiler In	Temperature of the boiler's heat exchanger inlet sensor
System Supply	Temperature of the system water after the boiler loop
System Return	Temperature of the system water returning to the boiler loop
Flue1	Temperature of the first sensing element of the boiler's flue gas sensor
Flue2	Temperature of the second sensing element of the boiler's flue gas sensor
Outdoor	Temperature of the remote outdoor air temperature sensor
Target Temperature	Current target temperature of the active priority.
Inputs	
Status	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shut down, Trouble
Input 1	Call for heat status on Input 1
Input 2	Call for heat status on Input 2 (Input 2 can be TT1 or 0-10VDC input)
Input 3	Call for heat status on Input 3
Input 4	Call for heat status on Input 4
0–10V	Voltage input for target adjust or modulation
Manual Limit	External manual limit on low voltage terminal strip
Auto Limit	External auto limit on low voltage terminal strip
Low Wtr Cutoff	Low water cutoff device (inside boiler jacket)
Air P-Switch	Limit device (inside boiler jacket) that will shut off the boiler if flue pressure becomes too high
Closure Switch	J18 jumper circuit closed or open (flow switch, CAD, etc.)
Blower Speed	Feedback from blower
Flame Signal	Number indicating the presence and quality of the flame used to shut down or boost the boiler
DHW Flow	Approximate gallons per minute water flow passing through the Combi brazed plate.
Outputs	
Status	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shut down, Trouble
Gas Valve	Control's gas valve circuit status
Circulator 1	Control's circulator 1 relay status
Circulator 2	Control's circulator 2 relay status
Circulator 3	Control's circulator 3 relay status
Circulator 4	Control's circulator 4 relay status
Boiler Circ	Boiler's circulator
Blower Signal	Control's signal controlling the blower speed
Additional Heat Demand	Additional heat demand contact status
Alarm	Alarm contact status



DIAGNOSTICS menu (continued)

Figure 89 DIAGNOSTICS menu (continued)

Menu/Item	Comment
Run Times	
Burner Time	Displays cumulative time the burner has been active (can be increased by user)
Input 1 Time / DHW Time	Displays cumulative time that Input 1 has been closed (Changes to DHW Time for Combi models).
Input 2 Time	Displays cumulative time that Input 2 has been closed (Or 0-10V ≥ 1 volt)
Input 3 Time	Displays cumulative time that Input 3 has been closed
Input 4 Time / PREHEAT Time	Displays cumulative time that Input 4 has been closed, changes to PREHEAT Time for Combi models, if configured for PREHEAT.
Ignition Count:	Displays total number of successful ignitions
Last 5 Proof of Ignition:	Displays last 5 Proof of Ignition flame valves read by the control
Last 5 Stabilization:	Displays last 5 Stabilization flame valves read by the control
Last Factory Reset:	Shows the time/date stamp of the of the last factory reset performed
Last Power Cycle:	Shows the time/date stamp of the last known power cycle
TO RESET ALL HISTORY COUNTERS TO ZERO:	To reset all history counters to zero: Enter the FAULT HISTORY menu. Then press the reset button. This will cause ALL history to be deleted. To maintain history, set counters individually.
FAULT HISTORY	
Ignition Retries	Displays cumulative ignition attempts. It is recommended that his be reset during yearly maintenance by selecting this line and pressing the Reset button
Manual Reset Cnt	Displays number of manual reset lockouts since last cleared
Auto Reset Cnt	Displays number of auto reset lockouts since last cleared
Lockout History 1 - 6	Choose this to view the second most recent error recorded
Fault Type	Displays the type of fault that occurred
Time	Displays time that lockout occurred
Date	Displays date that lockout occurred
Status	Displays what the status of the boiler was at the time of the error
Temperatures	Choose this to view the Boiler Temperatures at the time of the error
Inputs	Choose this to view the status of the Boiler Inputs at the time of the error
Outputs	Choose this to view the status of the Boiler Outputs at the time of the error
Manual Test Mode	
Status	Current operating status of the boiler. Prepurge, Ignition, Name of the system Type being satisfied, post purge, Warm Weather Shut down, Trouble
Inputs	Displays which inputs are presently calling for heat
Target Temp	Calculated target temperature based on outdoor temp or the max target if no ODR
Modulation	Displays what sensor the boiler is using to modulate from. May also indicate reason for boiler rate self-limiting.
Boiler Out	Temperature of the outlet sensor on the boiler heat exchanger
Boiler In	Temperature of the inlet sensor on the boiler heat exchanger
System Supply	Temperature of the system water after the boiler loop
System Return	Temperature of the system water returning to the boiler loop
Flue	Temperature of flue gases
Outdoor	Temperature of outdoor air
Blower Signal	Control's signal controlling the blower speed
Blower Speed	Blower's feedback to the control
Flame Signal	Number indicating the presence and quality of the flame used to shut down or boost the boiler
DHW Out/Flow	Temperature of the boiler's DHW outlet sensor and approximate flow in gallons per minute passing through the Combi brazed plate
Force Rate	Used to manually force a rate during a call for heat. Choose auto for normal operation
Manual Reset	Reset selected condition



SERVICE menus

Figure 90 SERVICE menus – navigation

Service Info	Comment
Name	Contractor name to appear in maintenance reminders and during lockouts
Phone	Contractor phone number
Model	Displays the boiler model selected in the boiler setup
CP Number	Enter the CP# of the boiler
Installed	Enter the date the boiler was installed
Last Maintenance Performed	Date automatically entered when Reset Reminder is chosen by contractor
Next Maintenance Due	Date automatically calculated when Reset Reminder is selected by contractor
Interval Settings	Contractor selects maintenance reminder frequency based on service history
Reset Reminder	Contractor selects this to update Last maintenance Date and Next Date. Homeowner uses this to ignore the reminder and update only the Next Date.
Last Calibration Date	Displays date of last calibration performed.

SERVICE INFO

Use this section to enter contractor’s information, Consumer Protection (CP) number, install date and to enter an automatic notice for maintenance (default is 12 months). Because this shows on the display, it is an automatic means of notifying the homeowner of need for scheduled maintenance by the technician. Select RESET REMINDER to reset for the next maintenance date.



Startup – fill the system

Clean system to remove sediment

1. The system must be thoroughly flushed (without boiler connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.
2. For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
3. Flush system until water runs clean and piping is free of sediment.

⚠ WARNING

Do not use petroleum-based cleaning or sealing compounds in boiler system. Damage to elastomer seals and gaskets in system could occur, resulting in substantial property damage.

Before filling the boiler and system with water, verify the following. **DO NOT fill with softened water.** Boiler corrosion can occur.

Failure to comply could result in boiler failure or unreliable operation.

Water chemistry

Water pH between 7.0 and 8.5

1. Maintain boiler water pH between 7.0 and 8.5. Check with litmus paper or have chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains

1. Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chloride concentration must be LESS THAN 200 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chloride levels are typically less than 5 ppm.
2. Do not use the boiler to directly heat swimming pool or spa water.
3. Do not fill boiler or operate with water containing chloride in excess of 200 ppm.

⚠ WARNING

Verify that the water chemistry meets the limitations and requirements of all other equipment in the system.

Antifreeze and Correct Dosage Amount

Use only antifreeze listed by Weil-McLain as suitable for use with **ECO Tec** Gas Boilers. See Figure 125, page 137 for information to obtain antifreeze through a Weil-McLain distributor.

1. Determine the freezing temperature needed (to protect against lowest likely temperature the system water will encounter).
2. Find the antifreeze concentration by volume needed for this temperature from the antifreeze manufacturer's data on the antifreeze container.
3. Add up the volume (gallons) of all system piping and components, including the expansion tank and boiler.
 - a. Boiler water content is listed in Figure 138, page 149.
 - b. Remember to include expansion tank water content.
4. Multiply this volume by the (percent) antifreeze needed to find the number of gallons of antifreeze to add.

Fill and test water system

1. Fill system only after ensuring the water meets the requirements of this manual.
2. Close manual and automatic air vents and boiler drain valve.
3. Fill to correct system pressure. Correct pressure will vary with each application.
 - a. Typical cold water fill pressure for a residential system is 12 psi.
 - b. Pressure will rise when boiler is turned on and system water temperature increases. Operating pressure must never exceed 24 PSIG.
4. For combi models only, purge domestic water up to cold water inlet by flushing water out the drain valve (Figure 54, page 44, Item #3). Once flushing is complete, allow water to flow through boiler's internal domestic water circuit by opening a faucet. Ensure proper flow rate is obtained. If the flow rate through several faucets seem reduced, remove and clean internal combi filters located in the Domestic Water's Return Manifold; see page 134 under section **Cleaning & Maintenance for Domestic Water Inlet Manifold**.
5. At initial fill and during boiler startup and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

⚠ WARNING

Eliminate all system leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure.

Purge air from water system

1. Connect a hose to the purge valve (see purge/drain valves, Item 11, in piping diagrams beginning on page 44). Route hose to an area where water can drain and be seen.
2. Close the boiler or system isolation valve between the purge valve and fill connection to the system.
3. Close zone isolation valves.
4. Open quick-fill valve on cold water make-up line.
5. Open purge valve.



Startup – fill the system (continued)

Freeze protection (if used)

▲WARNING Follow these guidelines to prevent possibility of severe personal injury, death or substantial property damage:

Use only the products listed by Weil-McLain for use with this boiler. See page 137 for information.

Thoroughly flush any system that has used glycol before installing the new boiler.

Review the material safety data sheets (MSDS) are available online. The MSDS contains information on potential hazards and first aid procedures for exposure or ingestion.

Check antifreeze inhibitor level at least annually. Glycol concentration and inhibitor levels may change over time. Add antifreeze to increase concentration if necessary. Add inhibitor as needed to bring to acceptable level, using inhibitor test kit to verify.

In addition to antifreeze and inhibitor, use and maintain minimum level of Sentinel X100 inhibitor as directed on this page.

If using freeze protection fluid with automatic fill, **install a water meter to monitor water make-up.** Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

DO NOT exceed 50% antifreeze by volume. Antifreeze moves more sluggishly than water and can interfere with heat transfer. At antifreeze concentrations higher than 50%, sludge can develop in the boiler, potentially causing damage to the heat exchanger.

Clean the system before filling. Always drain and flush the system thoroughly before filling with antifreeze. Sludge, iron oxide deposits and other sediment in the system inhibit flow and can cause rapid breakdown of inhibitors.

Use only antifreeze recommended by Weil-McLain.

NOTICE Weil-McLain provides information for application of the antifreeze products listed in this document only for use in Weil-McLain boilers. Do not apply these products or instructions for other applications. Local codes may require a backflow preventer or actual disconnection from city water supply.

6. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the air. Run until no noticeable air flow is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged. Follow the same procedure to purge air from the boiler and its internal piping.
7. Close the quick-fill water valve and purge valve and remove the hose. Open all isolation valves. Watch that system pressure rises to correct cold-fill pressure.
8. After the system has operated for a while, eliminate any residual air by using the manual air vents located throughout the system.
9. If purge valves are not installed in system, open manual air vents in system one at a time, beginning with lowest floor. Close vent when water squirts out. Repeat with remaining vents.
10. Open automatic air vent (diaphragm-type or bladder-type expansion tank systems only) one turn.
11. Starting on the lowest floor, open air vents one at a time until water squirts out.
12. Repeat with remaining vents.
13. Refill to correct pressure.

▲WARNING X100 inhibitor is required

1. It is required that the **ECO Tec** boiler have Sentinel X100 added to the system to prevent damage to the boilers' heat exchanger. See Replacement Parts section at the end of this manual for ordering information.
2. After filling the system as directed in these instructions, use a caulking gun to inject the X100 inhibitor concentrate into the system, or fill with the X100 in its liquid form, following the instructions on the tube or container.
3. After adding the inhibitor to the system, allow time for the water to circulate and mix. Then check the inhibitor level. Add additional inhibitor if necessary.
4. See separate instructions or Weil-McLain website for suggested guidelines to determine how much inhibitor to use.

Check/verify water chemistry

1. The system may have residual substances that could affect water chemistry.
2. After the system has been filled and leak tested, verify water pH and chloride concentrations are acceptable.
3. Test the pH of a sample of system water at least annually. The pH of the water mixture must be between 7.0 and 8.5. (Or use the Sentinel inhibitor test kit to check concentration.)
4. If pH is outside this range (or inhibitor test kit indicates low level), the inhibitor level may not be sufficient to prevent corrosion.
5. Verify and test antifreeze concentration, if used.

▲WARNING Test antifreeze concentration at least annually. If concentration is low, add antifreeze or drain system and refill with correct mixture.

6. Follow instructions on antifreeze container to determine the amount of antifreeze needed. **DO NOT** exceed 50% by volume concentration of antifreeze.
7. Follow the instructions on the Sentinel test kit to sample the system water and verify inhibitor concentration.
8. Check inhibitor level after adjustments are made. Check concentration annually.

Startup – final checks

⚠️WARNING Check for gas leaks

Before starting the boiler, and during initial operation, use a leak detector or smell near the floor and around the boiler for gas odorant or any unusual odor. Remove boiler jacket door and smell the interior of the boiler jacket. **Do not proceed with startup if there is any indication of a gas leak. Repair any leak at once.**

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

Propane boilers only — Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

Check thermostat circuits

1. Disconnect wires connected to the **Input 1, Input 2, Input 3 and Input 4** thermostat terminals (see Field wiring, beginning on page 58 for low voltage terminal locations and application information). Mark the wires before removing to avoid wiring errors when re-connecting them
2. Close each thermostat, zone valve and/or relay in the external circuit one at a time and check the voltmeter reading at each wire to a ground to ensure no voltage is being feed back into the boiler's control module.
3. **There should NEVER be a voltage reading when external device is closed.**
4. If a voltage reading is measured on the incoming wires, check and correct the external wiring.

⚠️WARNING **DO NOT connect the thermostat terminals to 3-wire zone valves.** This could cause control damage.

5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires.

Inspect/fill condensate system

Inspect/check condensate lines and fittings

Inspect the condensate drain line, condensate PVC fittings and condensate trap. (See page 56 for component locations.)

Fill condensate trap with water

1. Remove test port cap on vent adapter (see Figure 91).
2. Pour one cup full of clean water into test port.
3. Ensure condensate trap filled with water.
4. Reinstall test port cap on vent adapter.

Figure 91 Remove test port cap on vent adapter



⚠️WARNING The condensate trap must be filled with water during all times of boiler operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.



Startup – final checks (continued)

Final checks before starting boiler

- Read the instructions to adjust and set up the control.
- Verify that the boiler model is set correctly in the control, and that it displays correctly.
- Verify that the boiler and system are full of water and all system components are correctly set for operation.
- Verify that condensate trap is filled with water.
- Verify electrical connections are correct, securely attached, and sealed at cabinet openings.
- Inspect vent piping and air piping for signs of deterioration from corrosion, physical damage or sagging. Verify air piping and vent piping are intact and correctly installed per this manual.

To start the boiler

1. Apply power to the boiler via the field installed service switch.
2. Follow the Operating Instructions, Figure 92, page 101.
3. If this is the first time powering the boiler, please refer to the Control section of this manual starting on page 72. The control will prompt installer to go through our Wizard menu setup. Please complete the Wizard setup and ensure all connected sensors are detected and the correct boiler model is identified. If not, determine the cause and correct before proceeding.

If boiler does not start correctly

1. Check for loose connections, blown fuse or service switch off.
2. Are external limit controls (if used) open? Is boiler water temperature above 200°F?
3. Are the closure switch contacts open?
4. Are thermostats set below room temperature?
5. Is gas turned on at meter and boiler?
6. Is incoming gas pressure less than the minimum values given on page 19?
7. Are control settings correct for the application?
8. Is the warm weather shutdown activated?
9. If none of the above corrects the problem, refer to Troubleshooting, beginning on page 114.

Check system and boiler

Check water piping

1. Check system piping and DHW piping (Combi models only) for leaks. If found, shut down boiler and repair immediately. (See WARNING on pages 97 and 98 regarding failure to repair leaks.)
2. Vent any remaining air from system using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.

Check vent piping and air piping

1. Check for gas-tight seal at every connection and seam of air piping and vent piping.

WARNING Venting system must be sealed gas-tight to prevent flue gas spillage and carbon monoxide emissions which will result in severe personal injury or death.

Check gas piping

Check around the boiler and inside the boiler jacket for gas odor following the procedure of page 57 of this manual.

WARNING If you discover evidence of any gas leak, shut down the boiler at once. Find the leak source with bubble test and repair immediately. Do not start boiler again until corrected. Failure to comply could result in severe personal injury, death or substantial property damage.

Propane boilers — verify conversion

Verify boiler has been converted for propane. See page 14 for ECO Tec 80, 110, 150 or 199.

WARNING **DO NOT attempt to measure gas valve outlet pressure**

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment.

Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death or substantial property damage.

Boilers are shipped ready to operate on natural gas ONLY.

Failure to comply could result in severe personal injury, death or substantial property damage.

Check flame & combustion with instruments

1. Initiate a call for heat on one of the thermostat inputs.
2. Access the control installer menus by pressing and holding the WM logo on the top left for 5 seconds while in the middle "Homeowner" screen.
3. Make sure the Max firing rate is set to the maximum given in Figures 98 and 99, pages 110 and 111. If not, adjust as necessary. Then navigate to DIAGNOSTICS — Manual test mode (see Figure 89, page 95) and force the firing rate to HIGH (high fire).
4. Look at the flame through the flame inspection window. The high fire flame should be blue and should be stable. The burner surface should be covered with orange dots.
5. **Insert combustion analyzer probe** — Remove the test port cap from the vent flue adapter and insert a combustion test probe.
6. Test for CO₂ (or O₂) and for CO. The CO₂ values must comply with Figure 94, page 103. If results are acceptable, proceed to step 7. **IF NOT**, follow the instructions under the "Gas Valve Adjustment" section on page 102 or page 103 to set the throttle screw and offset regulating screw position. See **WARNING** on page 102 upper left.

CONTINUED AFTER NEXT PAGE



Startup – final checks (continued)

Figure 92 Operating instructions (WARNING -Verify that the control is set for the correct boiler model before proceeding.)

FOR YOUR SAFETY — READ BEFORE OPERATING



WARNING If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. Before OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor. See below.
- C. Use only your hand to toggle the switch and/or turn the manual gas valve. If the switch or valve will not move by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

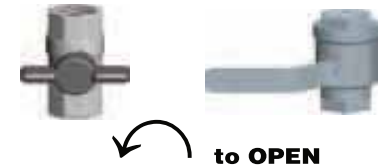
OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. Set room thermostat(s) to lowest setting.
3. Turn OFF all electrical power to the appliance.
4. Toggle the switch located on Boiler's internal automatic gas valve to the "off" position.
5. Locate boiler manual gas valve (in the gas piping connected to the boiler).
6. Turn boiler manual gas valve handle counterclockwise ↺ to OPEN gas supply.
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor.
8. If you smell gas, **STOP!** Turn the boiler manual gas valve to OFF. Then follow WHAT TO DO IF YOU SMELL GAS, above. If you don't smell gas, go to step 9, below.
9. Turn ON all electrical power to the appliance including the switch located on Boiler's internal automatic gas valve.
10. Set thermostat(s) to desired setting.
11. The boiler display will show symbols and/or text describing the status of the boiler as it proceeds through its operating sequence. "Standby" status means the burner is off.
12. If the appliance will not operate when there is a call for heat and piping is not hot, follow the instructions "To Turn Off Gas To Appliance" below and call your service technician or gas supplier.

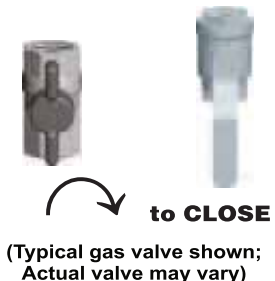


(Off Position Shown)

Gas valve CLOSED



Gas valve OPEN



TO TURN OFF GAS TO THE APPLIANCE

1. Set room thermostats to lowest setting.
2. Turn OFF all electrical power to the appliance including the switch located on Boiler's internal automatic gas valve.
3. Turn boiler manual gas valve knob clockwise ↻ to close gas supply.

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Startup – final checks (continued)

⚠WARNING If combustion at either high or low fire is outside the range given in Figure 95, page 105, follow the procedure given on this page or page 105 for adjusting the gas valve. If adjustment does not correct the problem, then shut down the boiler and contact your local Weil-McLain representative. The gas valve adjustment must be done only by a qualified technician, using calibrated test instruments. Failure to comply could result in severe personal injury, death or substantial property damage.

7. Measure natural gas input:
 - a. Operate boiler 10 minutes. Turn off other appliances.
 - b. At natural gas meter, measure time (in seconds) required to use one cubic foot of gas.
 - c. Calculate gas input:

$$\frac{3600 \times 1000}{\text{number of seconds from step b}} = \text{Btuh}$$

- d. Btuh calculated should approximate input rating on boiler rating label.
8. Use the control display to navigate to Manual test mode (see Figure 89, page 95) and force the firing rate to LOW (low fire).
9. Look at the flame through the flame inspection window. The low fire flame should be stable and evenly distributed over burner surface with a uniform orange color.
10. Repeat the combustion test as instructed in the previous steps.
11. Use the control display to navigate to Manual test mode (see Figure 89, page 95) and force the firing rate to AUTO (normal operation).
12. Reinstall the vent flue cap and ensure its sealed.

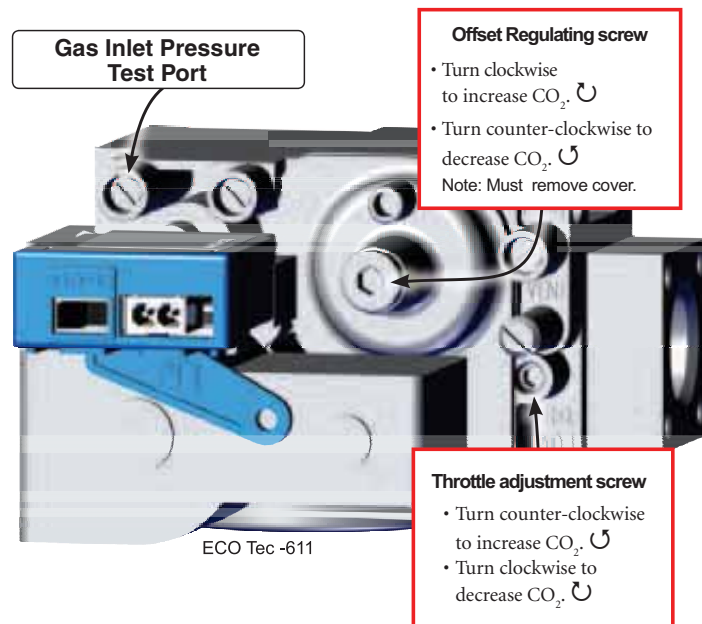
⚠WARNING You must reinstall the vent flue cap to prevent flue gas spillage into the boiler enclosure. Failure to comply could result in severe personal injury, death or substantial property damage.

Gas Valve Adjustment

⚠WARNING **DO NOT** attempt to adjust the throttle or offset screw unless done by a qualified technician, and with the use of calibrated combustion test instruments. Adjust the throttle or offset screw only as needed to meet the combustion values given in Figure 94, page 103. Must confirm correct low fire RPM before making any adjustments to Offset regulating screw.

1. Throttle screw adjustment is **only necessary** if specified elsewhere in this manual or if combustion tests indicate the need, as explained under “**Check flame & combustion with instruments,**” page 100.
2. Boiler behavior that might indicate a need to check combustion values at high fire (as per page 100) to verify boiler is in adjustment include: difficulty igniting, poor flame stability at low fire, combustion noise or high carbon monoxide values.
3. Combustion readings must be taken at both high fire and low fire. **DO NOT** attempt an adjustment of the throttle screw at low fire.
 - See Figure 93 for location of the throttle screw.

Figure 93 Throttle and Offset Regulating screw (ONLY for use by a qualified technician, using calibrated combustion test instruments)



⚠CAUTION Adjust the throttle adjustment screw in small movements.

High Fire

Make sure that the MAX RATE and MIN RATE for the PRIORITY that you are planning on testing on are set to 100% and 10% respectively. Then navigate to the MANUAL TEST MODE menu from the DIAGNOSTICS menu (Figure 89, page 95). After forcing the boiler to HIGH FIRE insure the BLOWER SPEED has achieved the RPM listed on Figures 98 or 99 (Pages 110 or 111). Take CO₂ and CO readings and adjust gas valve accordingly to Figures 93 and 94 allowing adequate time for the combustion analyzer to stabilize.



Startup – final checks (continued)

Figure 94 Acceptable combustion values — measured values must be within the ranges given below

Boiler model	Fuel	High fire		Low fire	
		% CO ₂	CO ppm	% CO ₂	CO ppm
80	NG	9.25 ± 0.5	< 100	8.75 ± 0.5	< 50
	LP	10.50 ± 0.5	< 150	10.15 ± 0.5	< 50
110	NG	9.25 ± 0.5	< 100	8.75 ± 0.5	< 50
	LP	10.50 ± 0.5	< 150	10.15 ± 0.5	< 50
150	NG	9.25 ± 0.5	< 100	8.80 ± 0.5	< 50
	LP	10.50 ± 0.5	< 150	9.90 ± 0.5	< 50
199	NG	9.25 ± 0.5	< 100	9.00 ± 0.5	< 50
	LP	10.50 ± 0.5	< 150	10.40 ± 0.5	< 50

- **Values above are with the boiler front door removed.** Values will increase about 0.2% once the door is reinstalled.
- **REINSTALL** the boiler door after completing service.
- Values above are for altitudes up to 5,500 feet. For higher altitudes, CO₂ may be slightly lower and CO slightly higher.
- The low fire CO₂ must be lower than the high fire CO₂ values.

- a. If the CO₂ is HIGH, turn the throttle screw (2.5mm Allen Head) CLOCKWISE to lower the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO₂ value is achieved.
- b. If the CO₂ is LOW, turn the throttle screw (2.5mm Allen Head) COUNTERCLOCKWISE to increase the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO₂ value is achieved.
- c. Confirm that the CO is within limits.

Low Fire

1. Adjust the boiler to (LOW) (minimum output) and allow the boiler to stabilize. Confirm the rpm value during operation with the Figures 98 or 99, Pages 110 or 111.
2. Remove the 4mm Allen Head cap, see Figure 93, page 102, for Offset screw adjustment.
 - a. If the CO₂ is HIGH, turn the offset regulating screw 4mm Allen Head COUNTERCLOCKWISE to lower the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO₂ value is achieved.
 - b. If the CO₂ is LOW, turn the regulating screw CLOCKWISE to increase the input. Allow the boiler to stabilize and take another reading. Continue until the desired CO₂ value is achieved.
 - c. Confirm that the CO is within limits.
 - d. Reinstall the 4mm Allen Head cap when adjustment is complete.

Re-check the Maximum and Minimum CO₂ and CO rate

1. Turn off the boiler and then turn it back on and put in Test Mode at maximum. Ensuring the CO₂ setting level has remained unchanged and confirm that CO is within limits.
2. Reduce to minimum and re-check the minimum rate output ensuring the CO₂ setting level has remained unchanged and confirm that CO is within limits.
3. In the event that the CO₂ and CO cannot be obtained, please contact your Weil-McLain representative.
4. Should you require any assistance during the set up procedure contact your Weil-McLain representative if the problem cannot be addressed with the information provided in this manual.

Check ignition system safety shutoff device

1. After the boiler has been installed, turn off the boiler.
2. Shut off the manual gas valve located on the gas line to stop flow of fuel to the boiler.
3. Turn on the boiler. It will start the ignition sequence, but will not light. After some time, the boiler will lockout, the display screen will have a red banner across the screen and will display “Ignition Fault 1”. It means that the boiler tried to ignite without success for five (5) times and went into Lockout mode. This means that the ignition system safety device worked properly.
4. Clear the Lockout condition by selecting “Manual Reset” on the Homeowner screen menu.
5. Open the manual gas valve located on the gas line to resume fuel supply to the boiler.

Check Heat exchanger, vent seals, and condensate dish joint

1. Operate the boiler on HIGH fire.
2. Using an inspection mirror, move the mirror around all heat exchanger joints and vent pipe connections at the top of the boiler and at the connection to the condensate dish. Also inspect the joint between the condensate dish to heat exchanger.
3. A leak would appear as vapor on the surface of a mirror. Also look for signs of weepage or other indications that there might be leakage.
4. If there is any indication of a leak at any joint, immediately shut down the boiler.
 - a. If possible, tighten the retaining screws or nuts (without over-tightening).
 - b. If this does not correct the problem, disassemble the components where the leak appeared. Use the procedures given in the Maintenance section of this manual.
 - c. When disassembling components, inspect gaskets to see if there is damage. Replace any damaged gasket.
 - d. Contact your Weil-McLain representative if the problem cannot be addressed with the information provided in this manual.



Startup – final checks (continued)

Check Thermostatic Mixing Valve Operation (Combi Model Only)

- Ensure an ASSE 1070 Thermostatic Mixing Valve is installed on the domestic hot water outlet pipe from the combi boiler and is installed per the manufacturer's instructions.
- Set Boiler Control (Figure 81, page 88) to be slightly higher than the desired temperature of the mixed hot water out of the mixing valve
- Open a faucet to allow water to flow through the combi boiler and allow boiler to operate and modulate to the set

temperature. More than one faucet may be required for steady modulation and outlet temperature.

- Once the combi boiler is delivering a steady temperature of domestic hot water, follow the manufacturer's instructions to properly adjust and set the thermostatic mixing valve.
- Make sure to check the hot water temperature at all fixtures. Additional thermostatic mixing valves may be installed in the system near or at fixtures. The Combi boiler's thermostatic mixing valve and/or other installed mixing valves may need adjusted accordingly.

Check-out/startup verification

Adjust and test boiler controls

1. Follow instructions in this manual to set and verify operation of the boiler controls.
2. Follow low water cutoff manufacturers instructions (if used).

Have the following been done?

- Is the control set for the correct boiler model?
- Installation date and time entered into control?
- Boiler and heat distribution units filled with water?
- Water chemistry verified per page 97?
- Sentinel X100 corrosion inhibitor added and water tested to be within range?
- Automatic air vents, if used, opened one full turn?
- Air purged from system?
- Air purged from gas piping? Piping checked for leaks?
- Has the condensate trap been primed and secured to drain tube with hose clamp?
- Control set to correct gas type and altitude settings?
- Propane orifice and mixer/venturi installed for propane firing and propane conversion label affixed to jacket?

⚠ WARNING Boilers are shipped ready to operate on natural gas ONLY. To operate on propane, you must follow the instructions in this manual to install the propane venturi and orifice. See page 14 for propane conversion. Failure to comply could result in severe personal injury, death or substantial property damage.

- Thermostat circuit wiring checked to ensure there are no stray voltages?
- Followed Operating Instructions, Figure 92, page 101?
- Burner flame and combustion verified per page 100?
- Control operation for space heating, DHW (Indirect tank) (if used), DHW (Combi model) verified per this manual?
- Additional field-installed controls tested as outlined by control manufacturers? (Boiler should be operating and

should go off when controls are tested. Verify controls cause automatic reset lockout or manual reset lockout as desired.)

- Additional field-installed limit control(s) set to system temperature requirements? Balancing valves and controls adjusted to provide design temperature to system?
- Flow adjusted/balanced for each zone of multiple zones systems?
- Thermostat heat anticipator (if available) set properly?
- Boiler cycled with thermostats (and with DHW aquastat, if installed) — Raised to highest setting and verified boiler goes through normal startup cycle? Lowered to lowest setting and verified boiler goes off?
- Combi models only:** Boiler cycled with hot water faucet. Verify boiler goes through normal start up cycle.
- Natural gas input measured? (page 102)
- Incoming gas pressure checked by connecting manometer to gas valve ahead of boiler? (Gas pressure must be at least the minimum values given on page 19, with boiler operating at high fire, and no more than 14 inches (355 mm) w.c. with boiler operating or boiler off.)
- Heat exchanger and vent seals checked with mirror to ensure no leakage?
- Observed several operating cycles for proper operation?
- Room thermostats set to desired room temperature (and DHW aquastat, if installed, to desired DHW storage temperature)?
- Combi models only:** Check that the **thermostatic mixing valve** is installed and is set correctly according to procedure on page 43 and information in the paragraph at the top of this page, and that the control is adjusted properly according to procedure on page 90 for Control adjustment procedure.
- All instructions shipped with this boiler reviewed with owner or maintenance person?

Before leaving:

- Fill in **Installation certificate**, page 151.
- Return instructions to envelope and give to owner or place inside boiler housing.

NOTICE

Fill out start-up data on the Installation and Service Certificate, page 151.



Annual startup and general maintenance

⚠WARNING Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the boiler. Failure to perform the service and maintenance could result in damage to the boiler or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death or substantial property damage.

Figure 95 Service and maintenance schedules

Service technician (see page numbers indicated for details)		Owner maintenance (see User's Information Manual)						
ANNUAL START-UP (See First-year special inspection)	• Address reported problems107	Daily	• Check boiler area.					
	• Inspect boiler area107			• Check air openings.				
	• Inspect boiler interior & jacket door gaskets.107				• Check pressure/ temperature gauge.			
	• Clean condensate trap.107	• Verify boiler jacket door is securely in place.						
	• Check all piping for leaks107							
	• Check air openings108							
	• Flue vent system and air piping108	Monthly	• Check vent piping.					
	• Check water system108			• Check air piping.				
	• Check expansion tank(s).108				• Check relief valve.			
	• Inspect ignition electrode108					• Check condensate drain system.		
	• Check ignition wiring.109						• Check automatic air vents (if used).	
	• Check all boiler wiring109							• Verify that domestic hot water is being supplied to fixtures at the correct temperature.
	• Check control settings109							
	• Perform startup and checks109							
	• Check low water cutoff109							
	• Check burner flame109							
	• Check flame signal.109							
	• Check blower speeds109							
	• Natural gas firing rates and corresponding blower speeds . . .110	• Operate relief valve.						
	• Propane gas firing rates and corresponding blower speeds . .111							
	• Check blower speeds (continued)112							
	• Check flue gas temperature112							
	• Manual Test Mode for Boilers112							
	• 3 Way Valve Test (Combi Model Only)112							
• Check Inlet gas pressure.112								
• Check Internal circulation pump112								
• High Altitude112								
• Check boiler relief valve113								
• Review with owner113								
• Reinstall jacket door after servicing113								
• Check Inlet gas pressure.112								
• Check Internal circulation pump112								
Combi Models Only:								
• Check Combi 3-way valve, DHW function and brazed plate . .113								
• Clean DHW brazed plate.113								
• Clean DHW external filter and internal Combi manifold filters . .113								
• Check DHW Temperatures113								



Annual startup

HANDLING CERAMIC FIBER MATERIALS

REMOVING BURNER, COVER PLATE or COVER PLATE COMPONENTS

▲WARNING The cover plate components, refractory insulation, and gaskets contain ceramic fiber materials that have been identified as carcinogenic, or possibly carcinogenic, to humans.

Ceramic fibers can be converted to cristobalite in very high temperature applications.

The International Agency for Research on Cancer (IARC) has concluded, “Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).”:

- Avoid breathing dust and contact with skin and eyes.
 - Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH web site at <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this web site.
 - Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Handle carefully to minimize dust that could be caused by abrasion.
- If replacement is necessary, remove the refractory from the boiler and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid

- Eye: Irrigate immediately
- Breathing: Fresh air.

FIRST-YEAR SPECIAL INSPECTION

NOTICE

It is recommended that you obtain a Weil-McLain Boiler Maintenance kit before attempting the first-year inspection, to ensure all parts that may be needed are available. This kit includes a heat exchanger cover plate gasket, burner gasket, new ignition electrode, and ignitor gasket. See listing in Replacement parts section of this manual. These parts must be on hand when you perform the first-year inspection in the event they must be replaced.

▲WARNING

Failure to replace the Items above when needed could result in severe personal injury, death or substantial property damage.

1. **No later than 12 months** after the boiler is installed, perform a first-year inspection of the boiler. This should include the following **in addition to routine annual start-up procedures**.
 - a. Inspect the heat exchanger and clean if necessary (see page 127, for access and cleaning procedures).
 - b. Inspect the cover plate insulation and gasket. Replace if not in good condition.
 - c. Inspect the burner and inspect carefully. Clean the burner thoroughly using a vacuum cleaner and compressed air if needed.
 - d. Make sure there is no blockage or accumulation of debris in the burner or the burner ports. Replace the burner if necessary.
 - e. Check the burner for tightness. Remove the cover plate insulation and tighten the burner mounting screws if needed, following the instructions on page 128.
 - f. Make sure to follow the inspection procedure given in “Check exchanger and vent seals,” page 103.
 - g. Disconnect the condensate trap and drain lines. Inspect, then flush thoroughly. Reinstall and refill the trap per page 99.
2. Determine any follow-up maintenance and service needs based on the condition of the heat exchanger and condensate lines.
 - a. If the heat exchanger shows substantial fouling, or if condensate lines show accumulation of sediment, schedule a follow-up service call to perform the first-year inspection again, sooner than the normal twelve months between.
 - b. Heavy fouling of the exchanger or condensate lines indicates possible combustion air contamination. Inspect the air intake area carefully, and remove possible contaminants. See page 20, for products to avoid.

▲WARNING

You must eliminate causes of corrosion and contamination to ensure reliable operation of the boiler and system.

Annual startup (continued)

▲WARNING The boiler should be inspected and started annually, at the beginning of the heating season, only by a qualified service technician. In addition, the maintenance and care of the boiler designated in Figure 95, page 105 and explained on the following pages must be performed to assure maximum boiler efficiency and reliability. Failure to service and maintain the boiler and system could result in equipment failure.

▲WARNING Electrical shock hazard — Turn off power to the boiler before any service operation on the boiler except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

Address reported problems

1. Inspect any problems reported by owner and correct before proceeding.

Inspect boiler area

1. Verify that boiler area is free of any combustible materials, gasoline and other flammable vapors and liquids.
2. Verify that air intake area is free of any of the contaminants listed on page 20 of this manual. If any of these are present in the boiler intake air vicinity, they must be removed. If they cannot be removed, reinstall the air and vent lines per this manual.

Inspect boiler interior & jacket door gaskets

1. Remove jacket door and inspect interior of boiler.
2. Visually inspect the jacket door gaskets on front of cabinet. Make sure all are in good condition. Obtain replacements if any gasket is damaged.

▲WARNING Jacket door gaskets must be intact, and must provide a reliable seal. Replace any damaged gasket.

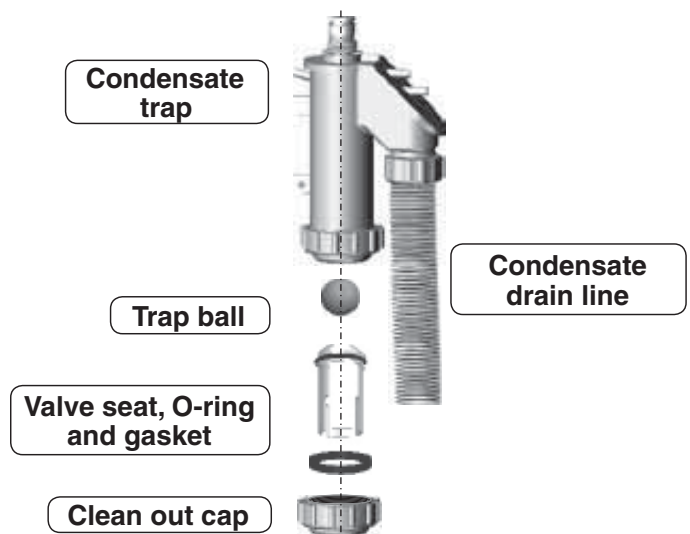
3. Remove the venturi air inlet silencer and clean if necessary. Reinstall silencer.
4. Vacuum any sediment from the inside of the boiler and components. Remove any obstructions.

▲WARNING Do not use solvents to clean any of the boiler components. The components could be damaged, resulting in unreliable or unsafe operation.

Clean condensate trap

1. For cleaning condensate trap, see Figure 96.
2. Remove pedestal front access panel to access the condensate trap, if floor standing.
3. Loosen the hose clamp connecting the condensate trap to the condensate drain tube. (See Figure 96). Pull the trap down to disengage the condensate drain tube.
4. Remove the clean out cap and remove the trap internal parts as shown.
5. Clean all trap components.
6. Re-assemble trap assembly. Re-install all lower gaskets.
7. Make sure the trap ball moves freely when re-inserted.
8. Fill trap with fresh water by pouring into the top of the trap body. Continue filling slowly until water begins flowing out the condensate drain line. Make sure the trap line is unobstructed and flows freely or follow the procedure on page 99 under “Fill condensate trap with water.”
9. Reattach the trap to the boiler condensate outlet. Push the trap up until fully engaged. Then retighten the hose clamp securing the trap to the tube. Check for secure connection.

Figure 96 Condensate trap cleaning



ECO Tec-020a

Check all piping for leaks

▲WARNING Eliminate all system or boiler leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines in the system and in the boiler and correct any problems found.
3. Check gas line using procedure on page 57.



Annual startup (continued)

Check air openings

1. Verify that combustion and ventilation air openings to the boiler room and/or building are open and unobstructed.
2. Check operation and wiring of automatic combustion air dampers, if used.
3. Verify that boiler vent discharge and air intake are clean and free of obstructions.

Flue vent system and air piping

1. Visually inspect entire flue gas venting system and combustion air piping for blockage, deterioration or leakage. Repair any joints that show signs of leakage in accordance with vent manufacturer's instructions. Verify that air inlet piping is connected and properly sealed.

▲WARNING Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Check water system

1. Verify all system components are correctly installed and operational.
2. Check the cold fill pressure for the system. Verify it is correct (usually around 12 PSIG).
3. Watch the system pressure as the boiler heats up (during testing) to ensure pressure doesn't rise too high. Excessive pressure rise indicates expansion tank sizing or performance problem.
4. Inspect automatic air vents and air separators. Remove air vent caps and briefly press push valve to flush vent. Reinstall caps. Make sure vents do not leak. Replace any leaking vents.
5. Check system water chemistry (pH, hardness and inhibitor level). See pages 97 and 98.

Check expansion tank(s)

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools.
2. See page 46 or page 50 depending on system type for information.
3. Tank types
 - **Closed-type** — welded gas tight and located above boiler. Tank is partially filled with water, leaving an air cushion for expansion.
 - Make sure a closed-type tank is fitted with a tank fitting, such as the B & G Tank-trol or Taco Taco-trol. This fitting reduces gravity circulation of air-saturated tank water back to the system and prevents the air from bubbling up through the water as it returns from the system.
 - Do not use automatic air vents in systems with closed-type tanks. The air will escape from the system instead of returning to the tank.
 - Eventually, the tank will waterlog and no longer control pressurization. The boiler relief valve will weep frequently.

- **Diaphragm- or bladder-type** — welded gas tight with a rubber membrane to separate the tank pressurizing air and the water. May be located at any point in the system, but preferably located on the suction side of the system circulator.
 - Systems with this type of expansion tank require at least one automatic air vent, preferably located on top of an air eliminator, as shown in examples in this manual.
4. If relief valve has tended to weep frequently, the expansion tank may be water logged or undersized.
 - a. **Diaphragm- or bladder-type expansion tank** — first, check tank size to be sure it is large enough for the system. If size is too small, add additional tank (or tanks) as necessary to provide sufficient expansion. If tank size is large enough, remove tank from system and check charge pressure (usually 12 PSIG for residential applications). If tank won't hold pressure, membrane has been damaged. Replace tank.
 - b. **Closed-type expansion tank** — tank is most likely waterlogged. Install a tank fitting if not already installed. Then check fill level per fitting manufacturer's instructions. If fill level is correct, check tank size against manufacturer's instructions. Replace with a larger tank if necessary.

Inspect ignition electrode

1. Remove the ignition electrode from the cover plate (see Item 13, page 130). Disconnect the ground wire and ignition cable connected to the electrode.
2. Discard the ignition electrode gasket.
3. Remove any white oxides accumulated on the ignition electrode using steel wool. If the ignition electrode cannot be cleaned satisfactorily, replace ignition electrode with a new one.
4. Ignition electrode rods should be parallel and spark gap should be 4.5mm.
5. Slide new gasket on to the ignition electrode. Reinstall ignition electrode, making sure gasket is in good condition and correctly positioned.

▲WARNING **TORQUE LIMIT** — Use a torque wrench when tightening the two ignition electrode retainer screws. DO NOT exceed 20 inch-pounds.

▲WARNING Check the seal of the ignition electrode, igniter gasket and cover plate. Failure to comply could cause a gas leak, resulting in severe personal injury or death.



Annual startup (continued)

Check ignition wiring

1. Check ignition cable electrical resistance. A good cable will have resistance between 950 and 1050 ohms. Replace if not acceptable.
2. Inspect boiler ground wire from heat exchanger access cover to ground terminal screw.
3. Verify all wiring is in good condition and securely attached.
4. Check ground continuity of wiring using continuity meter.
5. Replace ground wires if results are not satisfactory.

Check all boiler wiring

1. Inspect all boiler wiring, making sure wires are in good condition and securely attached.
2. Verify that all connectors are securely inserted.

Check control settings

1. Use the control display to navigate through all settings. Adjust settings if necessary.
2. Check settings of external limit controls (if any) and adjust if necessary. Adjust as needed to accommodate the system design.

Perform startup and checks

1. Start boiler and perform checks and tests specified in this manual, including combustion performance check starting on page 100.
2. Verify cold fill pressure is correct and that operating pressure does not go too high. Adjust water pressure and expansion tank charge pressure as necessary.
3. Complete the check-out procedure on page 104.

Check low water cutoff

Check the Low Water Cutoff for proper operation. Refer to manufacturer's instructions for operation and service.

Check burner flame

⚠️WARNING The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 106 of this manual. Failure to comply could result in severe personal injury.

1. Inspect flame through observation window using the procedure on page 100.
2. If flame is unsatisfactory at either high fire or low fire, check combustion values. If combustion is properly adjusted, turn off boiler and allow boiler to cool down. Then remove burner and clean it thoroughly using a vacuum cleaner or compressed air. Do not use compressed air to clean burner if performed inside a building.
3. To access the burner, remove the heat exchanger cover plate following the procedure beginning on page 128.
4. If replacing the burner, ensure the burner gasket is in good condition and correctly positioned. Follow all instructions on page 128 or 130 to reinstall all components.
5. Restart the boiler.
6. Inspect the flame at high and low fire. If flame is still not acceptable, check combustion values. If combustion is properly adjusted, obtain a replacement burner from Weil-McLain.

Check flame signal

1. Navigate to Diagnostics/Inputs on the control display (see Figure 80, page 87 for navigation instructions and Figure 88, page 94 for the complete Diagnostics menus).
2. The flame signal value (in micro amps) must be at least the boost value listed in Figure 97. If the flame signal drops below this level, the control will attempt to correct by increasing the blower speed to increase flame signal. At ignition, the proof of flame signal must be 0.8 or greater. Typical running flame signal should be between 4 and 6. This value will vary depending on blower modulation, gas type, combustion settings, altitude & age of components.

Figure 97 Running flame signal shutdown and boost values

Boiler Model	Flame Signal		Boiler Model	Flame Signal	
	Shut down	Boost		Shut down	Boost
80 NG	1.5	2.0	150 NG	1.5	2.5
80 LP	1.5	2.5	150 LP	1.5	2.5
110 NG	1.5	2.0	199 NG	1.5	2.0
110 LP	1.5	2.5	199 LP	1.5	2.5

3. A low flame signal may indicate a fouled ignition electrode or damaged ignition electrode insulation.
 - a. See Inspect ignition electrode, page 108 to remove and inspect the ignition electrode .
 - b. If required, clean the ignition electrode as instructed.
 - c. If cleaning the ignition electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the ignition electrode .
4. If flame signal still remains low:
 - a. Inspect the vent and air piping.
 - b. Check combustion values.
 - c. Then inspect the heat exchanger, following the procedures given in this manual for removal and reinstallation of the heat exchanger cover plate and other boiler components (see page 128).
 - d. Clean the exchanger as described in this manual if necessary.

Check blower speeds

1. For all installations make sure the correct altitude is set in the boiler setup menu. The control automatically adjusts low fire, ignition and high fire rates to compensate for high altitude conditions.
2. Use the control display to navigate to DIAGNOSTICS/Manual test mode (see Figure 80, page 87 for navigation instructions and Figure 88, page 94 for the complete Diagnostics menus).
3. Set the firing rate to LOW (low fire).
4. Write down the blower RPM value, it should be within 50 of the value given in Figure 98, page 110 for Natural gas, Figure 99, page 111 for LP propane gas, unless low fire speed was increased based on priority need.
5. Set the firing rate to IGNITION (ignition rate).
6. Write down the blower RPM value. It should be within 50 RPM of the value listed in Figure 98, page 110 for Natural gas, Figure 99, page 111 for LP propane gas,.
7. Set the firing rate to HIGH (high fire).



Annual startup (continued)

Figure 98 Natural gas firing rates and corresponding blower speeds (low fire, ignition, and high fire) — for altitudes up to 2,000 feet (default settings) and high altitude (above 2,000 feet).

Model		80			110			150			199		
Fuel Type	Altitude (feet)	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1
Low Fire													
NG	0-2,000	10%	1,900	10,200	10%	1,900	10,200	10%	1,750	15,000	10%	1,350	19,000
	2,500	10%	2,030	10,200	10%	2,030	10,200	10%	1,870	15,000	10%	1,440	19,000
	3,000	10%	2,070	10,200	10%	2,070	10,200	10%	1,900	15,000	10%	1,460	19,000
	3,500	10%	2,100	10,200	10%	2,100	10,200	10%	1,930	15,000	10%	1,490	19,000
	4,000	10%	2,140	10,200	10%	2,140	10,200	10%	1,960	15,000	10%	1,510	19,000
	4,500	10%	2,170	10,200	10%	2,170	10,200	10%	1,990	15,000	10%	1,530	19,000
	5,000	10%	2,210	10,200	10%	2,210	10,200	10%	2,020	15,000	10%	1,560	19,000
	5,500	10%	2,240	10,200	10%	2,240	10,200	10%	2,050	15,000	10%	1,580	19,000
	6,000	10%	2,300	10,200	10%	2,300	10,200	10%	2,090	15,000	10%	1,620	19,000
	6,500	10%	2,350	10,200	10%	2,350	10,200	10%	2,130	15,000	10%	1,650	19,000
	7,000	10%	2,400	10,200	10%	2,400	10,200	10%	2,160	15,000	10%	1,680	19,000
	7,500	10%	2,460	10,200	10%	2,460	10,200	10%	2,200	15,000	10%	1,720	19,000
	8,000	10%	2,510	10,200	10%	2,510	10,200	10%	2,240	15,000	10%	1,750	19,000
	8,500	10%	2,560	10,200	10%	2,560	10,200	10%	2,270	15,000	10%	1,790	19,000
	9,000	10%	2,620	10,200	10%	2,620	10,200	10%	2,310	15,000	10%	1,820	19,000
	9,500	10%	2,670	10,200	10%	2,670	10,200	10%	2,350	15,000	10%	1,850	19,000
10,000	10%	2,720	10,200	10%	2,720	10,200	10%	2,390	15,000	10%	1,890	19,000	
10,500	10%	2,780	10,200	10%	2,780	10,200	10%	2,420	15,000	10%	1,920	19,000	
11,000	10%	2,830	10,200	10%	2,830	10,200	10%	2,460	15,000	10%	1,950	19,000	
Ignition													
NG	0-2,000	87%	6,100	69,655	64%	6,100	69,655	48%	4,700	72,302	46%	3,530	91,000
	2,500	95%	6,570	69,655	69%	6,570	69,655	52%	5,030	72,302	48%	3,680	91,000
	3,000	97%	6,690	69,655	70%	6,690	69,655	53%	5,120	72,302	48%	3,730	91,000
	3,500	100%	6,810	69,655	72%	6,810	69,655	54%	5,210	72,302	49%	3,770	91,000
	4,000	100%	6,940	69,655	73%	6,940	69,655	54%	5,290	72,302	49%	3,810	91,000
	4,500	100%	7,060	69,655	75%	7,060	69,655	55%	5,380	72,302	50%	3,850	91,000
	5,000	100%	7,190	69,655	76%	7,190	69,655	56%	5,470	72,302	50%	3,890	91,000
	5,500	100%	7,310	69,655	78%	7,310	69,655	58%	5,560	72,302	51%	3,930	91,000
	6,000	100%	7,410	69,655	80%	7,410	69,655	58%	5,640	72,302	52%	4,010	91,000
	6,500	100%	7,520	69,655	81%	7,520	69,655	59%	5,730	72,302	54%	4,080	91,000
	7,000	100%	7,630	69,655	83%	7,630	69,655	60%	5,810	72,302	56%	4,160	91,000
	7,500	100%	7,730	69,655	85%	7,730	69,655	61%	5,890	72,302	58%	4,230	91,000
	8,000	100%	7,840	69,655	87%	7,840	69,655	62%	5,980	72,302	60%	4,300	91,000
	8,500	100%	7,940	69,655	88%	7,940	69,655	63%	6,060	72,302	62%	4,380	91,000
	9,000	100%	8,050	69,655	90%	8,050	69,655	64%	6,150	72,302	64%	4,450	91,000
	9,500	100%	8,150	69,655	92%	8,150	69,655	65%	6,230	72,302	66%	4,530	91,000
10,000	100%	8,260	69,655	94%	8,260	69,655	66%	6,320	72,302	69%	4,600	91,000	
10,500	100%	8,360	69,655	96%	8,360	69,655	67%	6,400	72,302	71%	4,670	91,000	
11,000	100%	8,470	69,655	98%	8,470	69,655	68%	6,480	72,302	74%	4,750	91,000	
High Fire													
NG	0-2000	100%	6,830	80,000	100%	8,950	110,000	100%	8,700	150,000	100%	6,800	199,000
	2,500	100%	6,830	73,200	100%	8,950	102,097	100%	8,700	139,223	100%	6,800	184,702
	3,000	100%	6,830	71,840	100%	8,950	99,987	100%	8,700	136,346	100%	6,800	180,886
	3,500	100%	6,830	78,640	100%	8,950	97,878	100%	8,700	133,470	100%	6,800	177,069
	4,000	100%	6,830	69,120	100%	8,950	95,768	100%	8,700	130,593	100%	6,800	173,252
	4,500	100%	6,830	67,760	100%	8,950	93,658	100%	8,700	127,716	100%	6,800	169,436
	5,000	100%	6,830	66,400	100%	8,950	91,549	100%	8,700	124,839	100%	6,800	165,619
	5,500	100%	6,830	65,040	100%	8,950	89,439	100%	8,700	121,962	100%	6,800	161,802
	6,000	100%	6,830	63,680	100%	8,910	87,708	100%	8,700	119,602	100%	6,710	157,241
	6,500	100%	6,830	62,320	100%	8,880	85,949	100%	8,700	117,203	100%	6,620	152,736
	7,000	100%	6,830	60,960	100%	8,840	84,190	100%	8,700	114,804	100%	6,540	148,231
	7,500	100%	6,830	59,600	100%	8,810	82,430	100%	8,700	112,405	100%	6,460	143,726
	8,000	100%	6,830	58,240	100%	8,780	80,671	100%	8,700	110,006	100%	6,370	139,221
	8,500	100%	6,830	56,880	100%	8,740	78,912	100%	8,700	107,607	100%	6,290	134,716
	9,000	100%	6,830	55,520	100%	8,710	77,152	100%	8,700	105,208	100%	6,200	130,212
	9,500	100%	6,830	54,160	100%	8,670	75,393	100%	8,700	102,809	100%	6,120	125,707
10,000	100%	6,830	52,800	100%	8,640	73,634	100%	8,700	100,410	100%	6,030	121,202	
10,500	100%	6,830	51,440	100%	8,600	71,874	100%	8,700	98,011	100%	5,950	116,697	
11,000	100%	6,830	50,080	100%	8,570	70,115	100%	8,700	95,611	100%	5,870	112,192	



Annual startup (continued)

Figure 99 Propane (LP) gas firing rates and corresponding blower speeds (low fire, ignition, and high fire) – for altitudes up to 2,000 feet (default settings) and high altitude (above 2,000 feet).

Model		80			110			150			199		
Fuel Type	Altitude (feet)	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1	%	RPM	BTU/Hr Note 1
Low Fire													
LP	0-2,000	10%	2,100	10,200	10%	2,100	10,200	10%	1,700	15,000	10%	1,300	19,000
	2,500	10%	2,240	10,200	10%	2,240	10,200	10%	1,840	15,000	10%	1,400	19,000
	3,000	10%	2,280	10,200	10%	2,280	10,200	10%	1,880	15,000	10%	1,420	19,000
	3,500	10%	2,320	10,200	10%	2,320	10,200	10%	1,910	15,000	10%	1,450	19,000
	4,000	10%	2,360	10,200	10%	2,360	10,200	10%	1,950	15,000	10%	1,470	19,000
	4,500	10%	2,400	10,200	10%	2,400	10,200	10%	1,990	15,000	10%	1,500	19,000
	5,000	10%	2,430	10,200	10%	2,430	10,200	10%	2,030	15,000	10%	1,530	19,000
	5,500	10%	2,470	10,200	10%	2,470	10,200	10%	2,060	15,000	10%	1,550	19,000
	6,000	10%	2,520	10,200	10%	2,520	10,200	10%	2,090	15,000	10%	1,590	19,000
	6,500	10%	2,560	10,200	10%	2,560	10,200	10%	2,120	15,000	10%	1,630	19,000
	7,000	10%	2,600	10,200	10%	2,600	10,200	10%	2,150	15,000	10%	1,660	19,000
	7,500	10%	2,650	10,200	10%	2,650	10,200	10%	2,180	15,000	10%	1,700	19,000
	8,000	10%	2,690	10,200	10%	2,690	10,200	10%	2,220	15,000	10%	1,740	19,000
	8,500	10%	2,730	10,200	10%	2,730	10,200	10%	2,250	15,000	10%	1,770	19,000
9,000	10%	2,780	10,200	10%	2,780	10,200	10%	2,280	15,000	10%	1,810	19,000	
9,500	10%	2,820	10,200	10%	2,820	10,200	10%	2,310	15,000	10%	1,850	19,000	
10,000	10%	2,860	10,200	10%	2,860	10,200	10%	2,340	15,000	10%	1,890	19,000	
10,500	10%	2,910	10,200	10%	2,910	10,200	10%	2,370	15,000	10%	1,920	19,000	
11,000	10%	2,950	10,200	10%	2,950	10,200	10%	2,400	15,000	10%	1,960	19,000	
Ignition													
LP	0-2,000	82%	6,200	65,871	60%	6,200	65,871	49%	4,700	74,124	45%	3,400	88,871
	2,500	89%	6,630	65,871	65%	6,630	65,871	53%	5,030	74,124	48%	3,640	88,871
	3,000	91%	6,740	65,871	66%	6,740	65,871	54%	5,120	74,124	49%	3,700	88,871
	3,500	93%	6,850	65,871	67%	6,850	65,871	55%	5,210	74,124	50%	3,760	88,871
	4,000	95%	6,970	65,871	69%	6,970	65,871	56%	5,300	74,124	51%	3,830	88,871
	4,500	97%	7,080	65,871	70%	7,080	65,871	57%	5,390	74,124	52%	3,890	88,871
	5,000	99%	7,200	65,871	71%	7,200	65,871	58%	5,480	74,124	52%	3,950	88,871
	5,500	100%	7,310	65,871	73%	7,310	65,871	59%	5,570	74,124	54%	4,020	88,871
	6,000	100%	7,440	65,871	75%	7,440	65,871	61%	5,630	74,124	54%	4,060	88,871
	6,500	100%	7,570	65,871	78%	7,570	65,871	62%	5,700	74,124	56%	4,110	88,871
	7,000	100%	7,710	65,871	80%	7,710	65,871	64%	5,770	74,124	57%	4,160	88,871
	7,500	100%	7,840	65,871	83%	7,840	65,871	66%	5,840	74,124	58%	4,210	88,871
	8,000	100%	7,970	65,871	86%	7,970	65,871	68%	5,900	74,124	59%	4,260	88,871
	8,500	100%	8,100	65,871	89%	8,100	65,871	70%	5,970	74,124	60%	4,310	88,871
9,000	100%	8,230	65,871	92%	8,230	65,871	72%	6,040	74,124	62%	4,360	88,871	
9,500	100%	8,370	65,871	95%	8,370	65,871	74%	6,110	74,124	63%	4,410	88,871	
10,000	100%	8,500	65,871	99%	8,500	65,871	76%	6,170	74,124	65%	4,460	88,871	
10,500	100%	8,490	65,871	100%	8,490	65,871	79%	6,240	74,124	66%	4,510	88,871	
11,000	100%	8,400	65,871	100%	8,400	65,871	82%	6,310	74,124	68%	4,560	88,871	
High Fire													
LP	0-2000	100%	7,240	80,000	100%	9,450	110,000	100%	8,550	150,000	100%	6,710	199,000
	2,500	100%	7,240	73,200	100%	9,440	102,097	100%	8,530	137,208	100%	6,690	181,945
	3,000	100%	7,240	71,840	100%	9,440	99,987	100%	8,530	133,794	100%	6,680	177,392
	3,500	100%	7,240	78,640	100%	9,430	97,878	100%	8,520	130,379	100%	6,670	172,839
	4,000	100%	7,240	69,120	100%	9,430	95,768	100%	8,520	126,964	100%	6,670	168,286
	4,500	100%	7,240	67,760	100%	9,430	93,658	100%	8,510	123,549	100%	6,660	163,733
	5,000	100%	7,240	66,400	100%	9,420	91,549	100%	8,500	120,135	100%	6,660	159,180
	5,500	100%	7,240	65,040	100%	9,420	89,439	100%	8,500	116,720	100%	6,650	154,627
	6,000	100%	7,240	63,680	100%	9,320	86,918	100%	8,380	113,919	100%	6,590	150,938
	6,500	100%	7,240	62,320	100%	9,230	84,427	100%	8,280	111,072	100%	6,530	147,183
	7,000	100%	7,240	60,960	100%	9,140	81,937	100%	8,170	108,224	100%	6,470	143,429
	7,500	100%	7,240	59,600	100%	9,050	79,447	100%	8,060	105,377	100%	6,410	139,674
	8,000	100%	7,240	58,240	100%	8,950	76,957	100%	7,960	102,529	100%	6,360	135,920
	8,500	100%	7,240	56,880	100%	8,860	74,467	100%	7,850	99,682	100%	6,300	132,165
9,000	100%	7,240	55,520	100%	8,770	71,976	100%	7,740	96,834	100%	6,240	128,411	
9,500	100%	7,240	54,160	100%	8,680	69,486	100%	7,640	93,987	100%	6,180	124,656	
10,000	100%	7,240	52,800	100%	8,590	66,996	100%	7,530	91,139	100%	6,120	120,902	
10,500	100%	7,240	51,440	100%	8,490	64,506	100%	7,420	88,291	100%	6,070	117,147	
11,000	100%	7,240	50,080	100%	8,400	62,016	100%	7,320	85,444	100%	6,010	113,393	



Annual startup (continued)

Check blower speeds (continued)

- Write down the blower RPM value. It should be within 50 RPM of the value given in Figure 98, page 110 for Natural gas, Figure 99, page 111 for LP propane gas.
- If any of the values are outside the ranges listed in the previous steps, contact the factory for technical assistance.

NOTICE

Minimum and maximum blower speeds can be adjusted within limits, but changing speeds will affect AFUE ratings.

Check flue gas temperature

- Set the boiler to high fire. Then adjust the control display to view flue gas temperature and boiler return temperature.
- The flue gas temperature should be no more than 50°F higher than the boiler return temperature. If temperature delta is higher, cleaning the Heat exchanger may be required. See the maintenance section starting on page 128.
- If the flue temperature is higher than this, shut down the boiler, allow to cool, and follow the procedure starting on page 128 to clean the heat exchanger.

Manual Test Mode for Boilers

- Navigate to Manual Test Mode screen under DIAGNOSTICS menu.
- Generate a call for heat and wait until the burner is lit, if not yet in operation.
- Press EDIT and select the desired FORCE RATE. Rate will be forced to setting for 30 minutes. Manual Test Mode resets at end of heating demand. If time out, boiler will revert to AUTO but will keep running if demand exist.

3 Way Valve Test (Combi Model Only)

- Navigate to Manual Test Mode screen under DIAGNOSTICS menu.
- Ensure boiler is in "Standby" with no calls for heat active.
- Press edit and select the desired position of the 3 way valve. This is a test feature to check if the 3 way valve is operational.
- The 3 Way Valve Actuator may be removed by the procedure shown in Figure 122, page 135. Once removed, use the display to change the position of the actuator and visually check to see if the motor shaft is moving. It is normal to see the shaft slide back and forth when the actuator is in the recessed state, but there should be no play in the shaft when it is in the extended state. The recess position of the shaft is for the DHW mode. The extended position of the shaft is for the space heating mode. When the actuator is detached, use a blunt object to push on the 3 way valve shaft still assembled in the Sanitary Shutter. This shaft should require some force to compress against the valve spring. If the shaft cannot be moved, or stuck in the compressed state, follow the procedures listed on page 135 Cleaning & maintenance for Flow Manifold.

Check Inlet gas pressure

Check inlet gas pressure to limits on page 19 and at the gas inlet pressure test port shown in Figure 93, page 102.

Check Internal circulation pump

- Check that the circulator light turns solid orange during boiler operation and that water flow exists.
- Check for water leaks or signs of any water damage.

High Altitude

Note 1 for Figure 98, page 110 for Natural gas and Figure 99, page 111 for LP propane gas —

The boiler will automatically derate the BTU values listed in by 4% per 1,000 feet above sea level.

NOTICE

In the USA Input rates are derated 4% for each 1000 ft. above sea level, beyond 2000 ft. in accordance with National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.

WARNING

For elevations above 11,000 feet, please contact Weil-McLain Technical Support for details

NOTICE

In Canada, Input rates are derated 10% for altitudes of 2000 ft. to 4500 ft. above sea level. Please use appropriate Fan Speed Settings for High Altitude provided in this manual.

In Canada for elevation beyond 4500 feet, please consult Provincial Authorities having jurisdiction and/or local codes.



Annual startup (continued)

Check boiler relief valve

1. Inspect the relief valve and lift the lever to verify flow as in the following warnings, excerpted from a relief valve manufacturer's warning label. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential.
2. Read page 48 or 51 before proceeding further.
3. Follow instructions below or perform procedures per relief valve manufacturer's printed instructions.

▲WARNING

Safety relief valves should be reinspected AT LEAST ONCE EVERY THREE YEARS, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency — not by the owner. Failure to reinspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death or substantial property damage.

▲WARNING

Following installation, the valve lever must be operated AT LEAST ONCE A YEAR to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal. Otherwise severe personal injury or property damage may result. If no water flows, valve is inoperative. Shut down boiler until a new relief valve has been installed.

4. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion tank waterlogging or under-sizing.

Review with owner

1. Review the User's Information Manual with the owner.
2. Emphasize the need to perform the maintenance schedule specified in the User's Information Manual (and in this manual as well).
3. Remind the owner of the need to call a licensed contractor should the boiler or system exhibit any unusual behavior.
4. Remind the owner to follow the proper shutdown procedure and to schedule an annual startup at the beginning of the next heating season.

Reinstall jacket door after servicing

▲WARNING

Reinstall boiler jacket door after start-up or servicing. The boiler jacket door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Inspect boiler jacket door gaskets on front of cabinet. Gaskets must be in good condition, with no tears or gaps. Replace if necessary.

Failure to keep the jacket door securely sealed and fastened could result in severe personal injury or death.

Combi Models Only:

Check Combi 3-way valve, DHW function and brazed plate

1. Cycle the 3-way valve by giving a boiler a call for heat and then turning on a DHW call by operating a faucet. Ensure that the valve and boiler operation changes from a space heating call to a domestic call and hot water is being delivered accordingly. It may be necessary to run "3 way valve test" listed on page 112.
2. Check for water leaks around 3-way valve, brazed plate, and brazed plate manifold fittings.

Clean DHW brazed plate

DHW/Combi brazed plate should be cleaned annually according to the instructions starting on page 131. Cleaning maybe required more frequently depending on water quality.

Clean DHW external filter and internal Combi manifold filters

1. Clean the filter on the domestic inlet water external to the boiler, installed in the near boiler piping. Follow the manufacturer's recommended cleaning procedure.
2. Clean the Combi Manifold DHW flow switch filter and the bypass filter according to the instructions on page 135.

Check DHW temperatures

Follow the procedure on page 104 under "Check Thermostatic Mixing Valve Operation" to ensure proper temperatures at all domestic hot fixtures. If a recirculation loop is installed, check to ensure recirculation pump is working properly. Also check aquastat, timer, and/or occupancy sensor for proper operation, if used.



Troubleshooting

VERIFY PROPER OPERATION AFTER SERVICING

Before calling for troubleshooting assistance, fill in the “**ECO Tec Gas Data Collection Sheet**” (starting on page 152). Record the boiler size and Consumer Protection (CP) number (located on the right side exterior of the boiler jacket).

BEFORE TROUBLESHOOTING –

⚠ WARNING Failure to adhere to these guidelines can result in severe personal injury, death or substantial property damage.

ELECTRICAL SHOCK HAZARD

TURN OFF ALL POWER TO THE BOILER WHEN SERVICING.

DO NOT JUMPER DEVICES

Never jumper (bypass) any device except for momentary testing.

REINSTALL Jacket door

The boiler jacket door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the jacket door securely fastened could result in severe personal injury or death.

BEFORE SERVICING or MAKING CONNECTIONS —

ALWAYS TURN POWER OFF TO THE BOILER TO PREVENT ELECTRICAL SURGES, WHICH CAN DAMAGE BOILER COMPONENTS.

LABEL WIRES BEFORE REMOVING

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

1. See Figure 100 for tools and kits recommended for troubleshooting **ECO Tec** boilers.
2. Check for 120VAC (minimum 102VAC to maximum 132VAC) to boiler.
3. Check the control's last six (6) lockout histories. (Navigate to the DIAGNOSTICS menus.)
 - a. See Figure 80, page 87 for HOMEOWNER NAVIGATION instructions and Figure 88, page 94 for the complete Diagnostics menus.
 - b. In the DIAGNOSTICS menu, select FAULT HISTORY and press the right arrow.
 - c. Record the fault counts, (Ignition Retries, Manual Reset Count, Auto Reset Count).
 - d. Follow information at the bottom of the screen to navigate through your lockout histories.

Figure 100 Tools and kits needed for troubleshooting

Tool	Purpose
#2 Phillips screwdriver	Multiple uses
2.5 & 4mm Allen wrench	To adjust gas valve settings
3mm Allen wrench	For removing ignition electrode screws
8mm wrench	To remove blower
10mm wrench	To remove heat exchanger cover plate
T20 long-handled Torx driver	To remove burner screws and mixer/venturi
Large crescent wrench	To remove gas valve
Multimeter	Measurements on sensors and electrical components
Manometer (Inclined or digital)	Measure the INLET gas pressure to the boiler
Combustion analyzer (Digital preferred)	Combustion testing and boiler adjustments
Contact thermometer	Checking surface temperatures of heat exchanger and pipes
Maintenance kit	ALWAYS have this kit on hand when performing maintenance in case replacement is required.

Check the following:

1. Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for 24VAC between thermostat wire nuts and ground.
2. Make sure all external limit controls are either installed (and closed) or temporarily jumpered for testing.
3. Make sure that connectors to the control are securely plugged in at module and originating control.
4. Gas pressures:
 - Maximum: 14" (355 mm) w.c. with no flow (gas valve lockup pressure).
 - Minimum: must be no less than the minimum values given on page 19 while operating on high fire.



Troubleshooting (continued)

Check control fuses

⚠ WARNING ALWAYS check control fuses before replacing the control or any major components (blower, etc.). If one of these fuses is blown, it can prevent the control or other components from operating.

1. Turn OFF power to boiler at external line switch. Then remove the control access door.
2. Locate fuses using Figure 102.
3. Remove and inspect the seven (7) fuses (Items 1, 2, and 3, Figure 102).
4. If necessary, replace one or more of the fuses:
 - a. Low voltage circuit fuse (Item 1) is a 3-amp 24VAC fast-blow (Littelfuse 0287003).
 - b. Line voltage circuit fuses (Item 2) are 2.5-amp 120VAC fast-blow (Littelfuse 032602.5).
 - c. Line voltage circuit fuses (Item 3) are 4-amp 120VAC fast-blow (Littelfuse 314004).

⚠ WARNING Do not jumper either fuse or replace with any fuse except as specified. Failure to comply could result in severe personal injury, death or substantial property damage.

5. Reinstall the control access cover.

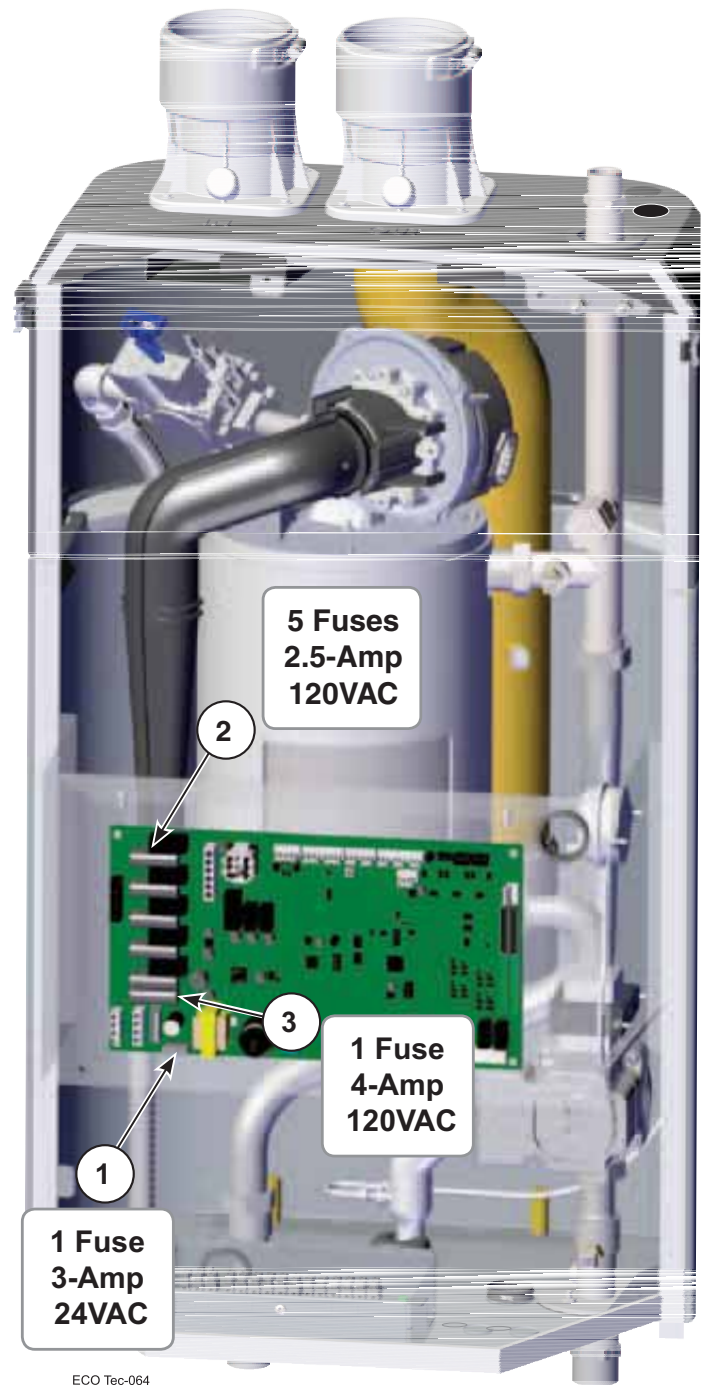
Checking temperature sensors

1. The boiler temperature sensors (Boiler In, Boiler Out, DHW Out, Flue, Outdoor, and System Supply/Return) are all resistance-type devices. Figure 101 shows the correct value for the sensor at various temperatures. For dual sensors, the temperature difference between the sensors must be no more than 10°F.
2. Use the resistance values at 32°F, 60°F, 70°F and 212°F to measure the sensor resistance at known temperatures (ice point, room temperature and sea level boiling point). For ice point and boiling point, insert the sensor in water at that temperature. Use an ohmmeter to read resistance value.
3. To check whether the control is correctly sensing temperature, you can use a resistance decade box. Connect the decade box temporarily in place of a sensor and read the corresponding temperature on the control display. The temperature should be close to the value corresponding to the input resistance.

Figure 101 Sensor resistance values

Temp (°F)	Sensor ohms		Temp (°F)	Sensor ohms		Temp (°F)	Sensor ohms	
	Min	Max		Min	Max		Min	Max
32	34265	37871	90	8504	9399	150	2517	2782
40	27834	30764	100	6847	7568	160	2091	2311
50	21630	23907	110	5545	6129	170	1744	1928
60	16944	18727	120	4517	4992	180	1461	1615
70	13372	14780	130	3698	4088	190	1229	1359
80	10629	11747	140	3043	3364	200	1038	1147

Figure 102 Control fuses



ECO Tec-064



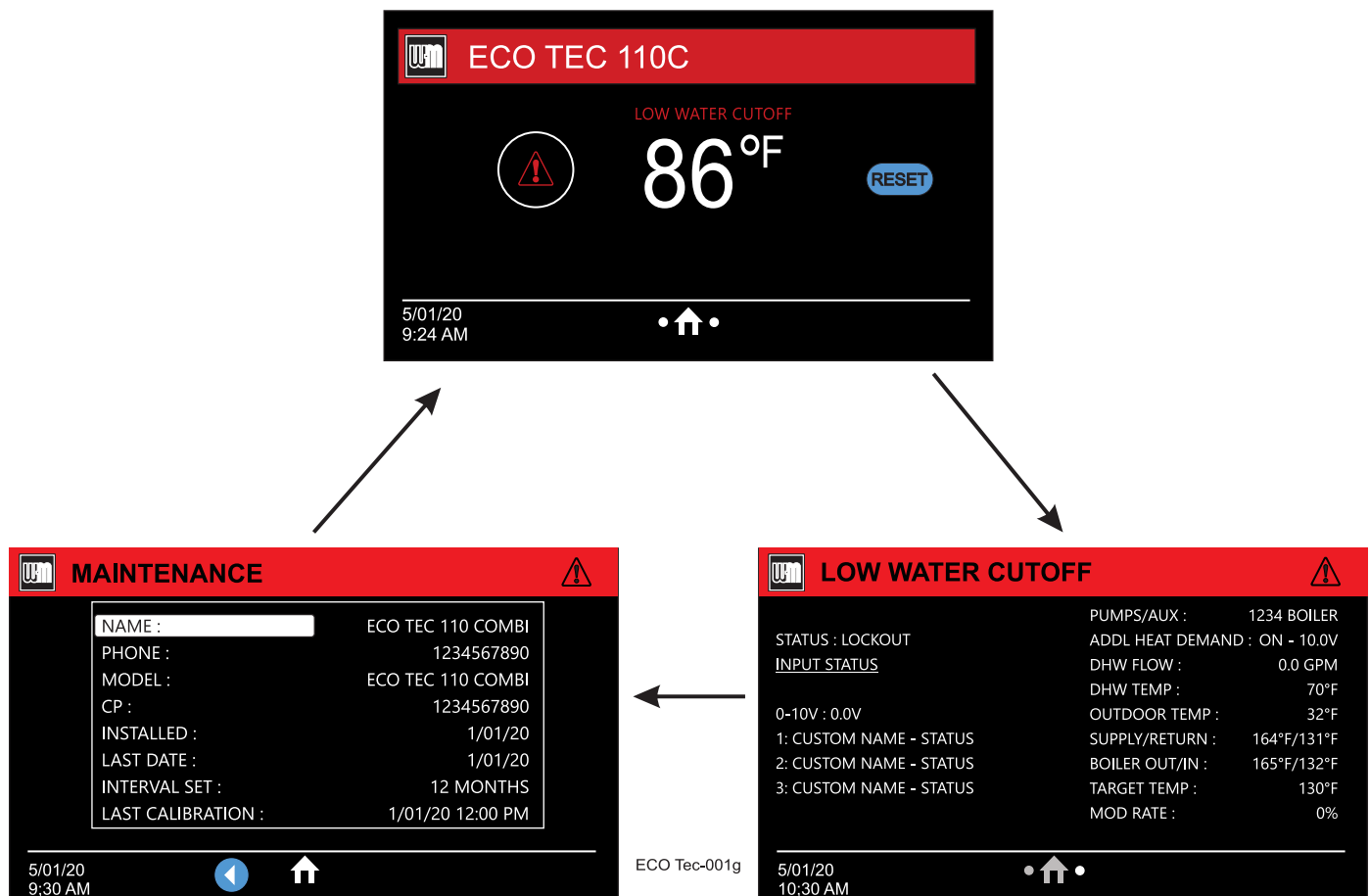
Troubleshooting (continued)

⚠️ WARNING Make sure to determine the causes of outages. Do not leave the boiler operating without a complete diagnosis.

Control fault indications

1. The control provides diagnostic information for both automatic reset conditions and manual reset conditions. See Figure 76, page 76 for information available on the control display and navigation instructions for all menus.
2. Figure 103 shows the screen behavior during a fault condition. The display illustration and text below in Figure 103 shows how to reset faults from the Home Owners screen.
3. Figure 105, page 117 lists conditions that will cause the control to display a constant red screen. The boiler will automatically restart if the condition self-corrects or the technician uses the control's manual reset screens to reset.

Figure 103 Control display toggles when in lockout, with screen red banner





Troubleshooting (continued)

Figure 104 Troubleshooting suggestions — control Error Condition Log

RESTART WIZARD

The user must hold the button for a specified length of time. Upon completion, this will erase user specific parameter settings and take the user back through the wizard.

2. Reset to Factory Default can be found on the BOILER SETTINGS menu, see Figure 80, page 87.

ONCE THIS IS CHOSEN, PREVIOUS SETTINGS CANNOT BE RECOVERED. ENSURE THIS ACTION IS TRULY DESIRED BEFORE CONTINUING.

RESET TO FACTORY DEFAULT

1. The user must hold the button for a specified length of time. Upon completion, this will reset the control settings back to factory installed settings.

ONCE THIS IS CHOSEN, PREVIOUS SETTINGS CANNOT BE RECOVERED. ENSURE THIS ACTION IS TRULY DESIRED BEFORE CONTINUING.

Figure 105 Troubleshooting suggestions — Control Error Condition Log

The Control is able to record information about the boiler’s condition at the time of the three previous faults or errors. This information is available to view in Contractor Menus under “DIAGNOSTICS” by selecting “FAULT HISTORY” The control will display the following information:

Information	Description	Action
Ignition Retries	Displays cumulative ignition attempts. It is recommended that this be reset during yearly maintenance.	Press and reset button to reset the count or select this parameter and press enter to reset.
Manual Reset Count	Records number of lockouts that required a manual reset since this count was last cleared.	Press the reset button to reset this count.
Auto Reset Count	Records number of lockouts that have automatically reset since this count was last cleared.	Press the reset button to reset this count.
Lockout History 1- 6	Details of present or last recorded lockout, up to 6 previous lockouts.	Select and press the right arrow key for more details.

How to read the last 6 lockout histories:

1. Press “DIAGNOSTICS” button.
2. Select “FAULT HISTORY” and press the right arrow key.
3. Select “LOCKOUT HISTORY #” and press the right arrow key.
4. Review fault information displayed on screen.

How to clear all lockout histories:

1. While on the “FAULT HISTORY” screen, hold the reset button until cleared.



Troubleshooting (continued)

Figure 106 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
Nothing shown on display screen and boiler will not respond to call for heat	Control is not receiving 24V power.	Check wiring for short circuit or incorrect wiring.	Correct wiring per wiring diagram including connection of transformer to the control.
		Check 3-amp low voltage fuse on control shown on page 115.	Replace fuse with proper part found in replacement part section of this manual. If fuse blows again recheck wiring per diagram.
		Check transformer connection to the control per wiring diagram. Check for 24V output of transformer.	Replace transformer if it is receiving 120VAC, but not outputting 24VAC.
Nothing is shown in display screen and no other boiler components are operating	Control is not receiving 120V power.	Check service switch and/or circuit breaker to boiler is turned on.	Turn on service switch to power boiler.
		Is there 120VAC at the service switch?	Troubleshoot and correct the power supply to the service switch.
		Check for 120VAC at the line voltage terminal block located at J1 on the circuit board.	Correct wiring to circuit board using the wiring diagram in this manual.
		Inspect 4-amp fuse as shown on page 115. Replace if necessary.	Replace the fuse with proper part found in the replacement part section of this manual. If fuse blows again recheck wiring per diagram.
Nothing is shown on display screen, but boiler is operating	Occurs if the communication is lost from the control to the display.	Check for loose connections and proper pin alignment/engagement on the control's plug J14 and the back of the display circuit board.	Check for continuity on the wire harness from the display to the communications board to circuit board. See repair parts section for proper replacement part.
		Cycle power off and on and check for operation.	Replace with new display module. See repair parts section for proper replacement part.
TEMP RISE TOO QUICKLY	Occurs if supply water temperature in heat exchanger rises faster than 10° F per second during the first two minutes the burner is on.	Automatically resets after 1 minute delay or using manual reset on display.	Verify water pipe is installed correctly per instructions in this manual.
		Manual reset is necessary after 5 automatic resets have occurred during the same Priority heat demand. Reset using manual reset screen on display.	Verify proper circulator and speed for boiler size and system requirements.
			See message displayed TEMPERATURE SENSOR and follow procedure for loose connections.
Communication errors	Occurs if display or main control communications out for 30 seconds.	Automatically resets when communication is re-established.	Improper connections may display the incorrect model numbers. Check for a loose connection at the molex plug on the control and connection on the back of the display.
Control fault	Occurs when micro-controllers on main board have a RAM or ROM error.	Check for hardware damages.	RAM or ROM errors can be reset with the manual reset option. If problems persist, replace main board.



Troubleshooting (continued)

Figure 107 Troubleshooting suggestions — Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
LOW WTR CUTOFF OPEN	Occurs if internal low water cutoff contacts open.	Manual reset of control if contacts are open.	<p>Check for low water condition in system. Repair system as necessary refer to piping section of this manual.</p> <p>If low water condition does not exist, check Diagnostics — Inputs screen to view status of Low Water Cutoff. If shown as OPEN check wiring between LWCO and control. If wiring is alright, remove LWCO and Clean probe. If problem still exist, then replace the LWCO.</p>
RETURN > SUPPLY	Occurs if a return water temperature is greater than the corresponding supply temperature by 10° F or more and burner has been lit for more than 60 seconds.	Automatically resets when condition no longer exists.	<p>Verify proper flow direction of the boiler circulator.</p> <p>Verify proper placement of system sensors. System sensors should be on system piping not on the boiler loop.</p> <p>Verify sensors are wired to correct terminal locations.</p> <p>System sensors may need to be located further away from the boiler loop connection to the system, if proximity to the boiler loop is causing sensors to be heated inaccurately.</p>
Boiler Output sensor or Flue sensor	Occurs if dual temperature sensors values have spread by more than 10° F.	Automatically resets when sensors are within 10° F.	Follow procedure for above for SHORT and OPEN sensor conditions to properly diagnose sensor. If measured resistance values of sensors convert to temperatures separated by more than 10° F replace the sensor.
FLUE TEMP TOO HIGH	Occurs if flue temperature sensor exceeds 210° F (Warning) or 220° F (Lockout).	<p>Automatic reset occurs if temperature drops below 210° F for 2½ minutes.</p> <p>Manual reset is required if the temperature rises above 220° F. Reset using manual reset screen on display.</p>	<p>Follow procedure above for SHORT and OPEN sensor conditions to properly diagnose sensor. In addition inspect heat exchanger combustion chamber and flue ways for abnormal wear or buildup.</p> <p>Inspect vent system for abnormal wear or damage.</p> <p>Contact Weil-McLain Technical Support.</p>



Troubleshooting (continued)

Figure 108 Troubleshooting suggestions — Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
LIMIT OPEN	Occurs if manual or automatic reset limit opens.	Automatic external limit will reset 2½ minutes after external limit device closes.	Is there an external safety device connected? If yes, trouble shoot the external limit to determine and correct the cause that opened the limit. Also check for loose wiring connections.
		Manual limit fault must be reset by choosing Manual Reset on the display.	Remove the Control cover and inspect the connector Ensure a jumper is installed across the MAN LIMIT terminals if not using a manual reset external limit. Ensure a jumper is installed across the AUTO LIMIT terminals if not using an automatic reset external limit.
HIGH TEMP LIMIT	Boiler temperature sensor reached High Temp Limit setting.	Reset using manual reset screen on display.	Verify that high limit setting is at least 10° F above the <u>maximum</u> target temperature <u>plus the off differential</u> .
			Verify all isolation valves are open and circulators are programmed into the control properly. The boiler circulator output and System Pump/Aux. output can be configured to turn on or off with each priority. Refer to the Control Setup section to configure these properly for the system.
			Verify water pipe is installed correctly per instructions in this manual.
			Verify proper circulator sizing for boiler size and system requirements.
			See message displayed TEMPERATURE SENSOR and follow procedure for loose connections.
FALSE FLAME	Occurs if flame is detected when there should be no flame.	Reset using manual reset screen on display.	Burner may be operating too hot due to incorrect combustion. Inspect flame and conduct combustion test. Force boiler into high fire. Check flue gases with combustion analyzer and correct using the maintenance and startup procedure in this manual.
			Verify FLAME SIGNAL value quickly goes to zero on the DIAGNOSTICS - INPUTS screen when the gas valve closes.
			Check for flame at burner via flame current with burner off. Turn boiler off and watch flame through observation port. If flame continues after shut down replace gas valve.
GAS RELAY FAULT 1-4	The control has detected a problem with gas valve output circuit.	Control will do automatic retry; lockout if retry unsuccessful; retry 1 hour after lockout — restart if condition cleared, but lockout requiring manual reset if condition still present. Requires manual reset if control is in lockout.	If lockout reoccurs replace control.



Troubleshooting (continued)

Figure 109 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
IGNITION 1 FAULT	Boiler went through 5 ignition attempts and never detected flame or flame sense value never reached minimum threshold for boiler model.	Automatically resets after 1 hour or can be reset by performing manual reset on boiler.	Check condensate trap for blockage allowing condensate to accumulate inside heat exchanger. Check ignition cable connection.
IGNITION 2 FAULT	Boiler went through 5 ignition attempts and did not meet running flame threshold for boiler model.		Fouled, worn, bent, or faulty igniter. Fouled ignition electrode can be cleaned for additional use with steel wool. Worn or badly fouled ignition electrode should be replaced with the proper repair part. Igniter rods should be parallel with a 4.5 mm (0.177 in) spark gap. NOTICE: Thin white deposits on the igniter are typical, but brown or black deposits could be the result of flue gas recirculation. Thoroughly inspect the venting system and termination for the possibility of leakage or flue gas feedback into the air line.
FLAME LOSS FAULT	Boiler went through 5 ignition attempts and flame value dropped below Proof of Ignition during stabilization time of ignition.		Dirty burner and/or heat exchanger will cause high back pressure and poor ignition. Follow procedure in maintenance section of this manual to clean burner and heat exchanger. Visual inspection of flue ways may not be sufficient to diagnose condition. Check combustion settings on high and low fire and adjust per setup instructions if necessary. Check flame signal during combustion testing according to page 109 section "Check flame signal." Check incoming gas pressure with boiler off and at high fire. Adjust within limits on rating label. Verify correct boiler model is selected in control and high altitude is selected for installations 5,500 above sea level. Check ignition cable resistance. Should measure 1000 Ohms (+/- 50 Ohms). Check for flue pipe and intake pipe restrictions or blockage. Check burner fasteners and gaskets. Check venturi gaskets and proper venturi. (Propane models use different venturi's).
AIR PRESSURE Switch Open	Occurs when Air Pressure connection is open.	Reset using Manual Reset screen on display.	Check boiler size selected in control against boiler rating label. Correct if necessary to select the proper boiler size. Check the factory jumper on J22 connection as seen on Figures 70, page 66 and Figure 71, page 68.
Closure Switch fault	Proof of Closure connections on J18 a Pins 2 and 3 are open.	Soft lockout for 4 minutes then unlocks and checks for up to 4 minutes. If still open, soft lockout for 4 minutes. Repeats once more then a manual lockout.	None - Check jumper on correct pins and secure connection. Flow switch attached - Check correct pump is on, check wiring to flow switch and check switch is closing. CAD - Check voltage to damper. Check damper is opening.



Troubleshooting (continued)

Figure 110 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
Configuration fault	Configuration data in the control safety micro does not match that in the control's application micro.	Correct the invalid configuration information.	Reconfirm all settings within the Control Settings screen. Cycle power to the unit. Perform a factory reset by going to Diagnostics – Control Settings – Factory Default Reset and follow the on-screen instructions.
DHW Outlet > Boiler Out	*Combi Only* DHW Outlet > Boiler Outlet + 10°F and burner has been firing for at least 30 seconds.	Clears when the DHW Outlet sensor < Boiler Outlet sensor plus 7°F.	Ensure appropriate water flow is being delivered by the installed circulators. Check appropriate valves are open. Check 3-way valve is operating correctly.
Internal Clock Fault	Occurs when the internal clock of the control is out of sync.	Clears when the control sees a valid clock count within the control.	Cycle power of the boiler. Check the wiring of the display. If problem persists, replace display.
Supply 60F > Return	Occurs if either Boiler Out temperatures are greater than Boiler In temperature by more than 60F or the burner has been on for less than 2 minutes. If this condition occurs when the burner has been on for more than 2 minutes, the burner stops firing but no message or lockout occurs.	The first time a lockout occurs, the time to clear is 2 minutes 30 seconds. The second time a lockout occurs it's a 3 minutes 30 second lockout. The third time, its 4 minutes 30 seconds, the fourth time its 5 minutes 30 seconds. The fifth time its 6 minutes 30 seconds. The system will retry, indefinitely, every 6 minutes 30 seconds as long as the temperatures return to being < 60 degrees. If the burner first for at least 2 minutes without the temperature difference exceeding 60 degrees, the time condition for the > 60 degree soft lockout is reset back to the minimum value of 2 minutes 30 seconds.	Ensure proper water flow is present through boiler. Ensure circulators are sized correctly per the system installation and are installed correctly. Check wiring to circulators. For Combi applications, add a pre-pump time to the Combi priority to mix and circulate water to reduce chances of this fault occurring.
Temperature Sensor Flue 1 Sensor Open Flue 1 Sensor Short Flue 2 Sensor Open Flue 2 Sensor Short Boiler Out 1 Sensor Open Boiler Out 1 Sensor Short Boiler Out 2 Sensor Open Boiler Out 2 Sensor Short Boiler In Sensor Open Boiler In Sensor Short	Specified sensor is sensed as Open/Short.	Clears automatically when sensor is no longer Open/Short.	Check for loose or damaged wires on the designated sensor and at the control board. Replace appropriate sensor. If issues persist, replace control.
Blower Fault 1	Blower does not reach zero RPM within 4 minutes when mode is Standby or Prepump.	Clears automatically after 1 hour.	Check for loose or disconnected low voltage wires to blower motor. Inspect low voltage blower motor harness.



Troubleshooting (continued)

Figure 111 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Faults

Display	Condition	Diagnostics	Corrective Action(s)
Blower Fault 2	Blower unable to reach required pre-purge speed or ignition speed. Blower failed to complete calibration within 4 minutes	Clears automatically after 1 hour.	Check for loose or damaged wires on high voltage and low voltage blower motor harnesses. Re-calibrate blower motor in Boiler Settings menu
Blower Fault 3	Blower is outside of minimum or maximum speed for 10 seconds.	1 hour automatic reset	Check for loose or damaged wires on high voltage and low voltage blower motor harnesses. Re-calibrate blower motor in Boiler Settings menu.
Voltage Too High Voltage Too Low No Voltage Detected	Voltage Configuration jumper on J6 installed incorrectly. 24VAC jumper installed when should be 120VAC. 120VAC jumper installed when it should be 24VAC. No jumper installed	Clears when correct jumper configuration is installed on J6	Ensure the J6 connector is firmly inserted. Check the connector on J6 on the control board. It should match what is specified for this product. Check incoming voltage on the main power to the boiler, as well as across each jumper of the J6 connector.
Hardware A2D Fault	The analog reading of the internal voltage reference on U1 read out of range 2 times in a row.	Clears when the analog internal voltage reference is within range.	Power cycle the boiler. If problems persist, replace the control.
Flame Circuit Fault	When the digital flame input does not sense the circuit to have discharged appropriately.	Unit receives manual reset.	Power cycle the boiler. If problems persist, replace the control



Troubleshooting (continued)

Figure 112 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Warnings

Display	Condition	Diagnostics	Corrective Action(s)
Supply Sensor	Occurs when Supply Sensor are chosen as the Target Modulation sensors and the Boiler In sensor is either open or short.	Clears warning when a valid sensor is detected.	<p>Check all the temperature readings of the boiler on the DIAGNOSTICS - TEMPERATURES menu to determine if any sensors are currently displayed as SHORT or OPEN. Compare this to the boiler temperatures recorded in the DIAGNOSTICS - ERRORS - LOCKOUT HISTORY # - TEMPERATURES during the last several lockout conditions. Determine which sensors are suspect and measure their resistance value and compare it to the values shown in Figure 101, page 115. If the resistance values are incorrect replace the temperature sensor. Refer to repair parts section for proper part number.</p> <p>Check wire harness for loose connections and pin engagement at sensor connection, chassis mount connection through control housing, and the control. Unplug connection at sensor and at control and check continuity between ends.</p> <p>If problem persists after checking Items above, replace control. Refer to repair parts section for kit number.</p>
Return Sensor	Occurs when Return Sensor are chosen as the Target Modulation sensors and the Boiler out sensor is either open or short.	Clears warning when a valid sensor is detected.	<p>Check all the temperature readings of the boiler on the DIAGNOSTICS - TEMPERATURES menu to determine if any sensors are currently displayed as SHORT or OPEN. Compare this to the boiler temperatures recorded in the DIAGNOSTICS - ERRORS - LOCKOUT HISTORY # - TEMPERATURES during the last several lockout conditions. Determine which sensors are suspect and measure their resistance value and compare it to the values shown in Figure 101, page 115. If the resistance values are incorrect replace the temperature sensor. Refer to repair parts section for proper part number.</p> <p>Check wire harness for loose connections and pin engagement at sensor connection, chassis mount connection through control housing, and the control. Unplug connection at sensor and at control and check continuity between ends.</p> <p>If problem persists after checking Items above, replace control. Refer to repair parts section for kit number.</p>
DHW Outlet Sensor	<p>*Combi Only*</p> <p>The DHW Outlet sensor read invalid.</p>	Clears warning when DHW Outlet sensors both read as valid.	<p>Check all the temperature readings of the boiler on the DIAGNOSTICS - TEMPERATURES menu to determine if any sensors are currently displayed as SHORT or OPEN. Compare this to the boiler temperatures recorded in the DIAGNOSTICS - ERRORS - LOCKOUT HISTORY # - TEMPERATURES during the last several lockout conditions. Determine which sensors are suspect and measure their resistance value and compare it to the values shown in Figure 101, page 115. If the resistance values are incorrect replace the temperature sensor. Refer to repair parts section for proper part number.</p> <p>Check wire harness for loose connections and pin engagement at sensor connection, chassis mount connection through control housing, and the control. Unplug connection at sensor and at control and check continuity between ends.</p> <p>If measured resistance values of sensors convert to temperatures separated by more than 10°F replace the sensor.</p> <p>If problem persists after checking Items above, replace control. Refer to repair parts section for kit number.</p>



Troubleshooting (continued)

Figure 113 Troubleshooting suggestions – Fault displays, diagnostics and corrective actions

Warnings

Display	Condition	Diagnostics	Corrective Action(s)
Outdoor Sensor Error	Outdoor temperature sensor short or OPEN.	Will automatically reset if the condition clears. Warning only. Max Target Temp is targeted until Outdoor Temp is restored, if used for target adjustment.	Determine which sensors are suspect and measure their resistance value and compare it to the values shown in Figure 101, page 115. If the resistance values are incorrect replace the temperature sensor. Refer to repair parts section for proper part number. Check wire harness for loose connections and pin engagement at sensor connection, chassis mount connection through control housing, and the control. Unplug connection at sensor and at control and check continuity between ends. If problem persists after checking Items above, replace control. Refer to repair parts section for kit number.
Exceeded Flow Rate	*Combi Only* The Combi block has a flow rate above the Maximum Flow Rate for the boiler model.	Clears warning when the flow rate is below the Maximum Flow Rate for the boiler model minus 0.5 GPM.	Check the flow rate through the Combi block of the boiler and reduce as necessary. Check flow sensor for damages and voltage readings to ensure a working flow sensor.
Target Reduced - Flue	Flue temperature detected between 200°F and 210°F. Modifies target temperature to prevent overheating flue.	Clears warning when Flue temperatures have been below 200°F and the target has returned to its original setpoint, then 1 hour of burner run time has elapsed without the Flue temperature exceeding 200°F.	Check the flue pipe for any blockages. Check the CO2 readings using an analyzer and adjust gas valve accordingly to match nominal CO2 readings within manual.
Target Reduced - Boiler	Boiler Outlet sensor detected above Max Boiler Temp minus Boiler Out On Diff. *Can only occur if using System Supply or DHW Out as a modulation sensor*	Clears warning when Boiler Outlet sensor is detected below Max Boiler Temp minus Boiler Out On Diff.	No corrective action required. Boiler is operating normally.
Target Reduced - Flow	Boiler Outlet sensor detected > Boiler Inlet sensor + 50°F. Modifies Target temperature to prevent overstressing heat exchanger.	Clears warning and target modification when Boiler Outlet sensor is detected ≤ Boiler Inlet sensor + 50°F.	Check water flow through the boiler heat exchanger. Check circulators for malfunction or wiring issues.
Clock Fault	When the real time clock chip is unable to be read.	When the real time clock chip is working correctly and has had a time written to it.	Enter an updated time/date. + If problems persist, replace display.
Software Incompatible	Main control and display software are not compatible.	Unit is updated to matching software.	Check software versions for main control and display. Replace the hardware that is the incorrect software version.
Virtual Input Active	If Modbus is activating any virtual TT input.	No virtual inputs are active.	Check Modbus communication device for virtual TT input commands.



Maintenance

⚠ WARNING DO NOT SERVICE THE BOILER WITHOUT A ECO Tec MAINTENANCE KIT AVAILABLE

The maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler.

Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage.

See Figure 125, page 137 for part number.

Cleaning the heat exchanger WATER SIDE, when required

1. Isolate the boiler from the heating system.
2. Inspect the heating system water. If there is evidence of sediment or corrosion, the boiler must be isolated from the system. The system must then be thoroughly cleaned to remove all sediment.
3. Isolate the cause of the system corrosion and correct the problem(s) before placing the boiler back in service.

⚠ WARNING Failure to comply could result in severe personal injury, death or substantial property damage.

Disconnect power

⚠ WARNING **Electrical shock hazard** — Disconnect all electrical power to the boiler before attempting maintenance procedures. Failure to complete could result in severe personal injury, death or substantial property damage.

Re-install boiler jacket door after startup or servicing

⚠ WARNING Reinstall boiler jacket door after start-up or servicing. The boiler jacket door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances.

Inspect boiler jacket door gaskets on front of cabinet. Gaskets must be in good condition, with no tears or gaps. Replace if necessary.

Failure to keep the jacket door securely sealed and fastened could result in severe personal injury or death.

Start-up and check/out

⚠ WARNING Removing and reinstalling components can change boiler behavior. After any maintenance procedure, you must prove the boiler is operating correctly. To do so, follow the complete procedure for boiler and system start-up, beginning on page 97. Failure to comply could result in severe personal injury, death or substantial property damage.



Cleaning heat exchanger flue side

Cleaning the heat exchanger FLUE SIDE or accessing the burner, if required

▲WARNING The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 106 of this manual. Failure to comply could result in severe personal injury.

Tools required

- Long-handled Torx driver, #20 - burner screws
- 3mm Allen wrench - ignition electrode screws
- 8mm Wrench - blower lock nuts
- 10mm Wrench or socket - heat exchanger cover nuts
- Torque wrench - proper tightening
- (1) Large Crescent wrench - gas valve removal
- (1) Pipe wrench - gas valve removal

Before proceeding:

1. Shut down the boiler:
 - a. Follow “To Turn Off Gas to Appliance” instructions on boiler and Operating instructions.
 - b. Close the boiler manual gas valve.
2. Allow time for the boiler to cool to room temperature if it has been firing.
3. Remove jacket door by undoing the two (2) latches on each side.
4. Lift the jacket door up and away from the boiler to remove.
5. Remove Control Bracket Cover by removing the two (2) screws and lifting it up.
6. Unplug display cable from control module and lift display bracket assembly up from bottom. Once bottom tabs are disengaged from control bracket, move assembly down to disengage tabs from top cabinet and place assembly in a safe location.

Remove components to access the heat exchanger flue side

1. See Figure 114, page 129 part A to locate components referenced in the following.
2. Remove the air silencer and disconnect gas valve and gas flex line:
 - a. See Figure 114, page 129 part A, B and C.
 - b. Locate the clip (Item 2) connecting the air silencer (Item 1) to the venturi (Item 7). Gently pull clip out and away from the venturi, set aside. Slide silencer away back and off of the venturi. Set the air silencer aside.

▲CAUTION Label all wires, if they are not already labeled prior to disconnection, when servicing controls. Wiring errors can cause improper and dangerous operation.

- c. Disconnect wire harness connected to gas valve, the low voltage wire harness connected to the blower, and the high voltage wire harness connected to the blower High Voltage jumper harness.

▲WARNING Support the gas valve. DO NOT allow it to hang from the gas valve flex line.

- d. Disconnect the gas valve and gas flex line where it connects to venturi to by loosening the gas valve swivel nut to disconnect gas valve from venturi. Set the valve & gas line to the side.

▲WARNING Use two wrenches when disconnecting the swivel nut and gas line to prevent damage to the gas valve and other gas line components.

3. Remove the blower/venturi assembly.
 - a. See Figure 115, page 130, part D.
 - b. Remove the two (2) 5mm locknuts connecting the blower and cover plate with 8mm wrench. Remove blower assembly. Inspect blower gasket, replace if gasket has taken a set or if any signs of wear.
 - c. Remove burner tube (80/110/199 models only) from cover plate located under blower gasket. Inspect and set aside
 - d. Cut tape, 2 locations, that secures cover plate top insulation to heat exchanger. Remove cover plate top insulation, set to the side.
 - e. Gently set blower/venturi assembly aside. Inspect blower/cover plate gasket (Item 9). If gasket appears damaged, discard and replace with a new gasket.
 - f. Disconnect the ground wire and ignition cable from the ignition electrode (Item 13).
 - g. Remove the ignition electrode (Item 13) by removing the two (2) Socket head 3mm Allen igniter bolts, see Figure 115, page 130 part E. Set the ignition electrode and screws aside. Discard used gasket. Be careful when handling the ignition electrode not to damage the igniter ceramic. Obtain a new ignition electrode gasket before reinstalling the ignition electrode.
 - h. Inspect the igniter ceramic and electrodes. Clean the electrodes carefully with steel wool. If the igniter ceramic is cracked or damaged, replace the igniter with a new one.
4. Remove the heat exchanger cover plate and burner:
 - a. See Figure 115, page 130 part F and part G.

▲WARNING Handle the heat exchanger cover plate/ burner assembly carefully to avoid damage to the bottom cover plate insulation with integrated seal. Place the assembly on a clean, flat surface with the assembly upside down, as shown in Figure 115, page 130 part F and part G.

- b. Use a 10mm wrench or socket to remove the nuts (Item 11) that secure the heat exchanger cover plate (Item 10) to the heat exchanger. [Four (4) nuts (ECO Tec 80/110), five (5) nuts (ECO Tec 150), six (6) nuts (ECO Tec 199).]
- c. Carefully lift the cover plate assembly (part F, Item 10) straight up vertically until the cover plate insulation with integrated seal clears the heat exchanger studs.
- d. Pull the assembly forward and out of the cabinet.
- e. Turn the cover plate assembly over and place on a flat surface.
- f. Be aware of blower studs to avoid damaging studs, insulation or burner.



Cleaning heat exchanger flue side (continued)

Inspect and clean the burner

1. See Figure 115, page 130 part G.
 - a. Slide the bottom cover plate insulation with integrated seal (Item 19) off of the burner. Set the insulation aside where it will be kept clean and protected from damage. If the insulation and/or the seal is damaged, it must be discarded and replaced with a new one.
 - b. Remove the burner and its gasket (Items 14 and 15) by removing the screws with a T20 Torx driver. Discard old burner gasket.
 - c. Inspect burner insulation resting on top of cover plate bottom. If damaged or worn, replace with new component. Burner Insulation may be resting on top of inner burner. If on burner, remove, inspect, and replace if necessary.
 - d. Clean burner flange and cover plate surface where burner gasket sits removing all old gasket material.
 - e. Inspect the interior of the burner. Brush and vacuum the interior if needed to remove lint or sediment. Alternative cleaning methods: • blow air from the inside out; • clean with a water spray from inside the burner; • swirl the burner thoroughly in a bucket of mild liquid laundry detergent water, then rinse thoroughly.
 - f. Inspect the burner exterior. It must be in good condition, with no visible damage.
 - g. Obtain a new burner gasket before re-installing the burner.

Inspect and clean the heat exchanger

1. Access the heat exchanger interior by following the previous instructions.
2. See Figure 115, page 130 part F.
3. Before using water to clean the heat exchanger, remove the circuit board. Label wires if they are not labeled. Set aside. Remove all connectors and wire harnesses from the circuit board and then remove the four (4) screws securing it to the bracket and undo plastic snap-fit standoffs holding circuit board to bracket.
4. Use a strong light to visually inspect the interior of the heat exchanger. Make sure the flue ways (tubes) are clear and unobstructed.
5. Use a vacuum cleaner to remove any accumulation on the heating surfaces. This includes removing any pieces of insulation that may have dropped into the exchanger.

⚠WARNING DO NOT use any solvent when cleaning the exchanger.

6. If the vacuum cleaner is unable to clean completely, wash the heating surfaces with clean, warm water.
 - a. Place a shallow pan under the boiler condensate tube connection.
 - b. Loosen the condensate tube hose clamp and slide the trap off of the drain connection. (See Figure 67, page 56 for reference.)
 - c. Spray fresh water into the heat exchanger and tubes to remove sediment. Collect water in the pan below.

Reinstall components

1. See Figure 114, page 129 and Figure 115, page 130 for reference.
2. Reinstall the circuit board to the control bracket and reconnect all connectors and wire harnesses.
3. Reinstall the burner (Item 14), burner insulation (Item 16 and burner gasket (Item 15) on to the cover plate (Item 10). Burner insulation must be aligned on cover plate with blower inlet hole and the two ends of the blower mounting studs. The small holes in the insulation are to align with the two ends of the blower mounting studs. The beveled edge of the insulation should be face up while resting on the bottom side of the cover plate. Tighten the burner screws (Item 17) using a torque wrench. The screws must be secure, but the torque must not exceed 20 inch-pounds. Use new burner screws from Weil-McLain that include thread sealant. If reusing burner screws, apply a High Temperature Loctite to burner screw threads, such as Loctite 638, to ensure proper sealing of combustion chamber.
4. Slide bottom cover plate insulation with integrated seal over burner and align outer seal holes and igniter hole with cover plate heat exchanger mounting holes and igniter hole.
5. Reinstall cover plate / burner / insulation assembly on heat exchanger and secure the cover plate with 10mm hex nuts (Item 11). Be careful to avoid damaging the insulation on the heat exchanger studs.

⚠WARNING You must gradually tighten the cover plate nuts using a torque wrench. The final torque MUST NOT exceed 45 inch-pounds. Alternate tightening until all nuts reach 45 inch-pounds.

6. Reinstall the igniter assembly (Item 13).
 - a. The ignition electrode gasket must be replaced with a new gasket.
 - b. Insert the ignition electrode (Item 13) into the cover plate opening, with the gasket in position.
 - c. Reinstall the two (2) Socket head Allen screws finger tight. Use a torque wrench to tighten the ignition electrode screws. DO NOT exceed 20 inch-pounds torque.
7. Reinstall cover plate top insulation by sliding it on top of the cover plate and over the igniter. Secure insulation by using two (2) pieces of high temperature tape, aluminum foil tape recommended. Tape should secure the insulation to the Heat Exchanger.
8. Reinstall the blower / venturi/gas valve assembly (Items 3, 4 and 7).
 - a. Reinstall burner tube (80/110/199 models only) inside top of cover plate. Make sure burner tube flange is flush with cover plate surface when installing. Flange notch should align with the index alignment feature in the Cover Plate burner tube recess.
 - b. Install blower gasket (Item 9) between blower and cover plate.
 - c. Use 8mm wrench to secure blower to cover plate with two (2) locknuts (Item 8).
 - d. Reconnect the two (2) blower wiring harnesses.
9. Reconnect the ignition cable and the igniter ground wire.
10. Replace the gas valve-to-venturi fiber washer (Item 6 Figure 114, page 129 part C) with a new fiber gasket. Slide



Cleaning heat exchanger flue side (continued)

the gas valve, gas line and swivel nut (Item 5) onto the venturi (Item 7) gas inlet. Inspect the gas valve flex line, making sure there are no signs of wear or damage. Replace if necessary. For LP models, confirm LP Gas Orifice is inserted into venturi gas inlet before making the connection.

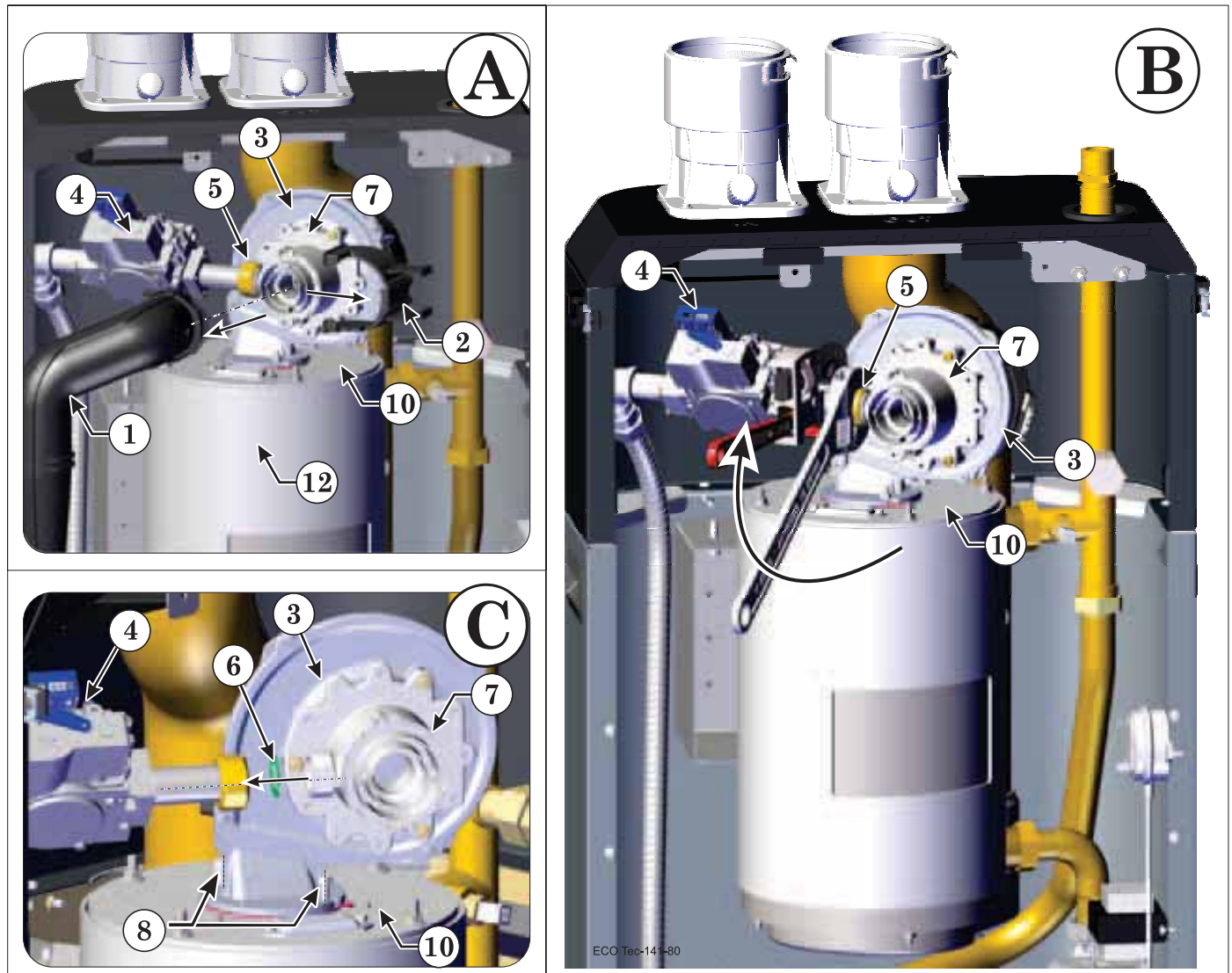
11. Using two (2) wrenches reconnect gas valve to venturi gas inlet.
12. Reinstall the air inlet silencer (Item 1) by pressing it onto the venturi air inlet. Rotate into the normal vertical position (see part A) of Figure 114, page 129.
13. Place silencer clip (Item 2) back onto the air inlet silencer/venturi.

WARNING Perform a complete start-up procedure when putting the boiler back into service. See page 97 and all instructions for start-up and verification. Include a soap suds leak test on all interior and exterior gas piping after starting the boiler.

Legend for Figures 112 and 113

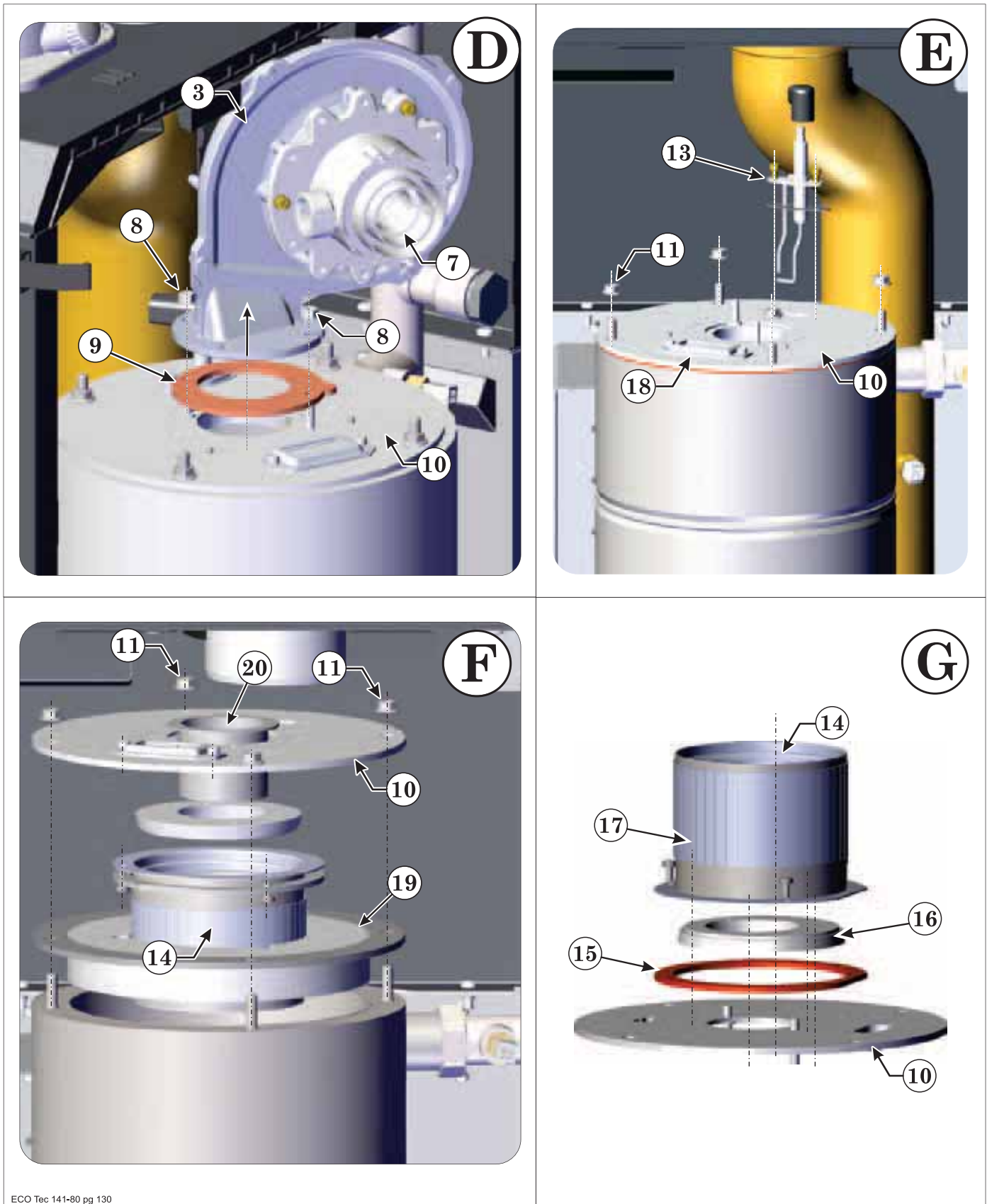
- | | |
|----------|---|
| A | Boiler interior, (Display, circuit board and display bracket removed to see combustion components). |
| B | Boiler interior, (Air silencer and toe top piece of heat exchanger insulation removed for clarity). |
| C | Gas valve from venturi disassembled to access the burner. |
| D | Blower and venturi disassembled to access the burner, (Gas valve assembly removed for clarity). |
| E | Ignition electrode assembly. |
| F | Heat exchanger cover plate and components. |
| G | Burner and components |
-
- | | | | |
|----|--|----|--|
| 1 | Air silencer | 12 | Heat exchanger insulation |
| 2 | Air silencer retainer clip | 13 | Ignition electrode assembly |
| 3 | Blower assembly | 14 | Burner |
| 4 | Gas valve | 15 | Burner gasket |
| 5 | Gas pipe swivel nut | 16 | Burner insulation |
| 6 | Fiber washer (light green) | 17 | Burner retainer screws (3) |
| 7 | Venturi assembly | 18 | Inspection plate window |
| 8 | Blower lock nuts 8mm (2) | 19 | Bottom cover plate insulation w/ integrated seal |
| 9 | Blower gasket | 20 | Burner tube |
| 10 | Cover plate | | |
| 11 | Combustion chamber cover plate retainer nuts (4) | | |

Figure 114 Accessing the burner or heat exchanger, air silencer and gas valve removal. (See Legend above).



Cleaning heat exchanger flue side (continued)

Figure 115 Accessing the burner , heat exchanger, blower assembly and venturi removal. (See Legend, page 129).



ECO Tec 141-80 pg 130

Cleaning DHW and Brazed Plate Heat Exchanger

Procedure for chemical cleaning of DHW circuit

Carefully read and follow the instructions contained.

Chemical cleaning and maintenance must be carried out by professionally qualified personnel, in compliance with the current regulations and according to the manufacturer's instructions. Do not carry out any operation on the sealed control parts.

Before carrying out any cleaning or maintenance operation, disconnect the unit from the electrical power supply using the switch and/or the special cut-off devices.

The disposal of chemicals and residues of chemical cleaning should be carried out in an appropriate manner, in accordance with current standards.

Domestic water for hot water production harder than 7 grains must be treated before entering combi boiler to avoid scaling internal combi boiler components.

Prolonged boiler operation with untreated water and/or hard water will reduce the production of domestic hot water. Cleaning the brazed plate and combi components may restore the performance of hot water production. Use only NSF approved chemicals that are safe for consumption and suitable for cleaning the combi components - stainless steel 316 (brazed plate) and brass (water manifolds and temperature sensor). Check chemical manufacturer's instructions and guidelines.

This procedure is intended as a guideline for restoration of the functionality of domestic hot water production.

Figure 116 Boiler connections for cleaning domestic water circuit



- | | |
|-----------------------------|-------------------|
| 1 Boiler In | 4 Boiler out |
| 2 Domestic hot water outlet | 5 Gas inlet |
| 3 Domestic cold water inlet | 6 Condensate tube |

⚠ DANGER Hot Water Can Scald!

- Consumer Product Safety Commission and some states recommend domestic hot water temperature of 130°F or less.
- When installing an **automatic mixing valve**, selection and installation must comply with valve manufacturer's recommendations and instructions.
- Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scald and cause injury.
- Children, elderly, infirm, or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:
- Install **automatic mixing valve** set according to those standards. (If used).
- Use lowest practical temperature setting.
- Check water temperature immediately after first heating cycle and after any adjustment.

⚠ WARNING Studies have indicated that dangerous bacteria can form in potable water distribution systems if certain minimum water temperatures are not maintained. Contact local health department for more information.

These single wall heat exchangers comply with National Standard Plumbing Code, provided that:

- Boiler water (including additives) is practically non-toxic, having a toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products.
- Boiler water pressure is limited to max. 30 psig by approved water relief valve.

NOTICE Before you start, check the compatibility of chemical cleaning product with the material of the heat exchanger and its components. The material of domestic hot water circuit is stainless steel class AISI 316. The brazed plate and water manifolds and temperature sensor are brass.

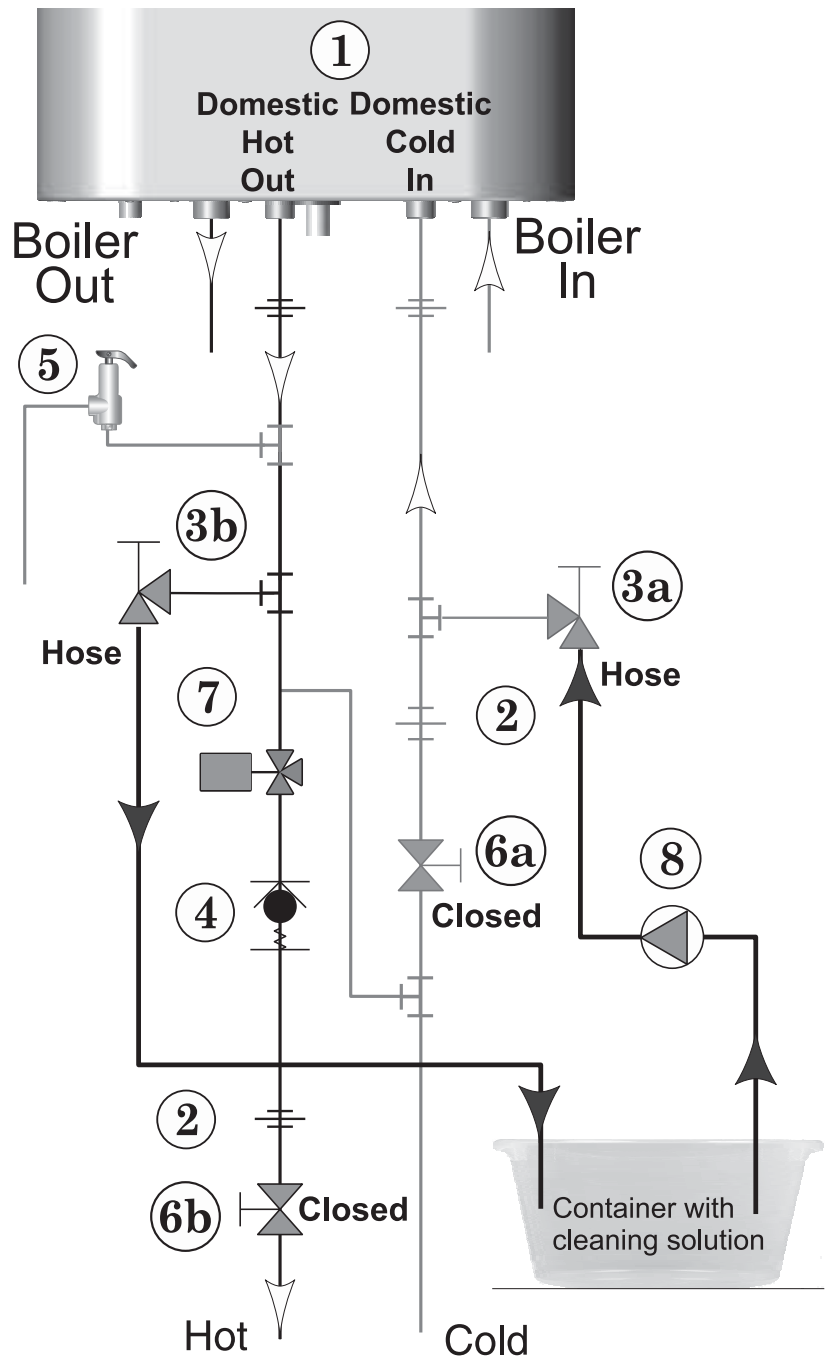


Cleaning DHW and Brazed Plate Heat Exchanger

Actions for chemical cleaning of Domestic hot water circuit (Refer to Figure 117)

1. Shut down the boiler:
 - a. Follow “To Turn Off Gas to Appliance” instructions on boiler and Operating instructions.
 - b. Close the boiler manual gas valve.
2. Close off the of cold water inlet valve (Item 6a) placed before the boiler inlet.
3. Release residual pressure in domestic hot water circuit in the boiler by opening a hot water tap downstream of the boiler. Then close the DHW hot water outlet valve (Item 6b).
4. Connect the pipe fittings and hoses of the pump for chemical cleaning to the cold water inlet (3a) and domestic hot water outlet (3b).
5. Fill the pump tank with the de-scaling chemical that is NSF approved. Be sure to follow the manufacturer's instructions for proper handling and disposable of the used cleaning solution.
6. Circulate the fluid within the domestic hot water circuit by activating the pump switch. Reversing the cleaning flow through the boiler's domestic water circuit by placing the circulating pump on the domestic hot water outlet hose may be required for proper cleaning.
7. At the end of the cleaning cycle, empty the pump from chemical and recover the product in appropriate containers for disposal.
8. Fill the pump with water and perform a washing cycle in order to remove the chemical product still present within the coils of the heat exchanger, recovering the liquid in suitable containers for disposal.
9. Repeat the washing with water more than once if necessary.
10. Disconnect the pipe fittings and hoses of the pump for chemical cleaning from the cold water inlet (3a) and domestic hot water outlet (3b).
11. Open the cold water inlet valve placed before the boiler inlet.
12. Reconnect the unit to the electrical power supply using the switch and/or the special cut-off devices and turn it ON.
13. Check the correct operation of the boiler and production of domestic hot water.

Figure 117 Domestic water circuit cleaning diagram instructions



ECO Tec-048

- | | |
|----------------------|---------------------------|
| ① Combi boiler | ⑤ Relief valve (150 PSIG) |
| ② Union | ⑥ Isolation valve |
| ③ Drain/Purge valve | ⑦ Three way mixing valve |
| ④ Spring check valve | ⑧ Circulating Pump |



Cleaning DHW and Brazed Plate Heat Exchanger

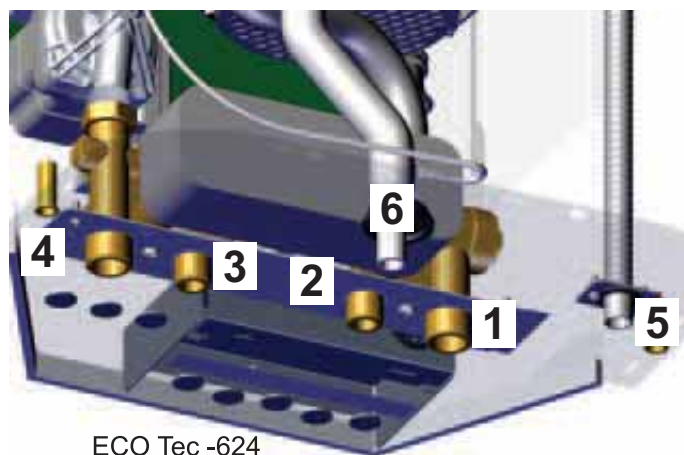
Before servicing Brazed Plate Heat Exchanger Assembly

1. Cool down boiler and brazed plate heat exchanger assembly. The following procedure may be used to cool down boiler and components. First follow the operating instructions on page 101 to properly shut off gas supply, but not the power to the boiler. Turn on a domestic hot fixture and allow cool water to flow through boiler. Boiler will lock out on an Ignition Fault but the internal circulator should continue to run cooling down the internal components. Once components are cooled down, turn off all electrical power going to the boiler following the operating instructions on page 101. If procedure is followed, continue on to #3.

WARNING Wait until heat exchanger/boiler is cooled down before proceeding. Water in brazed plate heat exchanger may still be **HOT!** Failure to do so can cause severe injury.

2. Shut down the boiler:
 - a. Follow “To Turn Off Gas to Appliance” instructions on boiler and Operating instructions.
 - b. Close the boiler manual gas valve.
 - c. Only needed if cool down procedure in Step #1 was not needed or followed.
3. Close the domestic cold water inlet isolation valve.
4. Release residual pressure in the domestic hot water circuit in the boiler by opening a hot water tap downstream of the boiler and drain the DHW components by opening the drain valves.
5. Close the space heating valves Boiler Out (1) and Boiler In (4) placed before the boiler connections.
6. Release residual pressure in boiler by operating relief valve or opening boiler drain. Drain boiler by opening drain on boiler in and boiler out.

Figure 118 Domestic water circuit on the Combi (Back view shown)



- | | |
|-----------------------------|-------------------|
| 1 Boiler In | 4 Boiler out |
| 2 Domestic hot water outlet | 5 Gas inlet |
| 3 Domestic cold water inlet | 6 Condensate tube |

Figure 119 Removal of brazed plate heat exchanger by loosening the two (2) screws.



Brazed plate heat exchanger removal for cleaning

1. Remove the Brazed Plate Heat Exchanger from boiler assembly by first removing the two (2) Allen Head bolts with a 4mm Allen wrench, see Figure 119. Push brazed plate back away from brazed plate manifolds clearing the bolt bosses on the brazed plate from the manifolds. Then slide the brazed plate up and to the left, removing it from the boiler.
2. The treatment time must be chosen according to the amount of scale deposits present in the brazed plate heat exchanger. However, the amount of time must always be less than the maximum treatment time specified by the chemical manufacturer’s product data sheet.

NOTICE The gas valve does NOT need to be removed to replace brazed plate heat exchanger.

3. Brazed plate heat exchanger can be immersed in a chemical cleaning bath.
4. At the end of the cleaning cycle recover the chemical product in appropriate containers for disposal.
5. Flush the brazed plate with potable water in order to remove the chemical product still present within the coils of the heat exchanger, recovering the liquid in suitable containers for disposal.
6. Repeat the rinsing with water more than once if necessary.
7. The cleaned brazed plate heat exchanger can now be reinstalled.

NOTICE The brazed plate heat exchanger must be reinstalled in the same orientation.

Cleaning/maintenance for Domestic Water Inlet & Outlet Manifolds

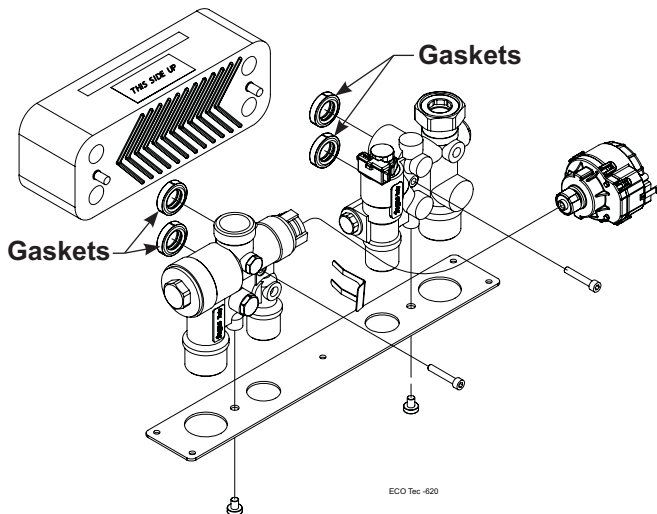
Brazed plate heat exchanger reinstalled

NOTICE

Four (4) new gaskets must be placed in the DHW inlet and DHW return plate connections to seal brazed plate heat exchanger. See Figure 132, page 144 for service part numbers.

1. Slide the brazed plate heat exchanger into rear of enclosure (ensure brazed plate is in proper orientation; label stating "This side up" should be facing up)
2. Lift brazed plate heat exchanger slightly up and align with DHW connections, reinstall the two (2) Allen head screws, and tighten securely. (Torque to 31 lb-in. +/- 4 lb-in.).

Figure 120 Reinstallation of brazed plate gaskets to brazed plate heat exchanger



WARNING

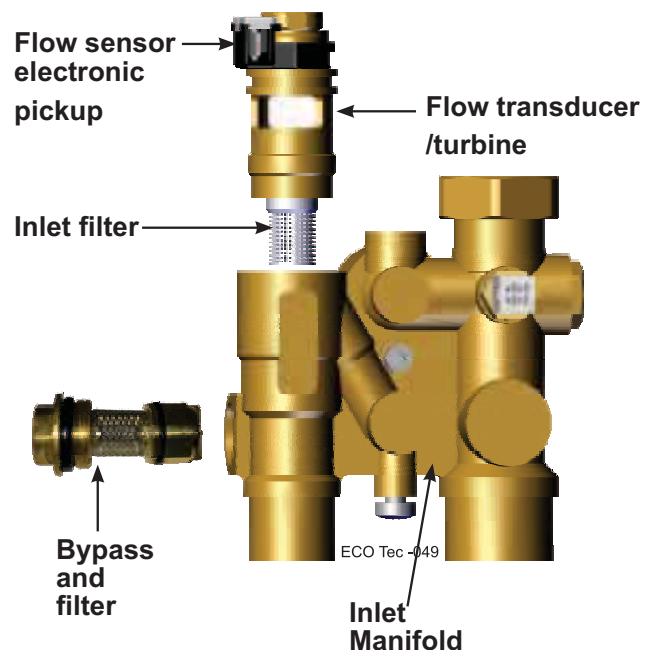
When re-installing components, make sure gaskets are in good condition and properly aligned before tightening screws.

3. Open the valve of CH system supply (1) and return (5) and fill the boiler with water. Purge all air from system. Check all water joints and ensure no leaks are present.
4. Open valves of the domestic cold water inlet and the domestic hot water outlet. Flush water through system by opening a fixture. Check all water joints and ensure no leaks are present.
5. Follow the operating instructions on page 101 to turn on the gas supply and to restore the electrical power to the boiler. The 3-way valve may be toggled back and forth to bleed air from the system. Follow procedure 1 through 3 on page 112 under "3 way valve test". Be sure to reset and clear any faults that may have occurred during this service.

Cleaning & Maintenance for Domestic Water Inlet Manifold (Refer to Figure 121)

1. Follow "To turn off Gas Appliance" instructions on boiler and Operating instructions and procedures 1-3 on page 133 "heat exchanger and its serviceable components".
2. Remove the flow sensor electronic pickup attached, by carefully lifting up and off of the flow transducer/turbine while keeping the wire attached to the flow sensor electronic pickup.
3. Remove the flow transducer/turbine using an 18mm hexagonal socket.
4. Detach the filter from the flow transducer/turbine, and clean filter by using air or water to push through the inside of the filter, opposite of normal flow. Be careful not to damage plastic filter.
5. Be sure to check the O-Ring and seat in the Inlet Manifold to make sure that they are clean and in good condition. Replace O-ring if damaged.
6. Reassemble flow transducer/turbine and filter, then reinsert flow transducer/turbine into the block and tighten down to 8.9 lbs-ft +/- 1.0 lbs-ft.
7. Re-connecting flow sensor electronic pickup to the flow transducer/turbine by gently pushing it down on the flow transducer/turbine. Make sure the wires are still connected to the flow sensor electronic pickup.
8. When servicing the flow transducer/turbine and filter, it is advised to inspect the by-pass filter.
9. Remove by-pass filter using 16mm (5/8") wrench. Clean the by-pass filter with water if needed. Make sure by-pass is in good working condition. Spring should be in relaxed state and in good working order.
10. Re-insert by-pass and tighten down to 6.3 lbs-ft +/- 1.0 lbs-ft.
11. The boiler inlet water temperature sensor is located in this manifold. Please refer to page 115 section "Checking temperature sensors" to verify proper working condition

Figure 121 Domestic Water Inlet Manifold components



Cleaning/maintenance for Domestic Water Inlet & Outlet Manifolds

12. Open valves of the domestic cold water inlet and the domestic hot water outlet. Flush water through system by opening a fixture. Check all water joints and ensure no leaks are present.

Cleaning and maintenance for Domestic Water Outlet Manifold (Refer to Figure 122 and Figure 123)

1. Follow “To turn off Gas Appliance” instructions on boiler and Operating instructions and procedures 4 and 5 on page 133
2. Slide actuator retaining clip out of the slot, see Figure 122.
3. Remove the actuator from Domestic Water Outlet Manifold while keeping wire attached.
4. Remove spacer using 28mm (1 1/8”) wrench, removing the sanitary shutter with it.
5. Remove heating cartridge using 22mm (7/8”) wrench
6. Clean components for both the Heating Cartridge and the Sanitary Shutter. Ensure springs are working properly by compressing them and shut off valves and valve seats are in good condition. If components are damage or have excessive wear they must be replaced.
7. Check both O-rings and seats to make sure they are undamaged. Replace O-rings if necessary. Clean O-ring seats and then apply a small amount of non-petroleum grease afterwards.
8. Apply a small amount of non-petroleum grease to the tip of the rod of the sanitary shutter, and reassemble it with the spacer.
9. Reinstall shutter/spacer into the Domestic Water Outlet Manifold, but do not tighten part.

10. Screw heating cartridge back into the Domestic Water Outlet Manifold, and tighten it down to 8.9 lbs-ft +/- 1.0 lbs-ft.
11. Tighten spacer down to 8.9 lbs-ft +/- 1.0 lbs-ft.
12. Reinstall actuator and actuator retaining clip back onto the Domestic Water Outlet Manifold.
13. The Domestic Hot Water temperature sensor is located in this manifold. Please refer to page 115 section “Checking temperature sensors” to verify proper working condition
14. Open the valves of CH system supply and return and fill the boiler with water. Purge all air from system. Check all water joints and ensure no leaks are present.

Figure 123 Domestic Water Outlet Manifold components disassembled

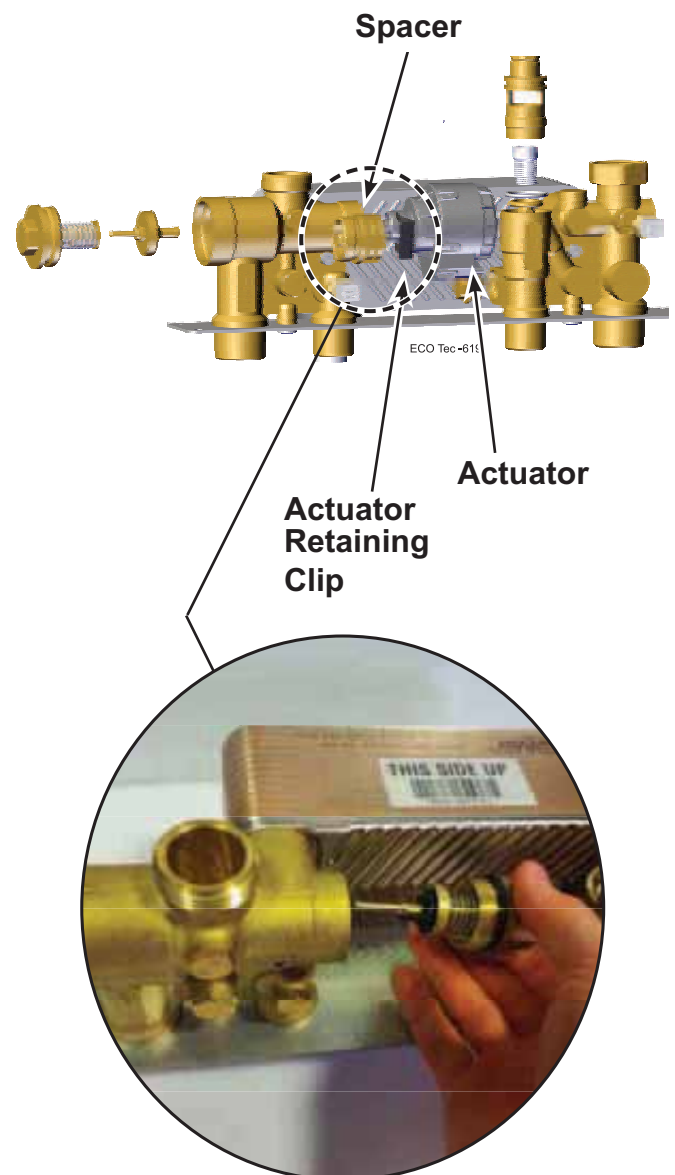
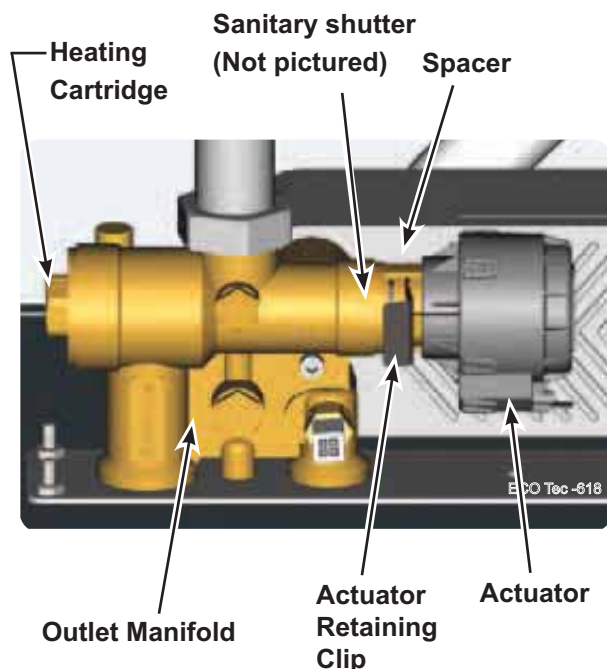


Figure 122 Domestic Water Outlet Manifold components





Replacement parts

⚠ WARNING DO NOT SERVICE THE BOILER WITHOUT A MAINTENANCE KIT AVAILABLE

The maintenance kit includes components that may have to be replaced when accessing or disassembling parts of the boiler. Failure to replace damaged components and to use only the parts specifically intended for the boiler can result in severe personal injury, death or substantial property damage. See Figure 125, page 137 for part number.

REPLACEMENT PART NUMBERS

Weil-McLain part numbers are found in this manual and in *Weil-McLain Boilers and Controls Repair Parts Lists*.

WHEN OPERATING THE BOILER ON PROPANE GAS

⚠ WARNING ALL ECO Tec boilers must be converted in order to operate with propane gas.

Figure 124 Propane conversion kits and instructions

Boiler model	Kit part number	Installation instructions
80/110	510-811-415	See page 14.
150	510-811-416	See page 14.
199	510-811-417	See page 14.

⚠ WARNING Failure to adhere to these guidelines can result in severe personal injury, death or substantial property damage.

OBTAIN PARTS ONLY THROUGH WEIL-McLAIN

Replacement parts must be purchased through a local Weil-McLain distributor. When ordering, specify boiler model and size and include description and part number of replacement part. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.

THE BOILER CONTAINS CERAMIC FIBER MATERIALS

The boiler contains ceramic fiber materials. Use care when handling these materials per instructions on page 106 of this manual. Failure to comply could result in severe personal injury.

REINSTALL Jacket door

Inspect boiler jacket door gaskets on front of cabinet and reinstall boiler jacket door after start or servicing. The boiler jacket door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room. This is particularly important if the boiler is located in the same room as other appliances. Failure to keep the jacket door securely fastened could result in severe personal injury or death.

BEFORE SERVICING or MAKING CONNECTIONS —

ALWAYS TURN POWER OFF TO THE BOILER TO PREVENT ELECTRICAL SURGES, WHICH CAN DAMAGE BOILER COMPONENTS.

LABEL WIRES BEFORE REMOVING

⚠ CAUTION Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.



Replacement parts (continued)

Figure 125 Miscellaneous service parts and kits

Description	Part Number	Description	Part Number
CHEMICALS			
Antifreeze, Sentinel X500, 1 Gallon	592-900-029	Bird screens (1 screen each) For 2" PVC vent and air pipes	560-907-728
Corrosion inhibitor, Sentinel X100	592-900-002	For 3" PVC vent and air pipes	383-500-105
Sentinel X100 Quick Test Kit.	592-900-005		
BOILER ACCESSORIES			
ECO Tec 80/110 maintenance kit — igniter, igniter gasket, venturi gasket, cover plate gasket, venturi-gas valve o-ring, refractory, inhibitor test kit, clips and instructions	383-700-265	Sidewall separate pipes vent/air termination kits (includes two cover plates) Kit for 2" PVC vent and air pipes. Approved for 80/110/150 models only	383-700-171
ECO Tec 155 maintenance kit — igniter, igniter gasket, venturi gasket, cover plate gasket, venturi-gas valve o-ring, refractory, inhibitor test kit, clips and instructions	383-700-266	Kit for 3" PVC vent and air pipes.	383-500-100
ECO Tec 199 maintenance kit — igniter, igniter gasket, venturi gasket, cover plate gasket, venturi-gas valve o-ring, refractory, inhibitor test kit, clips and instructions	383-700-267	Kit for 3" AL29-4C SS vent pipe and PVC air pipe	383-700-172
Condensate trap kit (supplied with boiler) — condensate tube, barb polypropylene 3/16, and hose clamps	383-700-268	PVC concentric vent kit — horizontal or vertical (includes components for concentric assembly) Kit for 2" PVC vent and air pipes. Approved for 80/110/150 models only	383-700-167
ECO Tec Pedestal - floor stand	383-700-339	Kit for 3" PVC vent and air pipes.	383-500-350
Wall bracket	383-700-386		
ECO Tec Easy Up Manifold	383-700-343	VENT/AIR PARTS AND KITS (PVC IPEX) available from IPEX ONLY	
Low Water Cut-Off	511-100-005	PVC concentric vent kit — horizontal or vertical (includes components for concentric assembly) 2" PVC concentric	196005
DHW Service Valve	383-700-346	Approved for 80/110/150 models only	
System sensor (2)	383-700-371	3" PVC concentric	196006
CONDENSATE HANDLING ACCESSORIES		VENT/AIR PARTS AND KITS (POLYPROPYLENE PIPE) available from M&G Simpson-Duravent ONLY	
Condensate neutralizer kit	383-500-631	M&G Simpson-Duravent PolyPro VERTICAL concentric vent/air kit; color = black (part number shown) or terra cotta (add -TC suffix) 2" polypropylene pipe	2PPS-VK
		3" polypropylene pipe	3PPS-VK
VENT/AIR PARTS AND KITS (PVC or STAINLESS STEEL) available from Weil-McLain		M&G Simpson-Duravent PolyPro SIDEWALL separate air and vent pipes 2" polypropylene pipe	2PPS-HTP
Weil-McLain Direct Exhaust Venting Kit Includes interior/exterior intake/exhaust plates. 2" & 3" vent screens, templates and mounting hardware	383-500-778	3" polypropylene pipe	3PPS-HTP
Weil-McLain sidewall vent/air cap termination kit for PVC vent and air pipes Includes sidewall vent/air termination cap, inside and outside cover plates, and mounting hardware; openings are sized for 3" PVC pipe (requires field-installed 3 x 2 adapter if using 2" vent/air pipes)	383-500-397	M&G Simpson-Duravent PolyPro 3" to 2" Adapter Polypropylene	3PPS-R2L
Weil-McLain sidewall vent/air cap termination kit for AL29-4C vent pipe and PVC air pipe Includes sidewall vent/air termination cap, inside and outside cover plates, and mounting hardware; openings are sized for 3" SS vent pipe and 3" PVC air pipe (requires field-installed 3 x 2 adapter if using 2" vent/air pipes)	382-200-430	VENT/AIR PARTS AND KITS (POLYPROPYLENE PIPE) available from Centrotherm Eco Systems ONLY	
		Centrotherm INNOFLUE SIDEWALL concentric vent/air kit 3" polypropylene pipe	ICWT352
		2" polypropylene pipe	ICWT242
		Centrotherm INNOFLUE VERTICAL concentric vent/air kit 2" polypropylene pipe	ICRT2439
		3" polypropylene pipe	ICRT3539
		Centrotherm INNOFLUE 3" to 2" Adapter Polypropylene	ISR0302
		Stainless Steel Vent/Flue & Air Adapter Connections	
		Heat Fab, Inc. — Saf T Vent	9301PVC
		Z Flex, Inc. — Z Vent	2SVSAFNS03
		Metal Fab, Inc. — CORR/Guard	3CGPVA

Go to www.weil-mclain.com to locate Weil-McLain distributors



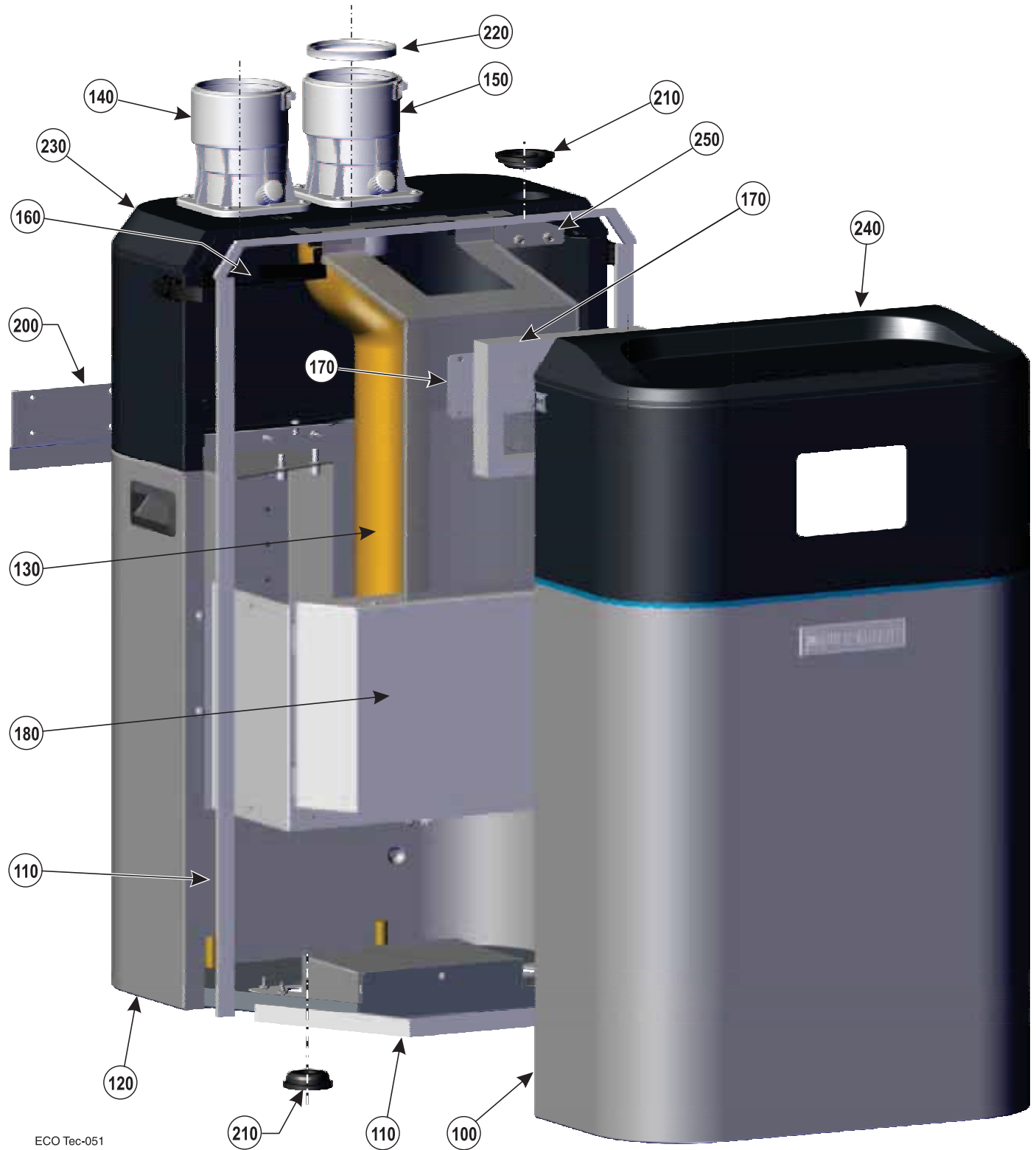
Replacement parts (continued)

Figure 126 Jacket parts – ECO Tec 80/110/150/199 (see Figure 127, page 139 for illustration)

Item	Name	Description / contents	Part Number
100	Jacket door	Jacket door, gaskets and labels	383-700-269
110	Gasket bottom, top & sides for jacket door	Seals for door bottom, sides and top of cabinet	383-700-363
120	Jacket Assembly	Jacket panels, gaskets and hardware	383-700-271
130	Flue pipe 80mm Polypropylene	Offset flue pipe	383-700-273
140	Adapter Vent-Air Inlet	Top air inlet adapter with internal gasket	383-700-274
150	Adapter Vent-Air Outlet	Top air outlet adapter with internal gasket	383-700-275
160	Air baffle and screws	Air baffle and screws	383-700-276
170	Display/bracket gasket	Display gasket	383-700-361
	Display/door gasket	Display housing to door gasket	
180	Panel control bracket/cover	Control bracket, cover and hardware	383-700-280
190	Display board bracket and gaskets (Not shown)	Mounting for the display to inside of cabinet	383-700-281
200	Wall mount bracket		383-700-386
210	Dome plug	Hole plug, 1-3/8" Dia. Black, for sealing Combi pipe holes	383-700-362
	Pipe grommet seal (for 2" I.D. hole)	Seals top water pipe to cabinet	
	Pipe grommet seal (for 1-5/8" I.D. hole)	Seals condensate tube to bottom of cabinet	
220	Flue gasket		383-700-384
230	Kit-Service Cabinet Top		383-700-390
240	Kit-Service Cabinet Door Top		383-700-391
250	Water pipe bracket		383-700-393

Replacement parts (continued)

Figure 127 Jacket assembly – ECO Tec 80/110/150/199 (see Figure 126, page 138 for part numbers)



ECO Tec-051



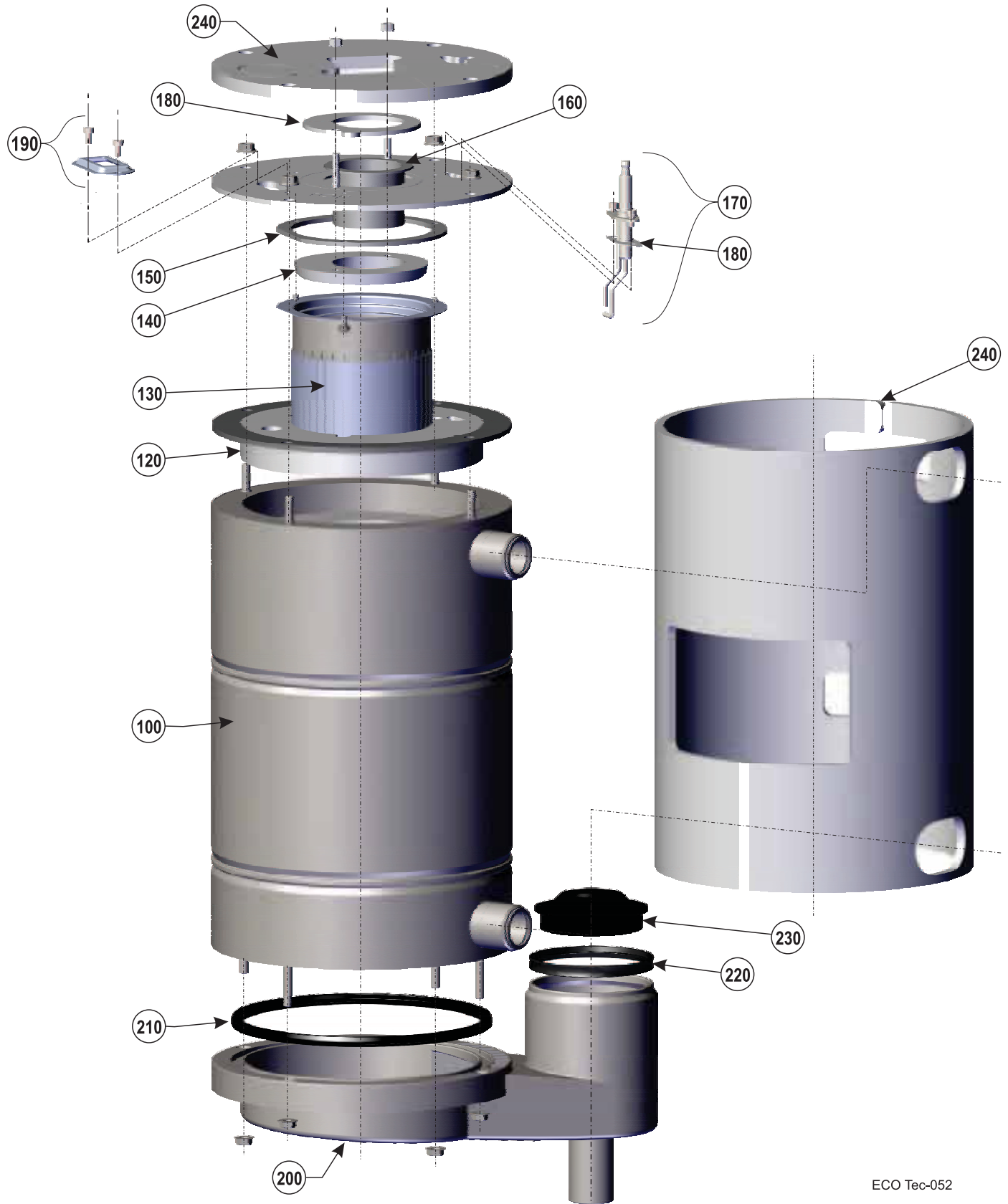
Replacement parts (continued)

Figure 128 Heat exchanger parts ECO Tec 80/110/150/199 (see Figure 129, page 141 for illustration)

Item	Name	Part Number	Model 80	Model 110	Model 150	Model 199
100	Heat exchanger	383-700-284	●	●	—	—
		383-700-285	—	—	●	—
		383-700-286	—	—	—	●
110	Heat exchanger, condensate dish, cover plate, burner, igniter, sight glass, refractory, water sensors, gaskets, silicone, and hardware (includes Items 100, 120, 130, 140, 150,160,170,180, 210, 220, and 230)	383-700-287	●	●	—	—
		383-700-288	—	—	●	—
		383-700-289	—	—	—	●
120	Insulation with integrated seal - bottom cover plate	383-700-291	●	●	—	—
		383-700-292	—	—	●	—
		383-700-293	—	—	—	●
130	Burner	383-700-297	●	●	—	—
		383-700-298	—	—	●	—
		383-700-299	—	—	—	●
140	Disc burner refractory	383-700-372	●	●	—	—
		383-700-373	—	—	●	●
150	Burner gasket	383-700-300	●	●	—	—
		383-700-301	—	—	●	●
160	Burner tube	383-700-290	●	●	—	●
170	Ignition electrode kit (igniter, gasket and screws)	383-700-295	●	●	●	●
180	Kit - Service Silencer O-ring, blower gasket, gas flex line, and igniter gaskets	383-700-360	●	●	●	●
190	Sight glass kit (bracket, glass, gaskets, and hardware)	383-700-185	●	●	●	●
200	Condensate dish	383-700-331	●	●	—	—
		383-700-332	—	—	●	—
		383-700-333	—	—	—	●
210	Condensate dish gasket	383-700-381	●	●	—	—
		383-700-382	—	—	●	—
		383-700-383	—	—	—	●
220	Flue gasket	383-700-384	●	●	●	●
230	Flue restrictor	383-700-364	●	●	—	—
240	Top cover insulation & heat exchanger insulation wrap	383-700-366	●	●	—	—
		383-700-367	—	—	●	—
		383-700-368	—	—	—	●

Replacement parts (continued)

Figure 129 Heat exchanger assembly ECO Tec 80/110/150/199 (see Figure 128, page 140 for part numbers)



ECO Tec-052



Replacement parts (continued)

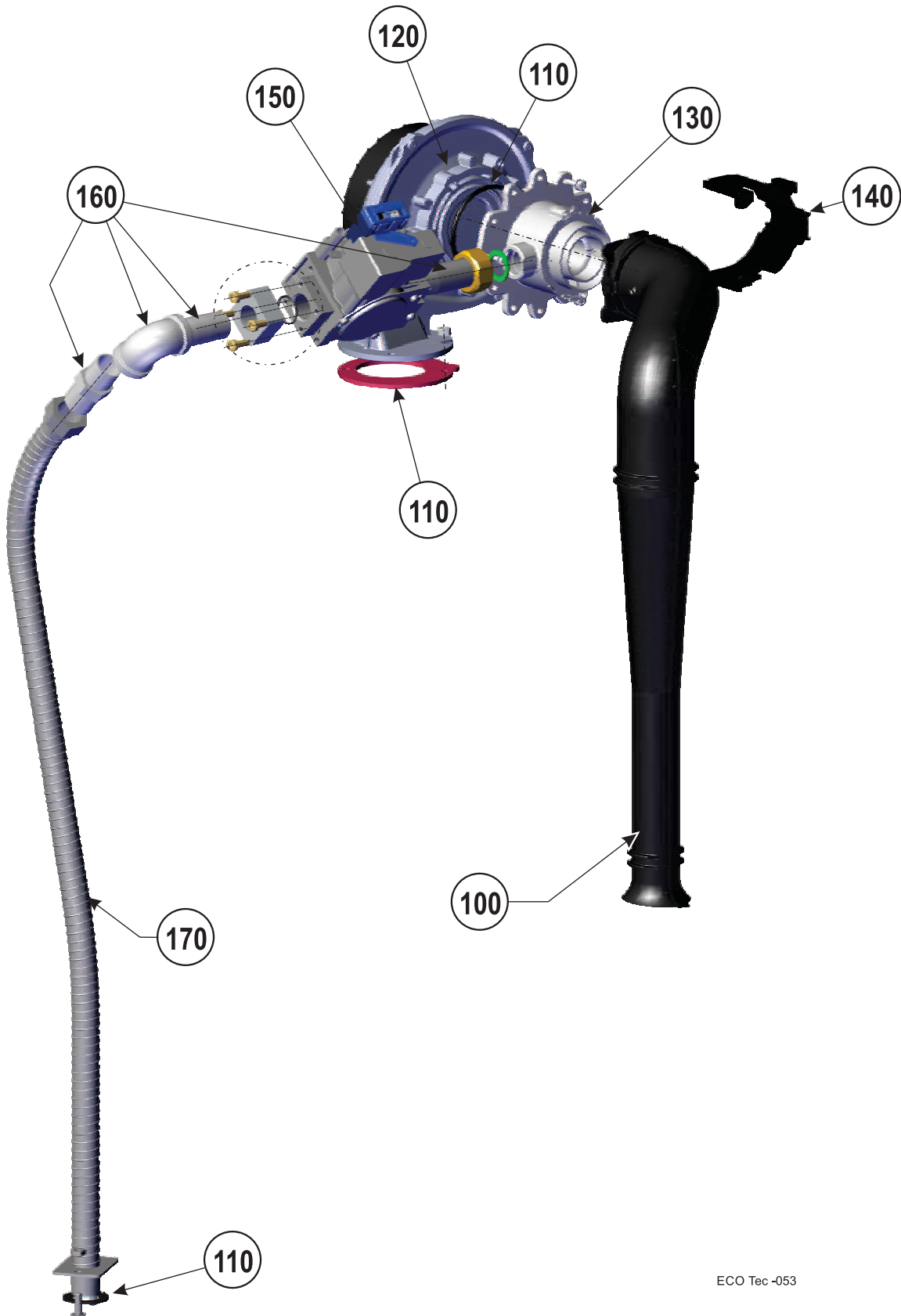
Figure 130 Combustion components parts ECO Tec 80/110/150/199 (see Figure 131, page 143 for illustration)

Item	Name	Part Number	Model 80/110	Model 150	Model 199
100	Air silencer, clip and gasket	383-700-294	●	●	●
110	Kit - Service Silencer O-ring, blower gasket, gas flex line, and igniter gaskets	383-700-360	●	●	●
120	Blower, gasket and hardware	383-700-303	●	●	—
		383-700-304	—	—	●
130	Venturi	383-700-305	●	—	—
		383-700-306	—	●	—
		383-700-307	—	—	●
140	Air silencer clip	383-700-308	●	●	●
150	Gas valve assembly	383-700-313	●	●	●
160	Adapter gas flex line, elbow, gas valve flange with hardware and the gas pipe	383-700-283	●	●	●
170	Gas flex line	383-700-224	●	●	●



Replacement parts (continued)

Figure 131 Combustion components parts ECO Tec 80/110/150/199 (see Figure 130, page 142 for part numbers)



ECO Tec -053



Replacement parts (continued)

Figure 132 Combi water piping for ECO Tec 80/110/150/199 (see Figure 134, page 145 for illustration)

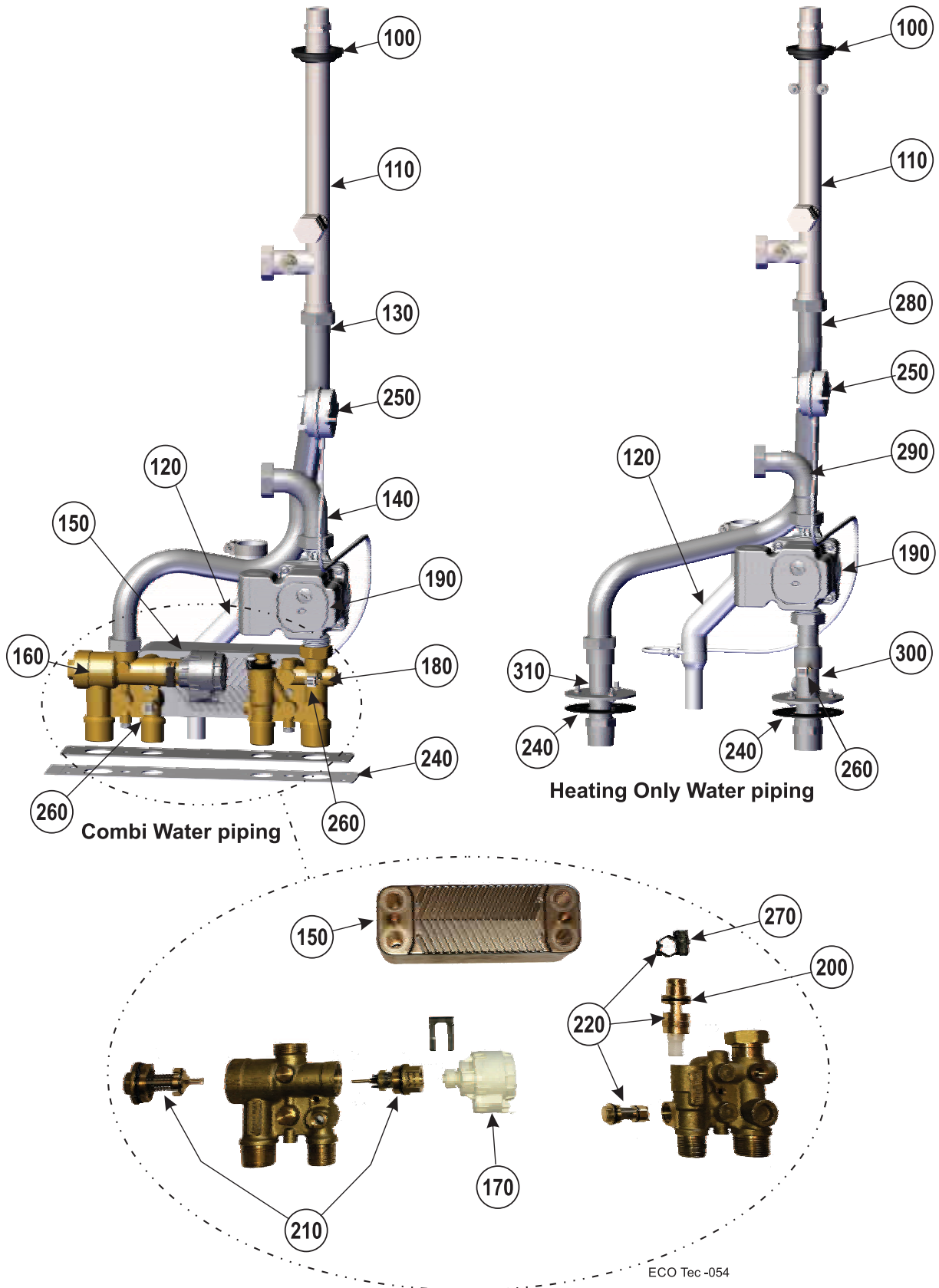
Item	Name	Description / contents	Part Number
100	Grommet - water pipe sealing		383-700-361
110	Pipe - water top		383-700-377
120	Condensate drain tube	with hose nipple	383-700-268
130	Pipe - water flex 1"		383-700-378
140	Pipe - water return		383-700-375
150	Brazed plate heat exchange	includes Item 230	383-700-355
160	DHW flow manifold	includes Item 210	383-700-356
170	Actuator - 3-way valve	includes retaining clip	383-700-358
180	DHW return manifold	with sensor tapping, includes Item 220	383-700-357
190	Circulator		383-700-379
200	Flow transducer/turbine		383-700-380
210	DHW flow manifold components		383-700-349
220	DHW return manifold components		383-700-350
230	Brazed plate gaskets	(not shown)	383-700-359
240	DHW, return & supply gaskets		383-700-392
250	Pressure switch		383-700-329
260	Water temperature sensor		383-700-319
270	Flow sensor electronic pickup		383-700-389

Figure 133 Heating Only water piping for ECO Tec 80/110/150/199 (see Figure 134, page 145 for illustration)

Item	Name	Description / contents	Part Number
100	Grommet - water pipe sealing		383-700-361
110	Pipe - water top		383-700-377
120	Condensate drain tube	with hose nipple	383-700-268
240	DHW, return & supply gaskets		383-700-392
250	Pressure switch		383-600-073
260	Water temperature sensor		383-700-319
280	Pipe - water flex 1"		383-700-378
290	Pipe - water return		383-700-375
300	Pipe - water return bottom	with sensor tapping	383-700-376
310	Pipe - water supply bottom		383-700-374

Replacement parts (continued)

Figure 134 Combi and Heating Only water piping for ECO Tec 80/110/150/199
 (see Figure 132, page 144 or Figure 133, page 144 for part numbers)



ECO Tec -054

Go to www.weil-mclain.com to locate Weil-McLain distributors



Replacement parts (continued)

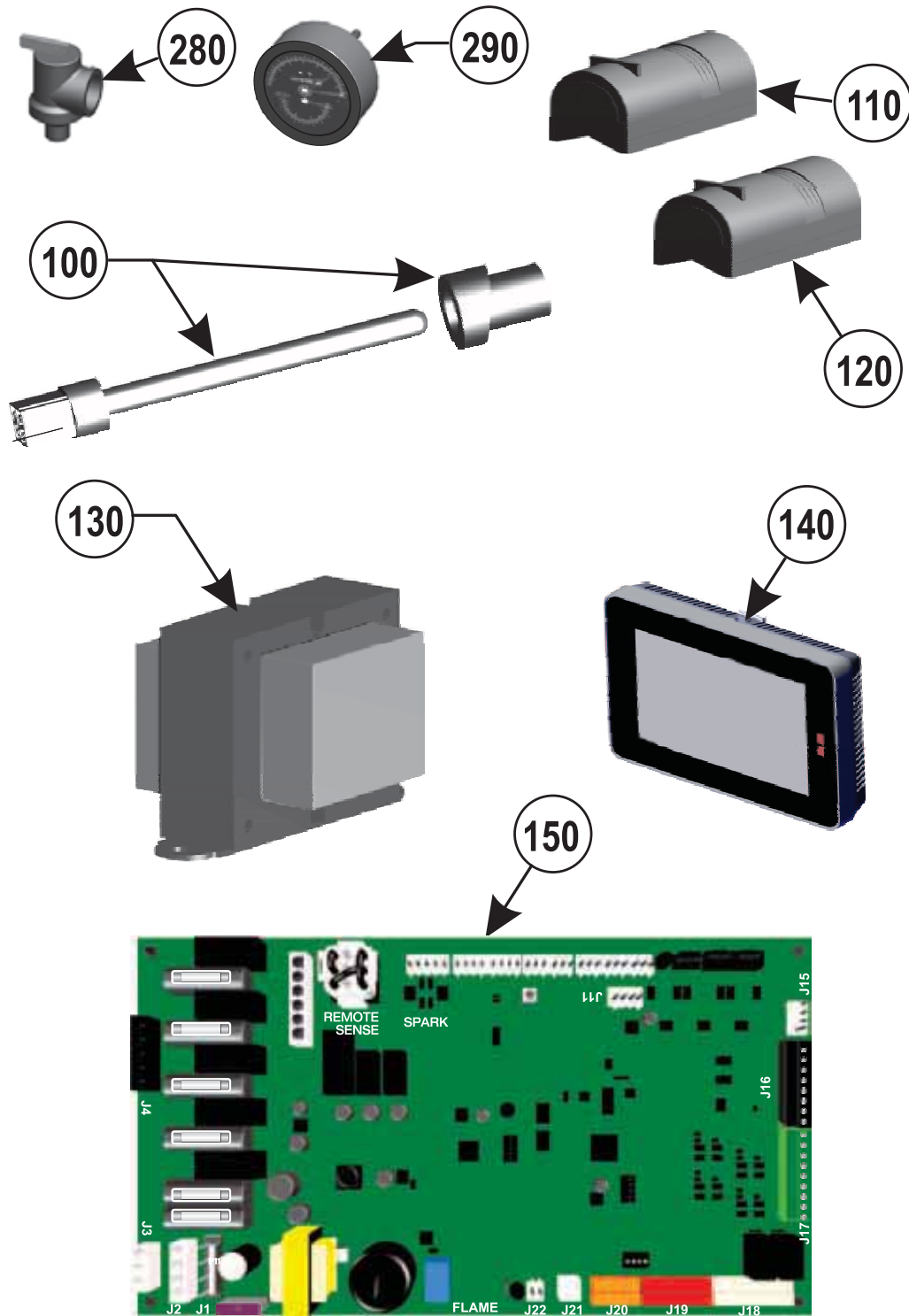
Figure 135 Controls and electrical components - ECO Tec 80/110/150/199 (see Figure 136, page 147 for illustration)

Item	Name	Description / contents	Part Number
100	Flue temperature sensor & grommet	One (1) sensor & grommet	383-500-600
110	Outdoor temperature sensor		383-500-125
120	System temperature sensor	Two (2) sensors	383-700-371
130	Transformer 120V/50V/24V	50 VA transformer	383-700-320
140	Display board assembly	Includes circuit board and plastic housing	383-700-321
150	Control module assembly	Control module and housing	383-700-322
160	Wire harness – line voltage (not shown)		383-700-323
170	Wire harness – low voltage (not shown)		383-700-324
180	Ignition cable (not shown)		383-500-619
190	Fuse 2.5 amp, (qty. 5) fast blow Ato 4 amp, fast blow Fuse 3 amp, (qty. 1) fast blow Ato 4 amp, fast blow Fuse 4 amp, (qty. 1) fast blow Ato 4 amp, fast blow	(not shown – see Figure 102, page 115)	383-700-369
200	Jumper for low voltage terminal blocks (not shown)	Five (5) Jumpers	383-500-641
210	Connector electrical control (not shown)	Includes Eight (8) connectors	383-900-111
220	Low voltage sealed wire grommet (not shown)	Seals thermostat wire at entrance to cabinet	383-700-385
230	Harness - Blower jumper (not shown)		383-700-351
240	Harness - Display to control module (not shown)		383-700-352
250	Harness - Actuator (Combi only) (not shown)		383-700-353
260	Harness - Flow sensor (Combi only) (not shown)		383-700-354
270	Harness - BMS (not shown)		383-700-272
280	Relief valve	30 PSIG relief valve – shipped loose for field installation	383-500-095
290	Pressure & temperature gauge	Shipped loose for field installation	380-000-000



Replacement parts (continued)

Figure 136 Controls and electrical assemblies - ECO Tec 80/110 /150/199 (see Figure 135, page 146 for part numbers)

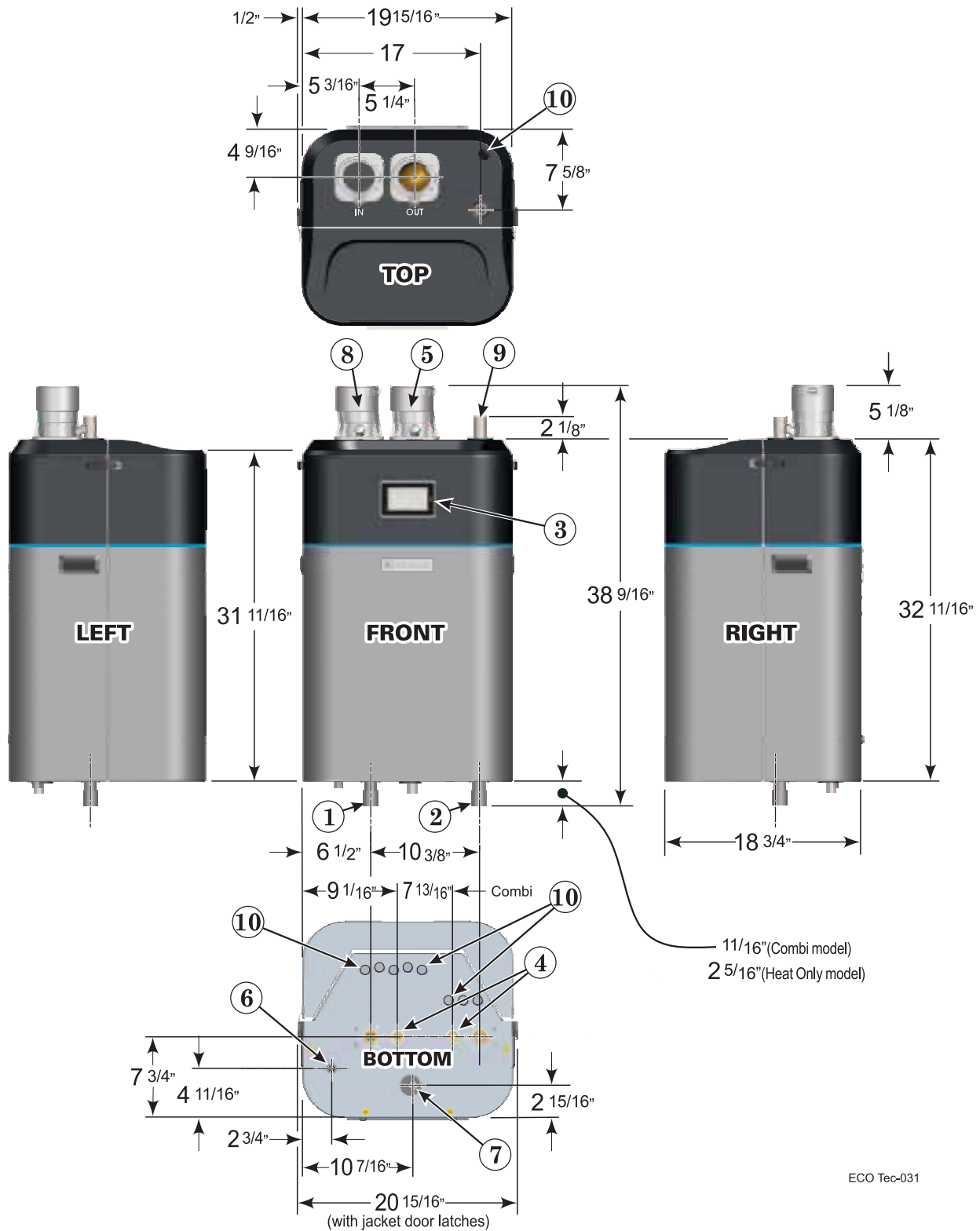


ECO Tec-154



Dimensions

Figure 137 Dimensional data – ECO Tec 80/110/150/199 (all dimensions in inches)



ECO Tec-031



Ratings – ECO Tec boilers

Figure 138 Ratings and engineering data – ECO Tec 80/110/150/199



AHRI Certified Ratings

Boiler Model	CSA Input	Heating Capacity	Seasonal Efficiency	Net Water Rating	Boiler Water Content	Vent/ Comb. Air Connection Diameter	% Input derate vs vent length (Values shown are at MAX vent/air pipe length — See Note 6) Direct Vent Venting ONLY			
							Natural gas		Propane	
							2" Vent/air piping	3" Vent/air piping	2" Vent/air piping	3" Vent/air piping
ECO Tec	Btuh (Note 5)	Btuh (Note 2)	AFUE, % (Note 1)	MBH (Note 3)	Gallons	Inches (Note 4)				
80	80,000	74,000	95.0	64	2.2	3" PVC/PP/SS	5 %	—	5 %	—
110	110,000	100,000	95.0	87	2.2	3" PVC/PP/SS	10%	5 %	10%	5 %
150	150,000	139,000	95.0	121	3.1	3" PVC/PP/SS	13%	5 %	13%	5 %
199	199,000	184,000	95.0	160	3.8	3" PVC/PP/SS	13%	5 %	13%	5 %

Notes

- As an Energy Star Partner, Weil-McLain has determined that **ECO Tec 80, 110, 150 and 199** boilers meet the Energy Star guidelines for energy efficiency. NOTE: Adjusting boiler firing rate will affect AFUE rating.
- Based on standard test procedures prescribed by the United States Department of Energy. Ratings also referred to as CSA Output. NOTE that only DOE Heating Capacity and AFUE are certified by AHRI. AFUE is also known as Annual Fuel Utilization Efficiency or Seasonal Efficiency.
- Net AHRI ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Ratings are based on a piping and pickup allowance of 1.15. An additional allowance should be made for unusual piping and pickup loads.
- ECO Tec** boilers must be direct-vented. **ECO Tec** boilers require special venting, consistent with Category IV boiler. Use only the vent materials and methods specified in this manual. **ECO Tec** boilers may be direct exhaust vented with Kit option. **ECO Tec** vent/air pipes can be either 2" or 3". An adapter is required for 2" venting.
- Ratings shown are for sea level applications only. For altitudes from sea level to 2,000 feet above sea level, the **ECO Tec** boiler requires no modifications and automatically derates itself by approximately 4% per 1000 feet above sea level.
- All of the boilers will automatically de-rate as vent/air pipe length increases, due to the pressure loss through the piping. For vent/air pipe lengths less than the maximum, the derate equals the value above (% Input derate vs. vent length) times vent length ÷ 100, for all except for the 199 - 2" venting. 199 - 2" derate equals 13% times vent length ÷ 50.

THE OUTDOOR SENSOR SUPPLIED WITH THE BOILER MUST BE INSTALLED UNLESS EXEMPTED BELOW: IMPORTANT

In accordance with **Section 303 of the 2007 Energy Act**, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is not used for any space heating.
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil (not applicable to Combi model).



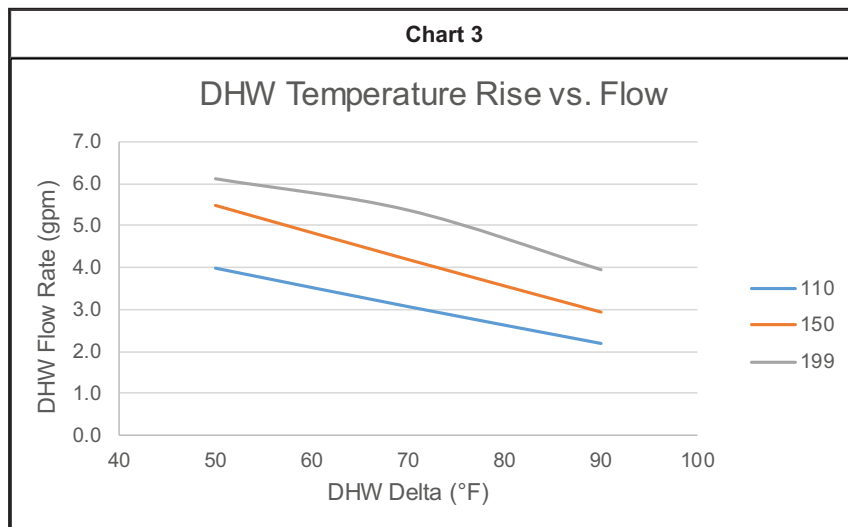
Ratings— ECO Tec boilers

Figure 139 Engineering Data – ECO Tec 80/110/150/199 boilers

Boiler Model	Shipping weight	Operating weight	Water content	Water flow rate per boiler		Vent/air pipe size: (Provide a separate vent for each boiler)	Electrical service required
	Pounds per boiler	Pounds per boiler		GPM @ 20°F rise	GPM @ 40°F rise		Amps per boiler
	HO / Combi	Note 1 HO / Combi	Gallons per boiler			Note 2	Note 3
80	138 / 147	141 / 152	2.2	7.4	3.7	2" or 3"	15.0
110	138 / 147	141 / 152	2.2	10.0	5.0	2" or 3"	15.0
150	150 / 159	162 / 172	3.1	13.9	7.0	2" or 3"	15.0
199	161 / 170	178 / 187	3.8	18.4	9.2	2" or 3"	15.0

Notes	
1	Operating weight is the total weight of the boiler, including water.
2	Vent/air pipes can be either 2" or 3" pipe. All of the boilers will automatically de-rate as vent/air pipe length increases, due to the pressure loss through the piping. See Figure 138, page 149 for details. All ECO Tec installations require a separate vent pipe and termination for each boiler. Vent piping cannot be manifolded. Install and terminate vents as described in vent/air installation instructions in this manual. Combustion air piping can be individually piped or manifolded.
3	Total amp requirement includes up to four (4) circulators, not exceeding 2.2 amps per circulator.

Figure 140 DHW Temperature Rise vs Flow (Chart 3)





Installation and Service Certificate

Boiler Data		
Boiler Model / Series ECO Tec _____ / Series _____		Date installed _____
Consumer Protection (CP) Number _____	FUEL: Natural _____ LP _____	Btu Input _____
<p>CERTIFIED THAT:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Installation instructions have been followed. <input type="checkbox"/> Check-out sequence has been performed. <input type="checkbox"/> Information on next two pages is certified to be correct. <input type="checkbox"/> Information received and left with owner/maintenance person. 		
<p>Installer _____</p> <p>_____</p> <p style="text-align: center;">(Company) (Address)</p>		
<p>_____</p> <p>_____</p> <p style="text-align: center;">(Phone) (Installer's Signature)</p>		



Installation and Gas Boiler Data Collection Sheet

Boiler Model / Series ECO Tec _____ / Series _____		Date Installed: _____	
CP Number: _____	Fuel Type: Natural ___ LP ___	BTU Input: _____	
Flame signal on control display at HIGH fire: _____		Flame signal on control display at LOW fire: _____	
Was venturi changed? YES ___ NO ___	Was gas valve throttle adjusted? YES ___ NO ___	Was gas valve offset adjusted? YES ___ NO ___	
Boiler Settings		Priority 1 Settings	
Boiler Model: ECO Tec _____		System Type:	_____
Altitude: _____ Feet		Target Modulation Sensor:	_____
Fuel Type: NG ___ Propane ___		Target Adjust:	_____
ODT Sensor Exempt: YES ___ NO ___		Max Target Temp:	_____ °F
Manual Reset High Temp Limit: _____ °F		Min Target Temp:	_____ °F
WWSD Temp: _____ °F		Outdoor Temp for Min Target:	_____ °F
Adjust Outdoor: _____ °F		Outdoor Temp for Max Target:	_____ °F
Circulator Exercising		Voltage for Max Target:	_____ V
Circulator 1: ON ___ OFF ___		0-10V Min:	_____ V
Circulator 2: ON ___ OFF ___		Target Boost Time:	_____ Mins
Circulator 3: ON ___ OFF ___		System Supply On Diff:	_____ °F
Circulator 4: ON ___ OFF ___		System Supply Off Diff:	_____ °F
Boiler Circ: ON ___ OFF ___		Cold Start Error:	_____ °F
Freeze Protection		Max BLR Temp:	_____ °F
Circulator 1: ON ___ OFF ___		Boiler Out On Diff:	_____ °F
Circulator 2: ON ___ OFF ___		Boiler Out Off Diff:	_____ °F
Circulator 3: ON ___ OFF ___		Max On Time:	_____ Mins
Circulator 4: ON ___ OFF ___		Min On Time:	_____ Mins
Boiler Circ: ON ___ OFF ___		Run Boiler Pump:	YES ___ NO ___
		Run Aux Pump/Output:	YES ___ NO ___
Input Assignments		Pre Pump:	_____ Sec
Input 1: Priority ___ Aux ___ OFF ___		Post Pump:	_____ Sec
Input 2: Priority ___ Aux ___ OFF ___		Max Rate:	_____ %
Source: TT1 ___ OR 0-10V ___		Min Rate:	_____ %
Input 3: Priority ___ Aux ___ OFF ___		Additional Heat Demand:	1st ___ 2nd ___ OFF ___
Input 4: Priority ___ Aux ___ OFF ___		Response Time:	_____ Mins
		Combi enabled:	ON ___ OFF ___
		Hot Water Temp. :	_____ °F
		DHW On Diff:	_____ °F
		DHW Off Diff:	_____ °F
		PREHEAT Mode:	OFF ___ ECON ___ H.PERF ___
		PREHEAT Temp.:	_____ °F
		PREHEAT Circ Diff:	_____ °F
		PREHEAT On Diff:	_____ °F
		PREHEAT Off Diff:	_____ °F
		ECO BOOST:	ON ___ OFF ___
		ECO BOOST Setpoint:	_____ °F
		ECO BOOST On Diff:	_____ °F
		ECO BOOST Off Diff:	_____ °F



Installation and Gas Boiler Data Collection Sheet

CO2 @: High Fire _____ % Low Fire _____ %			
CO@: High Fire _____ ppm Low Fire _____ ppm			
Natural Gas / LP input rate measured: HIGH _____ CFH / LOW _____ CFH			
Priority 2 Settings		Priority 3 Settings	
System Type:	_____	System Type:	_____
Target Modulation Sensor:	_____	Target Modulation Sensor:	_____
Target Adjust:	_____	Target Adjust:	_____
Max Target Temp:	_____ °F	Max Target Temp:	_____ °F
Min Target Temp:	_____ °F	Min Target Temp:	_____ °F
Outdoor Temp for Min Target:	_____ °F	Outdoor Temp for Min Target:	_____ °F
Outdoor Temp for Max Target:	_____ °F	Outdoor Temp for Max Target:	_____ °F
Voltage for Max Target:	_____ V	Voltage for Max Target:	_____ V
Voltage for Min Target:	_____ V	Voltage for Min Target:	_____ V
Target Boost Time:	_____ Mins	Target Boost Time:	_____ Mins
System Supply On Diff:	_____ °F	System Supply On Diff:	_____ °F
System Supply Off Diff:	_____ °F	System Supply Off Diff:	_____ °F
Cold Start Error:	_____ °F	Cold Start Error:	_____ °F
Max BLR Temp:	_____ °F	Max BLR Temp:	_____ °F
Boiler Out On Diff:	_____ °F	Boiler Out On Diff:	_____ °F
Boiler Out Off Diff:	_____ °F	Boiler Out Off Diff:	_____ °F
Max On Time:	_____ Mins	Max On Time:	_____ Mins
Min On Time:	_____ Mins	Min On Time:	_____ Mins
Run Boiler Pump:	YES___ NO___	Run Boiler Pump:	YES___ NO___
Run Aux Pump/Output:	YES___ NO___	Run Aux Pump/Output:	YES___ NO___
Pre Pump:	_____ Sec	Pre Pump:	_____ Sec
Post Pump:	_____ Sec	Post Pump:	_____ Sec
Max Rate:	_____ %	Max Rate:	_____ %
Min Rate:	_____ %	Min Rate:	_____ %
Additional Heat Demand:	1st___ 2nd___ OFF___	Additional Heat Demand:	1st___ 2nd___ OFF___
Response Time:	_____ Mins	Response Time:	_____ Mins



ECO Tec Gas Boiler Data Collection Sheet

Customer Info:		Maintenance Info:	
Contact:		Name:	
Contractor:		Phone:	
Job name:		Model:	
City, state:		CP#:	
Distributor:		Installed:	

System Components:	Boiler/System Piping Details (Please Sketch)
Near boiler pipe size:	
DHW tank (yes/no):	
DHW direct/system:	
DHW model:	
DHW pipe size:	
DHW circulator model:	
Is there air in system?:	
Diagnostic Errors:	
Ignition retries:	
Manual reset CNT:	
Auto reset CNT:	
Software Versions:	
Display:	
Main micro:	
Second micro:	

Lockout History #1	Outputs:	Lockout History #2	Outputs:
Fault Name:	Output 1:	Fault Name:	Output 1:
Fault Type:	Output 2:	Fault Type:	Output 2:
Fault Time:	Output 3:	Fault Time:	Output 3:
Fault Date:	Output 4:	Fault Date:	Output 4:
Status:	Boiler Circ:	Status:	Boiler Circ:
Temperatures:	Blower signal:	Temperatures:	Blower signal:
Status:	Additional Heat Demand:	Status:	Additional Heat Demand:
Boiler out 1:	Alarm:	Boiler out 1:	Alarm:
Boiler out 2:		Boiler out 2:	
DHW out 1:		DHW out 1:	
DHW out 2:		DHW out 2:	
Boiler in:		Boiler in:	
Flue 1:		Flue 1:	
Flue 2:		Flue 2:	
Outdoor:		Outdoor:	
Inputs:		Inputs:	
Status:		Status:	
Input 1:		Input 1:	
Input 2:		Input 2:	
Input 3:		Input 3:	
Input 4:		Input 4:	
Manual limit:		Manual limit:	
Auto limit:		Auto limit:	
Low WTR Cutoff:		Low WTR Cutoff:	
Air Pressure Switch:		Air Pressure Switch:	
Closure Switch:		Closure Switch:	
Blower Speed:		Blower Speed:	
Flame signal:		Flame signal:	
DHW Flow:		DHW Flow:	
Outputs:		Outputs:	
Status:		Status:	
Gas valve:		Gas valve:	



Lockout History #3		Outputs:		Lockout History #4		Outputs:	
Fault Name:		Output 1:		Fault Name:		Output 1:	
Fault Type:		Output 2:		Fault Type:		Output 2:	
Fault Time:		Output 3:		Fault Time:		Output 3:	
Fault Date:		Output 4:		Fault Date:		Output 4:	
Status:		Boiler Circ:		Status:		Boiler Circ:	
Temperatures:		Blower signal:		Temperatures:		Blower signal:	
Status:		Additional Heat Demand:		Status:		Additional Heat Demand:	
Boiler out 1:		Alarm:		Boiler out 1:		Alarm:	
Boiler out 2:				Boiler out 2:			
DHW out 1:				DHW out 1:			
DHW out 2:				DHW out 2:			
Boiler in:				Boiler in:			
Flue 1:				Flue 1:			
Flue 2:				Flue 2:			
Outdoor:				Outdoor:			
Inputs:				Inputs:			
Status:				Status:			
Input 1:				Input 1:			
Input 2:				Input 2:			
Input 3:				Input 3:			
Input 4:				Input 4:			
Manual limit:				Manual limit:			
Auto limit:				Auto limit:			
Low WTR Cutoff:				Low WTR Cutoff:			
Air Pressure Switch:				Air Pressure Switch:			
Closure Switch:				Closure Switch:			
Blower Speed:				Blower Speed:			
Flame signal:				Flame signal:			
DHW Flow:				DHW Flow:			
Outputs:				Outputs:			
Status:				Status:			
Gas valve:				Gas valve:			

Lockout History #5		Outputs:		Lockout History #6		Outputs:	
Fault Name:		Output 1:		Fault Name:		Output 1:	
Fault Type:		Output 2:		Fault Type:		Output 2:	
Fault Time:		Output 3:		Fault Time:		Output 3:	
Fault Date:		Output 4:		Fault Date:		Output 4:	
Status:		Boiler Circ:		Status:		Boiler Circ:	
Temperatures:		Blower signal:		Temperatures:		Blower signal:	
Status:		Additional Heat Demand:		Status:		Additional Heat Demand:	
Boiler out 1:		Alarm:		Boiler out 1:		Alarm:	
Boiler out 2:				Boiler out 2:			
DHW out 1:				DHW out 1:			
DHW out 2:				DHW out 2:			
Boiler in:				Boiler in:			
Flue 1:				Flue 1:			
Flue 2:				Flue 2:			
Outdoor:				Outdoor:			
Inputs:				Inputs:			
Status:				Status:			
Input 1:				Input 1:			
Input 2:				Input 2:			
Input 3:				Input 3:			
Input 4:				Input 4:			
Manual limit:				Manual limit:			
Auto limit:				Auto limit:			
Low WTR Cutoff:				Low WTR Cutoff:			
Air Pressure Switch:				Air Pressure Switch:			
Closure Switch:				Closure Switch:			
Blower Speed:				Blower Speed:			
Flame signal:				Flame signal:			
DHW Flow:				DHW Flow:			
Outputs:				Outputs:			
Status:				Status:			
Gas valve:				Gas valve:			

