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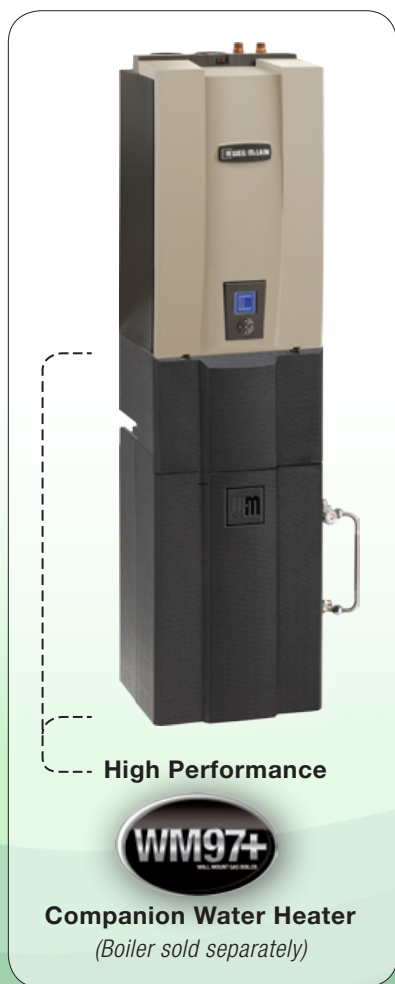


Companion Water Heater

for WM97+ Gas-Fired Boilers

Product Manual

- Installation
- Maintenance
- Startup
- Parts



High Performance



Companion Water Heater
(Boiler sold separately)



Mobile Product
Library



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.

Part number 635-500-156/0113



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WM97+ Boiler with Companion Water Heater (CWH)

WM97+ Boiler

(Model 70/110 shown)

WM97+ Companion Water Heater

(Shown with typical external pipe routing — pipes can be routed out either side or both sides)



WM97+ Boiler Installation summary

Follow the boiler manual, this manual, and all applicable codes. Installation consists of the following:

- Mount boiler on the wall.
- Mount boiler at height shown in the boiler manual and make sure clearance is provided on right or left side for piping as directed.
- Install gas piping, condensate trap and condensate piping, positioned to route out the side opening(s) in the piping access panel.
- Set the WM97+ boiler control for the desired operation of the CWH.
- Perform all start-up tests to verify proper operation of boiler and water heater.

Companion Water Heater (CWH) Installation summary

Follow the boiler manual, this manual, and all applicable codes. Installation consists of the following:

- Position the CWH under the boiler and check fit of the piping access cover. Orient with DHW connections on either side by rotating the water heater 180°.
- Mount the CWH circulator, street tee, bushing and drain valve.
- Connect the flexible lines from the circulator and CWH boiler connections to the boiler domestic water connections on the bottom of the boiler.
- Mount the mixing valve assembly supplied with the CWH, following the mixing valve instructions provided with the valve kit.
- Install and pipe the T&P relief valve in the CWH.
- Connect from the mixing valve and cold water tee to the domestic water system.
- Connect the plug-in wire harnesses from the CWH to the harnesses in the boiler.
- Set the mixing valve and instruct the owner in operation of the CWH and boiler.



Please read before proceeding

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.

⚠ WARNING This manual provides installation and operation guidelines for the Weil-McLain CWH indirect water heater. The installer is responsible for ensuring that the installation complies with this manual, the boiler manual and all applicable codes.

NOTICE **Massachusetts installations** — The water heater must be installed by a licensed plumber. The installation must follow all Massachusetts code requirements. The domestic water piping must comply with the piping shown in this manual. See “Domestic water piping,” page 8, for details and code requirements.

NOTICE When calling or writing about the water heater — Please have the water heater serial number from the serial number label, located on the side of the water heater, on to the rating plate.

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

⚠ WARNING

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

Read all instructions before installing. Failure to follow all instructions in proper order can cause severe personal injury, death or substantial property damage.

When servicing water heater

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow water heater to cool before performing maintenance.

Operating restrictions

- Read precautions on page 6.
- Maximum boiler water temperature — 200°F.
- Maximum working pressure for tank — 150 PSIG.
- Water chemistry limits:
 - hardness — less than 6 grains/gal.
 - pH — above 6 and less than 8.
 - chlorides — less than 200 ppm.
- A water softener in the domestic water system is acceptable.
- Filtration — If domestic water tends to contain sediment, provide filtration equipment as needed to remove sediment.

Boiler water restrictions

- Thoroughly flush the boiler system (without water heater connected) to remove sediment.
- The water heater heat exchanger can be damaged by build-up or corrosion due to sediment.
- Boiler water (including additives) must be practically non-toxic, having toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products. Sentinel products supplied for the WM97+ are acceptable.
- If antifreeze is used in boiler system:
 - Local codes may require a backflow preventer on cold water supply line.
 - Use antifreeze specifically intended for hydronic heating systems. Inhibited propylene glycol is recommended.
 - Follow boiler manual instructions for antifreeze usage.
 - Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze.

Location

- This water heater is not intended for outdoor installation.
- Install the water heater so if the tank or any connections should leak, the water flow will not cause damage to area near water heater, or to lower floors of structure. When such locations cannot be avoided, install a suitable drain pan under water heater. Drain pans are available at your local plumbing supply store.
- This product is designed for vertical installation only.

Pre-installation

Codes

1. Installation must conform with instructions in this manual and, where applicable:
 - local, state, provincial, and national codes, laws, regulations and ordinances.
 - in Canada — B149.1 or B149.2 Installation Code.
2. CWH water heaters are exempt from ASME Section VIII, Division 1 Code construction per Interpretation VIII-1-86-136. Check with local codes for applicability.
3. Where recommendations in this manual differ from local or national codes, local or national codes take precedence.

CSA Low Lead Content Only certification

1. This product has been certified by CSA to Class 6853 01 — Low Lead Content Certification Program — Plumbing Products.
2. Applicable requirements:
 - a. NSF/ANSI 372-2010 Drinking water system components — Lead Content.
 - b. California Health and Safety Code 116875 (known as AB-1953-2006).
 - c. Louisiana House Bill HB.471, Louisiana's Lead reduction Law.
 - d. Vermont Act No. 193 - 2008 Consumer Products Prohibition against Lead.
 - e. Maryland House Bill 372 [Statute 12- 605], Business Occupations and Professionals — Plumbers — Lead Free Materials.

Code restrictions

National Standard Plumbing Code

1. Single-wall heat exchanger in water heater complies with National Standard Plumbing Code, provided that:
 - a. Boiler water (including additives) is practically non-toxic, having toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products, and
 - b. Boiler water pressure is limited to maximum 30 PSIG by approved relief valve.

Uniform Plumbing Code

1. Single-wall heat exchangers are permitted if they satisfy all of the following requirements —
 - a. The heat transfer medium is potable water or contains only substances which are recognized as safe by the U. S. Food and Drug Administration.
 - b. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system.
 - c. The equipment is permanently labeled to indicate that only additives recognized as safe by the FDA shall be used in the heat transfer medium.
2. Other heat exchanger designs may be permitted where approved by the Administrative Authority.

Clearances and placement

1. The CWH must be mounted under the WM97+ boiler, with the boiler installed to meet all required clearances in the boiler manual.
2. **IN ADDITION, provide 18 inches clearance minimum** on the mixing valve side.
3. Read and comply with “Location,” page 4 of this manual.

NOTICE

The 18-inch mixing valve side clearance below is **MANDATORY**. The 1½” clearance on the opposite side is strongly recommended (a smaller clearance will make servicing more difficult). **ADDITIONAL** clearance may be needed if piping is routed on both sides of the boiler/water heater.

Figure 1 Clearance required (in addition to clearances specified in the WM97+ manual) — right-mounted mixing valve

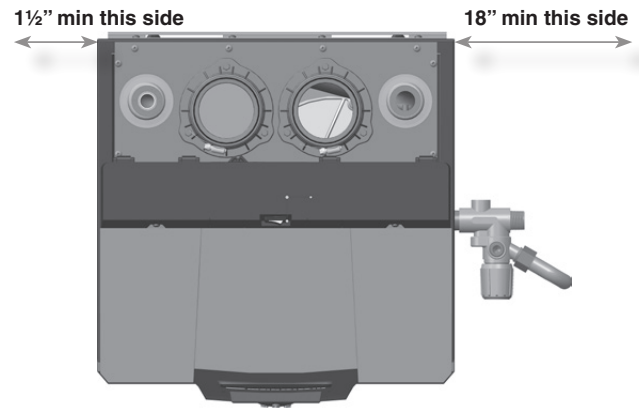


Figure 2 Clearance required (in addition to clearances specified in the WM97+ manual) — left-mounted mixing valve

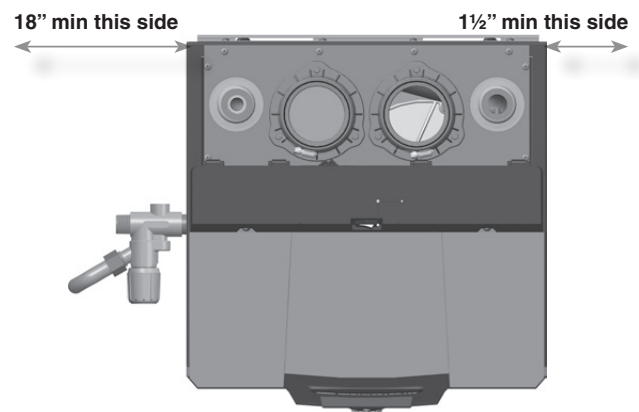
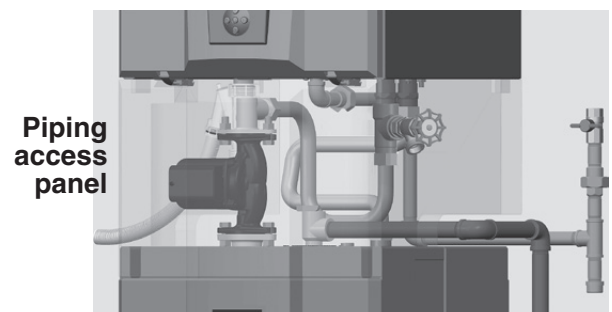


Figure 3 Align water heater under boiler as needed for the piping access panel to fit in place



Pre-installation *(continued)*

Domestic water piping requirements

1. Install unions on all piping for easy removal of water heater.
2. Use **dielectric unions or couplings** to protect hot and cold water fittings from corrosion when connecting dissimilar materials such as copper and galvanized iron pipe.
3. **When the supply pressure is higher than 70 PSIG**, install a pressure reducing valve on cold water supply line to prevent water loss through T&P relief valve. A thermal expansion tank is also required.

⚠ WARNING

Studies have indicated that dangerous bacteria, including **legionella pneumophila**, can form in the potable water distribution system if certain minimum water temperatures are not maintained. Contact your local health department for more information.

Water heater operating restrictions

1. Read the operating limits under “Operating restrictions,” page 4.

Boiler water restrictions

1. Read the WARNINGS under “Boiler water restrictions,” page 4.

Adjusting leveling legs

1. Before installing any piping, level the CWH.
2. Carefully tip the water heater onto its side.
3. Screw in the leveling legs.
4. Return the water heater to the upright position and set in place.
5. Adjust the legs as necessary to level the water heater.

Alignment of CWH under the boiler

1. When in place, there must be sufficient room to route all required piping connections to the water heater and the WM97+ boiler.
2. Verify the fit-up of the piping access panel — the CWH must be directly underneath the WM97+ boiler. Test fit the access panel to be sure before installing piping. Panel must be unobstructed.



Hot Water Can Scald!

- Water heated to temperature for clothes washing, dish washing and other sanitizing needs can scald and cause permanent injury.
- Children, elderly, and infirm or physically handicapped persons are more likely to be permanently injured by hot water. Never leave them unattended in bathtub or shower. Never allow small children to use a hot water tap or draw their own bath.
 - If anyone using hot water in the building fits the above description, or if state laws or local codes require certain water temperatures at hot water taps, you must take special precautions:
 - Use lowest possible temperature setting.
 - Install a thermostatic protective device at each point of use in addition to the mixing valve installed at the water heater.
- Water passing out of drain valves may be extremely hot. To avoid injury:
 - Make sure all connections are tight.
 - Direct water flow away from any person.

For all applications:

Protection must be taken against excessive temperature and pressure! — Install a temperature & pressure (T&P) relief valve (like that provided with the water heater) and thermostatic mixing valve (like that provided with the water heater). In addition, a thermostatic protective device at each point of use may also be necessary.

CWH Mixing valve

⚠ DANGER

Mixing valve must be installed

Follow all instructions in this manual and in the mixing valve manufacturer's literature provided with the water heater to install the mixing valve.

CWH orientation

1. The CWH can be installed with its domestic water inlet/outlet connections on the right or on the left.
2. Place the CWH on the floor below the WM97+ boiler.
3. The CWH circulator must be installed on the top left front boiler water connection in all applications. See details in this manual for piping requirements and circulator orientation.

Mixing valve installation and adjustment

1. See Figure 4 (right side mounting) or Figure 5 (left side mounting).
2. The mixing valve kit is shipped loose with the CWH and must be field installed.

⚠ WARNING The mixing valve kit illustrated in this manual is the Honeywell AMX302TLF. If another mixing valve is used as a replacement later, it must provide all of the functionality of the AMX302TLF.

3. The mixing valve kit includes the mixing valve (upper fitting), cold water tee and flex connector line.

⚠ DANGER Follow the instructions in the mixing valve manufacturer's manual supplied with the mixing valve kit. Be sure to set the mixed water temperature as directed and to instruct the homeowner. See warnings and danger information on page 6. Failure to install the correct water temperature control devices and properly set water temperature can result in severe personal injury or death.

⚠ WARNING DO NOT attempt to solder any connection directly to the mixing valve or return fitting. This will damage the mixing valve or return fitting, resulting in possible failure to properly control water temperature supplied to the DHW system. Solder only to adapter fittings that are NOT connected to the valve or return fitting.

⚠ WARNING

The mixing valve assembly shown below and in the piping diagrams throughout this manual are for the Honeywell AMX302TLF.

Figure 4 Mixing valve assembly, CWH connections on right side

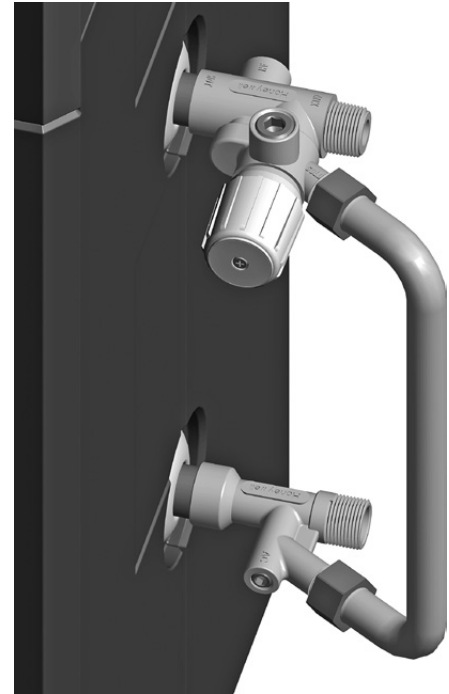


Figure 5 Mixing valve assembly, CWH rotated, connections on left



Domestic water piping *(continued)*

LEGEND for Figure 6, page 8

▲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**.

▲WARNING When the supply pressure is higher than 70 PSIG, install a **pressure reducing valve** on cold water supply line to prevent water loss through T&P relief valve. A thermal expansion tank is also required.

Mass Code This symbol, where used in this manual, indicates the item is required by Massachusetts code.

OPTIONAL This symbol indicates the item is optional, unless required by applicable codes.

1 Companion Water Heater (CWH) — stainless steel heat exchanger and tank with integral foam enclosure — shown with WM97+155 boiler and right-side piping connections — piping can be routed either side or both, depending on clearances (see page 7 for instructions to mount and connect the mixing valve supplied with the CWH)

2 WM97+ boiler — Model WM97+70, 110 or 155 (155 shown)

3 Domestic water cold inlet

4 DHW mixed outlet from mixing valve

5 Mixing valve cold water tee (supplied with mixing valve)

5a Mixing valve flexible metal connector (supplied with mixing valve)

6 Honeywell mixing valve — **Figure 6, page 8** shows the Honeywell AMX302TLF mixing valve assembly — refer to mixing valve literature supplied with the CWH — AMX302TLF is ASSE 1017 compliant.



6a Mixed temperature adjustment knob — **▲WARNING** DO NOT adjust this knob without following instructions supplied with mixing valve assembly.

6b Mixing valve hot water inlet port (HOT) — ¾" FNPT — Connects directly to CWH hot water outlet pipe

6c Mixing valve mixed water outlet port (MIX) — ¾" MNPT — domestic hot water system supply connection

6d Mixing valve recirculation port (R) — ½" FNPT — Recirculation connection — Follow mixing valve instructions and information beginning on page 10 of this manual. (Requires 3/8" Allen wrench to remove.)

6e Mixing valve cold water inlet port (COLD) — ½" flare fitting — Assemble mixing valve components (items 5, 5a and 6) according to the instructions supplied with the mixing valve.

6f (AH) — **▲WARNING** **DO NOT USE** — The water from this

port is not regulated by the mixing valve.

7 T&P relief valve (mounted in top of CWH) — supplied with CWH

- Use only the T&P valve supplied with the water heater. See Replacement parts for part number.
- Install the T&P relief valve as shown in the piping connection instructions in this manual.

8 T&P relief valve discharge piping —

- Must be made of material serviceable for temperatures of 250°F or greater.
- Must be directed so that hot water flows away from all persons.
- Must be directed to a suitable place for disposal.
- Must be installed so as to allow complete draining of the T&P relief valve and discharge line.
- Must not be excessively long.
- Must not be directly connected to a drain — terminate discharge piping within 6" from floor — refer to local codes.
- Must not be plugged, reduced or restricted or terminated with a threaded end.
- Must not be subjected to freezing.

▲WARNING Do not install any valve between the T&P relief valve and CWH connection, or on T&P relief valve discharge piping. Do not plug T&P relief valve or its discharge piping. Improper placement and piping of T&P relief valve can cause severe personal injury, death or substantial property damage.

- Pipe from relief valve to floor drain, if available.

9 Domestic mixed water supply to system

10 Thermal expansion tank — **OPTIONAL**

- **REQUIRED** if cold water line is equipped with a backflow preventer or pressure reducing valve — see **EXPANSION TANK WARNING** on page 8.

11 DHW drain valve — supplied with CWH

- Install the drain valve on the cold water inlet tee (port AC) as shown.

12 Isolation valves

13 Cold domestic water supply

14 Backflow preventer — **OPTIONAL** — **Mass Code** — (required for Commonwealth of Massachusetts)

15 Pressure reducing valve — **OPTIONAL**

- **REQUIRED** when the supply pressure is higher than 70 PSIG — A thermal expansion tank is also required.

16 Unions

17 Vacuum breaker — **OPTIONAL**

18 Shock arrester — **OPTIONAL**

▲WARNING Dishwashers, clothes washers, and fast-closing positive shutoff valves incorporated in the system all contribute to creating water shock. Install a water hammer arrester to prevent damage to pipes and appliances. See control manufacturer's instructions for application and installation.

19 Heat trap loops (12" minimum) — **OPTIONAL**

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.

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 system supply 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, 1998, for further information.

Time delay at fixtures

1. Figure 7 is from the ASPE Domestic Water Heating Design Manual, 1998. It shows the time required for usable hot water to arrive at a fixture based on the fixture flow rate (available from industry and manufacturer's data) and the length and diameter of the dead-end branch pipe supplying the fixture.
2. The time lag should generally not exceed 30 seconds.
3. For residential and office applications, the owner may prefer a limit of 10 seconds.
4. You can use Figure 7 as a guide to determining the location of circulation return lines relative to fixtures.

Balancing

1. When multiple branches are connected to the supply piping, each branch must be connected to the recirculation system.
 - a. At each of these connections to the return piping, install shutoff valves, a flow metering device, check valve and a strainer as shown in Figure 8.
 - b. Check local codes for specific installation requirements.
2. These branches must be balanced to prevent pipe erosion and unacceptable time delays at some fixtures.
3. Balancing options include circuit setters, memory stop valves or factory preset devices (with flow metering provision in the piping).

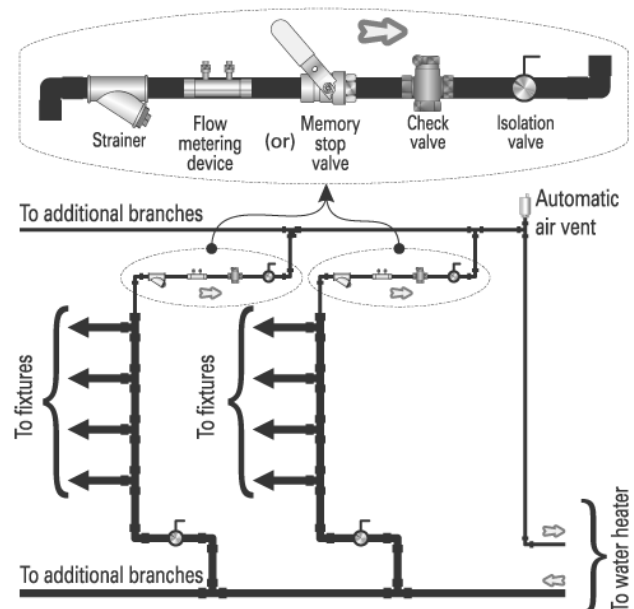
Components required

1. For residential applications, consult circulator manufacturer's data for circulator selection and additional components required.
2. On most commercial systems, install the devices shown in Figure 8, and any other devices or piping methods required by local codes.
 - a. The check valves are required to prevent fixtures from taking hot water through the return lines.
 - b. Shutoff valves are needed to allow cleaning and replacing balancing devices.
 - c. Include strainers to remove sediment which could damage the circulator and / or affect the flow balancing devices.

Figure 7 Time lag to obtain hot water at fixture for branch lengths of 10 and 25 feet (ASPE Domestic Water Heating Design Manual)

Time in seconds required to get hot water at fixture									
Fixture flow rate (GPM)		0.5		1.5		2.5		4.0	
Piping length (feet) -		10	25	10	25	10	25	10	25
Copper pipe	½"	25	63	8	21	5	13	3	8
	¾"	48	119	16	40	10	24	6	15
Steel pipe	½"	63	157	21	52	13	31	8	20
	¾"	91	228	30	76	18	46	11	28
CPVC pipe	½"	64	159	21	53	13	62	8	20
	¾"	95	238	32	79	19	48	12	30
NOTE: Select branch size and length for less than 31 seconds delay.									

Figure 8 Recirculation components



Domestic water piping shown for water heater at bottom of system with upfeed risers. No air vent is needed if fixtures are above return line (downfeed risers, for example).

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Recirculation (if used) *(continued)*

3. Size the circulator and piping based on the temperature drop allowed between the water available at the water heater and the water delivered at the fixture.
 - a. The return piping will almost always be smaller than the supply piping, but should never be smaller than 1/2" to prevent problems with the circulator.
4. Make provision for removal of air in all return lines. Where the returns cannot be vented by topmost fixtures in the system, install automatic air venting at the top of the return piping.

Connecting to the water heater

1. Install the domestic water components as shown in Figure 6, page 8.
2. See the following pages for piping between boiler and water heater, boiler lower pipe routing and CWH relief valve.
 - a. WM97+70 or 110 boiler:
Mixing valve on right side of CWH: page 12
Mixing valve on left side of CWH: page 14
 - b. WM97+155 boiler:
Mixing valve on right side of CWH: page 16
Mixing valve on left side of CWH: page 18

Components (see Figure 9)

Recirculation pump

1. Little flow is required to maintain a temperature in the piping.
2. Size of pump depends on minimum flow requirements of the mixing valve.
3. Minimum flow rates of the mixing valve must be maintained (minimum for Honeywell AMX302TLF is 0.25 GPM).

Recirculation pump aquastat

1. Used to control the on-off position of the circulator. Aquastat is set 5° to 10° lower than mixed water outlet of the mixing valve.
2. The pump cannot run continuously — bypass through the mixing valve will eventually allow the temperature on the piping to climb to the water heater temperature during draw periods.

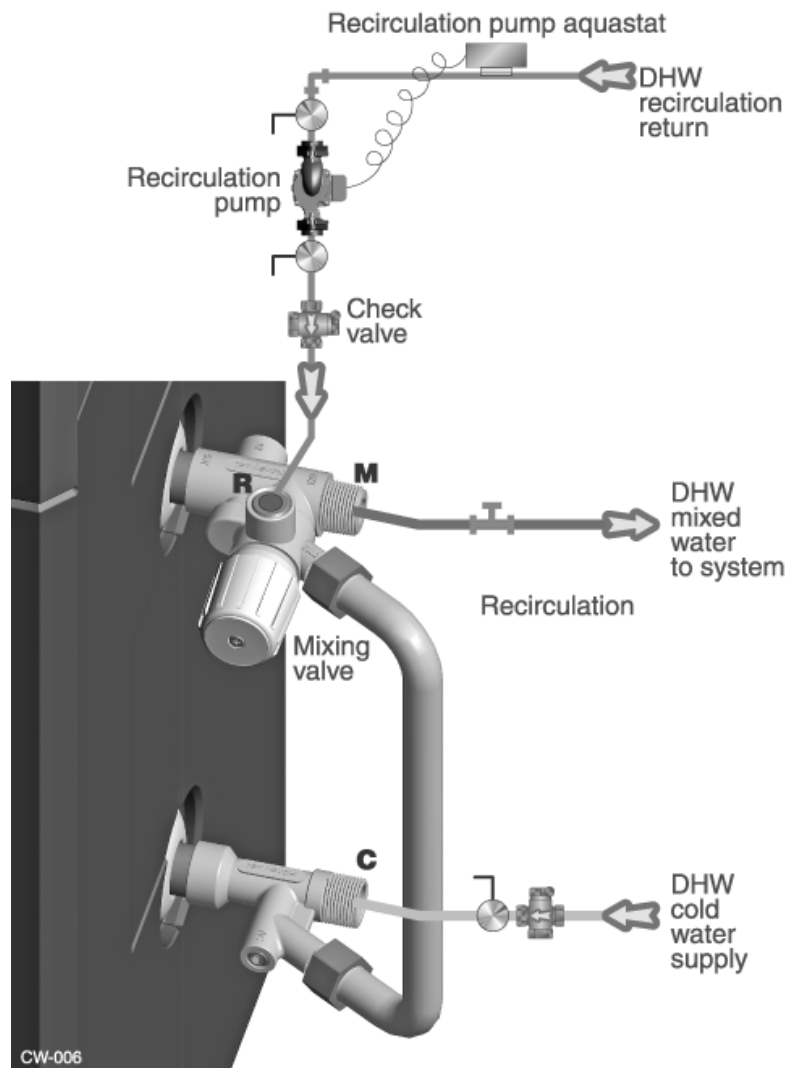
Check valve

1. Assures the flow of water in one direction.

Operation

1. When temperature at recirculation pump aquastat falls 10° below temperature to be maintained — recirculation pump turns on.
2. When aquastat reaches temperature — Circulator turns off.

Figure 9 Recirculation piping at mixing valve





Boiler/CWH piping — 70 or 110 / Right-side mixing valve

CONNECTIONS TO BOILER AND SYSTEM

NOTICE

The CWH can be placed with its DHW connections on the left side or on the right side (by rotating the unit 180 degrees). This instruction is for installations with the CWH with its DHW connections on the RIGHT side. The boiler shown must be either a model WM97+70 or WM97+110.

1. Boiler water RETURN connection from CWH

2. Boiler water SUPPLY connection to CWH

3. Water heater T & P relief valve connection

T&P relief valve is shipped loose with the CWH for field installation.

4. Upper tank temperature sensor

5. DHW supply and return connections on side

Follow instructions on page 7 to install the mixing valve that is supplied with the CWH.

6. Boiler hot water SUPPLY to CWH

7. Boiler water RETURN from CWH

8. Gas supply connection to boiler

Installer must provide hard piping or flexible gas line between boiler connection and gas line connection (item 20).

9. Condensate trap connection to boiler

10. CWH boiler water circulator (shipped loose with CWH)

This circulator is shipped loose with the CWH. The circulator flows boiler water through the internal heat exchanger coil. The WM97+ boiler control cycles the circulator based on domestic water demand.

The circulator must be installed in the location and flow direction shown on the next page. Otherwise, the water heater will not perform correctly.

The circulator is 3-speed with an integral flow/check valve.

WARNING The circulator speed MUST be set at “1(LO)” when connected to a WM97+70 or 110. The circulator speed MUST be set at “3(HI)” when connected to a WM97+155.

11. Circulator mounting hardware (shipped loose with CWH)

The lower mounting flange, bolts, nuts and gaskets are shipped loose for installation with the circulator. Note that the lower flange must be rotated 10 degrees clockwise relative to the front face of the CWH.

12. Upper circulator flange/boiler water connection (shipped loose with CWH)

This fitting is shipped loose for field installation in the location and position shown on the opposite page.

13. Flexible boiler water RETURN line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

14. Service tee, 1” (shipped loose with CWH)

Install the service tee in the location shown in this manual to provide location for the boiler drain valve (item 16). A bushing, 1”x $\frac{3}{4}$ ” NPT, is supplied for mounting the boiler drain valve as shown in this manual.

15. Bushing for mounting hose bibb drain valve (shipped loose with CWH)

Install the 1” x $\frac{3}{4}$ ” bushing in the service tee.

16. Boiler drain valve, $\frac{3}{4}$ ” (shipped loose with boiler)

This valve is shipped loose with the WM97+ boiler. It must be located as shown on the opposite page when the boiler is connected to a CWH.

17. Flexible boiler water SUPPLY line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

18. T & P relief valve (shipped loose with CWH)

T & P relief valve is shipped loose with the CWH for field installation in the location shown on the next page.

19. Relief valve discharge piping

The relief valve outlet MUST be piped to a safe discharge location, following all local codes. See page 9 for instructions and requirements.

20. Gas connection with manual gas valve, union and drip leg (gas valve is shipped loose with boiler)

The manual gas valve shown on the opposite page is shipped loose for field installation. Follow all instructions in the WM97+ Boiler manual for sizing and installing gas connections. The manual gas valve and piping shown as item 20 must be installed OUTSIDE the piping access panel and braced/supported from the wall or other structure. Orient the piping for best routing through one of the piping access panel sides.

21. To building gas supply

22. Condensate trap assembly (shipped loose with boiler)

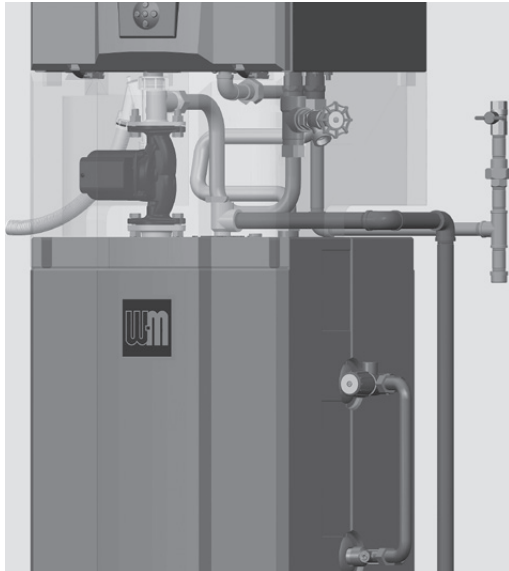
The trap assembly is shipped loose for field assembly and installation. Follow WM97+ boiler manual instructions for trap assembly and installation. Orient the trap for best routing of the condensate drain line through the right or left opening in the piping access cover.

23. Connect to condensate drain piping

Follow all WM97+ Boiler manual instructions for connecting condensate drain piping.

Boiler/CWH piping — 70 or 110 / Right-side mixing valve (cont.)

Figure 10 Typical piping for WM97+70 or 110 — CWH installed with right-side mixing valve



NOTICE

All piping must comply with the instructions in the WM97+ Boiler manual.

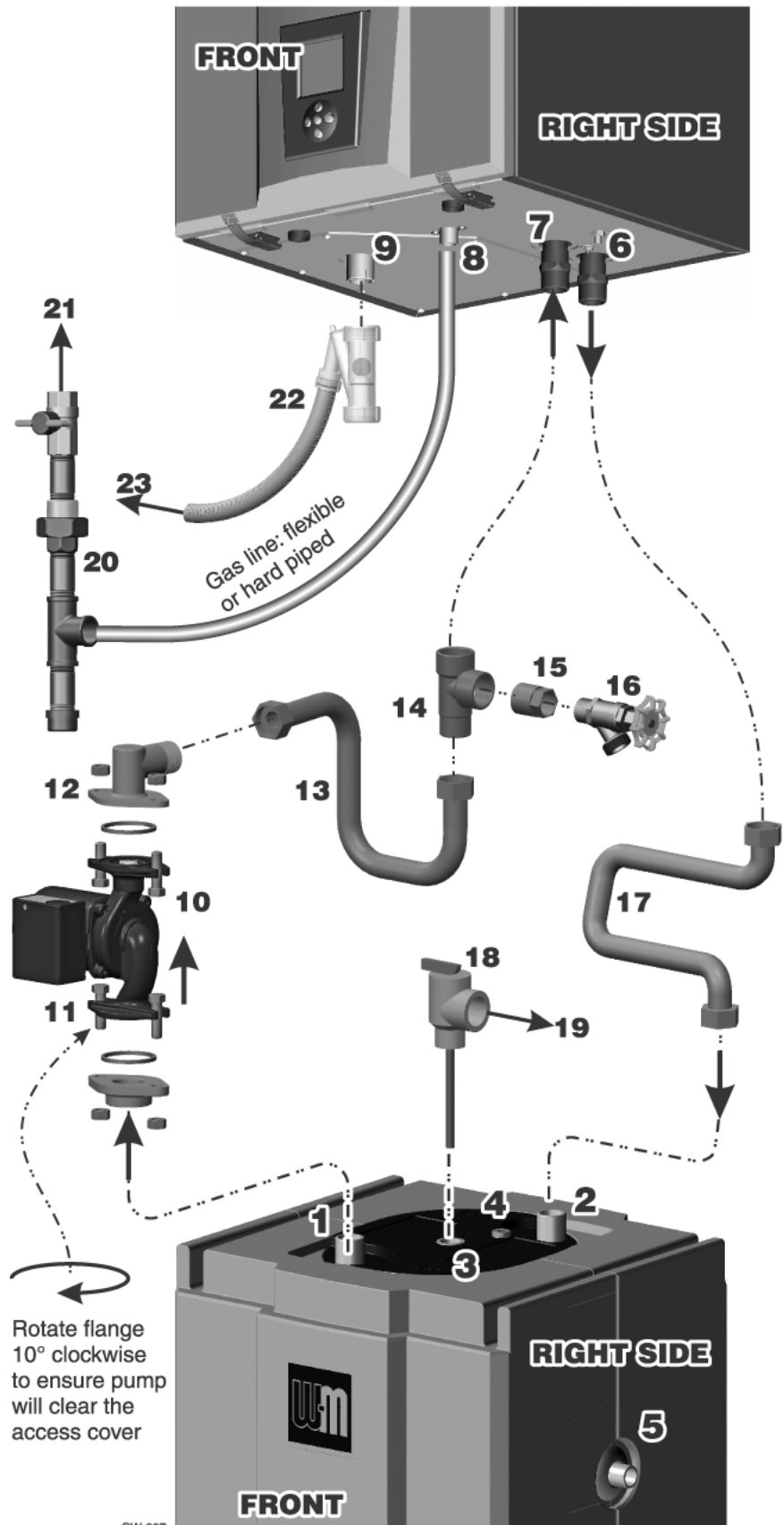
Piping can be routed out either side or both sides of the CWH piping access cover. The example shown here is just one possibility.

CWH circulator mounting

- The circulator **MUST** be mounted in the position shown — pumping out of the water heater toward the boiler DHW return. This is required to flow boiler water through the water heater in the correct direction.
- Rotate the lower circulator flange adapter 10° clockwise (looking down on the flange). This is necessary to ensure the circulator electrical housing will clear the inside of the piping access cover.

Boiler water connections

- The CWH boiler water supply and return lines **MUST** be routed to the boiler connections as shown to ensure proper flow.



CW-007



Boiler/CWH piping — 70 or 110 / Left-side mixing valve

CONNECTIONS TO BOILER AND SYSTEM

NOTICE

The CWH can be placed with its DHW connections on the left side or on the right side (by rotating the unit 180 degrees). This instruction is for installations with the CWH with its DHW connections on the LEFT side. The boiler shown must be either a model WM97+70 or WM97+110.

1. Boiler water RETURN connection from CWH

2. Boiler water SUPPLY connection to CWH

3. Water heater T & P relief valve connection

T&P relief valve is shipped loose with the CWH for field installation.

4. Upper tank temperature sensor

5. DHW supply and return connections on side

Follow instructions on page 7 to install the mixing valve that is supplied with the CWH.

6. Boiler hot water SUPPLY to CWH

7. Boiler water RETURN from CWH

8. Gas supply connection to boiler

Installer must provide hard piping or flexible gas line between boiler connection and gas line connection (item 20).

9. Condensate trap connection to boiler

10. CWH boiler water circulator (shipped loose with CWH)

This circulator is shipped loose with the CWH. The circulator flows boiler water through the internal heat exchanger coil. The WM97+ boiler control cycles the circulator based on domestic water demand.

The circulator must be installed in the location and flow direction shown on the next page. Otherwise, the water heater will not perform correctly.

The circulator is 3-speed with an integral flow/check valve.

WARNING The circulator speed MUST be set at “1(LO)” when connected to a WM97+70 or 110. The circulator speed MUST be set at “3(HI)” when connected to a WM97+155.

11. Circulator mounting hardware (shipped loose with CWH)

The lower mounting flange, bolts, nuts and gaskets are shipped loose for installation with the circulator. Note that the lower flange must be rotated 10 degrees counterclockwise relative to the front face of the CWH.

12. Upper circulator flange/boiler water connection (shipped loose with CWH)

This fitting is shipped loose for field installation in the location and position shown on the opposite page.

13. Flexible boiler water RETURN line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

14. Service tee, 1” (shipped loose with CWH)

Install the service tee in the location shown in this manual to provide location for the boiler drain valve (item 16). A bushing, 1”x $\frac{3}{4}$ ” NPT, is supplied for mounting the boiler drain valve as shown in this manual.

15. Bushing for mounting hose bibb drain valve (shipped loose with CWH)

Install the 1” x $\frac{3}{4}$ ” bushing in the service tee.

16. Boiler drain valve, $\frac{3}{4}$ ” (shipped loose with boiler)

This valve is shipped loose with the WM97+ boiler. It must be located as shown on the opposite page when the boiler is connected to a CWH.

17. Flexible boiler water SUPPLY line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

18. T & P relief valve (shipped loose with CWH)

T & P relief valve is shipped loose with the CWH for field installation in the location shown on the next page.

19. Relief valve discharge piping

The relief valve outlet MUST be piped to a safe discharge location, following all local codes. See page 9 for instructions and requirements.

20. Gas connection with manual gas valve, union and drip leg (gas valve is shipped loose with boiler)

The manual gas valve shown on the opposite page is shipped loose for field installation. Follow all instructions in the WM97+ Boiler manual for sizing and installing gas connections. The manual gas valve and piping shown as item 20 must be installed OUTSIDE the piping access panel and braced/supported from the wall or other structure. Orient the piping for best routing through one of the piping access panel sides.

21. To building gas supply

22. Condensate trap assembly (shipped loose with boiler)

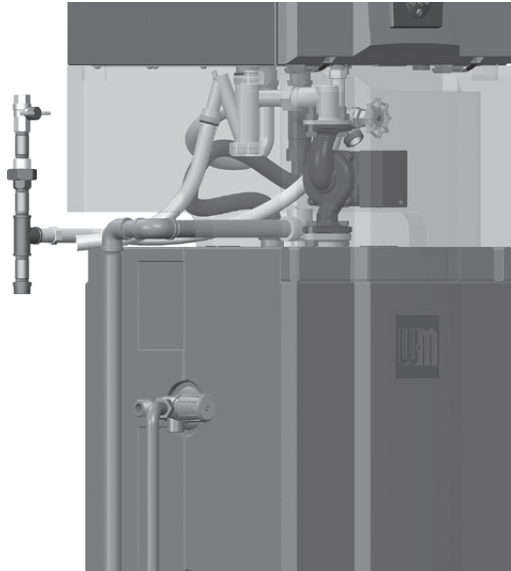
The trap assembly is shipped loose for field assembly and installation. Follow WM97+ boiler manual instructions for trap assembly and installation. Orient the trap for best routing of the condensate drain line through the right or left opening in the piping access cover.

23. Connect to condensate drain piping

Follow all WM97+ Boiler manual instructions for connecting condensate drain piping.

Boiler/CWH piping — 70 or 110 / Left-side mixing valve (cont.)

Figure 11 Typical piping for WM97+70 or 110 — CWH installed with left-side mixing valve



NOTICE

All piping must comply with the instructions in the WM97+ Boiler manual.

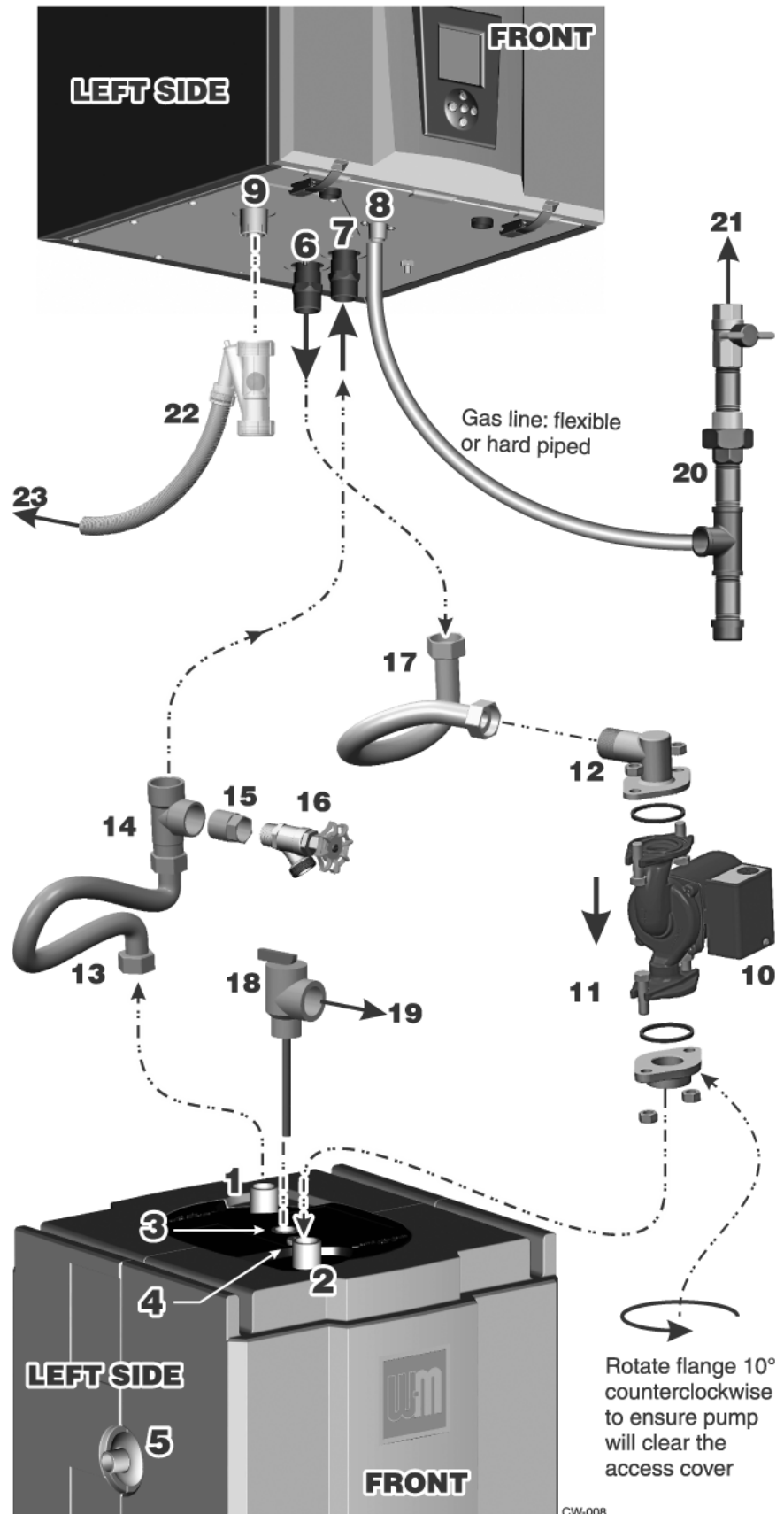
Piping can be routed out either side or both sides of the CWH piping access cover. The example shown here is just one possibility.

CWH circulator mounting

- The circulator **MUST** be mounted in the position shown — pumping out of the boiler toward the CWH. This is required to flow boiler water through the water heater in the correct direction.
- Rotate the lower circulator flange adapter 10° counterclockwise (looking down on the flange). This is necessary to ensure the circulator electrical housing will clear the inside of the piping access cover.

Boiler water connections

- The CWH boiler water supply and return lines **MUST** be routed to the boiler connections as shown to ensure proper flow.





Boiler/CWH piping — 155 / Right-side mixing valve

CONNECTIONS TO BOILER AND SYSTEM

NOTICE

The CWH can be placed with its DHW connections on the left side or on the right side (by rotating the unit 180 degrees). This instruction is for installations with the CWH with its DHW connections on the RIGHT side. The boiler shown must be a model WM97+155.

1. Boiler water RETURN connection from CWH

2. Boiler water SUPPLY connection to CWH

3. Water heater T & P relief valve connection

T&P relief valve is shipped loose with the CWH for field installation.

4. Upper tank temperature sensor

5. DHW supply and return connections on side

Follow instructions on page 7 to install the mixing valve that is supplied with the CWH.

6. Boiler hot water SUPPLY to CWH

7. Boiler water RETURN from CWH

8. Gas supply connection to boiler

Installer must provide hard piping or flexible gas line between boiler connection and gas line connection (item 20).

9. Condensate trap connection to boiler

10. CWH boiler water circulator (shipped loose with CWH)

This circulator is shipped loose with the CWH. The circulator flows boiler water through the internal heat exchanger coil. The WM97+ boiler control cycles the circulator based on domestic water demand.

The circulator must be installed in the location and flow direction shown on the next page. Otherwise, the water heater will not perform correctly.

The circulator is 3-speed with an integral flow/check valve.

WARNING The circulator speed MUST be set at “1(LO)” when connected to a WM97+70 or 110. The circulator speed MUST be set at “3(HI)” when connected to a WM97+155.

11. Circulator mounting hardware (shipped loose with CWH)

The lower mounting flange, bolts, nuts and gaskets are shipped loose for installation with the circulator. Note that the lower flange must be rotated 10 degrees clockwise relative to the front face of the CWH. Note that the lower flange must be rotated 10 degrees clockwise relative to the front face of the CWH.

12. Upper circulator flange/boiler water connection (shipped loose with CWH)

This fitting is shipped loose for field installation in the location and position shown on the opposite page.

13. Flexible boiler water RETURN line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

14. Service tee, 1” (shipped loose with CWH)

Install the service tee in the location shown in this manual to provide location for the boiler drain valve (item 16). A bushing, 1”x $\frac{3}{4}$ ” NPT, is supplied for mounting the boiler drain valve as shown in this manual.

15. Bushing for mounting hose bibb drain valve (shipped loose with CWH)

Install the 1” x $\frac{3}{4}$ ” bushing in the service tee.

16. Boiler drain valve, $\frac{3}{4}$ ” (shipped loose with boiler)

This valve is shipped loose with the WM97+ boiler. It must be located as shown on the opposite page when the boiler is connected to a CWH.

17. Flexible boiler water SUPPLY line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

18. T & P relief valve (shipped loose with CWH)

T & P relief valve is shipped loose with the CWH for field installation in the location shown on the next page.

19. Relief valve discharge piping

The relief valve outlet MUST be piped to a safe discharge location, following all local codes. See page 9 for instructions and requirements.

20. Gas connection with manual gas valve, union and drip leg (gas valve is shipped loose with boiler)

The manual gas valve shown on the opposite page is shipped loose for field installation. Follow all instructions in the WM97+ Boiler manual for sizing and installing gas connections. The manual gas valve and piping shown as item 20 must be installed OUTSIDE the piping access panel and braced/supported from the wall or other structure. Orient the piping for best routing through one of the piping access panel sides.

21. To building gas supply

22. Condensate trap assembly (shipped loose with boiler)

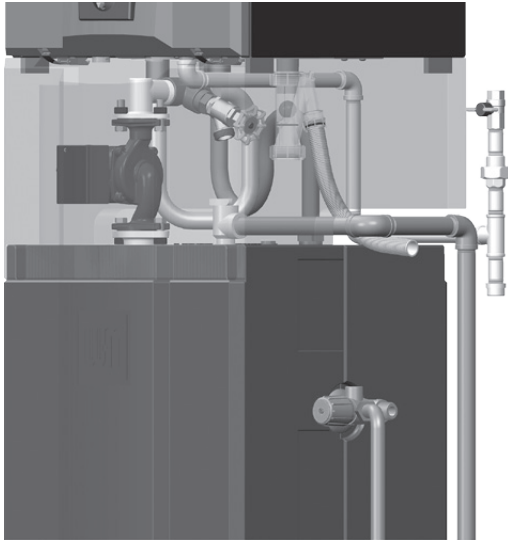
The trap assembly is shipped loose for field assembly and installation. Follow WM97+ boiler manual instructions for trap assembly and installation. Orient the trap for best routing of the condensate drain line through the right or left opening in the piping access cover.

23. Connect to condensate drain piping

Follow all WM97+ Boiler manual instructions for connecting condensate drain piping.

Boiler/CWH piping — 155 / Right-side mixing valve (cont.)

Figure 12 Typical piping for WM97+155
— CWH installed with right-side
mixing valve



NOTICE

All piping must comply with the instructions in the WM97+ Boiler manual.

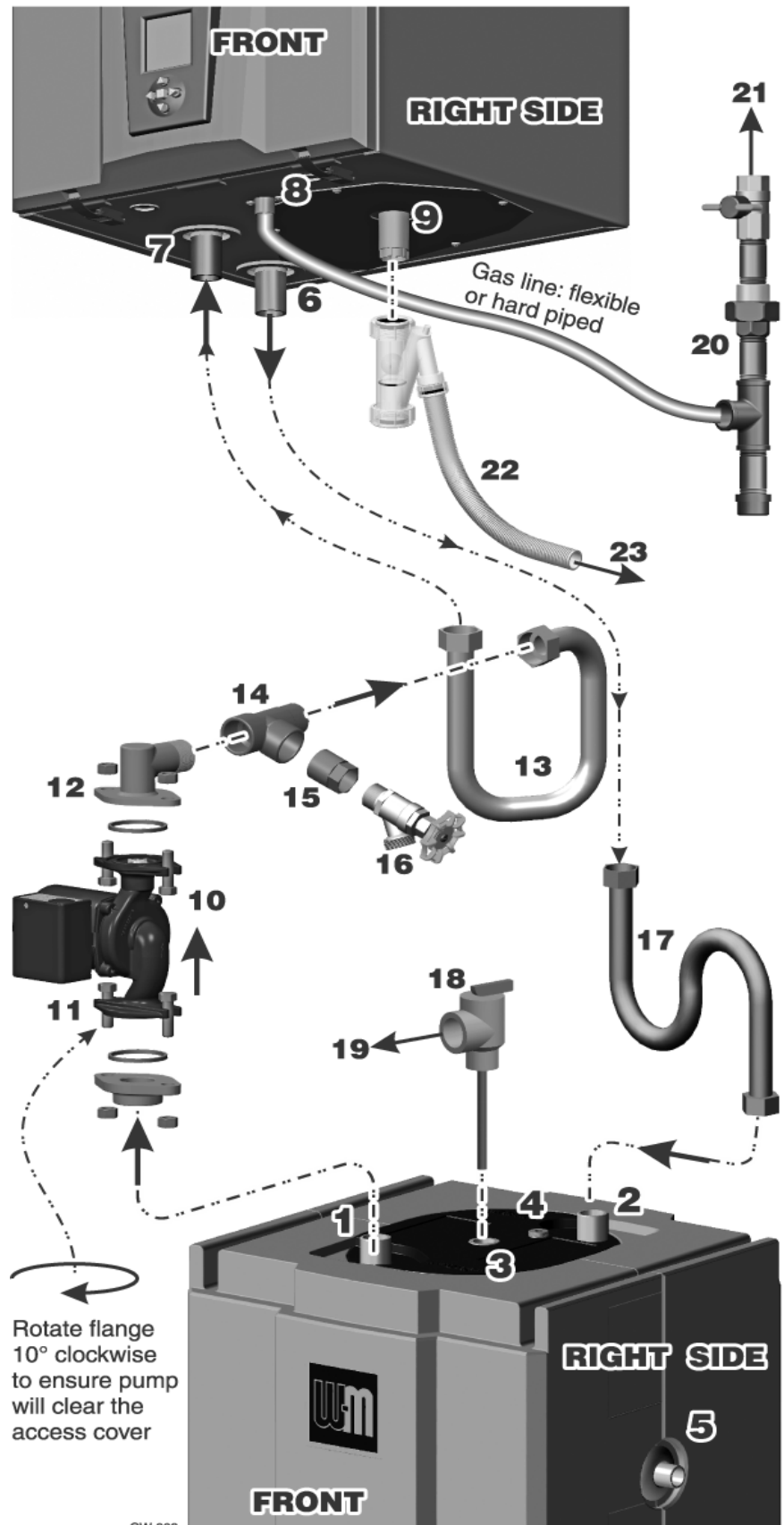
Piping can be routed out either side or both sides of the CWH piping access cover. The example shown here is just one possibility.

CWH circulator mounting

- The circulator **MUST** be mounted in the position shown — pumping out of the water heater toward the boiler DHW return. This is required to flow boiler water through the water heater in the correct direction.
- Rotate the lower circulator flange adapter 10° clockwise (looking down on the flange). This is necessary to ensure the circulator electrical housing will clear the inside of the piping access cover.

Boiler water connections

- The CWH boiler water supply and return lines **MUST** be routed to the boiler connections as shown to ensure proper flow.



CW-009



Boiler/CWH piping — 155 / Left-side mixing valve

CONNECTIONS TO BOILER AND SYSTEM

NOTICE

The CWH can be placed with its DHW connections on the left side or on the right side (by rotating the unit 180 degrees). This instruction is for installations with the CWH with its DHW connections on the LEFT side. The boiler shown must be a model WM97+155.

1. Boiler water RETURN connection from CWH

2. Boiler water SUPPLY connection to CWH

3. Water heater T & P relief valve connection

T&P relief valve is shipped loose with the CWH for field installation.

4. Upper tank temperature sensor

5. DHW supply and return connections on side

Follow instructions on page 7 to install the mixing valve that is supplied with the CWH.

6. Boiler hot water SUPPLY to CWH

7. Boiler water RETURN from CWH

8. Gas supply connection to boiler

Installer must provide hard piping or flexible gas line between boiler connection and gas line connection (item 20).

9. Condensate trap connection to boiler

10. CWH boiler water circulator (shipped loose with CWH)

This circulator is shipped loose with the CWH. The circulator flows boiler water through the internal heat exchanger coil. The WM97+ boiler control cycles the circulator based on domestic water demand.

The circulator must be installed in the location and flow direction shown on the next page. Otherwise, the water heater will not perform correctly.

The circulator is 3-speed with an integral flow/check valve.

WARNING The circulator speed MUST be set at “1(LO)” when connected to a WM97+70 or 110. The circulator speed MUST be set at “3(HI)” when connected to a WM97+155.

11. Circulator mounting hardware (shipped loose with CWH)

The lower mounting flange, bolts, nuts and gaskets are shipped loose for installation with the circulator.

12. Upper circulator flange/boiler water connection (shipped loose with CWH)

This fitting is shipped loose for field installation in the location and position shown on the opposite page.

13. Flexible boiler water RETURN line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

14. Service tee, 1” (shipped loose with CWH)

Install the service tee in the location shown in this manual to provide location for the boiler drain valve (item 16). A bushing, 1”x $\frac{3}{4}$ ” NPT, is supplied for mounting the boiler drain valve as shown in this manual.

15. Bushing for mounting hose bibb drain valve (shipped loose with CWH)

Install the 1” x $\frac{3}{4}$ ” bushing in the service tee.

16. Boiler drain valve, $\frac{3}{4}$ ” (shipped loose with boiler)

This valve is shipped loose with the WM97+ boiler. It must be located as shown on the opposite page when the boiler is connected to a CWH.

17. Flexible boiler water SUPPLY line (either of two flexible lines shipped loose with the CWH)

Two 1-inch flexible stainless steel hoses are shipped loose for field installation. Use one hose each for boiler water CWH supply and return connections. Make sure a gasket is placed in each the hex fittings on the hose ends. No pipe dope or tape is needed. DO NOT over-tighten — gasket would be damaged.

18. T & P relief valve (shipped loose with CWH)

T & P relief valve is shipped loose with the CWH for field installation in the location shown on the next page.

19. Relief valve discharge piping

The relief valve outlet MUST be piped to a safe discharge location, following all local codes. See page 9 for instructions and requirements.

20. Gas connection with manual gas valve, union and drip leg (gas valve is shipped loose with boiler)

The manual gas valve shown on the opposite page is shipped loose for field installation. Follow all instructions in the WM97+ Boiler manual for sizing and installing gas connections. The manual gas valve and piping shown as item 20 must be installed OUTSIDE the piping access panel and braced/supported from the wall or other structure. Orient the piping for best routing through one of the piping access panel sides.

21. To building gas supply

22. Condensate trap assembly (shipped loose with boiler)

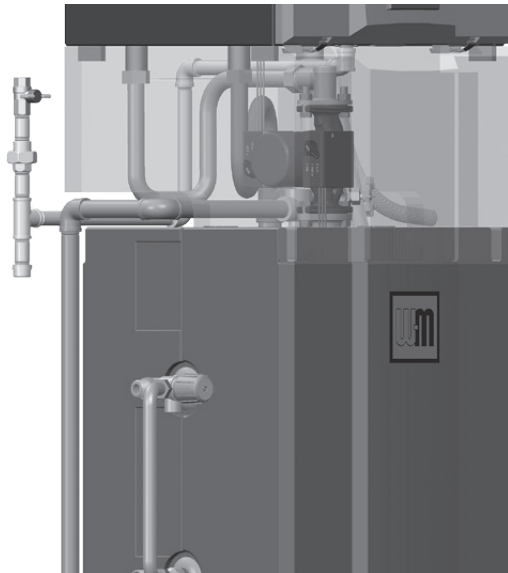
The trap assembly is shipped loose for field assembly and installation. Follow WM97+ boiler manual instructions for trap assembly and installation. Orient the trap for best routing of the condensate drain line through the right or left opening in the piping access cover.

23. Connect to condensate drain piping

Follow all WM97+ Boiler manual instructions for connecting condensate drain piping.

Boiler/CWH piping — 155 / Left-side mixing valve (cont.)

Figure 13 Typical piping for WM97+155 — CWH installed with left-side mixing valve



NOTICE

All piping must comply with the instructions in the WM97+ Boiler manual.

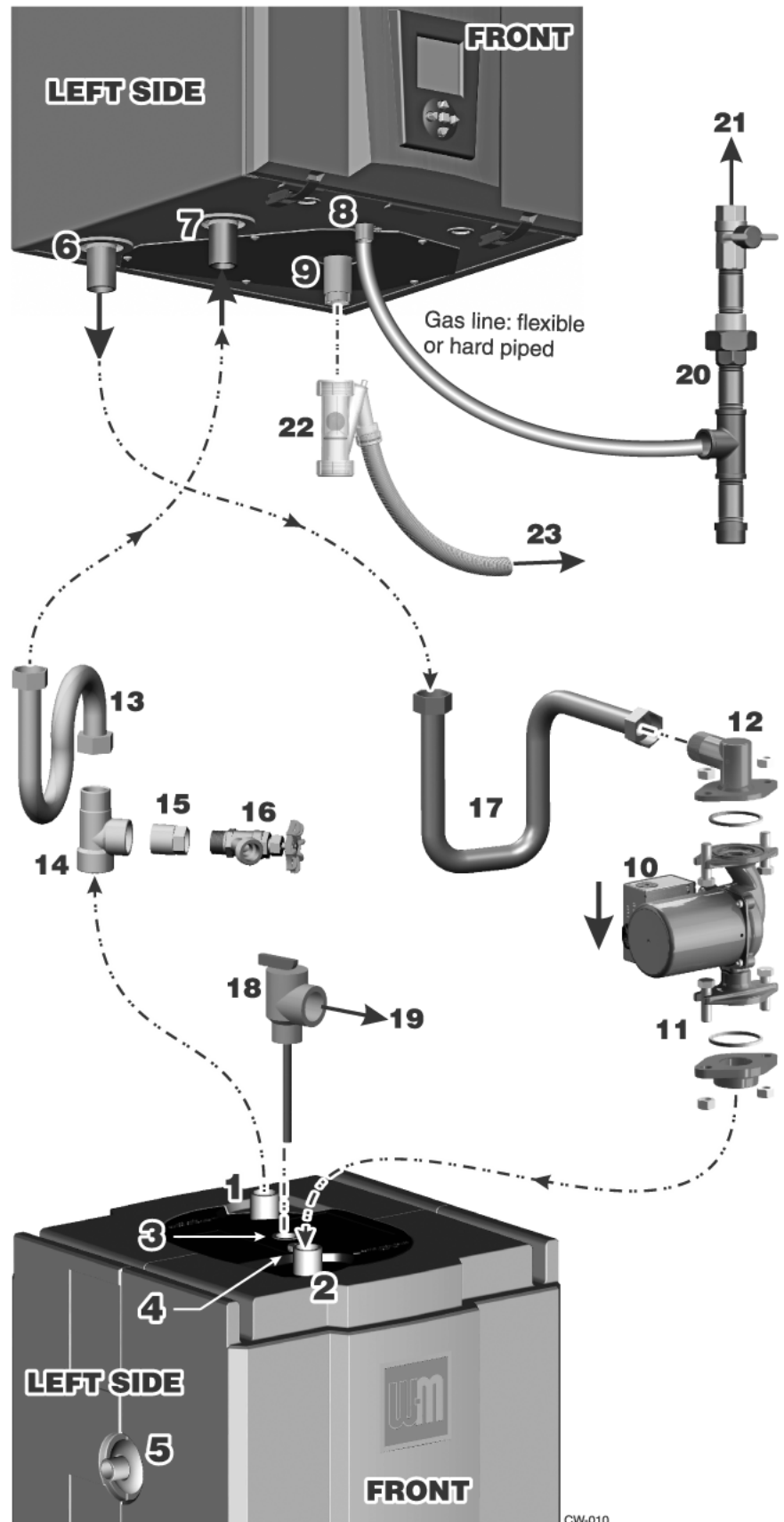
Piping can be routed out either side or both sides of the CWH piping access cover. The example shown here is just one possibility.

CWH circulator mounting

- The circulator **MUST** be mounted in the position shown — pumping out of the boiler toward the CWH. This is required to flow boiler water through the water heater in the correct direction.

Boiler water connections

- The CWH boiler water supply and return lines **MUST** be routed to the boiler connections as shown to ensure proper flow.



CW-010

Wiring



Electrical shock hazard — Can cause severe personal injury, death or substantial property damage. Disconnect power before installing and/or servicing.



CWH circulator — The CWH circulator is shipped loose with the CWH and must be installed as instructed in this manual.

Connect circulator and sensor harnesses

1. All wiring connections to the Companion Water Heater are pre-wired and available in the WM97+ boiler lower jacket interior.
2. Remove the two plastic plugs from the WM97+ jacket bottom (see Figure 16 or Figure 17).
3. Route the tank sensor harness and CWH circulator harness through these openings (circulator harness through left opening, sensor through right opening).
4. **Quick-connect connectors** — Connect the harnesses to the mating connectors in the WM97+ boiler — one for the circulator and one for the tank temperature sensors.
 - a. See Figure 14 or Figure 15 for the location of the harness connectors in the boiler.
 - b. The circulator harness must be attached to the connector in the boiler and to the connector at the CWH circulator.
 - c. The CWH tank sensor harness is factory wired to the sensors in the CWH tank. Route the harness end through the right-side opening and attach to the sensor harness connector in the boiler.
5. **Grommets** — The harnesses are fitted with grommets to seal the bottom openings. Press the grommets through the openings and work into position.

WARNING The grommets must be seated properly to prevent room air leakage into the boiler enclosure.

Figure 16 WM97+70 or 110 jacket bottom wire harness openings

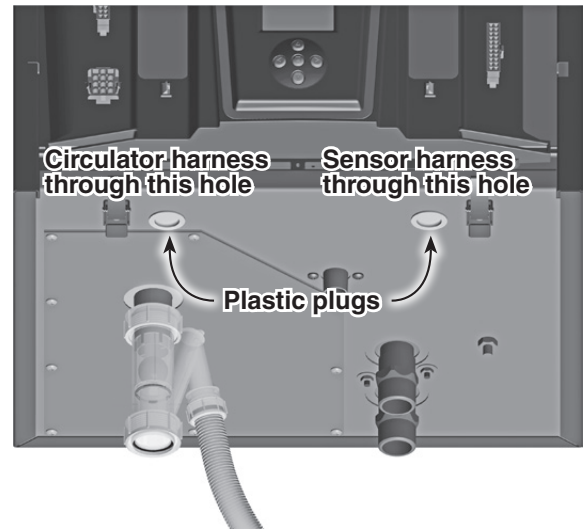


Figure 17 WM97+155 jacket bottom wire harness openings

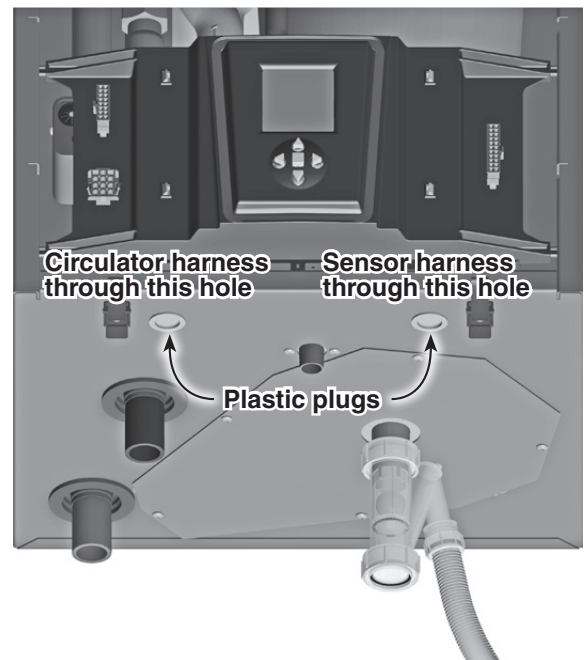


Figure 14 WM97+70/110 harness connector locations

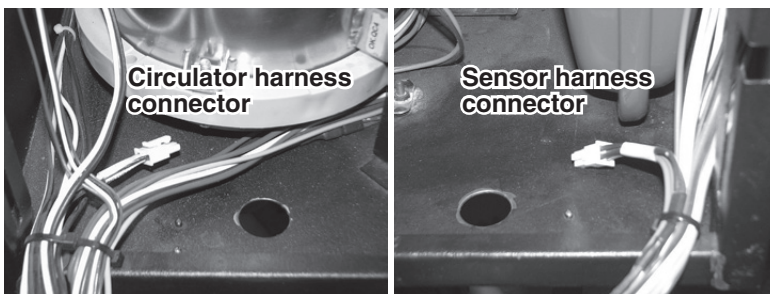


Figure 15 WM97+155 harness connector locations





Water heater filling and start-up



The installation and water chemistry must meet the requirements below. Failure to comply could result in damage to the water heater, causing possible severe personal injury, death or substantial property damage.

Boiler water restrictions

- Thoroughly flush the boiler system (without water heater connected) to remove sediment.
- The water heater heat exchanger can be damaged by build-up or corrosion due to sediment.
- Boiler water (including additives) must be practically non-toxic, having toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products.
- If antifreeze is used in boiler system:
 - Local codes may require a backflow preventer on cold water supply line.
 - Use only antifreeze products listed in the WM97+ Boiler manual.
 - Follow WM97+ Boiler manual instructions for antifreeze usage.

Filling the domestic water tank

1. The CWH tank contains domestic water. The CWH heat exchanger coil water is circulated from and to the boiler with the CWH circulator.
2. Fill the CWH tank and domestic water system with fresh domestic water that meets the chemistry requirements below.
 - a. Hardness — less than 6 grains/gal.
 - b. pH — above 6 and less than 8.
 - c. Chlorides — less than 200 ppm.
3. A water softener in the domestic water system is acceptable. A water softener is recommended if water hardness may exceed the limit above.
4. Do not exceed a fill pressure of 70 PSIG.



When the water supply pressure is higher than 70 PSIG, make sure that a pressure-reducing valve is installed on the cold water supply line to prevent leakage from the T&P relief valve. A thermal expansion tank is also required.

5. Vent the piping as necessary to remove any trapped air.

Start-up checklist

- ☐ Verify that T&P relief valve is properly installed and piped as directed in this manual and per local code requirements.
- ☐ Verify that the CWH (boiler and DHW) and boiler piping are complete and that the system is filled with water and pressurized.
- ☐ Verify that all air has been bled from both domestic and boiler water systems.
- ☐ Check all fittings and piping for leaks.
- ☐ Verify that all wiring is installed correctly.
- ☐ Set mixing valve temperature as described in the mixing valve instruction manual supplied with the mixing valve kit.
- ☐ **Start boiler according to the WM97+ Boiler Manual** and to the control setup information in this manual.

WM97+ control set-up

- ☐ **Quick set-up** — see “CWH Performance Mode quick set-up” on page 22 for set-up using default settings for water heater operation. This will cover most applications.
- ☐ **Customizing CWH operation** — see “WM97+ Control settings — Advanced” on page 24. This page and the pages following provide details about control operation, menu navigation and methods for customizing the default operating parameters.

Verify operation

- ☐ Verify that the boiler and water heater are operating correctly, per WM97+ Boiler manual.

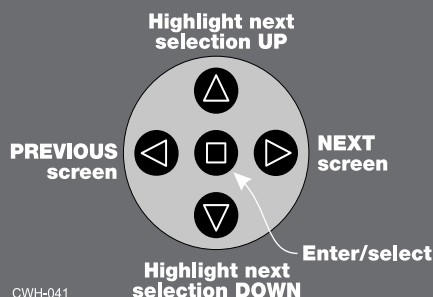
Homeowner instruction

- ☐ Review the following sections with the homeowner or system operator:
 - **WM97+ Boiler/CWH User's Information Manual** (includes information for setting WM97+ control for CWH)
 - **Adjusting Water Heater Temperature**
 - **CWH Water Heater Maintenance**

CWH Performance Mode quick set-up

NOTICE See page 41 for performance ratings at HIGH PERFORMANCE, NORMAL and ECONOMY.

CONTROL NAVIGATION BUTTONS



SUGGESTED CWH PERFORMANCE SETTINGS

WM97+70	HIGH PERFORMANCE
WM97+110	NORMAL
WM97+155	NORMAL

Exceptions:

Light loads: If load is always light, Performance mode can be set to ECONOMY. When using this setting, clearly explain to the homeowner how to change to a higher output setting if ECONOMY does not provide sufficient hot water.

Heavy loads: If maximum capacity is required, set the Performance mode to HIGH PERFORMANCE.

Scheduled performance: Use the SCHEDULED Performance mode option to program the Wm97+ control to change performance mode based on time of day and weekdays vs weekends. See instructions in this manual for setting time periods in SCHEDULED mode.

BOILER MODEL
WM 97+ 155

CWH TANK:
DETECTED

OUTDOOR SENSOR
ATTACHED

WARNING: IF INCORRECT
REFER TO BOILER
MANUAL

CONTINUE ▶

This screen advances after 20 seconds or when ENTER is pushed. On all starts after the CWH has been ACCEPTED and the control set up for CWH, the opening screen will close after 20 seconds and change to the BOILER STATUS screen.

-----DANGER!-----
CWH TANK DETECTED
SEE USER MANUAL

THE DHW OUTLET OF THE
TANK MUST BE
INSTALLED WITH THE
PROVIDED THERMOSTATIC
MIXING VALVE.
BEFORE OPERATING THE
BOILER VERIFY THAT
THE MIXING VALVE IS
INSTALLED, SET, AND
WORKING PROPERLY.

◀DISABLE DHW ACCEPT▶

The DANGER screen above occurs on initial start-up and any time that Performance Mode is changed from "OFF" to any other selection. The screen must be accepted by a contractor and the control set up to allow CWH operation.

CONTRACTOR DOMESTIC
HOT WATER SETTINGS

DHW
PERFORMANCE: OFF

CHANGE SETTING ▲▼
◀PREVIOUS ENTER▶

Choosing ACCEPT at the DANGER screen will cause the control to go to the screen above. Press ENTER to go to the Performance Mode screen. Select the desired performance mode to activate CWH operation.

DHW PERFORMANCE

OFF-DISABLED

HIGH PERFORMANCE

NORMAL

ECONOMY-MAX SAVINGS

VACATION

SCHEDULE

SELECT OPTION ▲▼
◀PREVIOUS ENTER▶

-----DANGER!-----
CWH TANK DETECTED
SEE USER MANUAL

THE DHW OUTLET OF THE
TANK MUST BE
INSTALLED WITH THE
PROVIDED THERMOSTATIC
MIXING VALVE.
BEFORE OPERATING THE
BOILER VERIFY THAT
THE MIXING VALVE IS
INSTALLED, SET, AND
WORKING PROPERLY.

◀DISABLE DHW ACCEPT▶

-----WARNING!-----
CWH TANK DETECTED
SEE PRODUCT MANUAL

HOT WATER STORAGE
TANK TEMPERATURE IS
SET USING THE
ELECTRONIC BOILER
CONTROL

HOT WATER DELIVERY
TEMPERATURE IS SET
USING THE
THERMOSTATIC MIXING
VALVE

CONTINUE ▶

CONTRACTOR DOMESTIC
HOT WATER SETTINGS

DHW
PERFORMANCE: #####

TANK STORAGE
TEMPERATURE: ###°F

MAX RUN TIME: ####MIN
ADJUST SCHEDULES
WEEKDAYS▶
WEEKENDS▶

ADVANCED SETUP▶
SELECT OPTION ▲▼
◀PREVIOUS ENTER▶

Mode	Description
OFF-DISABLED	Contractor-selected — CWH operation is disabled; can only be activated by a contractor User-selected — CWH operation turned off; can be turned on by user in the Performance Mode Menu WARNING When performance mode is set to OFF-DISABLED, no freeze protection is provided in control operation. In other performance modes, the WM97+ control will always maintain a minimum temperature to reduce possibility of freeze-up.
HIGH PERFORMANCE	Delivers the highest performance available and maximizes the energy of the stored water for demanding applications. Use during peak-demand periods when multiple fixtures will be running.
NORMAL	A balance of performance and efficiency. Delivers hot water for a shower, sinks, or faucets continually (except WM97+70 model). General setting for most times of the day.
ECONOMY	Saves energy by operating with lower boiler temperatures and storing tank at lower temperature for lowest standby losses. Not recommended for showering with 70°F temperature rise. Ideal setting in schedule mode for low-use periods.
VACATION	Maintains tank temperature above 50°F to deter freezing in tank. This mode will not supply hot water to the user.
SCHEDULED	This mode allows programming up to 4 different performance modes to occur at different times of the day. There are different schedules for Weekdays (M-F) and Weekends. This allows energy savings by keeping the tank at low temperatures when not needed and meeting peak demands during times of typical high usage. These times must be programmed by the contractor or user.

Water heater maintenance

▲WARNING Boiler water — read and comply with all requirements under “Boiler water restrictions,” page 4.

▲WARNING Water from opened drain valves, unions and other connections may be extremely hot. To avoid severe personal injury, death or substantial property damage:

- Tighten all drain hose connections.
- Direct hot water away from all persons.

ATTENTION USER!

▲WARNING Have the water heater serviced at least once annually by a qualified service technician.

Follow the **maintenance procedures** below at least monthly.

See WM97+ User’s Information Manual for information on setting the control.

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

MONTHLY maintenance by user

- At least **MONTHLY**, visually check valves, pipes and fittings for leaks.
- Check hot water supply at several outlets. Make sure water temperature is not too hot.
- Call qualified service technician to repair leaks or address problems.

ANNUAL maintenance by qualified service technician

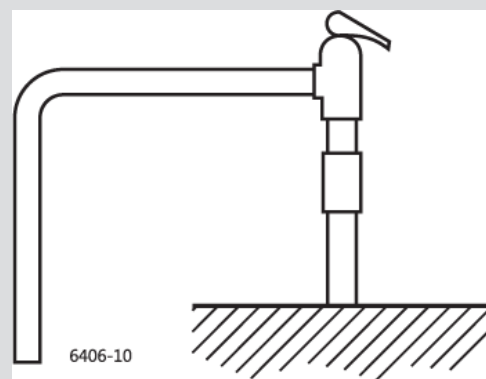
▲WARNING Check water supply temperature at several outlets to ensure the water temperature is acceptable for intended use and that all temperature control devices are functioning properly. Read page 4 and verify that all requirements are met by the installation.

Perform the following procedures:

- ☐ Perform any procedures required by local codes.
- ☐ Verify system pressure both on domestic water and boiler water sides.
- ☐ **Manually operate T&P relief valve at least once a year** (see Figure 18). This will release some hot water. Move operating lever to open position for a few seconds and then move it back, allowing it to snap closed. After T&P relief valve is operated, if it continues to release water, close cold water inlet to water heater immediately. Follow draining instructions, and replace the T&P relief valve. If T&P relief valve weeps periodically, it may be due to thermal expansion. Install an expansion tank if not already installed.

Figure 18 T&P valve operation

▲WARNING Before operating the T&P relief valve, make sure no one is in front of or around the T&P relief valve discharge piping. Hot discharge water can cause severe personal injury or substantial property damage.



▲WARNING Plugging T&P relief valve or discharge piping can cause excessive pressure in the water heater, resulting in severe personal injury, death or substantial property damage.

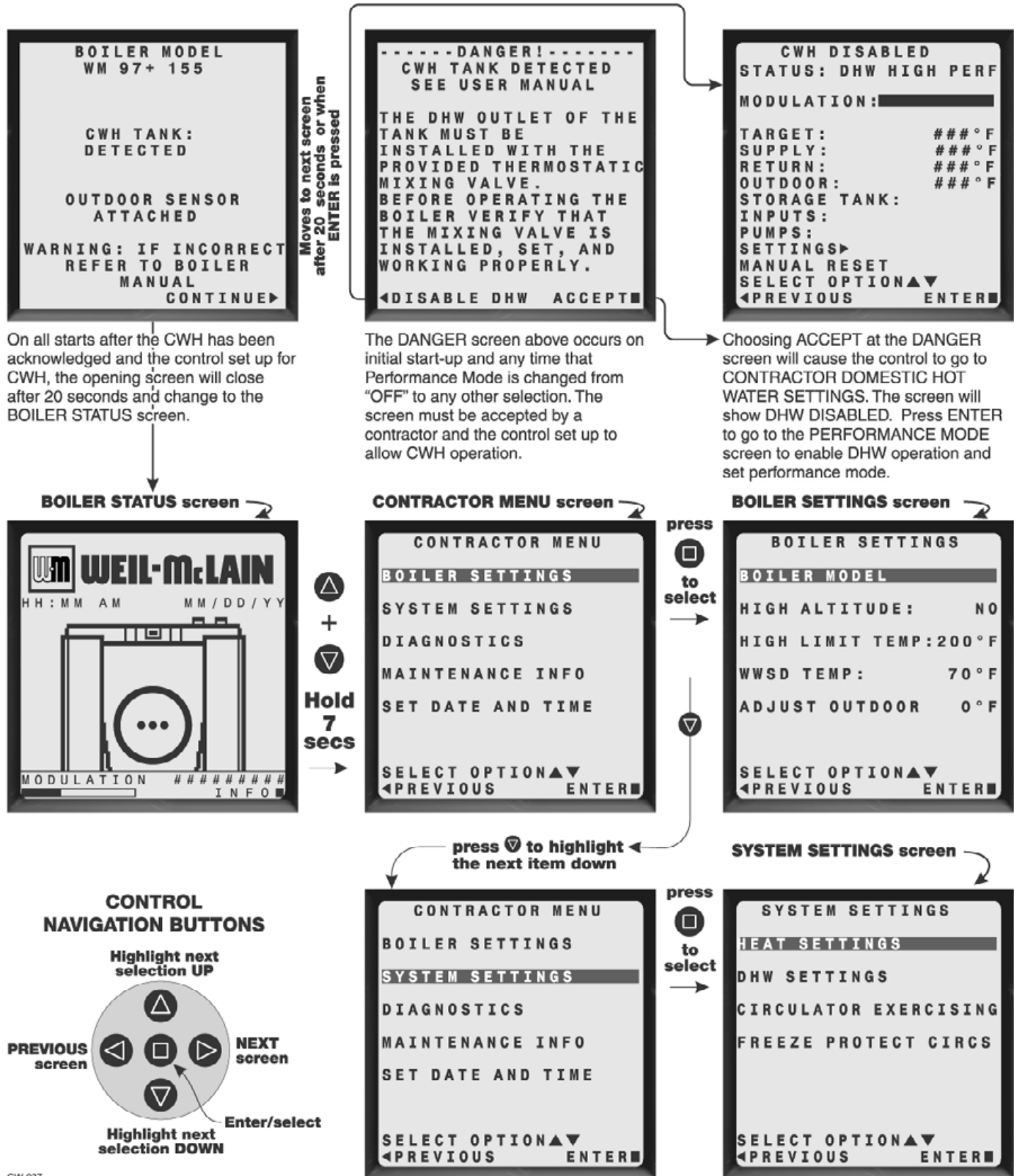
- ☐ The CWH must use **ONLY** the circulator model supplied with the unit or suggested by Weil-McLain. The circulator is water-lubricated and does **NOT** require oiling.
- ☐ Check valves, pipes and fittings for leaks.
- ☐ Check function of all controls and valves (see control manufacturer’s instructions).
- ☐ Review homeowner’s maintenance responsibilities and their frequencies.

Shutdown procedure

1. Drain the water heater if it will be shut off and exposed to freezing temperatures. Freezing water will expand and may damage water heater.
 - a. If boiler water contains sufficient antifreeze, then only the domestic water needs to be drained.
 - b. If boiler water does not contain sufficient anti-freeze, then the boiler water and the domestic water must be drained.

WM97+ Control settings — Advanced

Figure 19 WM97+ control menu access — accessing contractor menus — press and hold the UP and DOWN buttons for 7 seconds to go from any screen to the CONTRACTOR MENU screen



CW-037



WM97+ Control settings — Advanced *(continued)*

DHW SETTINGS

1. If a CWH is used, the settings for control operation during CWH calls for heat are set under the DHW SETTINGS menus.
2. The settings apply ONLY to Zone 1.

DHW PERFORMANCE:

1. Use this setting to select which performance mode is desired.
 - a. High – Max Hot Water
 - b. Normal
 - c. Economy – Max Savings
 - d. Off-Disable
 - e. Vacation (when user needs the CWH off or user is on vacation.
 - f. Schedule (if user wants to set different performance modes at different times throughout the day.
2. The temperature presets are chosen based on normal best setting for CWH performance modes.
3. The temperature values can be changed by a technician using the ADVANCED SETUP menu.

TANK STORAGE TEMPERATURE:

1. Use this setting to change the CWH tank storage temperature only.
2. When changing this setting, DHW PERFORMANCE will be set to CUSTOM.
3. This temperature will not be saved if the user changes DHW PERFORMANCE modes.
4. It is recommended to change the DHW tank storage temperature in the ADVANCE SETUP menu, when needed, under the appropriate DHW PERFORMANCE mode. ADVANCED SETUP is accessible from the CONTRACTOR DHW SETTINGS menu.

MAX RUN TIME

1. This is the longest time the boiler will continue in DHW mode before switching to space heating (if there is a space heating call).
2. Setting MAX ON TIME to off will cause the control to never switch to space heating while CWH call for heat is present.

▲WARNING This could present a freeze hazard for some installations if the CWH temperature sensors were reading incorrectly and created a constant call to the control.

ADJUST SCHEDULES (WEEKDAYS / WEEKENDS)

1. Use this setting to setup a schedule during the weekdays and weekends to have the DHW performance modes change at certain times throughout the day.
2. For example, the user can have the CWH at HIGH – MAX HOT WATER during peak demand times, and ECONOMY – MAX SAVINGS during times of the day when domestic hot water is unlikely to be used.

ADVANCED SETUP:

1. Use this setting to adjust and customize the operating parameters for HIGH – MAX HOT WATER, NORMAL, and ECONOMY – MAX SAVINGS.

TO DISABLE CWH OPERATION AND REVERT TO HEATING OPERATION ONLY

1. To disable CWH operation and revert to space heating only operation:
 - a. Turn off power to the WM97+ boiler.
 - b. Remove the WM97+ boiler front door panel.
 - c. Rotate the control housing forward.
 - d. Disconnect the sensor wiring harness connection (see page 20 for location).
 - e. Restore the control housing to upright position.
 - f. Replace the boiler front door panel.
2. Visually inspect boiler front door to be sure it is sealed all around its perimeter. Verify that the two door latches are tight.

▲WARNING The boiler front door must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room.

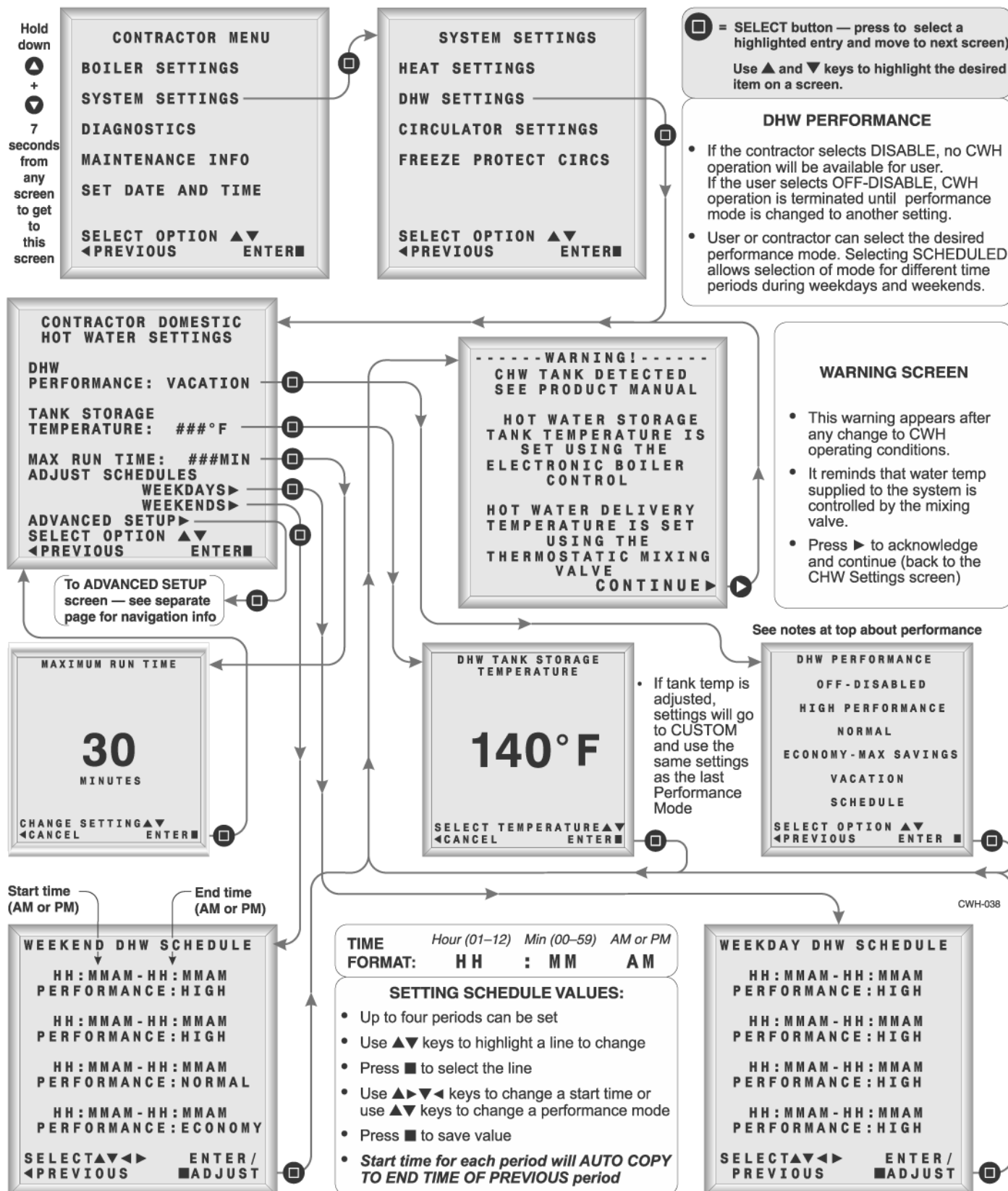
This is particularly important if the boiler is located in the same room as other appliances.

Failure to keep the door securely fastened could result in severe personal injury or death.

3. Turn power on to the boiler.

WM97+ Control settings — Advanced *(continued)*

Figure 20 Contractor DHW SETTINGS menus (see Figure 21, page 27 for setting values and descriptions)



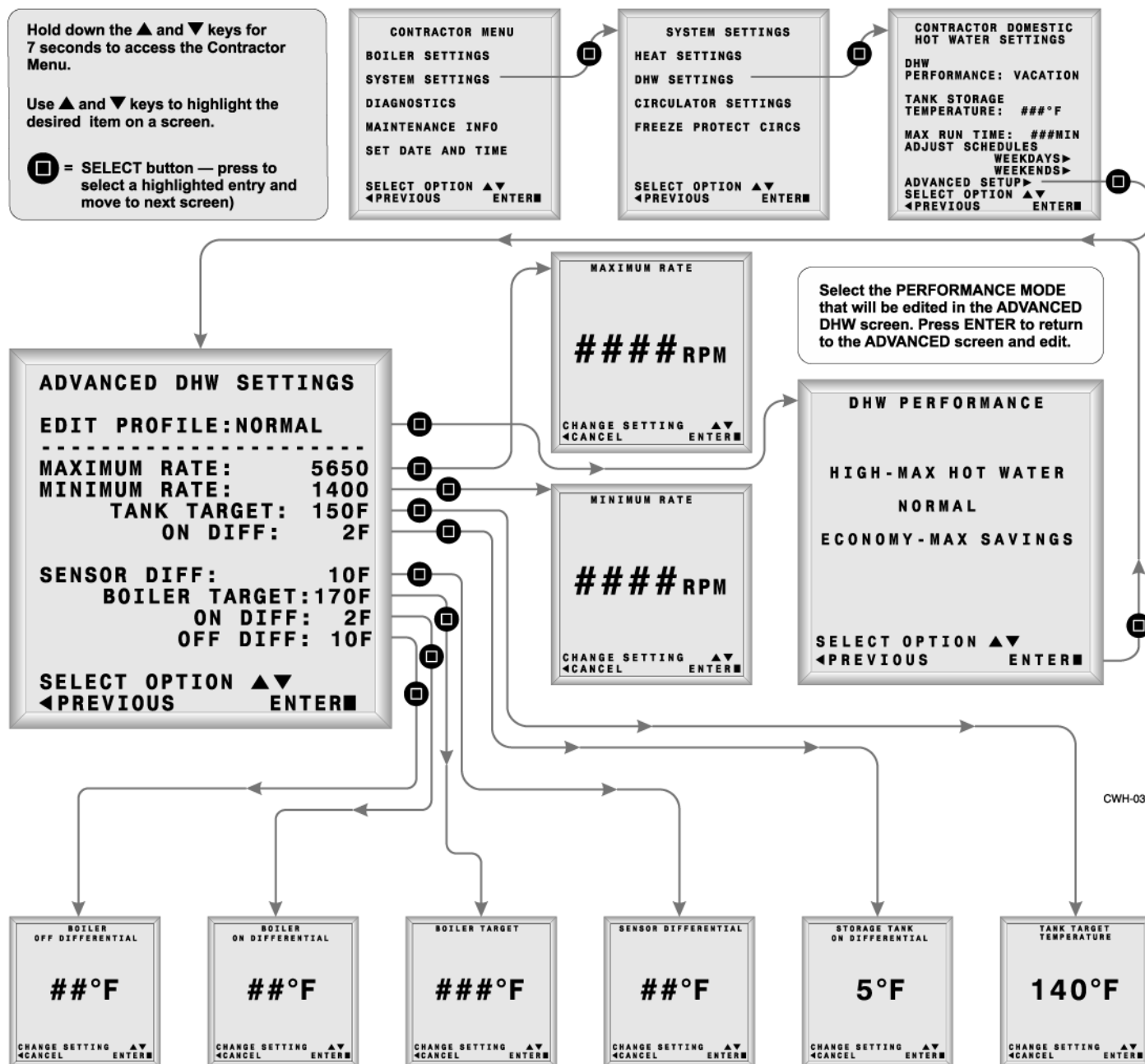
WM97+ Control settings — Advanced *(continued)*

Figure 21 Default DHW Performance Mode Settings menus (see Figure 19, page 24 for access information)

Parameters		HIGH	NORMAL	ECONOMY	VACATION	DISABLED/ OFF	Description of Parameter
Tank Storage Target — Upper Sensor Set Point		170°F	150°F	135°F	50°F	None	Target temperature to modulate boiler output to. Boiler will modulate to either BOILER TARGET or DHW Storage Target.
Tank Diff On		2°F	2°F	2°F	0°F		Call for heat starts if upper tank temperature drops below: Tank Storage <i>minus</i> Diff On
Tank Sensor Diff		10°F	10°F	10°F	0°F		Call for heat starts if lower tank temperature drops below: Tank Storage <i>minus</i> Sensor Diff <i>minus</i> Diff On
Boiler Target — When Upper Tank Temperature is lower than: Tank Storage <i>minus</i> Diff On		185°F	170°F	150°F	100°F		Maximum boiler outlet temperature the control should use for the performance mode.
Boiler Diff On		2°F	2°F	2°F	10°F		Boiler restarts burner if there is a demand and boiler temperature has dropped below: Boiler Target <i>minus</i> Boiler Diff On
Boiler Diff Off		10°F	10°F	10°F	10°F		Control shuts down the burner if boiler supply water temperature exceeds: Boiler Target <i>plus</i> Boiler Diff Off
Minimum DHW Blower Speed — minimum RPM the blower can target during a DHW call	WM97+70	1100	1100	1100	1100		The adjustment limit for these are linked to the boiler's absolute min as well as High Altitude. See WM97+ Boiler manual for instructions to change blower speed.
	WM97+110	1400	1400	1400	1400		
	WM97+155	1300	1300	1300	1300		
Maximum DHW Blower Speed — maximum RPM the blower can target during a DHW call	WM97+70	4300	4300	4300	4300		The adjustment limit for these are linked to the boiler's absolute max as well as High Altitude. See WM97+ Boiler manual for instructions to change blower speed.
	WM97+110	5650	5650	5650	5650		
	WM97+155	5500	5500	5500	5500		

WM97+ Control settings — Advanced *(continued)*

Figure 22 Contractor **ADVANCED DHW SETTINGS** menus (see Figure 21, page 27 for setting values and descriptions)



Troubleshooting

Troubleshooting procedures

NOTICE

Follow the troubleshooting guidelines step by step. Always double-check your results. Skipping or not completing steps can lead to wrong conclusions, repeated callbacks to the jobsite and unhappy customers.

Preparation for troubleshooting

Documents needed

- ☐ WM97+ Boiler manual
- ☐ Mixing valve instruction manual
- ☐ CWH Product manual
- ☐ Get the latest boiler manual and CWH manual revisions from www.Weil-McLain.com.
- ☐ Review all manuals before leaving for the jobsite.

Tools needed

- ☐ Electrical meter to measure voltage and continuity.
- ☐ Pressure gauge (such as Watts #276H300 test gauge).
- ☐ Temperature gauge.
- ☐ Stopwatch.
- ☐ Bucket — 1 gallon or larger, with volume markings.

Suggested parts to have on hand.

- ☐ Tank temperature sensors — see Replacement parts for part number.

Information needed before the service call

- ☐ Boiler model number.
- ☐ CP number.
- ☐ Have the boiler manual and wiring and piping schematics readily available.

Troubleshooting *(continued)*

Figure 23 Typical problems and causes and page location for details

Problem	Check possible causes		Page
Insufficient hot water	YES <ol style="list-style-type: none"> 1 Undersized water heater? 2 High-flow shower heads? 3 Boiler system improperly sized? 4 Check component parts. 5 Check boiler operating temperatures. 	<ol style="list-style-type: none"> 6 Check for air in the system. 7 Check tank temperature setting. 8 Check circulator speed. 9 Clean the boiler water system. 	31
Excessive domestic water temperature	YES <ol style="list-style-type: none"> 1 Boiler operating temperature set too high? 2 Recirculation loop needed? 	<ol style="list-style-type: none"> 3 Thermostatic mixing valve set too high? 4 No thermostatic mixing valve installed or mixing valve is defective? 	33
Boiler relief valve lifting or weeping	YES <ol style="list-style-type: none"> 1 Undersized expansion tank? 2 Faulty boiler expansion tank? 3 Faulty boiler relief valve? 	<ol style="list-style-type: none"> 4 Faulty boiler fill valve? 5 Tank heat exchanger coil leaking? 	34
Temperature/pressure relief valve lifting or weeping	YES <ol style="list-style-type: none"> 1 Undersized or missing domestic water side expansion tank? 2 Faulty domestic water side expansion tank? 3 Faulty T & P relief valve? 	<ol style="list-style-type: none"> 4 High domestic water supply pressure? 5 Possible water hammering or pressure spikes? 6 Boiler operating temperature too high? 	35
Water on the floor near the tank	YES <ol style="list-style-type: none"> 1 Check for leaks from sources other than the water heater. 2 T & P relief valve lifting and discharging? 	<ol style="list-style-type: none"> 3 Loose piping connections or drain valve leaking? 	36
Top of tank or enclosure wet	YES <ol style="list-style-type: none"> 1 Check for leaks from sources other than the water heater. 	<ol style="list-style-type: none"> 2 Loose piping connections? 	36
Water quality problems	YES <ol style="list-style-type: none"> 1 Water smells like “rotten eggs.” 2 Milky water. 	<ol style="list-style-type: none"> 3 Discolored water from the hot water faucet. 	37

Troubleshooting *(continued)*

Insufficient hot water

1 Undersized water heater?

- There are many methods of sizing various applications, i.e. ASHRAE sizing tables or ASPE domestic water heating design manual.
 - Confirm the water demand required for the application.
- Confirm the flow rates of the fixtures.
 - For example, was the tank sized for shower heads at 2.0 gpm, while the actual heads are 5.0 gpm?
 - Use a bucket and a stopwatch to determine fixture flow rates.
- Evaluate the hot water usage pattern for a day.
 - Is the peak demand unusually high for the application?
- Has the demand for domestic hot water changed since the system was installed?
 - A bathroom remodeling project — new shower fixtures or a whirlpool tub would substantially change the domestic water demand.
 - New appliance added, such as a dishwasher or clothes washer?

2 Boiler system improperly sized?

- Can the boiler provide the required output to meet the domestic water load?
 - Have a qualified service technician determine the domestic water heating load.
 - Compare to the capacities listed at the end of this manual to ensure the WM97+ boiler and CWH water heater are correctly sized.

3 Check component parts.

- Is the WM97+ control set properly and operating correctly?
 - Review WM97+ Boiler manual and this manual to check control settings.
 - If water heater control is set to “SCHEDULE,” check whether the problem is occurring during times when the operating mode is set to Economy.
 - Try changing operating mode to “High-performance.”
- During a call for heat by the water heater, does the CWH circulator begin pumping, does the boiler fire? Check all components in the system to ensure they are properly functioning.

4 Check boiler operating temperatures.

- If possible, increase the boiler operating temperature to 180°F or 190°F or increase tank storage temperature. Read the boiler manual and this manual for adjustment instructions and WARNINGS.
- Maintain a minimal temperature in the boiler during non-heating seasons.
 - A boiler typically has a higher standby loss than the indirect water heater.
 - After a long standby period, the colder boiler may absorb the stored energy within the water heater during the initial call for heat.



Troubleshooting *(continued)*

Insufficient hot water *(continued)*

5 Check for air in the system

- An air-bound water heater or boiler will not circulate system water properly, resulting in a lack of heat transfer.
- Air can be trapped in piping loop sections, the tank coil or the flexible water lines between the boiler and CWH.
 - Connect a drainage hose to the boiler supply piping purge valve (shown in WM97+ manual suggested piping).
 - Close the WM97+ internal by-pass valve (be sure to return to normal position after purging).
 - Allow water to flow into the boiler return line from the make-up water connection to the system.
 - Allow water to flow until air bubbles no longer appear in the discharge from the drainage hose.
 - Remove drainage hose and return by-pass valve to the normal position.

6 Clean the boiler water system.

- A dirty boiler system can cause deposits to form on the water heater coil. This insulates the coil, reducing the heat transfer.
 - Clean the boiler system per the boiler manufacturer's instructions.
- Install a strainer in the boiler piping on older installations or for systems likely to carry sediment.

7 Check tank temperature setting

- Follow directions in this manual to navigate to the tank temperature setting menu.
- Increase the setting if necessary.
- Also check the operating mode. Change mode to "High-max performance" if water heater is set to another mode.

8 Check DHW circulator speed

- The CWH is supplied with a 3-speed circulator. The speed switch on the circulator must be set to:
 - **Speed 1** for WM97+70 or 110 boilers.
 - **Speed 3** for WM97+155 boilers.

Troubleshooting *(continued)*

Excessive domestic water temperature

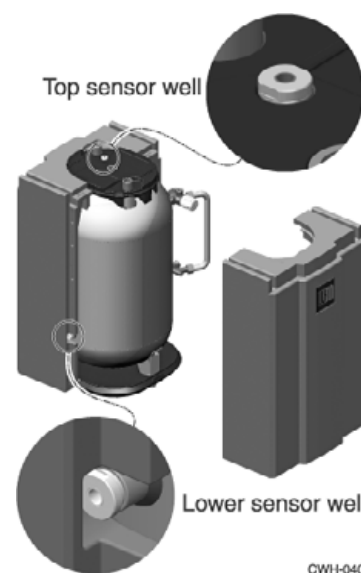
1 Adjust WM97+ control settings and check operation.

- Follow instructions in the boiler manual and this manual to adjust tank temperature and boiler water temperature.
- If controls are set properly, check tank sensor installation and operation.
 - See the illustration at right for locations of the sensor wells. The lower well is on the side opposite the DHW connections. (This illustration shows a right-oriented tank.)
 - Check whether sensors are inserted completely into their wells. If not, press in firmly and recheck CWH operation.
 - If sensors are properly inserted in their wells, disconnect each sensor harness and attach an ohmmeter. The table below shows the correct values for the sensor at various temperatures.

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

- 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. To check whether the WM97+

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 WM97+ control display. The temperature should be close to the value corresponding to the input resistance.



2 Recirculation loop needed?

- Installing a properly-sized recirculation loop will not only provide prompt delivery of hot water, but it will

provide circulation and mixing of the water within the tank.

3 Thermostatic mixing valve set too high?

- Follow instructions in the mixing valve manual to check mixing valve setting temperature. Adjust if neces-

sary following the manual's specified procedure.

4 No thermostatic mixing valve installed or mixing valve is defective?



IF THE MIXING VALVE IS NOT INSTALLED, DISCONTINUE USE OF THE CWH AND INSTALL THE MIXING VALVE FOLLOWING INSTRUCTIONS IN THIS MANUAL AND THE MIXING VALVE MANUAL.

- The CWH **must not** be operated without a mixing valve installed per the instructions in this manual and the mixing valve manual.
- Follow instructions in the mixing valve manual to check valve operation. If valve is correctly installed and does not operate correctly, replace the mixing valve.



Troubleshooting *(continued)*

Boiler relief valve lifting or weeping

1 Undersized expansion tank?

- Insufficient allowance for expansion on the boiler side can cause the boiler pressure relief valve to lift.
- The tank must be sized to handle the total volume of water in the boiler system, the boiler and all inter-connecting piping. The volume for the CWH boiler piping and heat exchanger is 1.4 gallons.

2 Faulty boiler expansion tank?

- Is the expansion tank defective, waterlogged or improperly charged?
 - Check for failed gaskets or bladders, or a faulty Schraeder valve.
 - Tank must be isolated and pressure relieved from boiler side when testing.
 - Use a tire gauge to check the charge pressure of the tank.
- Turn the boiler limit up to a higher setting and let the system run at a higher temperature. This will simulate maximum expansion in the boiler system.
 - If the boiler relief valve lifts and/or there is a significant increase in the boiler system pressure, the expansion tank is flooded or undersized.

3 Faulty boiler relief valve?

- Is the boiler pressure relief valve functioning properly? Dirt and water deposits can accumulate under the valve seat.

4 Faulty boiler fill valve?

- Is the valve filling to the correct pressure?

5 Tank heat exchanger coil leaking?

- Turn the boiler power OFF.
- Close the boiler supply and return isolation valves.
- Isolate the water heater from the domestic water system by closing isolation valves.
- Attach a hose to the water heater drain valve (if not directly connected to a drainage location).
- Open the water heater drain valve to allow the tank-side pressure to drop.
- Watch the pressure on the boiler P/T gauge. If this pressure drops noticeably, there is a leak in the piping or in the tank heat exchanger. Locate the problem and correct. Replace the CWH tank if necessary.



Troubleshooting *(continued)*

CWH Temperature/pressure relief valve lifting or weeping

1 Undersized or missing domestic water side expansion tank?

- Is there a thermal expansion tank installed on the domestic supply piping and is it properly sized?
 - A thermal expansion tank is required if the domestic supply piping includes a backflow preventer or pressure reducing valve.
 - Ensure the potable water expansion tank is properly sized according to the water heater volume and supply pressure.
 - During long periods when there are no draws from the tank (i.e. overnight), the T&P relief valve may lift or weep due to thermal expansion, but may function properly during normal periods of tank draws.

2 Faulty domestic water side expansion tank?

- Is the expansion tank defective, water logged or improperly charged?
 - Check for failed gaskets or bladders, or a faulty Schraeder valve.
 - Use a tire gauge to check the charged pressure of the tank.
 - Tank must be isolated and pressure relieved when testing.

3 Faulty T&P relief valve?

- Is the temperature/pressure relief valve functioning properly? Dirt and water deposits can accumulate under the valve seat.

4 High domestic water supply pressure?

- Check the domestic supply pressure entering the water heater.
 - If the pressure is over 70 psi it is recommended to install a pressure reducing valve. A thermal expansion tank is required if a PRV is installed.
 - This will prevent any pressure spikes or increases in pressure due to thermal expansion which may cause the T&P valve to lift or weep.

5 Possible water hammering or pressure spikes?

- Check the domestic system for possible sources of water hammering or pressure spikes.
 - Some appliances such as clothes washers and dishwashers utilize fast acting valves which may cause water hammering or pressure spikes through the domestic water system.
- Install water hammer arrestors as required per the manufacturer's instructions, or install flexible connectors to isolate the tank from the domestic system

6 Check boiler operating temperature.

- If the boiler operating temperature is too high, stacking can occur in the water heater raising the domestic water temperature close to the boiler operating temperature. — Reduce the boiler operating temperature to 180°F. Also follow page 33 suggestions if the problem persists.



Troubleshooting *(continued)*

Water on the floor near the tank

1 Check for leaks from sources other than the water heater.

- Check for possible water seepage through foundation cracks. Did the water appear after a heavy rain?

2 Is the source of water from the T&P relief valve?

- Place a bucket under the discharge piping of the T&P relief valve and monitor it for a day or two. This is a procedure that can be done by the homeowner.
- If the T&P relief valve is the source, refer to page 35 of this guide.

3 Loose piping connections or drain valve leaking?

- Check all connections – boiler connections, domestic connections, etc.
- Check all the boiler connections to the water heater. Check drain valve for leakage.
 - A build-up of corrosion is a sure sign of a leak.
- Excessive force or water hammer can damage the welds where the piping connections enter the water heater tank. Remove the front of the CWH enclosure to check tank and connections.
 - If water is leaking from around one of the tank connections, a weld may have been broken. Contact your Weil-McLain supplier to determine how to handle the problem.

Top of tank or enclosure wet

1 Check for leaks from sources other than the water heater

- Check for possible overhead pipes leaking onto the tank.

2 Loose piping connections?

- Check all connections – piping connections to the tank and elsewhere in the vicinity.
- Check around valve stems.
- A build-up of corrosion around a joint is a sure sign of a leak.

Troubleshooting *(continued)*

Water quality problems

1 Water smells like “rotten eggs.”

- The most common cause of water to smell like “rotten eggs” is a non-toxic sulfate reducing bacteria.
 - The bacteria usually enters into the water system through a break in the supply piping or during construction/maintenance of the supply piping.
 - The bacteria survives in the water system by converting sulfate (SO_4) in the water to hydrogen sulfide (H_2S) gas.
 - It is this gas that creates the “rotten egg” smell.
 - The presence of hydrogen sulfide can also affect the taste of the water.
- Along with the stench caused by this bacteria, black deposits that typically indicate pipe and/or fitting corrosion may also appear in the water.



In extremely high concentrations, hydrogen sulfide gas can be toxic. However, the gas is detectable prior to reaching harmful levels.

- The bacteria will thrive in any water system under the following conditions:
 - High levels of sulfur in the water
 - Activated hydrogen in the water from cathodic reactions within the tank
 - Water with little or no dissolved oxygen
 - Storing the domestic water below 130°F
- Other causes of smelly water:
 - Chlorides of magnesium and calcium gives water a bitter taste
 - Chloride of sodium will produce a salty tasting water
 - Sulfates above 50 ppm in the water gives the water a medicinal taste.
 - Carbon dioxide in water with a low pH results in water that is fizzy.
 - Iron and tannic waters will produce water with a bad taste and odor.
- Treatment
 - The treatment of this situation requires the water system to be shock-chlorinated. Depending on the severity of the bacteria within the water system, several treatments may be needed.

2 Milky water.

- When water is initially drawn from the faucet it appears to be milky or cloudy, but it becomes clear after the water is allow to stand for several minutes.
 - This is usually an indication that the water contains high levels of soluble gases, such as oxygen, chlorine, carbon dioxide, hydrogen sulfide or others.
 - As the water system pressure increases, the amount of gas that water can hold in a solution decreases.
- When air and gases are forced out of the heated water, the problem may be evident in one or both of the following conditions:
 - Gases, in the form of small bubbles, may make the water appear milky from the tap, but clear after several minutes when those bubbles will separate.



Troubleshooting *(continued)*

Water quality problems *(continued)*

- This is similar to the reaction that occurs as air bubbles form on the walls of a pan shortly before the water begins to boil.
- The release of dissolved gas can also create air pockets and air locks in the water system piping. This can cause spurts of air or gases when opening the hot water faucet.
- There is generally no cure for milky water caused by dissolve gases, although it can be reduced with aerated faucets. In some applications the amount of air and gases precipitating out of the water will reduced in time. It should be noted that these gases are not harmful to the end user.

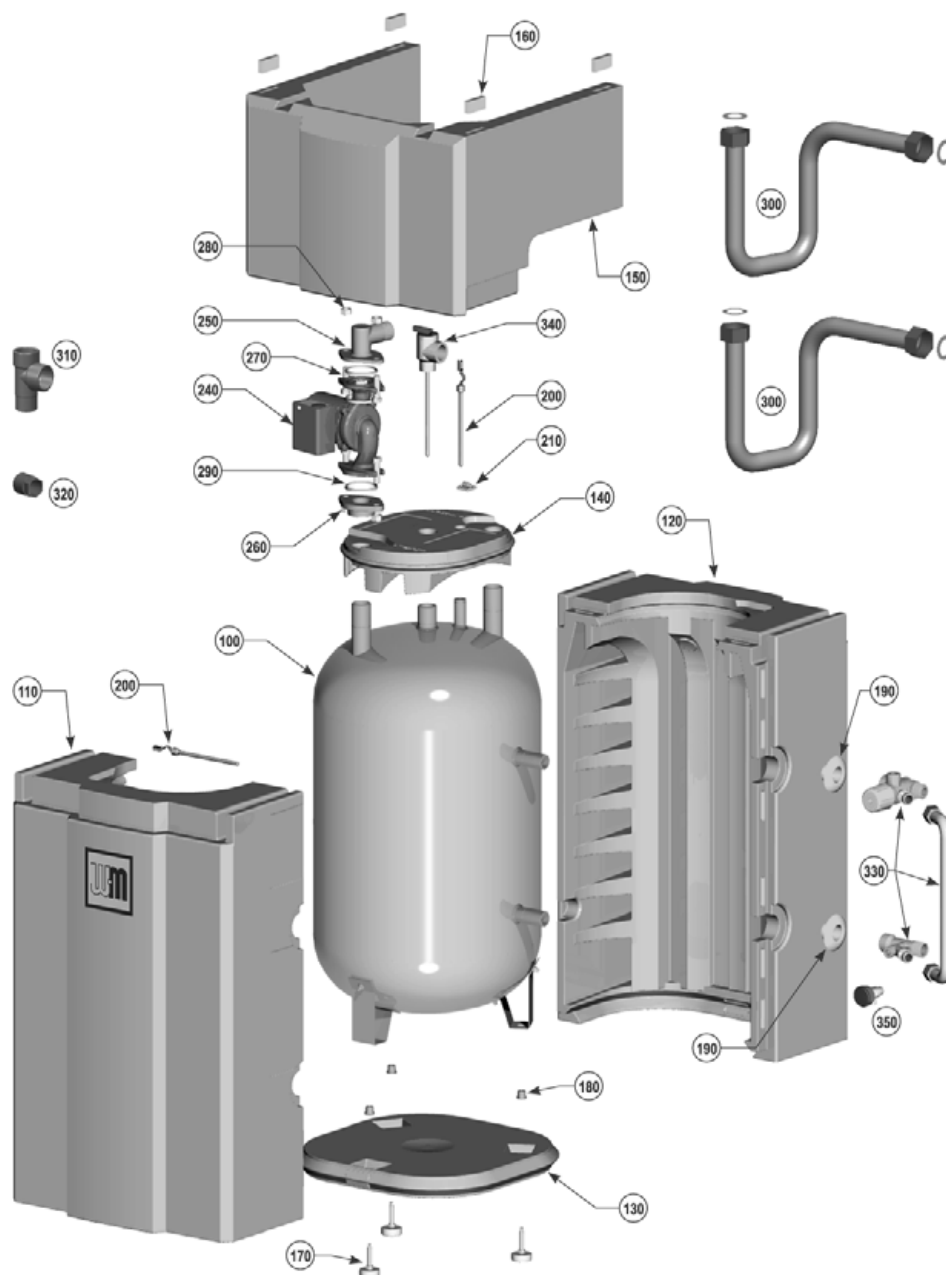
3 Discolored water from the hot water faucet.

- The water from the hot water faucet appears discolored, either rusty, brown, black or yellow.
 - Because the tank is stainless steel, which is resistant to corrosion, the problem is not tank-related.
 - The problem is usually a non-toxic iron-reducing bacteria that is commonly found in soil, well water, water treatment plants and piping systems.
 - The bacteria usually thrives in systems in which the soluble iron exceeds 0.2 ppm.
 - The bacteria will feed on the soluble iron in the water, producing “rusty-color” water as a by-product of the feeding process.
- Variables in which the bacteria can thrive:
 - Elevated levels of iron and manganese in the water
 - Water with little or no dissolved oxygen
 - Water storage temperatures below 140°F
- Items that can potentially increase the presence of the bacteria:
 - Water softeners.
 - Well water.
 - Long periods of no water movement.
- Treatment
 - Treatment requires the water system to be shock-chlorinated.
 - Depending on the severity of the bacteria within the water system, several treatments may be needed.
 - Check the pH and chlorides of the water in the water heater tank and the boiler system.
 - The pH must be between 6 and 8.
 - Chlorides must be less than 200 ppm.
 - Note the pH and chloride readings on the warranty sheet.
- Items that can affect the pH reading:
 - Water softeners.
 - Water treatment plants.
 - Cl (chlorides) added, especially during the summer
 - Fl (fluorides) added in treatment in large cities
 - Elevated levels of iron, manganese, and sulfur.
- If the pH is high or low, this has a major effect on the metal tanks, piping and heat transfer surfaces.

Replacement parts

Figure 24 Water heater replacement parts

Item	Description	W-M Part Number
100	Tank	635-900-059
110	Jacket front	383-700-211
120	Jacket back	634-200-215
130	Jacket bottom	634-200-216
140	Jacket top	383-700-212
150	Jacket pipe access cover	634-200-218
160	Jacket retainer magnets (4 required)	563-039-981
170	Leveling legs (3 required)	590-424-256
180	Riveted nuts	561-928-450
190	Grommet, 1.22" OD (2 required)	562-248-756
200	Temperature sensor (2 required) Sensor well — top sensor Sensor well — bottom	383-700-210 383-700-213 383-700-214
210	Temperature sensor clip (holds down sensor by securing sensor wires)	562-650-119
220	Wire harness, top and lower temperature sensors (not shown)	591-391-998
230	Wire harness, circulator (not shown)	591-391-999
240	Circulator, Taco 3-speed, with integral flow/check valve — DO NOT SUBSTITUTE another circulator model	511-405-145
250	Circulator flange with 90-degree elbow	560-907-735
260	Circulator flange, 1" NPT	563-910-026
270	Circulator flange bolts	562-136-260
280	Circulator flange nuts	561-928-235
290	Circulator flange gasket	590-317-543
300	Flexible boiler water connector, 1" NPT both ends (includes rubber grommet each end) (2 required)	560-907-700
310	Tee, 1" FNPT x 1" FNPT x 1" MNPT	561-550-096
320	Bushing, 1" x 3/4" NPT	Obtain locally
330	Mixing valve kit, Honeywell AMX302TLF (includes mixing valve, inlet water fitting and flexible cold water connector pipe)	383-700-209
340	T&P Relief, Watts	633-500-038
350	Drain Valve, 1/4" NPT	511-246-402





Determine required temperature rise

Determine domestic water inlet water temperature — TI

TI is the groundwater temperature typical for the boiler location.

Determine required domestic water outlet temperature — TO

This is the required temperature exiting the mixing valve.

Determine required domestic water temperature rise — TR

The required temperature rise is the difference between TO and TI. Use the closest value in the Ratings table, next page.

$$TR = TO - TI$$

Example — a home in Philadelphia requires 115°F domestic water.

What is the required temperature rise?

1. The groundwater temperature for the Philadelphia area is 47°F.

$$TI = 47^{\circ}\text{F}$$

2. The required domestic water outlet temperature is 115°F.

$$TO = 115^{\circ}\text{F}$$

3. The required temperature rise is the difference:

$$TR = 115 - 47 = 68^{\circ}\text{F}$$

4. Use the 70°F temperature rise capacity chart on the next page to select the required water heater/boiler combination.



Ratings

Boiler Model	CWH Capacity (GPM) @ 70°F Temp Rise								
	(For DHW entering temperature of 45°F — capacities will decrease at higher DHW inlet water temperatures)								
	CWH Performance Mode:								Pump Speed
	High (170°F Storage)			Normal (150°F Storage)			Economy (135°F Storage)		
GPM @ 8-min Draw	GPM @ 15-min Draw	GPM @ Continuous Draw	GPM @ 8-min Draw	GPM @ 15-min Draw	GPM @ Continuous Draw	GPM @ 8-min Draw	GPM @ Continuous Draw		
WM97+ 70	4.0	2.9	1.7	3.2	2.3	1.7	2.3	1.6	Speed 1 (Lo)
WM97+ 110	4.1	3.4	2.7	3.2	2.6	2.5	2.4	1.6	Speed 1 (Lo)
WM97+ 155	4.2	3.5	3.1	3.2	2.7	2.5	2.5	1.6	Speed 3 (Hi)

Boiler Model	CWH Capacity (GPM) @ 50°F Temp Rise								
	(For DHW entering temperature of 65°F — capacities will decrease at higher DHW inlet water temperatures)								
	CWH Performance Mode:								Pump Speed
	High (170°F Storage)			Normal (150°F Storage)			Economy (135°F Storage)		
GPM @ 8-min Draw	GPM @ 15-min Draw	GPM @ Continuous Draw	GPM @ 8-min Draw	GPM @ 15-min Draw	GPM @ Continuous Draw	GPM @ 8-min Draw	GPM @ Continuous Draw		
WM97+ 70	4.6	3.7	2.5	3.5	2.9	2.5	2.5	2.0	Speed 1 (Lo)
WM97+ 110	5.1	4.3	3.6	4.0	3.4	3.3	2.5	2.0	Speed 1 (Lo)
WM97+ 155	6.1	5.6	4.2	4.0	3.5	3.4	2.6	2.0	Speed 3 (Hi)



AHRI ratings

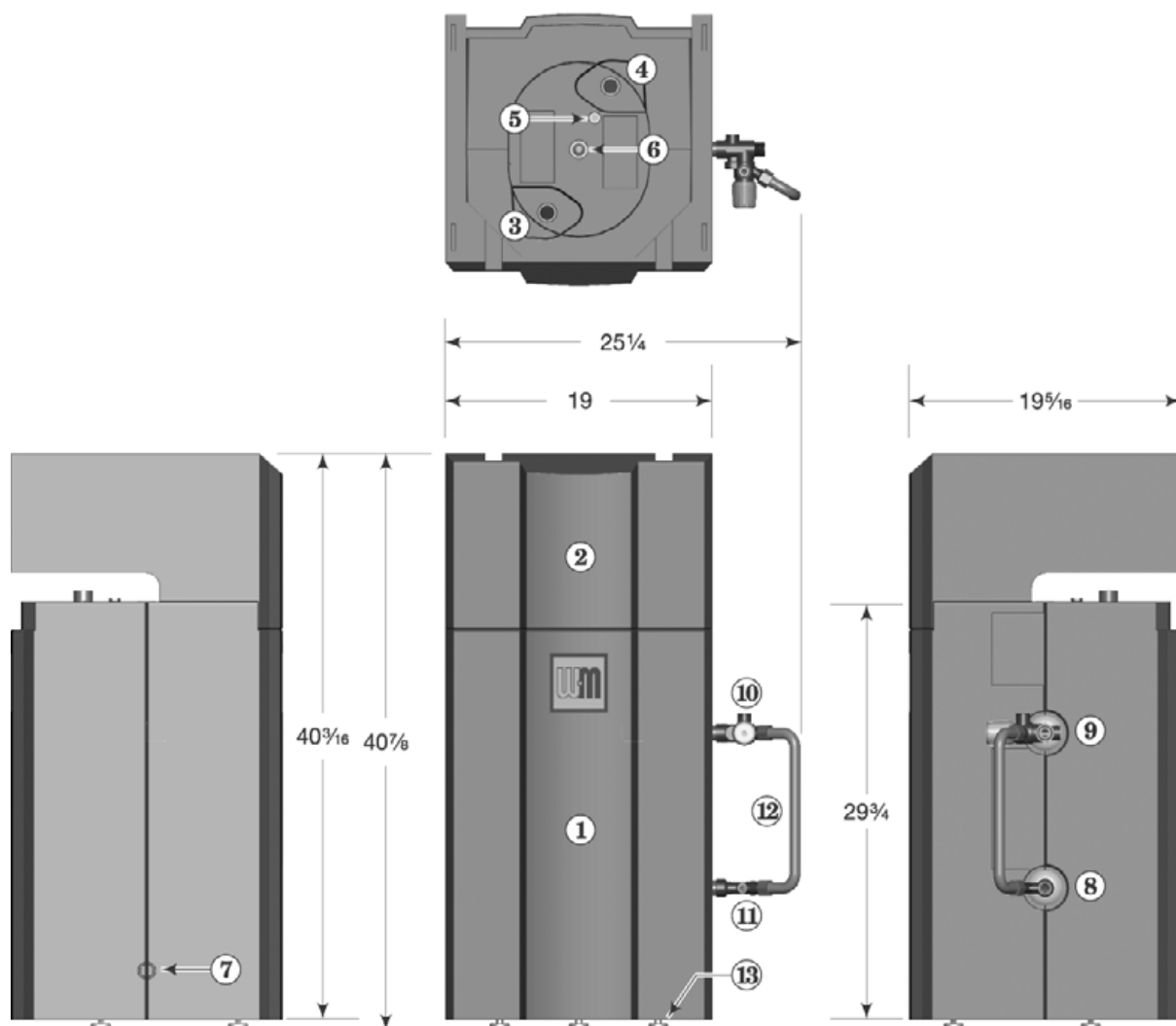


Water Heater Model	AHRI certified ratings								
	180°F boiler water entering 58°F to 135°F domestic water								
	Potable Water Volume	Heat Source Water Volume	Standby Heat Loss	Continuous Draw Rating	First Hour Rating	Minimum Heat Output Rate from Heat Source	Minimum Heat Source Flow Rate	Heat Source Friction Loss	First Draw Rating
	Gallons	Gallons	Degrees F per hour	GPH	GPH	Btu/hr	GPM	Feet w.c.	GPH
CWH	18.2	1.4	2.5	172	187	113,000	14.0	3.6	15
The ratings in this table are certified by AHRI. The conditions under which these ratings were obtained are listed below.									
These ratings were obtained with a heat source output rate of at least 113,000 Btu/hr at a heat source flow rate of 14 gpm. Other results will be obtained under different conditions.									

See previous page for ratings at other conditions

Dimensions

Figure 25 Dimensions — CWH Companion Water Heater, right-side mixing valve orientation — All dimensions in INCHES



1. CWH water heater, tank and enclosure

Tank can be oriented with DHW inlet/outlet connections on right or rotated 180° to place DHW connections on the left.

Enclosure front and rear sections snap together. Front portion can be pulled forward to expose the interior for service and inspection.

2. CWH piping access cover

3. Boiler water RETURN connection (to boiler) (1" MNPT)

4. Boiler water SUPPLY connection (from boiler) (1" MNPT)

5. Top tank temperature sensor

6. T&P relief valve tapping (3/4" FNPT)

7. Lower tank temperature sensor

8. DHW inlet connection (3/4" MNPT)

9. DHW outlet connection (3/4" MNPT)

10. Mixing valve (Honeywell AMX302TLF) — kit includes item 11 and item 12

11. Cold water tee

12. Flexible metal connector

13. Leveling legs

