

DHW

Indirect-Fired Water Heaters

Instruction manual

- Installation
- Maintenance
- Start-Up
- Parts
- Usage

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.

Read all instructions before installing

Installer — Leave this manual in the envelope and affix near the water heater. Consider piping and installation when determining water heater location. Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

User — Read important user safety information found on pages 2 and 11. Installation and service should only be performed by a qualified service technician. Retain this manual for future reference.

Read this page first



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

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.

DANGER 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 some type of tempering device, such as an automatic mixing valve, at hot water tap or water heater. Automatic mixing valve must be selected and installed according to valve manufacturer's recommendations and instructions.
- 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.

Protection Must Be Taken Against Excessive Temperature and Pressure!

- Installation of a Temperature & Pressure (T&P) relief valve is required.

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1 Pre-installation

Codes

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.

DHW water heaters are exempt from ASME Section VIII, Division 1 Code construction per Interpretation VIII-1-86-136. Check with local codes for applicability.

Where recommendations in this manual differ from local or national codes, local or national codes take precedence.

Location

This water heater is not intended for outdoor installation.

Select a convenient location for water heater, based on domestic and boiler piping hook-ups.

Keeping the distance between boiler and water heater short will:

- reduce piping heat loss.
- provide minimum friction loss.

Install water heater so if 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.

Recommended clearances

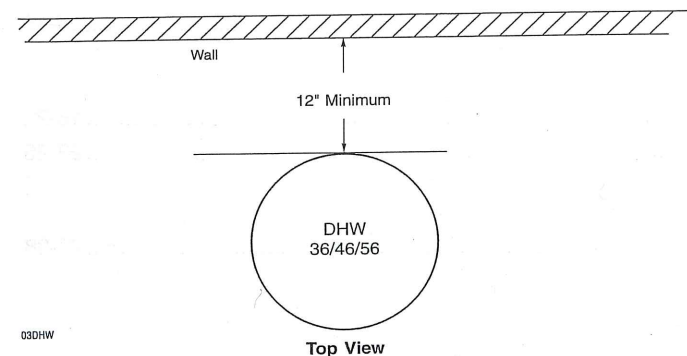
Installation location must provide adequate clearances for servicing and proper operation of the water heater.

DHW 36/46/56 (see Figure 1)

- Zero clearance is permissible to either side of water heater, but Instruction label may be hidden.
- Top (vertical) clearance is 12" minimum.
- Refer to boiler manual for boiler clearances.

Figure 1

Clearance recommendations



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Operating restrictions

- Maximum domestic hot water temperature (**Use only for special high-temperature operational requirements**):
 - 160°F for DHW 36/46/56.
- Maximum boiler water temperature — 210°F.
- Maximum working pressure for inner (domestic water) tank — 150 psig.
- Maximum working pressure for outer (boiler water) tank — 45 psig.
- pH and chloride limits for water heaters are:
 - chloride — less than 80 mg/l.
 - pH — above 6 and less than 8.
- Maximum recommended domestic operating pressure 70 psig.

Code restrictions

National Standard Plumbing Code

Single wall heat exchanger in water heater complies with National Standard Plumbing Code, provided that:

- boiler water (including additives) is practically non-toxic, having toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products, and
- boiler water pressure is limited to maximum 30 psig by approved relief valve.

Uniform Plumbing Code — Paragraphs L3.2 and L3.3

Single-wall heat exchangers are permitted if they satisfy all of the following requirements —

1. The heat transfer medium is potable water or contains only substances which are recognized as safe by the U. S. Food and Drug Administration.
2. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system.

Exception: Steam complying with #1, above.
3. The equipment is permanently labeled to indicate that only additives recognized as safe by the FDA shall be used in the heat transfer medium.

Other heat exchanger designs may be permitted where approved by the Administrative Authority.

2 Water heater piping

Temperature & pressure (T & P) relief valve

CAUTION To reduce risk of excessive pressures and temperatures in water heater, install temperature and pressure protective equipment required by local codes, but no less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANSI Z21.22. This valve must be marked with a maximum working pressure of the water heater.

1. Size T&P relief valve by the following specifications, unless they conflict with local codes:
 - DHW 36/46/56: 3/4" NPT with an AGA Rating of 100,000 BTU/hr, with a long element. Set to relieve at 150 psi. (Watts model 100XL-8 relief valve or equivalent.)

DHW water heaters are exempt from ASME Section VIII per **Interpretation VIII-1-86-136**. Consult local codes for applicability.

2. Installing T&P relief valve – DHW 36/46/56 (Page 7)
 - Install T&P relief valve either:
 - a. in tapping marked AUX.
 - b. in run (straight through leg) of tee located at domestic hot water outlet of water heater. (Required for the Commonwealth of Massachusetts.) Use a long element T&P relief valve.
3. T&P relief valve discharge piping must be:
 - made of material serviceable for temperatures of 250°F or greater.
 - directed so that hot water flows away from all persons.
 - directed to a suitable place for disposal.
 - installed so as to allow complete draining of the T&P relief valve and discharge line.

T&P relief valve discharge piping must not be:

- excessively long. Using more than 2 elbows or 15 feet of piping can reduce discharge capacity.
- directly connected to a drain. Terminate discharge piping within 6" from floor. Refer to local codes.
- plugged, reduced or restricted.
- subjected to freezing.

Air vent

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

1. Remove plastic shipping cap from 1/2" NPT pipe fitting on top of water heater.
2. Install 1/2" x 1/8" reducer bushing provided with water heater, using suitable pipe dope or tape.
3. Install automatic air vent provided with water heater, using suitable pipe dope or tape.
4. Unscrew vent cap on air vent one full turn. Leave cap unscrewed one turn for normal venting.

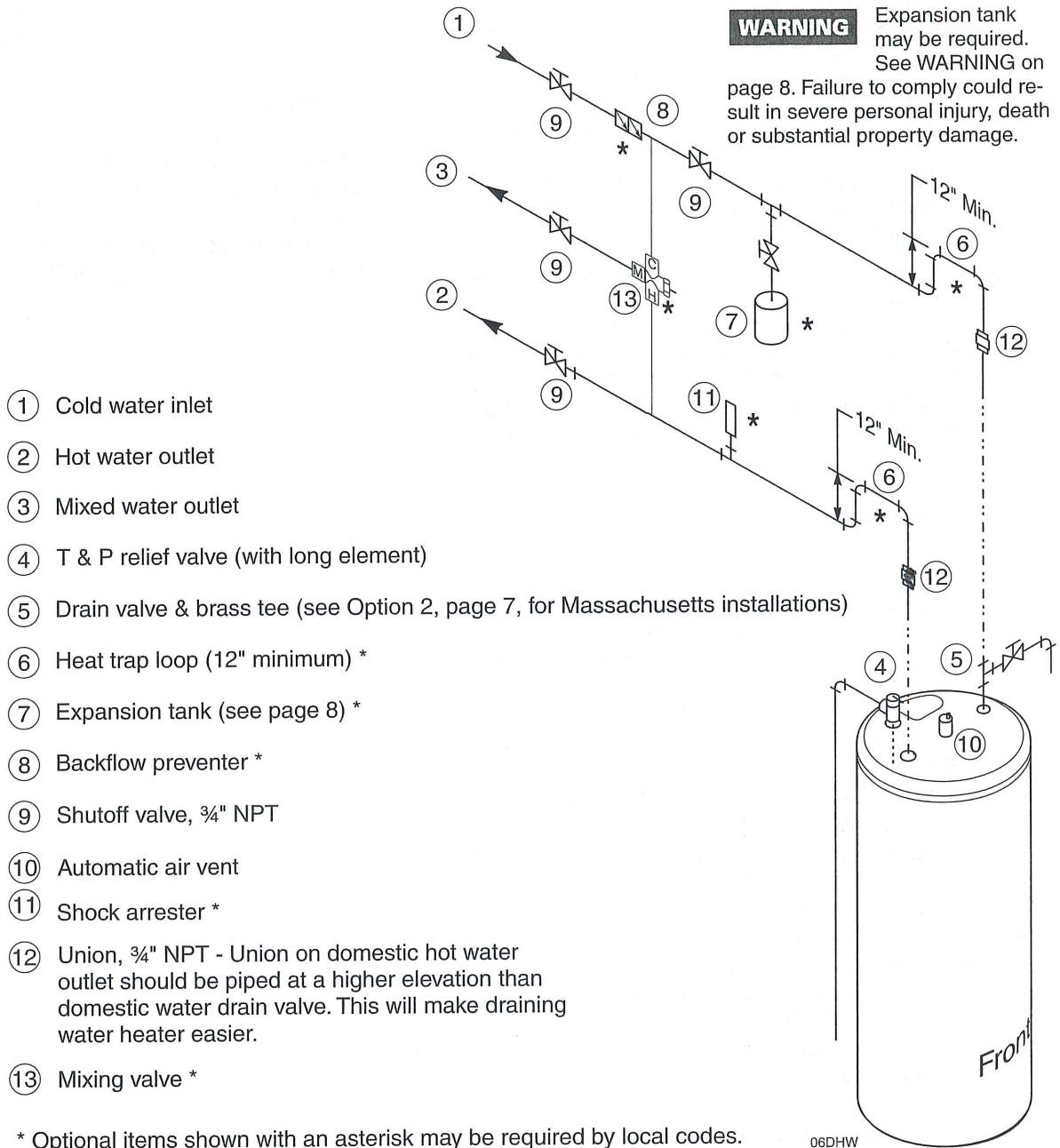
2 Water heater piping continued

Figure 2

Piping — Option 1

DHW 36/46/56

(See Figure 3, page 7, for Option 2, required for Massachusetts)



Drain valve

DHW 36/46/56

Option 1

Apply the following and Figure 2 to water heaters other than those installed in Massachusetts. For Commonwealth of Massachusetts installations, see Option 2, Figure 3, page 7.

1. Install the 3/4" NPT brass tee (supplied with water heater) in the domestic water inlet piping using suitable pipe dope or tape, located as shown in Figure 2.
2. Pipe the drain valve off of the brass tee as shown in Figure 2, using suitable pipe dope or tape.
3. For jurisdictions requiring a vacuum breaker, use the piping shown in Figure 3, page 7, (Option 2).

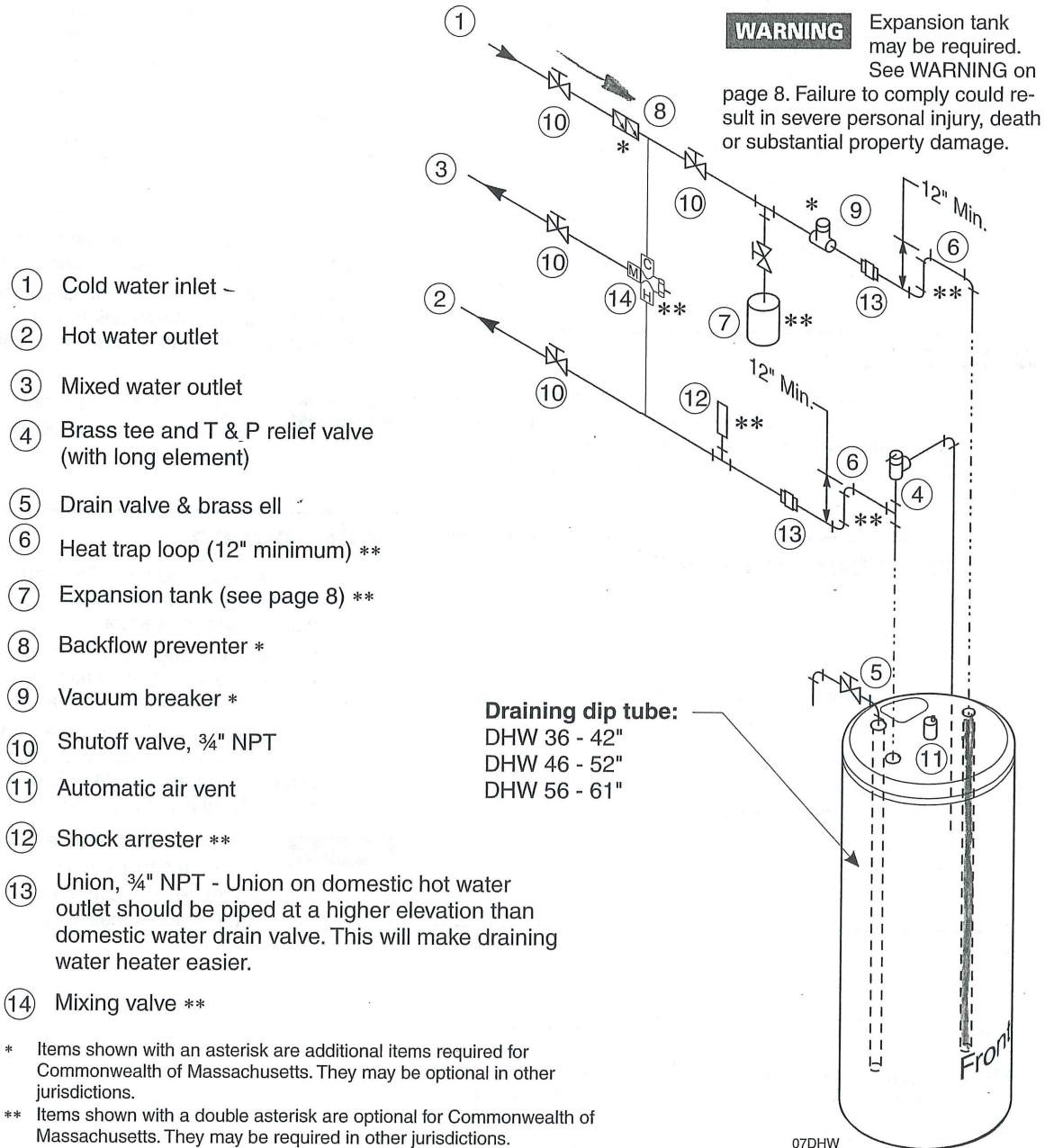
2 Water heater piping continued

Figure 3

Piping — Option 2

DHW 36/46/56

(Required for Commonwealth of Massachusetts)



Drain valve

DHW 36/46/56

Option 2

Apply the following and Figure 3 to water heaters installed in Massachusetts. The drain valve is mounted in the AUX tapping on top of the water heater.

1. Insert an open-ended "draining" dip tube into the AUX tapping on top of the heater.
2. Connect a 3/4" NPT elbow to the AUX tapping, using suitable pipe dope or tape.
3. Pipe the drain valve (supplied with water heater) to the elbow, using suitable pipe dope or tape, as shown in Figure 3.
4. Pipe the T & P relief valve in the run of the 3/4" NPT brass tee (supplied with heater), located in the domestic water outlet piping as shown in Figure 3.

2 Water heater piping continued

Thermal expansion

WARNING If a backflow preventer, check valve, or pressure reducing valve is piped on cold water inlet of water heater, you must install an expansion tank on cold water supply line to prevent normal thermal expansion from repeatedly forcing open T&P relief valve. The T&P relief valve is not intended for constant duty, such as relief of pressure due to repeated normal system expansion.

Refer to expansion tank manufacturer's instructions for proper sizing.

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

Water hammer

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.

General piping information

- For domestic water piping, see page 6.
- See Section 9: Piping Appendix, pages 16-25, for:
 - Boiler water piping.
 - Multiple water heater piping.
 - Recirculation system piping.
- See Table 1 for piping connections:
 - All plumbing must meet or exceed all local, state and national plumbing codes.
 - Use pipe dope or tape suitable for potable water.
 - Use isolation valves to isolate system components.

Table 1

Piping (Inches NPT)

Water Heater Model	Connections		Recommended Piping Between Water Heater and Boiler	Recirculation Dip Tube	
	Domestic Water Inlet/Outlet	Boiler Water Supply/Return		Length (inches)	Diameter (inches)
36	3/4	1	1	35	3/4
46	3/4	1 1/4	1 1/4	45	3/4
56	3/4	1 1/4	1 1/2	55	3/4

See Piping Appendix, pages 16-25, for recirculation system piping.

Domestic water piping

- Union on domestic hot water outlet should be piped at a higher elevation than domestic water drain valve. This will make draining water heater easier.
- Install unions for easy removal of water heater. 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.
- If copper pipe is used for domestic water connections, first solder pipe to a threaded adapter, and then screw adapter into cold water inlet on top of water heater. Inlet contains an internal plastic dip tube rated at 230°F, which can be damaged by heat from soldering.
- When water supply pressure is higher than T&P relief valve rating, install a pressure reducing valve on cold water supply line to prevent water loss through T&P relief valve.
- If water heater will replace tankless coil in boiler, disconnect piping to coil or remove coil from boiler and replace with a cover plate. Allow water to drain from coil. Do not plug tankless coil.

DANGER Plugging tankless coil inlet and outlet will result in severe personal injury, death or substantial property damage.

Boiler piping

- If plastic pipe is used for boiler water piping, it must have a maximum oxygen diffusion rate of 0.1 mg/liter-day for boiler and water heater protection.
- 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 antifreeze specifically intended for hydronic heating systems. Inhibited propylene glycol is recommended.

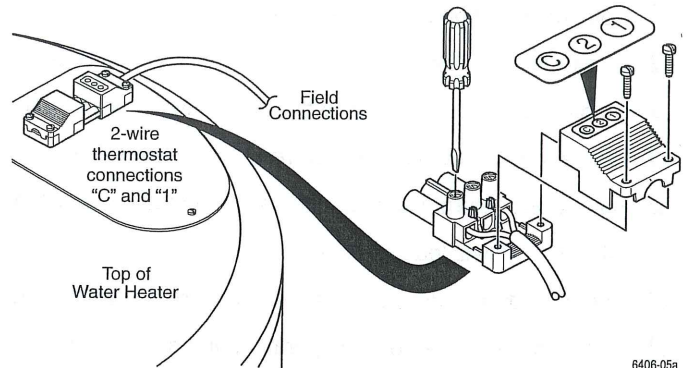
DANGER Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze. This can cause severe personal injury, death or substantial property damage.

3 Wiring

Water heater thermostat connection

The DHW indirect water heaters utilize a snap-set connector for easy wiring between water heater thermostat and boiler controls (also see Section 10: Wiring Appendix pages 26-38). See Figure 4. Indirect water heater rated for low voltage only (24 V).

Figure 4
DHW 36/46/56
thermostat connection



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4 Water heater start-up

Filling the inner (domestic water) tank

- CAUTION**
- Never use water heater unless inner and outer tanks are completely filled with water.
 - Inner tank must be completely filled and pressurized before pressurizing outer tank.

1. Close domestic water drain valve.
2. Open domestic water isolation valves for water heater.
3. Vent air from inner (domestic water) tank by opening nearest hot water faucet. Fill domestic water tank completely by allowing water to run until there is a constant flow of water.
4. Close hot water faucet.

6. If antifreeze is used in boiler water, check concentration. Boiler water (including additives) must be practically non-toxic, having a toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products. Inhibited propylene glycol is recommended. Follow antifreeze manufacturer's instructions.

- WARNING** Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze. This can cause severe personal injury, death or substantial property damage if ignored.

Figure 5

Open cap on air vent to allow air to escape from outer tank

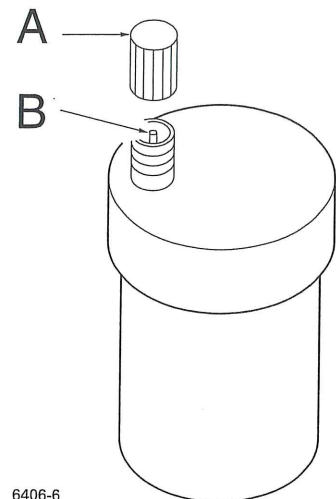
Filling the outer (boiler water) tank

- CAUTION**
- Never use water heater unless inner and outer tanks are completely filled with water.
 - Inner tank must be completely filled and pressurized before pressurizing outer tank.

1. Close boiler water drain valve at boiler water outlet of water heater.
2. Open water heater's boiler water isolation valves.
3. Allow air to escape from outer (boiler water) tank by opening cap "A" (see Figure 5) on automatic air vent, located on top of water heater.

NOTICE For proper operation of the water heater, always leave vent cap unscrewed one full turn.

4. Follow instructions furnished with boiler to fill with water.
5. When tank is full, air will stop escaping, and air vent will close. If air vent does not seat properly (i.e., water leaks out), remove cap "A". Briefly push in valve "B" (see right) and release it to clean valve seat. Screw cap "A" on completely, then unscrew one turn.



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4 Water heater start-up continued

Start-up checklist

- Long element T&P relief valve is properly installed and drain discharge is directed away from all persons.
- Both inner and outer tanks are filled with water.
- All air has been bled from both domestic and boiler water systems.
- Automatic air vent is installed and cap is unscrewed one full turn.
- Cold and hot water lines are correctly connected to domestic water system.
- Supply and return piping from boiler is correctly connected to water heater.
- All wiring is installed correctly.
- Thermostat on water heater is set according to system requirements. See page 11.
- Boiler and water heater are operating properly.
- Fittings and piping have been checked for leaks.
- Installer has reviewed the following sections with system maintainer:
 - General Safety
 - Water Heater Start-Up
 - Adjusting Water Heater Temperature
 - Water Heater Maintenance

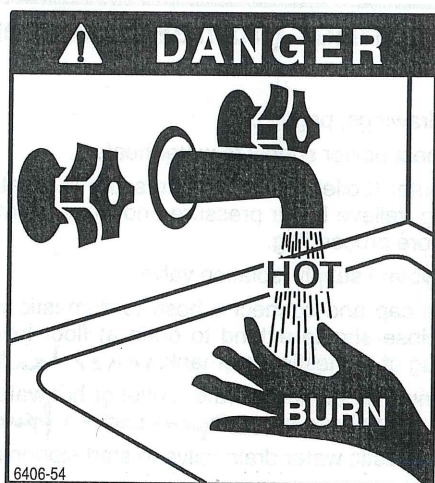
5 Adjusting water heater temperature

DANGER Hot Water Can Scald!

- Water temperature over 125°F can cause severe burns instantly, or death from scalds.
- Feel water before bathing or showering.
- Consumer Product Safety Commission and some states recommend temperature settings of 130°F or less. Setting thermostat higher than 130°F setting will increase risk of scald injury and can cause severe personal injury or death.
- Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scald and cause permanent injury.
- Children and elderly, infirm, or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:
 - Install an automatic mixing valve at water heater or at each hot water faucet, bath, and shower outlet. Selection and installation must comply with valve manufacturer's recommendations and instructions.
 - Use the lowest practical temperature setting.
 - Check water temperature after any adjustment. You must follow "Setting the Thermostat" section.

General notes

- Household water usage patterns will affect water temperature at any faucet or shower. Occasionally check temperature at each point of use, then adjust thermostat accordingly. Always recheck temperature after adjusting thermostat.
- When hot water is used in repeated small quantities, a "stacking" effect can develop in hot water tank. The upper layer of water in tank can be much hotter than lower layers.
- Lowering the thermostat setting or installing automatic mixing valves as indicated in these instructions will reduce water temperature levels. Consult your installer or service technician.



Setting the thermostat

DHW 36/46/56

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 thermostat is factory set to its lowest temperature. The Indicator (◁) on label is a preferred starting point for setting temperature. This may or may not be suitable for your needs.

Turn thermostat knob **clockwise** ↻ to increase water temperature.

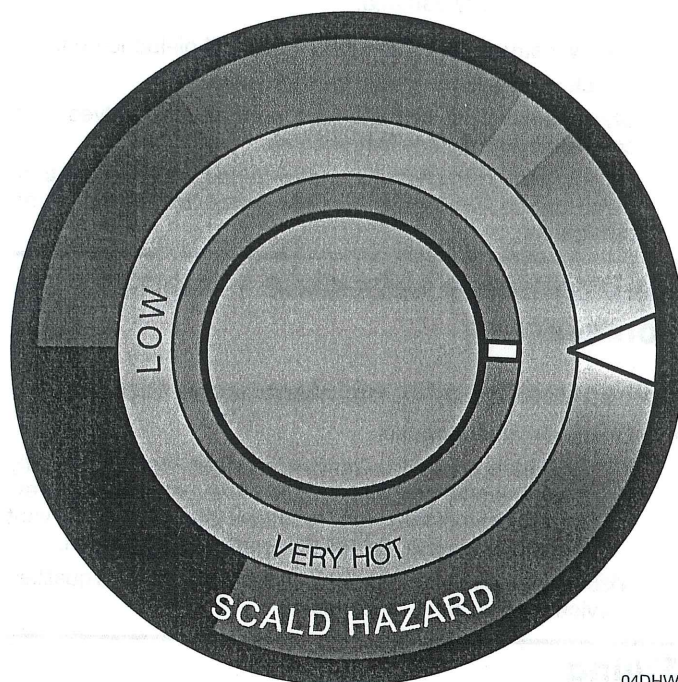
Turn thermostat knob **counter-clockwise** ↺ to reduce water temperature.

When decreasing temperature setting, the stored hot water must be used before checking temperature at faucet.

Check water temperature at a hot water faucet immediately after first heating cycle. Further temperature adjustment may be necessary as water heating system is used. Recheck water temperature at faucet after adjustment.

When adjusting thermostat, be sure boiler limit control is set a minimum 20°F higher.

WARNING At no time should boiler limit control be set above 210°F. This can cause severe personal injury, death or substantial property damage if ignored.



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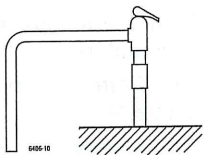
6 Water heater maintenance

Maintenance schedule – annual service technician

Annual service by qualified service technician to include:

- Any procedures required by local codes.
- Check air vent operation.
- Verify system pressure. Air venting procedure may require adding water to bring system up to pressure, typically 12 psig.
- Manually operate T&P relief valve at least once a year. This will release some hot water.

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



- 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 T&P relief valve. If T&P relief valve weeps periodically, it may be due to thermal expansion (see "Thermal Expansion", page 8). Do not plug T&P relief valve or discharge piping.

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

- Follow instructions on circulator to oil it, if oil-lubricated.
- Check valves, pipes and fittings for leaks.
- Check function of field-installed controls and valves (see control manufacturer's instructions).
- Review homeowner's maintenance responsibilities and their frequencies, including any not listed in the following paragraphs.

Maintenance schedule – monthly homeowner

Homeowner monthly maintenance to include:

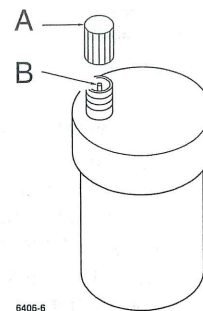
- Check air vent operation:
 - Automatic air vent — remove cap (see Figure 6). Briefly push in valve and release it to clean valve seat. Screw cap on completely, then unscrew one turn. If air vent does not operate, call qualified service technician.
- Visually check valves, pipes and fittings for leaks. Call qualified service technician to repair leaks.

Filling

See **Filling the Inner (Domestic Water) Tank**, and **Filling the Outer (Boiler Water) Tank**, on page 9.

Figure 6

Remove air vent cap to check operation



Draining

Drain water heater if it will be shut off and exposed to freezing temperatures. Freezing water will expand and may damage water heater.

If boiler water contains sufficient antifreeze, then only the domestic water needs to be drained.

If boiler water does not contain sufficient antifreeze, then the boiler water and the domestic water must be drained.

CAUTION Close boiler water isolation valves and relieve pressure to below 15 psi in outer tank before draining inner tank to prevent damage to inner tank.

If antifreeze is used in boiler water, check concentration. Boiler water (including additives) must be practically non-toxic, having toxicity rating or class of 1, as listed in *Clinical Toxicology of Commercial Products*. Inhibited propylene glycol is recommended. Follow antifreeze manufacturer's instructions.

WARNING Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze. This can cause severe personal injury, death or substantial property damage if ignored.

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.

Draining inner (domestic water) tank

See piping drawings, pages 6-7.

1. Disconnect power supply to water heater.
 - If outer (boiler water) tank pressure is greater than 15 psig, relieve boiler pressure and close isolation valves before proceeding.
2. Close system supply isolation valve.
3. Remove cap and connect a hose to domestic water drain valve. Hose should extend to drain at floor level to allow siphoning of domestic water tank. *inner tank*
4. Open union on domestic water outlet or hot water faucet at highest point above heater. *Open water faucet - Hot*
5. Open domestic water drain valve to start siphoning.
6. When draining is complete, close union or hot water faucet and domestic water drain valve.

6 Water heater maintenance continued

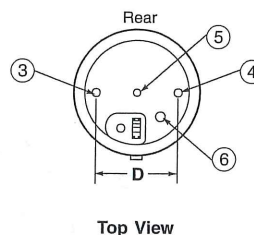
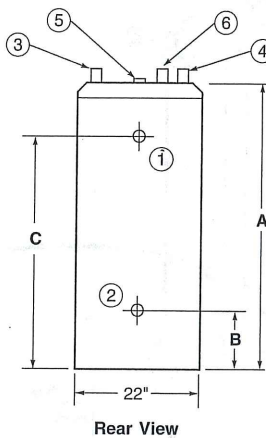
Draining outer (boiler water) tank

See piping drawings, pages 6-7.

1. Disconnect power supply to water heater.
2. Close boiler water isolation valves between water heater and boiler.
3. Connect hose to boiler water drain valve at water heater. Open and drain water to a safe place.
4. To speed draining, loosen air vent on top of tank.
5. When draining is complete, close drain valve and retighten air vent.

7 Water heater dimensions & specifications

DHW 36/46/56



- ① Boiler water return
- ② Boiler water supply
- ③ Domestic water inlet
- ④ Domestic water outlet
- ⑤ Air vent
- ⑥ AUX - For long element T&P relief valve or drain valve, and for use as a return connection if circulated domestic water is required - see piping drawings, pages 6 - 7

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Water Heater Model	Capacity (gallons)		Heating Surface (ft ²)	Head Loss (feet)	Dimensions (inches)					Approximate Shipping Weight (lb.)	
	Domestic	Boiler			Boiler Side	Domestic Inlet/Outlet & AUX	Boiler Water Supply & Return	A	B		C
DHW-36	36	6	16	1	¾	1	46	9	38	14 ¼	155
DHW-46	46	8	20	1 ¼	¾	1 ¼	57	9	49	14 ¼	180
DHW-56	56	8	24	1 ½	¾	1 ¼	66	9	58	14 ¼	200

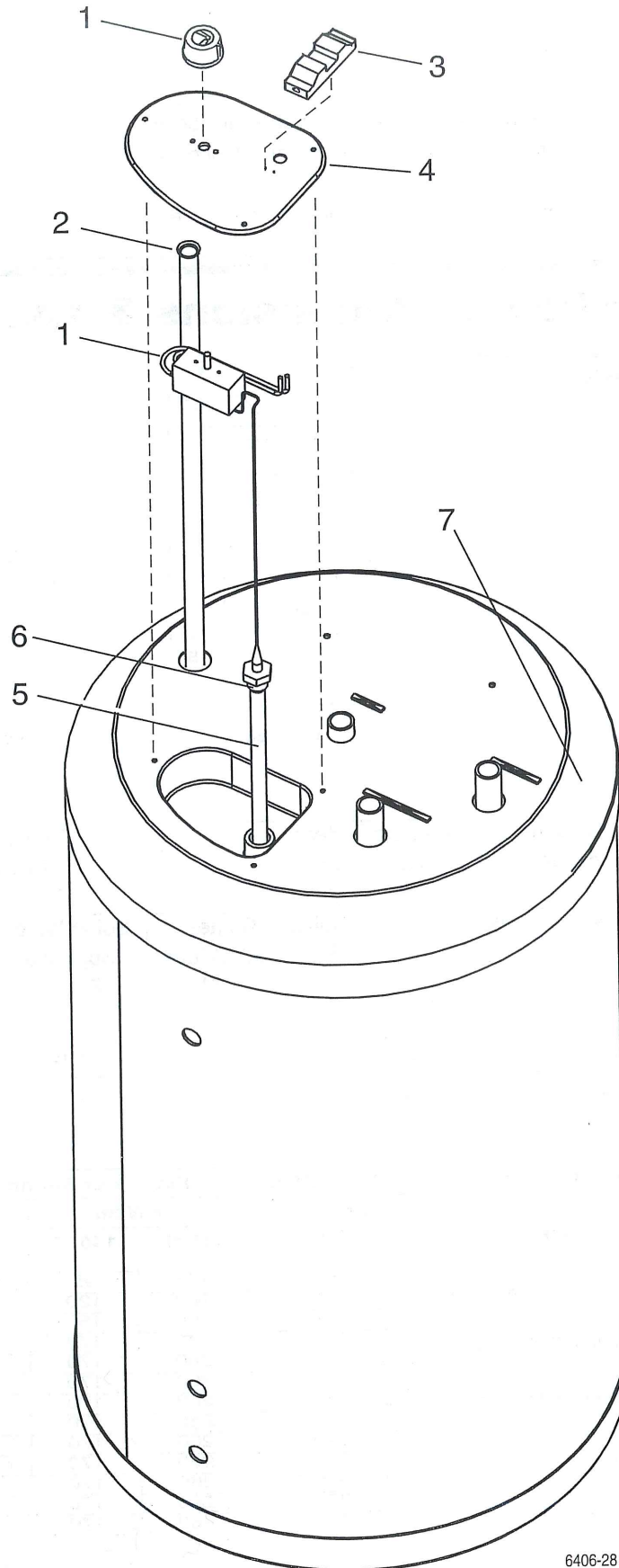
First hour ratings are based on the following conditions:

- 50 °F Domestic inlet water temperature.
- 200 °F Boiler water supply temperature.
- Assumes approximately 80% usable storage.
- Boiler side flow rates should be:
 DHW-36 – 9 GPM
 DHW-46 – 13 GPM
 DHW-56 – 20 GPM

Boiler DOE Heating Capacity MBH	First Hour Rating Capacity (GPH) for the DHW Line					
	DHW 36		DHW 46		DHW 56	
	115 °F	140 °F	115 °F	140 °F	115 °F	140 °F
50	125	95	135	100	145	115
70	160	120	170	130	180	140
90	200	150	210	160	220	170
110	235	170	245	185	255	195
130	260	170	280	210	290	220
150	260	170	320	220	330	250
170	260	170	355	220	365	275
190	260	170	365	220	400	300
210	260	170	365	220	440	350
250	260	170	365	220	510	380
300	260	170	365	220	600	410
350	260	170	365	220	670	410
400	260	170	365	220	670	410

8 Replacement Parts

DHW 36/46/56



6406-28

Part Number 635-500-141/0602

8 Replacement Parts continued

Item	Description	Size	Part Number
1	Thermostat Kit with Knob - No Cover Plate		633-900-130WT
not shown	Air Vent, Automatic, # 400	1/8"	635-100-003WT
not shown	Drain Valve Kit		633-900-117WT
2	DHW 36 Dip Tube Kit	3/4"	633-900-119WT
	DHW 46 Dip Tube Kit	3/4"	633-900-120WT
	DHW 56 Dip Tube Kit	3/4"	633-900-125WT
not shown	"O" Rings, 2 each	3/4"	635-600-096WT
3	Snap-Set with Wire Connector		635-600-145WT
4	Cover Plate and Plastic Fasteners		633-900-200WT
5	DHW 36 Drywell and "O" Ring		635-600-062WT
	DHW 46 Drywell and "O" Ring		635-600-063WT
	DHW 56 Drywell and "O" Ring		635-600-064WT
6	Drywell "O" Ring		635-600-150WT
not shown	Thermostat with Cover Plate Kit		633-900-102WT
7	Plastic Top Cover (specific to tank size)		Special Order

9 Piping appendix

Figure 7



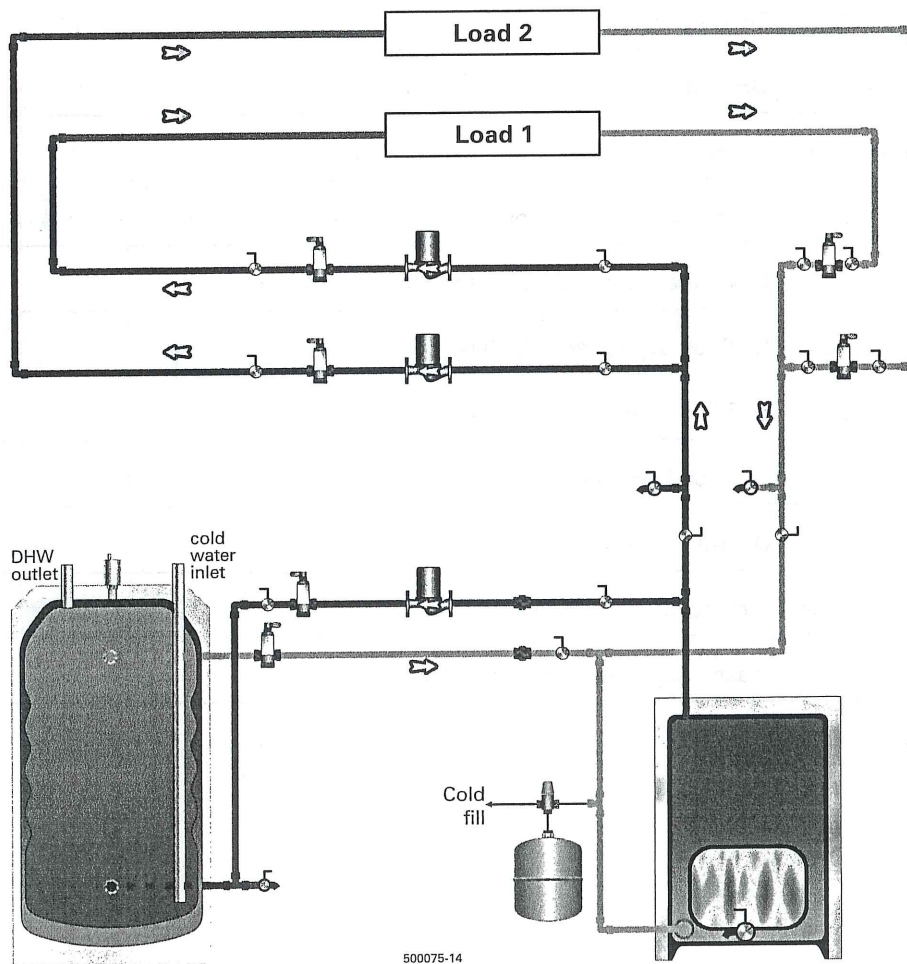
DHW 36/46/56

• Zoning with pumps

- Place pumps at beginnings of zones. Placing them at the ends of zones could result in heating idle zones.
- Size manifold piping for total flow of all zone pumps.
- Locate flow/check valves as close as possible to water heater boiler side connections — to reduce heat loss between cycles.

Wiring options:

- Figure 17, page 27 — Priority zone pump
- Figure 20, page 30 — Pump relays with domestic priority
- Figure 21, page 31 — Pump relays without domestic priority



Notes

1. This drawing is conceptual only. It shows representative piping components and layout. Manufacturer does not represent that this drawing meets any particular mechanical or building codes. The installer is responsible for inclusion of all required safety devices, or other miscellaneous piping hardware not shown on drawing. The installer is responsible for proper sizing/selection of all hardware shown on this diagram.
2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

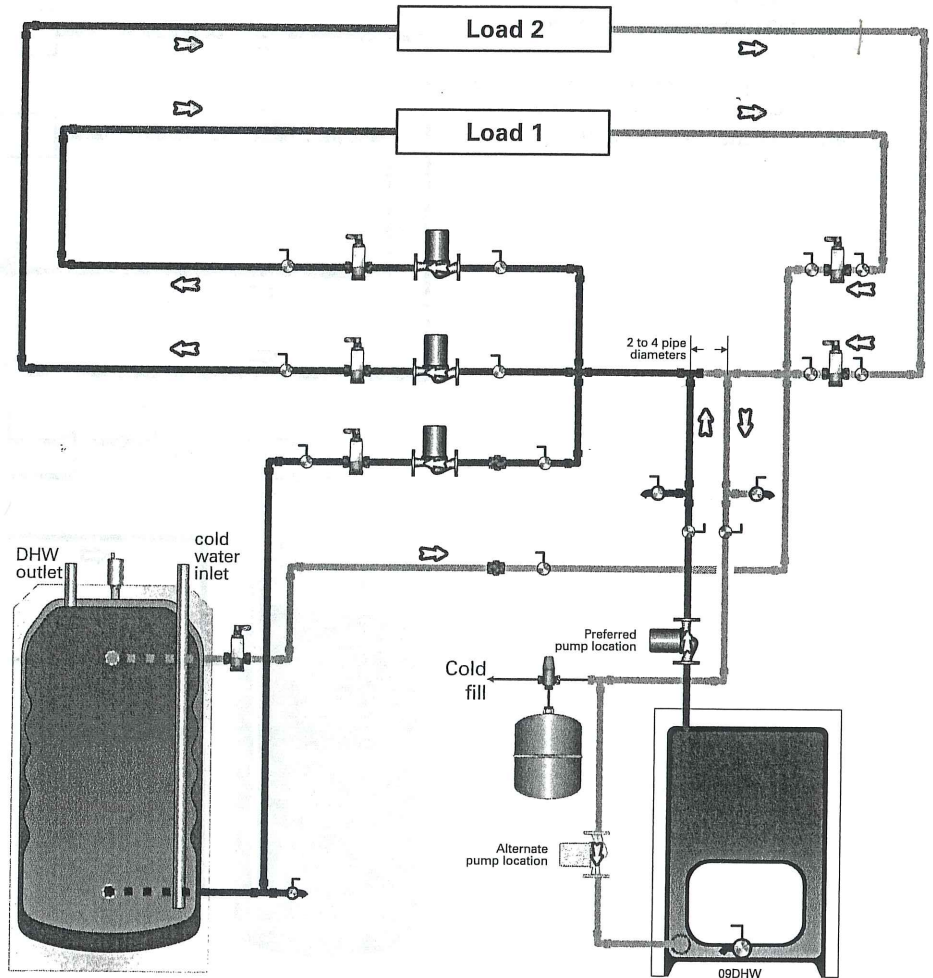
Figure 8

DHW 36/46/56

- Zoning with pumps
- Primary/secondary piping
- Place pumps at beginnings of zones. Placing them at the ends of zones could result in heating idle zones.
- Size primary circuit manifold for total flow of all zone pumps, with pressure drop of no more than 1 foot W.C.
- Locate flow/check valves as close as possible to water heater boiler side connections — to reduce heat loss between cycles.

Wiring options:

- Figure 17, page 27 — Priority zone pump
- Figure 20, page 30 — Pump relays with domestic priority
- Figure 21, page 31 — Pump relays without domestic priority



Notes

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2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

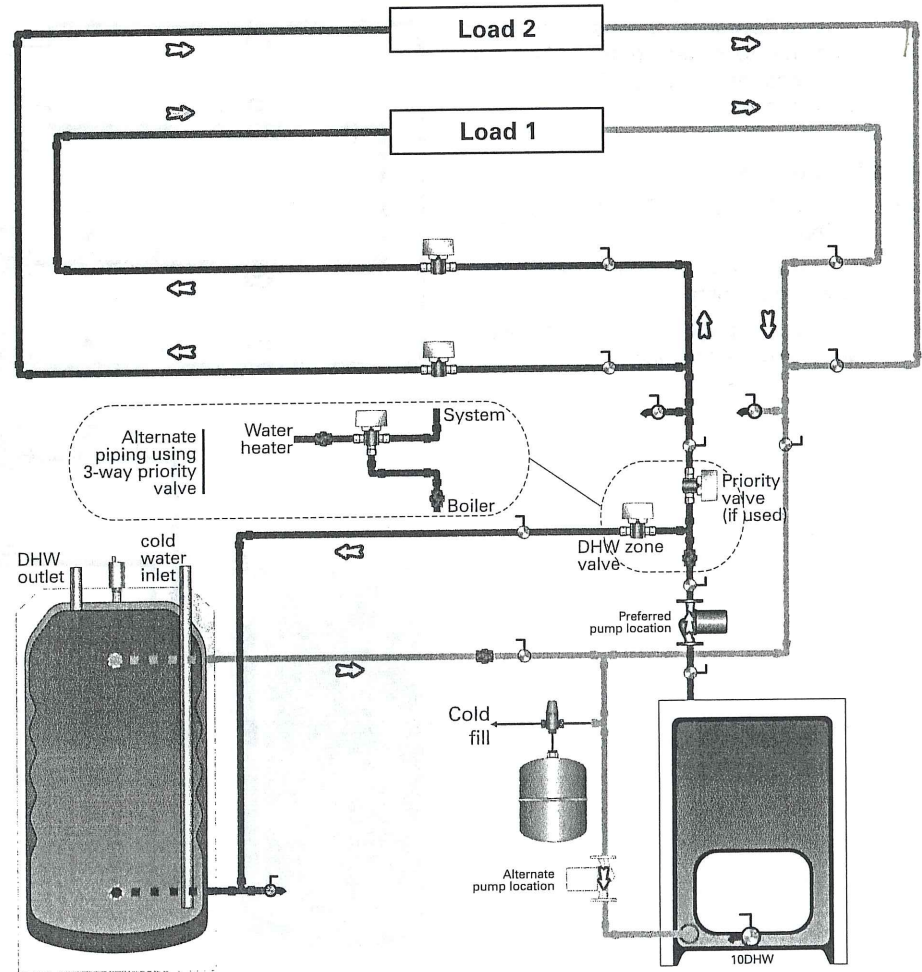
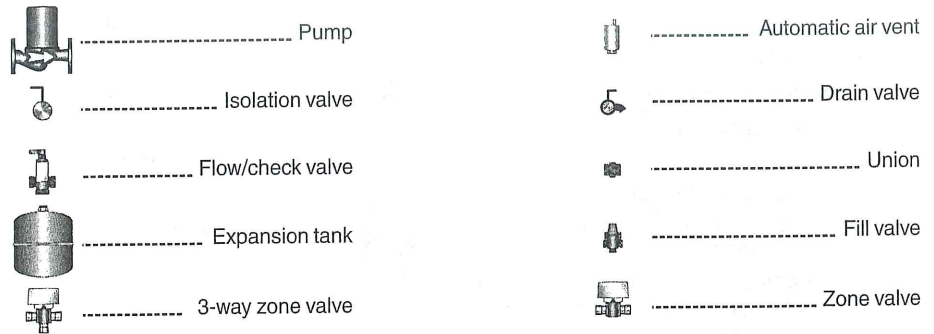
Figure 9

DHW 36/46/56

- Zoning with zone valves

Wiring options:

- Figure 26, page 36 or Figure 27, page 37 — Priority using 2-way valve
- Figure 24, page 34 or Figure 25, page 35 — Priority with 2-way priority valve and 2-way zone valve on water heater circuit
- Figure 22, page 32 or Figure 23, page 33 — No priority, using 2-way zone valve on water heater circuit



Notes

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2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

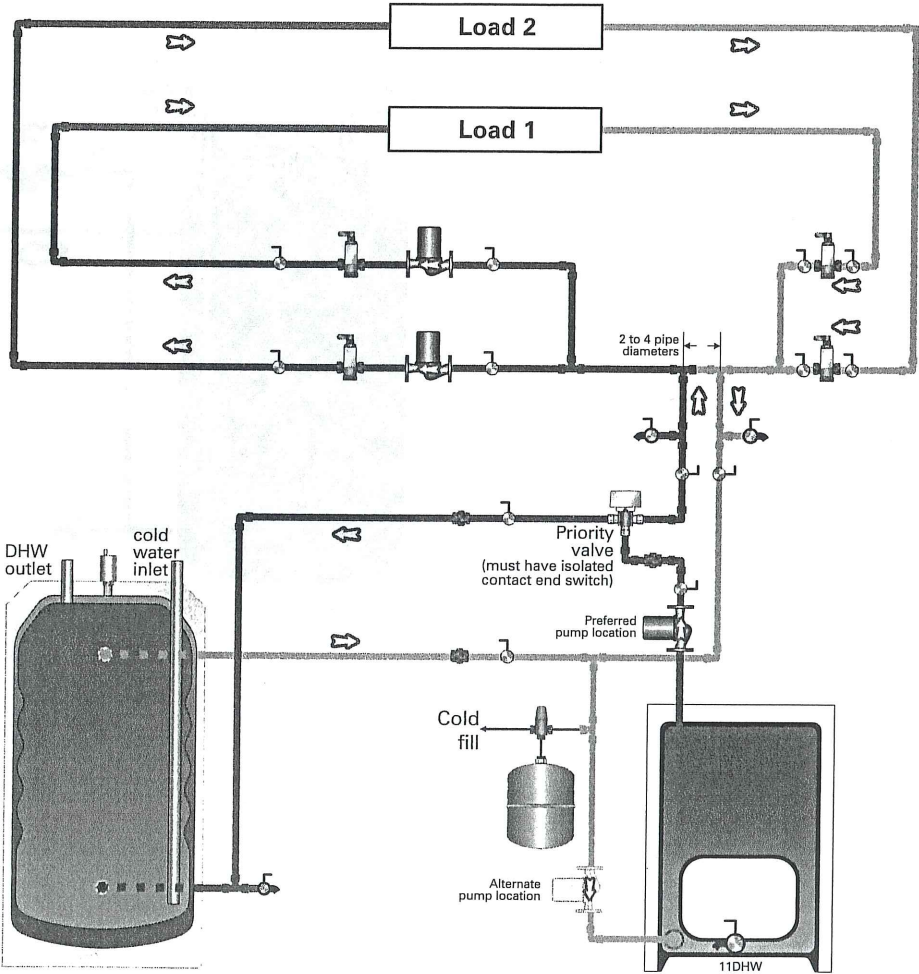
Figure 10

DHW 36/46/56

- Zoning with pumps
- Primary/secondary piping
- Place pumps at beginnings of zones. Placing them at the ends of zones could result in heating idle zones.
- Size primary circuit manifold for total flow of all zone pumps, with pressure drop of no more than 1 foot W.C.

Wiring options:

- Figure 28, page 38 — Pump relays and 3-way priority valve and priority relay



Notes

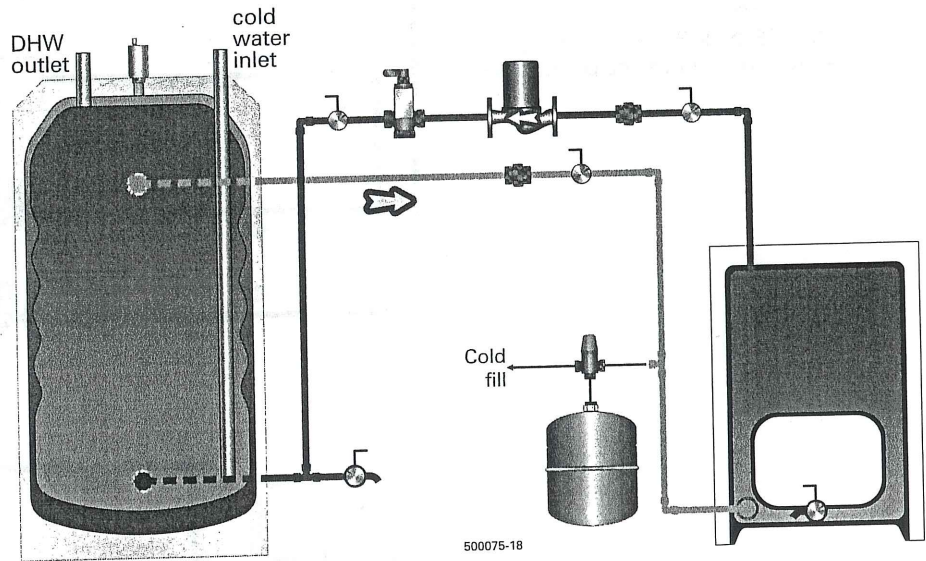
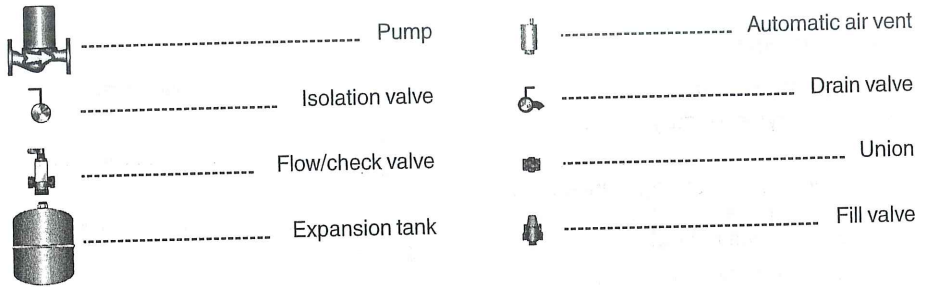
1. This drawing is conceptual only. It shows representative piping components and layout. Manufacturer does not represent that this drawing meets any particular mechanical or building codes. The installer is responsible for inclusion of all required safety devices, or other miscellaneous piping hardware not shown on drawing. The installer is responsible for proper sizing/selection of all hardware shown on this diagram.
2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

Figure 11

Dedicated single boiler with single water heater in residential application (typically DHW 36/46/56).

- Locate flow/check valve as close as possible to water heater boiler side connections — to reduce heat loss between cycles.



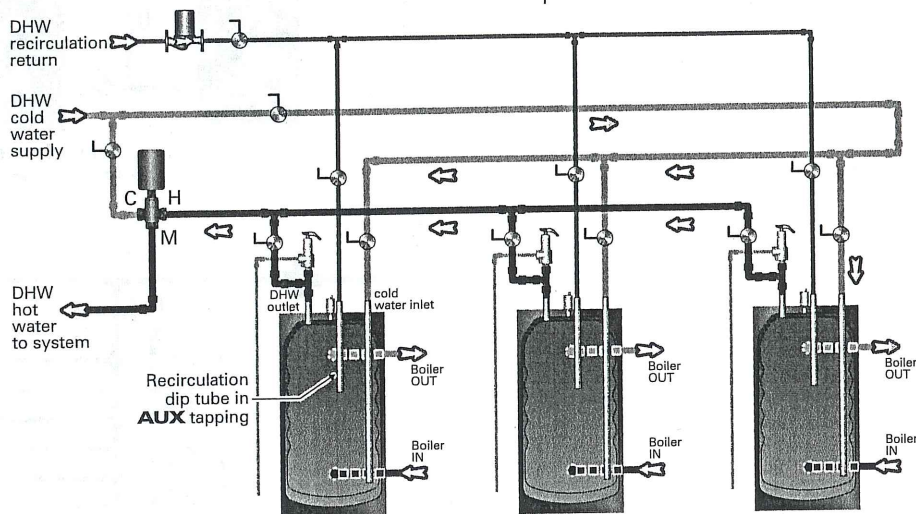
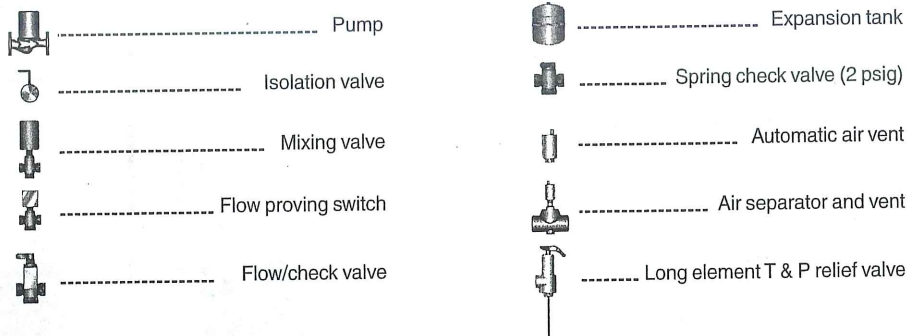
Notes

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2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

Figure 12

Multiple water heaters — domestic water piping



05DHW

Water heaters (front)

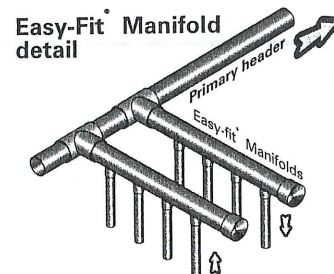
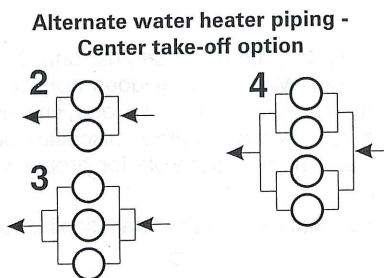
WARNING Failure to install automatic mixing valve where recommended can result in severe personal injury or death.

Notes

1. The drawings on this page are conceptual only. They show representative piping components and layout. Manufacturer does not represent that these drawings meet any particular mechanical or building codes. The installer is responsible for inclusion of all required safety devices, or other miscellaneous piping hardware not shown on drawing. The installer is responsible for proper sizing/selection of all hardware shown on this diagram.
2. Any one DHW tank thermostat may be utilized to control heater temperature.
3. Install automatic mixing valve at either the system hot water connection or at each water heater.
4. See pages 24-25 for additional recirculation information and piping detail.

Figure 13

Details for Figure 14, page 22 — alternate water heater piping and Easy-Fit® Manifold detail

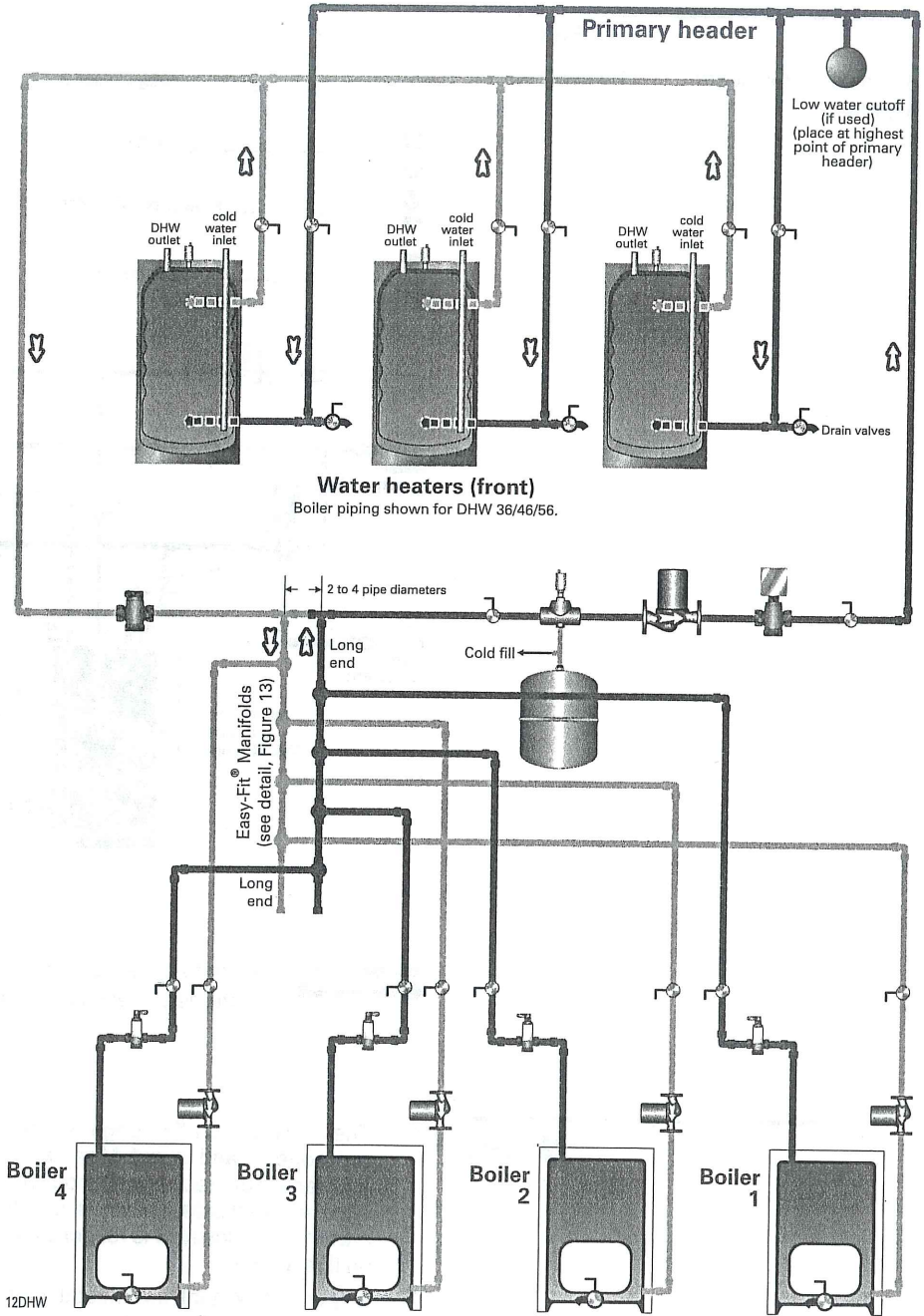


500075-19b

9 Piping appendix continued

Figure 14

Multiple water heaters and dedicated multiple boilers — boiler water piping
(see legend and details in Figure 13, page 21)



Notes

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2. See manufacturer's installation instructions for specific details on installing the boiler.

9 Piping appendix continued

Recirculation and heat tracing

Maintaining domestic water temperature in the supply piping

Two options are available to maintain supply temperature available at or near the fixtures on storage water heating systems:

- **Recirculation**

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. Consult local codes and American Society of Plumbing Engineers (ASPE) Domestic Water Heating Design Manual, 1998, for further information.

- **Self-regulating heat tracing**

Self-regulating heat tracing may be a better alternative than recirculation for residential and small commercial applications. Self-regulating heat tracing uses electrical energy to maintain water temperature, but it eliminates the need for return piping and components required in a recirculation system.

Time delay at fixtures

Table 2 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. The time lag should generally not exceed 30 seconds. For residential and office applications, the owner may prefer a limit of 10 seconds.

You can use Table 2 as a guide to determining the location of circulation return lines relative to fixtures.

Balancing

When multiple branches are connected to the supply piping, each branch must be connected to the recirculation system. 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 15 on page 25. Check local code for specific installation requirements.

These branches must be balanced to prevent pipe erosion and unacceptable time delays at some fixtures.

Balancing options include circuit setters, memory stop valves or factory preset devices (with flow metering provision in the piping).

9 Piping appendix continued

Recirculation and heat tracing continued

Components required

For residential applications, consult pump manufacturer's data for pump selection and additional components required.

On most commercial systems, install the devices shown in Figure 15, page 25, and any other devices or piping methods required by local codes. The check valves are required to prevent fixtures from taking hot water through the return lines. Shutoff valves are needed to allow cleaning and replacing balancing devices. Include strainers to remove sediment which could damage the pump and/or affect the flow balancing devices.

Size the pump and piping based on the temperature drop allowed between the water available at the water heater and the water delivered at the fixture. 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 pump.

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

Install a recirculation dip tube in the AUX tapping on top of the water heater. This requires mounting the T&P relief valve as shown for Option 2 in the piping diagrams, pages 6 and 7. See Figure 16 for the piping required to the water heater.

Table 2

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 (from ASPE)									
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	1/2"	25	63	8	21	5	13	3	8
	3/4"	48	119	16	40	10	24	6	15
Steel pipe	1/2"	63	157	21	52	13	31	8	20
	3/4"	91	228	30	76	18	46	11	28
CPVC pipe	1/2"	64	159	21	53	13	62	8	20
	3/4"	95	238	32	79	19	48	12	30

NOTE: Select branch size and length for less than 31 seconds delay.

9 Piping appendix continued

Figure 15

Recirculation components

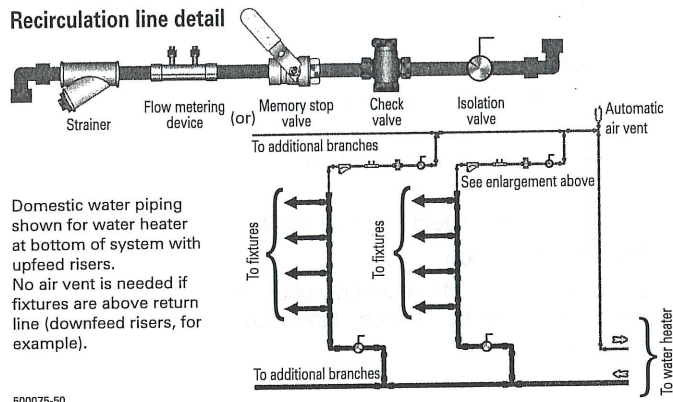
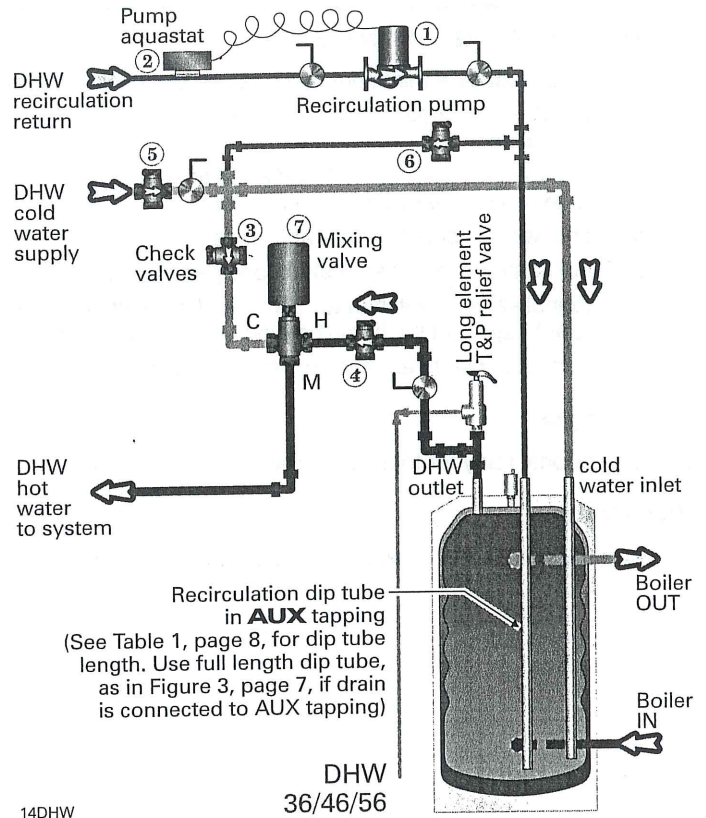


Figure 16

Recirculation connection at water heater



Components

- 1 Circulator — Little flow is required to maintain a temperature in the piping. Size of circulator depends on minimum flow requirements of the tempering valve. Minimum flow rates of the tempering valve must be maintained.
- 2 Aquastat — 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 (#7). The circulator cannot run continuously as bypass through the mixing valve will eventually allow the temperature on the piping to climb to the water heater temperature during draw periods.
- 3-6 Check valves — Assure the flow of water in one direction. Each check valve functions as follows: #3 and #4 prevent bypass in the event of pressure drop, #5 prevents thermal siphoning of hot water to the cold water supply, #6 prevents flow of cold water to the tempered water supply. A draw of tempered water will not result in flow of cold water into the return loop.

Operation

- During period of normal use (fixtures on) — Circulator is off. There is no flow through #6, there is flow through #5 equal to the flow at the fixtures, there is flow through #3 and/or #4 equal to flow at fixture.

- When all fixtures are off — Circulator is off. There is no flow through #3, #4, #5 or #6. Water temperature in piping is cooling.
- When temperature at aquastat #2 falls 10° below temperature to be maintained — Circulator is on. There is flow through #6 equal to the minimum required by the mixing valve, flow through #3 and #4 equals the flow of the circulator. There is no flow through #5.
- Aquastat reaches temperature — Circulator is off. There is no flow through #3, #4, #5 or #6.

Problems

- Missing check valves #3 or #4 — Extreme pressure drop can cause reverse flow of water; hot to cold supply or cold to hot supply.
- Missing check valve #5 — Hot water can migrate from the water heater back through the cold water supply.
- Missing check valve #6 — Cold water can be forced back through the tempered water supply when a fixture is opened.
- No aquastat #2 — Pump runs continuously. Small amount of water will pass through mixing valve. Eventually all hot water is flowing through valve. Recirculated water through cold port, hot water through hot port.

10 Wiring appendix

WARNING

Electrical shock hazard.

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

Wiring requirements

1. All wiring must be a minimum of 18 gauge and installed in accordance with:
 - U.S.A. — National Electrical Code and any other national, state or local code requirements having jurisdiction.
 - Canada — CSA C22.1 Canadian Electrical Code Part 1 and any other national, provincial and local code requirements having jurisdiction.
2. If original wire as supplied with appliance must be replaced, Type 90° C or its equivalent must be used.
3. Refer to control component instructions packed with boiler for application information.
4. An optional service switch may be installed in water heater electrical circuit. This switch would only shut off the water heater, not the home heating system. Do not shut off water heater if there is a chance of freezing.
5. All electrical contacts are shown with no power applied - off shelf condition.

Circulators

6. Size priority relay for total amp draw of all circulators.

Zone Valves

7. Size transformer for maximum load of all zone valves.

10 Wiring appendix continued

Figure 17

Typical wiring :

- Zoning with pumps
- Using priority zone pump
- Refer to *Wiring requirements* on page 26.
- See also Figures 18 and 19, pages 28 and 29, for wiring connections to OWB water boilers when using priority zone pump.

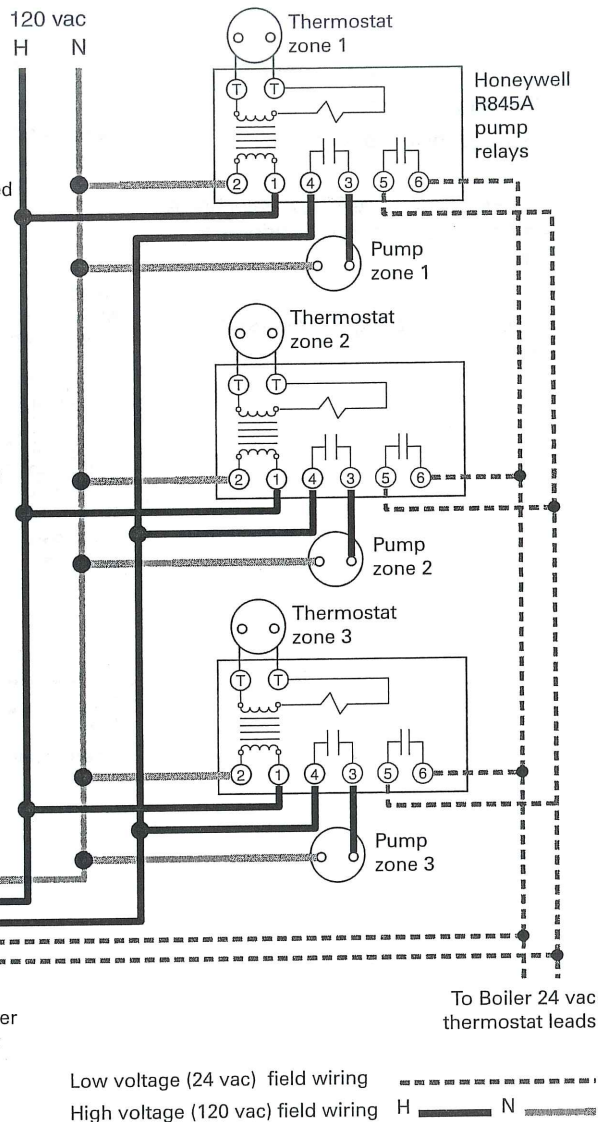
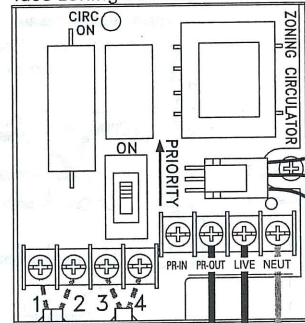
Apply this wiring to systems in:

- Figure 7, page 16
- Figure 8, page 17

NOTE -
Primary/secondary piping systems
 Boiler loop pump (for primary/secondary piping systems, as in Figure 10, page 19) should be powered by the boiler control or transformer/relay for packaged residential boilers. Provide a pump relay for this pump when pump relay is not provided with boiler.

NOTE -
 Maximum of 4 total pump zones when wiring 1 zone for priority.

Priority zone pump (water heater circuit)
 Taco zoning circulator



Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

Figure 18

Typical wiring – boiler connections:

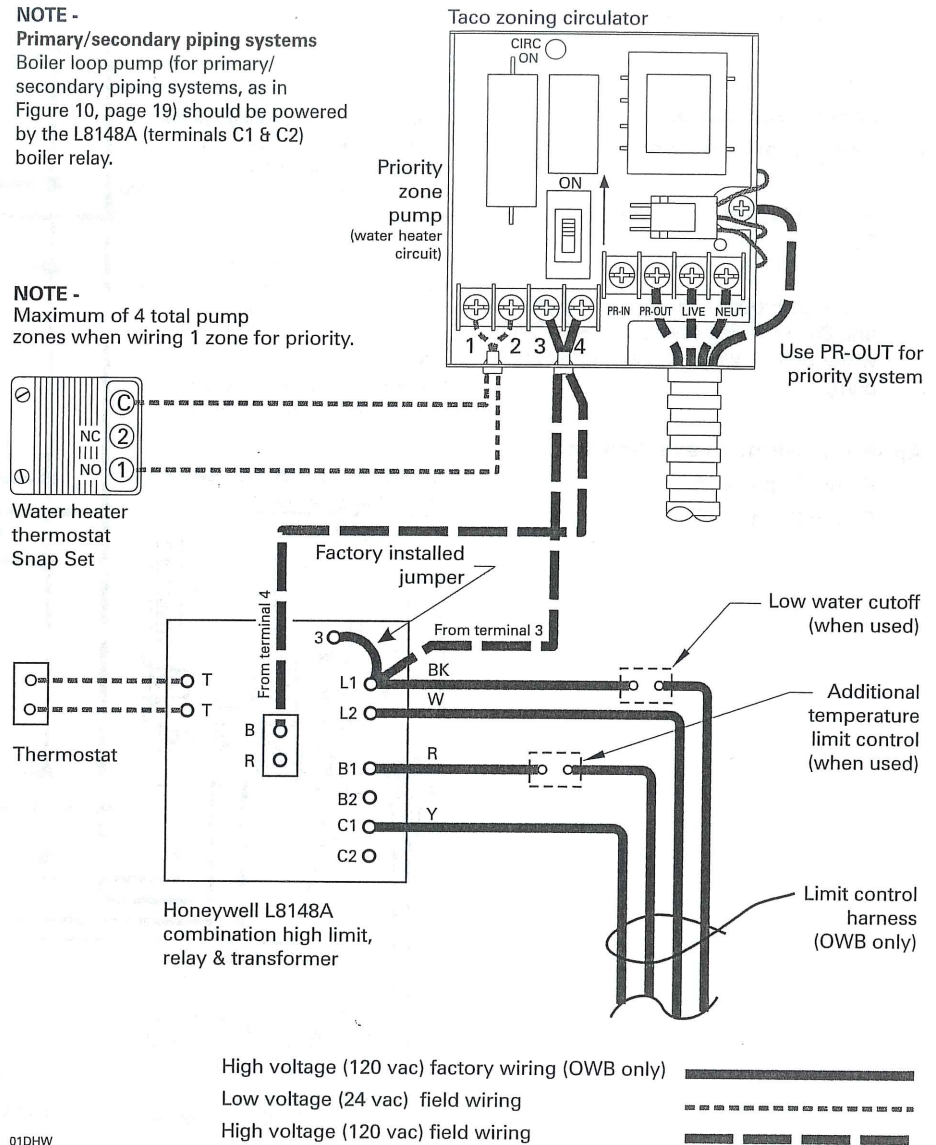
- **Zoning with pumps**
- **Using priority zone pump**

- See Figure 17, page 27, for water heater and zone connections to priority zone pump.

- Refer to *Wiring requirements* on page 26.

NOTE -
Primary/secondary piping systems
 Boiler loop pump (for primary/secondary piping systems, as in Figure 10, page 19) should be powered by the L8148A (terminals C1 & C2) boiler relay.

NOTE -
 Maximum of 4 total pump zones when wiring 1 zone for priority.



Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

Figure 19

Typical wiring – boiler connections:

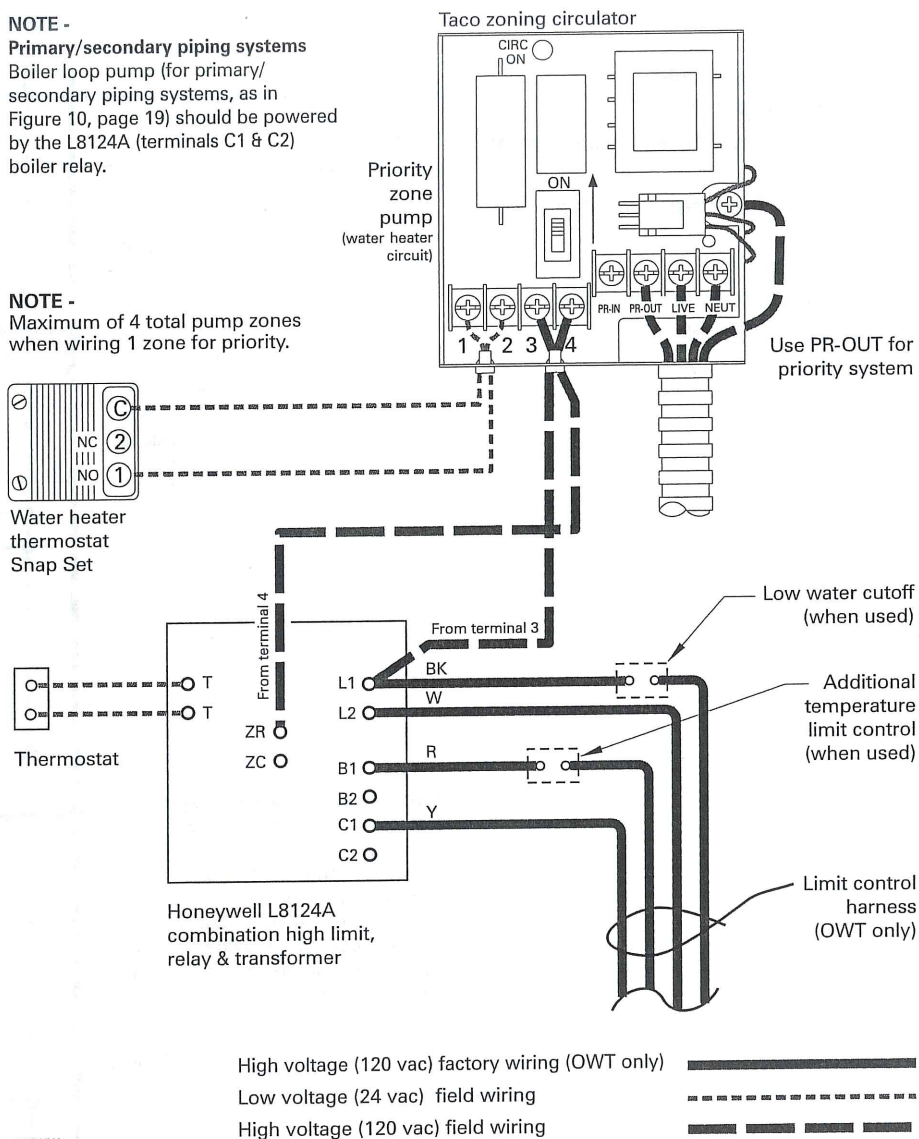
- Zoning with pumps
- Using priority zone pump

- See Figure 17, page 27, for water heater and zone connections to priority zone pump.

- Refer to *Wiring requirements* on page 26.

NOTE -
Primary/secondary piping systems
 Boiler loop pump (for primary/secondary piping systems, as in Figure 10, page 19) should be powered by the L8124A (terminals C1 & C2) boiler relay.

NOTE -
 Maximum of 4 total pump zones when wiring 1 zone for priority.



02DHW

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

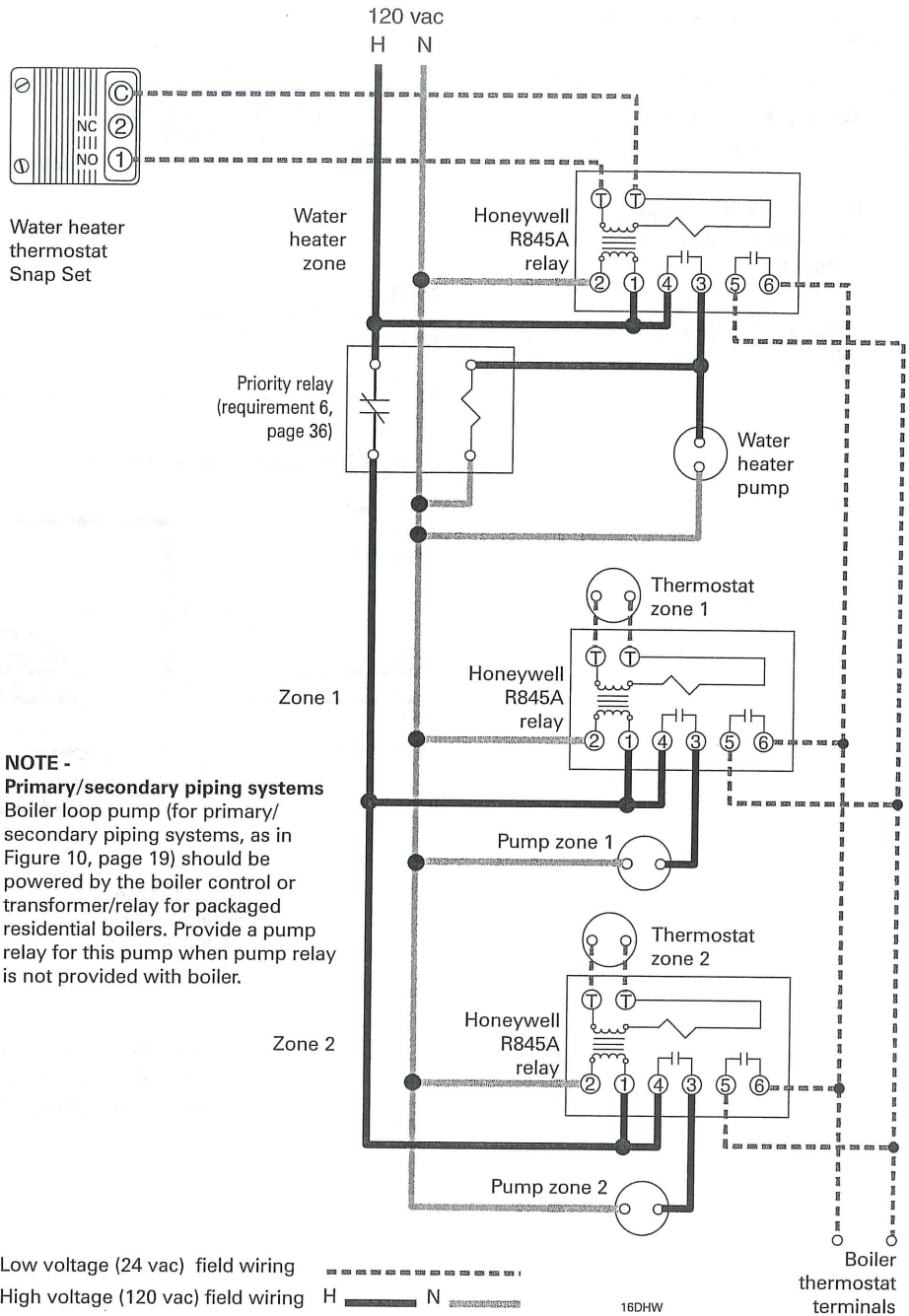
10 Wiring appendix continued

Figure 20

- Zoning with pumps
 - Using pump relays
 - Domestic priority with priority relay
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 7, page 16
- Figure 8, page 17



NOTE -
Primary/secondary piping systems
 Boiler loop pump (for primary/secondary piping systems, as in Figure 10, page 19) should be powered by the boiler control or transformer/relay for packaged residential boilers. Provide a pump relay for this pump when pump relay is not provided with boiler.

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

Figure 21

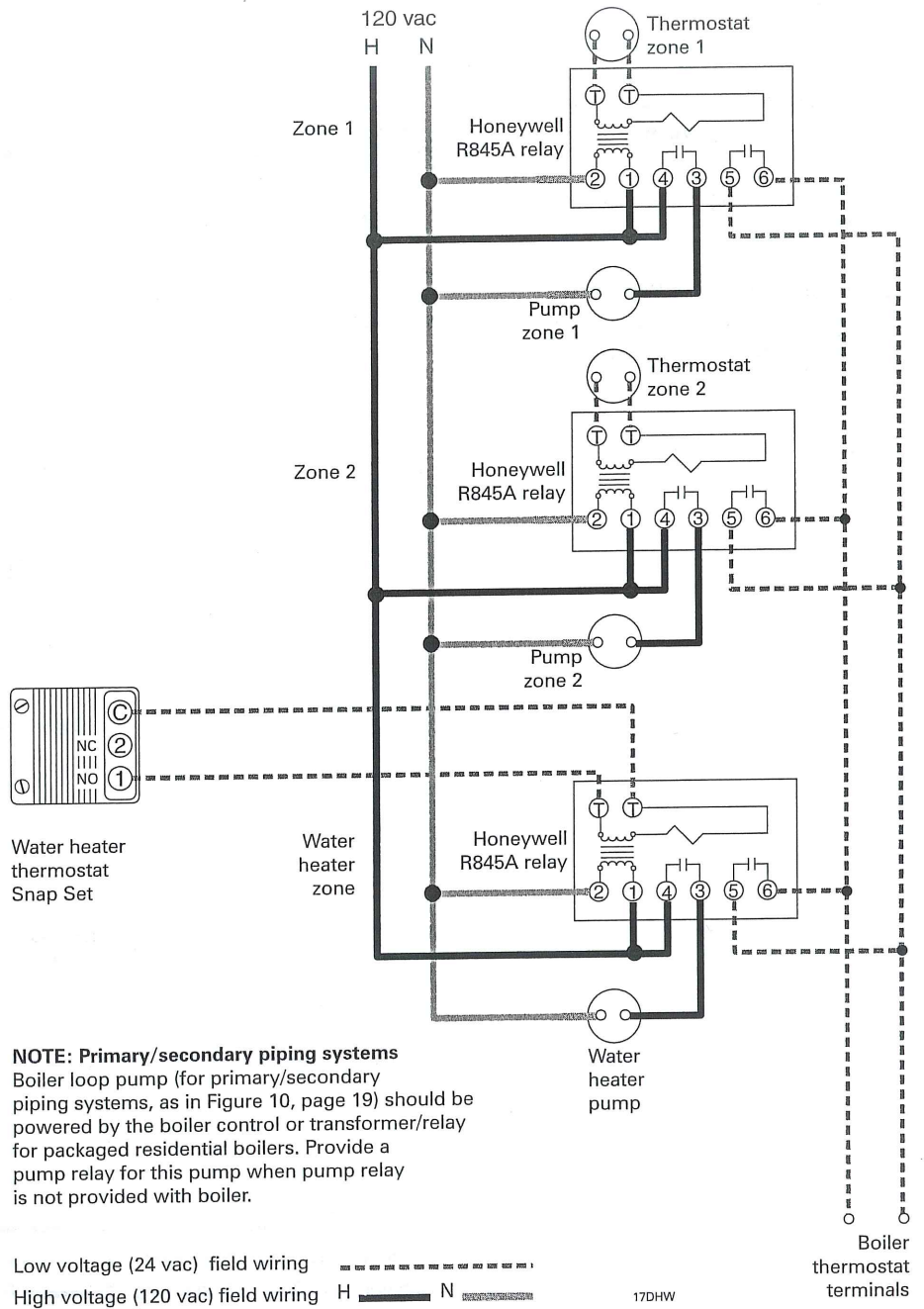
Typical wiring:

- Zoning with pumps
- Using pump relays
- No domestic priority

- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 7, page 16
- Figure 8, page 17



NOTE: Primary/secondary piping systems
 Boiler loop pump (for primary/secondary piping systems, as in Figure 10, page 19) should be powered by the boiler control or transformer/relay for packaged residential boilers. Provide a pump relay for this pump when pump relay is not provided with boiler.

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

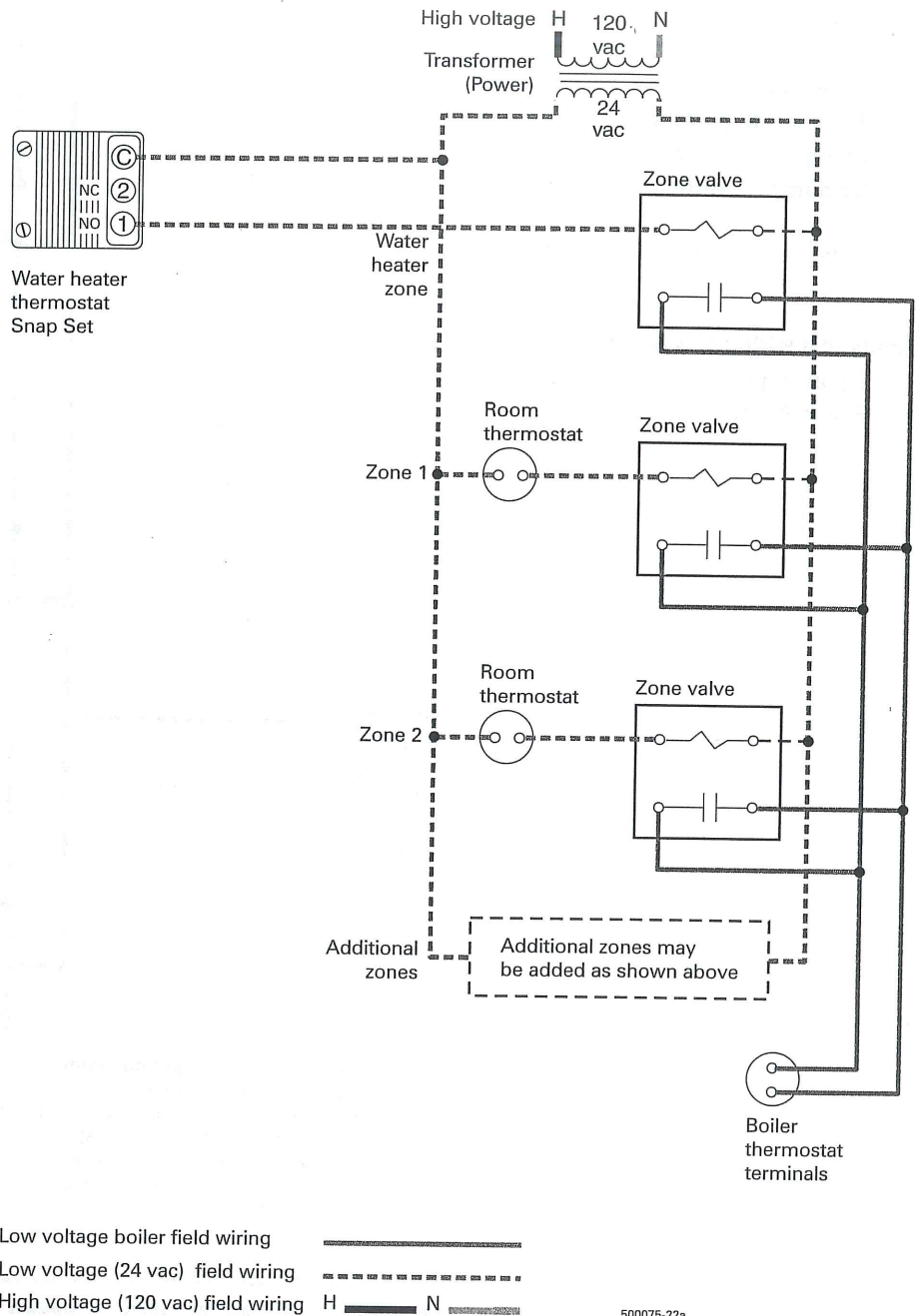
Figure 22

Typical wiring:

- Zoning with 4-wire zone valves
- No domestic priority
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9, page 18 (using 2-way water heater zone valve and no priority valve)



Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

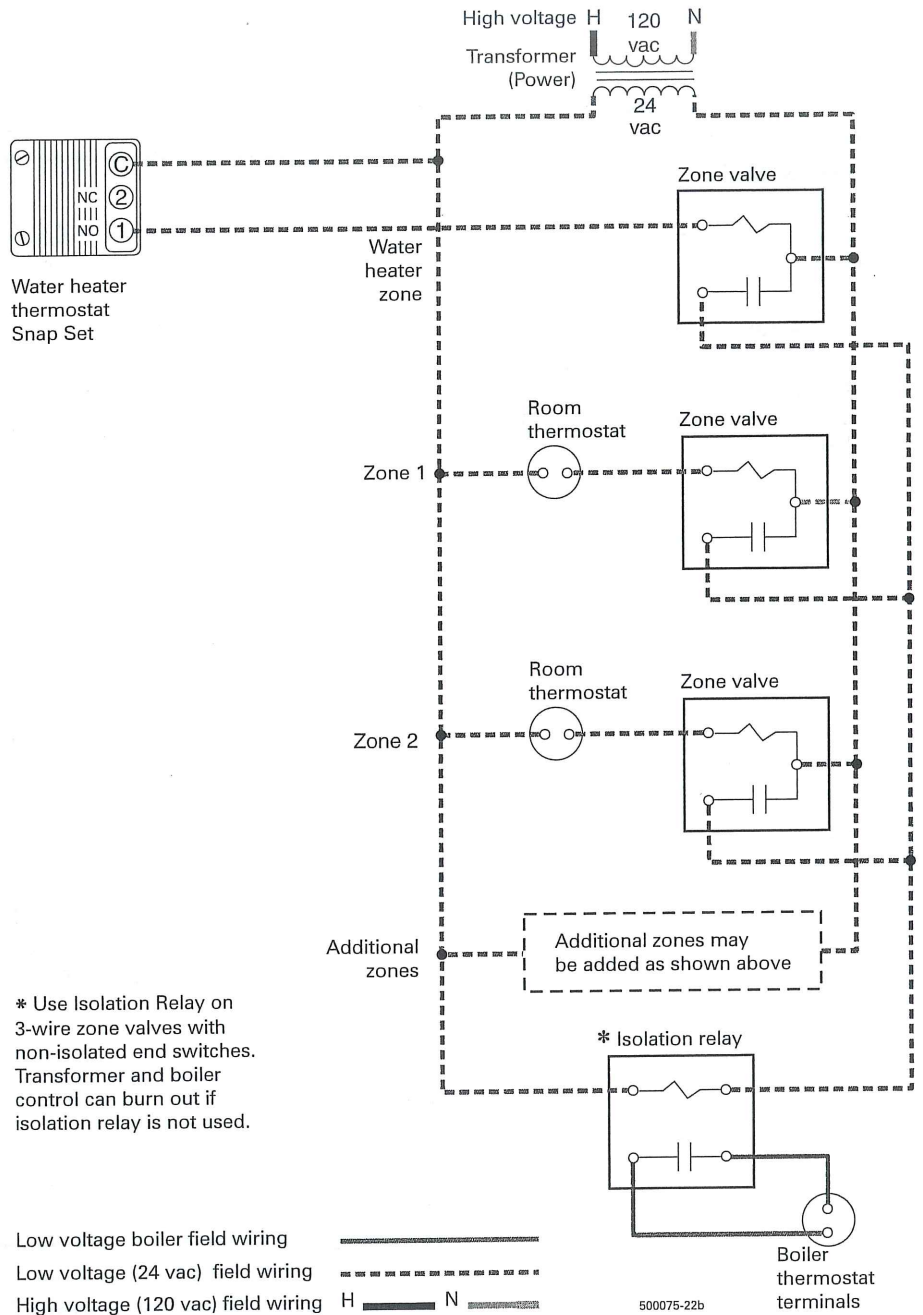
Figure 23

Typical wiring:

- Zoning with 3-wire zone valves
- No domestic priority
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9, page 18 (using 2-way water heater zone valve and no priority valve)



* Use Isolation Relay on 3-wire zone valves with non-isolated end switches. Transformer and boiler control can burn out if isolation relay is not used.

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

Figure 24

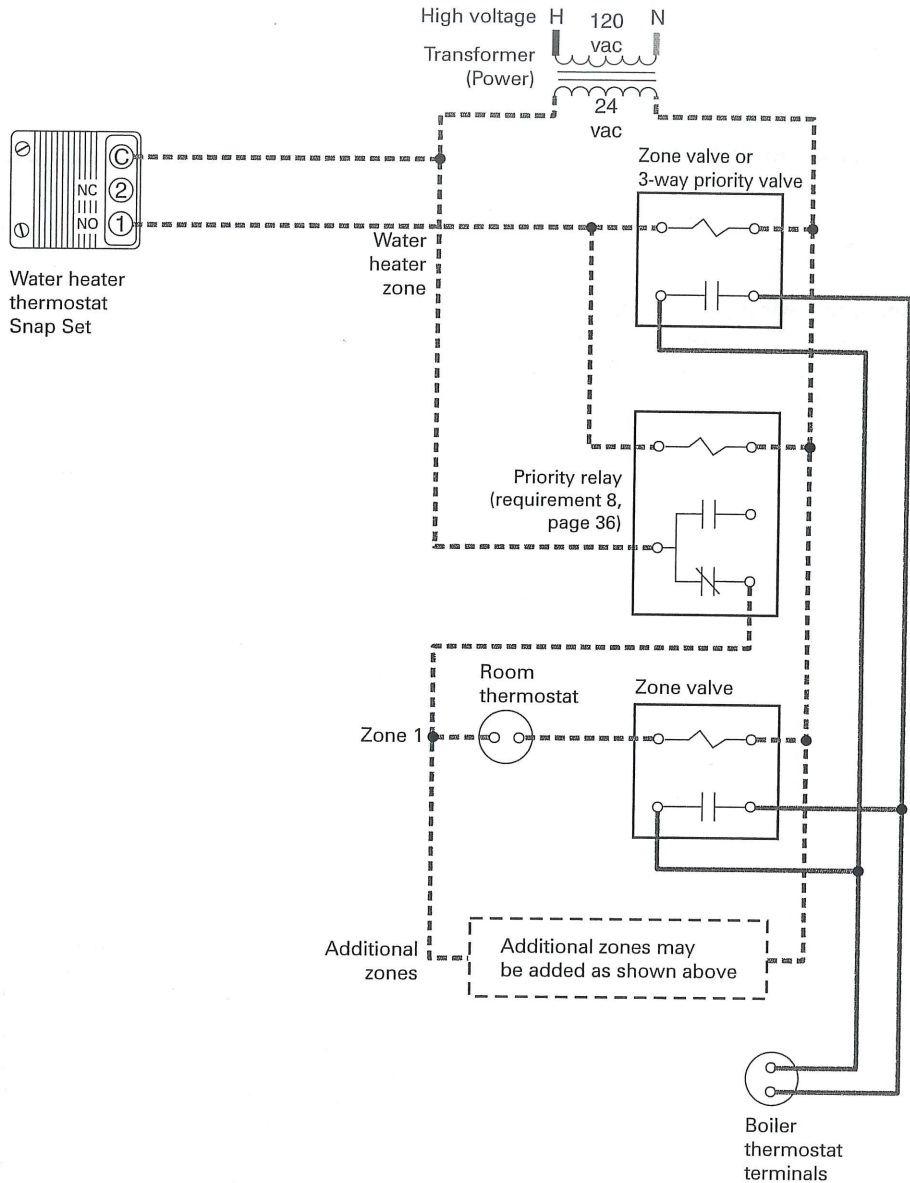
Typical wiring:

- Zoning with 4-wire zone valves
- With OR without domestic priority
- DHW 36/46/56

- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9, page 18 (using 3-way priority valve or NO priority using 2-way water heater zone valve and no priority valve)



Low voltage boiler field wiring
 Low voltage (24 vac) field wiring
 High voltage (120 vac) field wiring H N

500075-23a

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

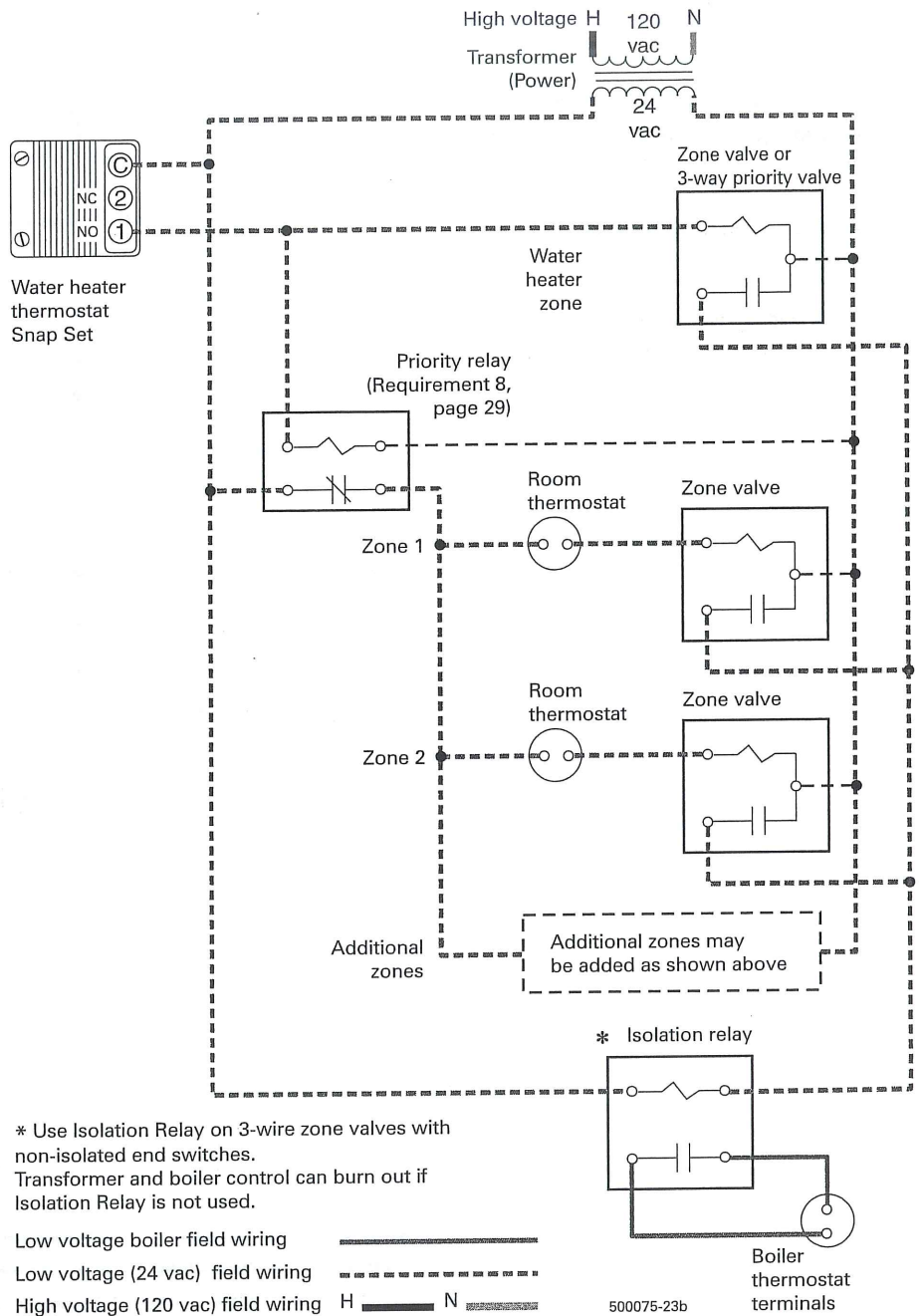
Figure 25

Typical wiring:

- Zoning with 3-wire zone valves
- With OR without domestic priority
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9, page 18 (using 3-way priority valve or NO priority using 2-way water heater zone valve and no priority valve)



Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

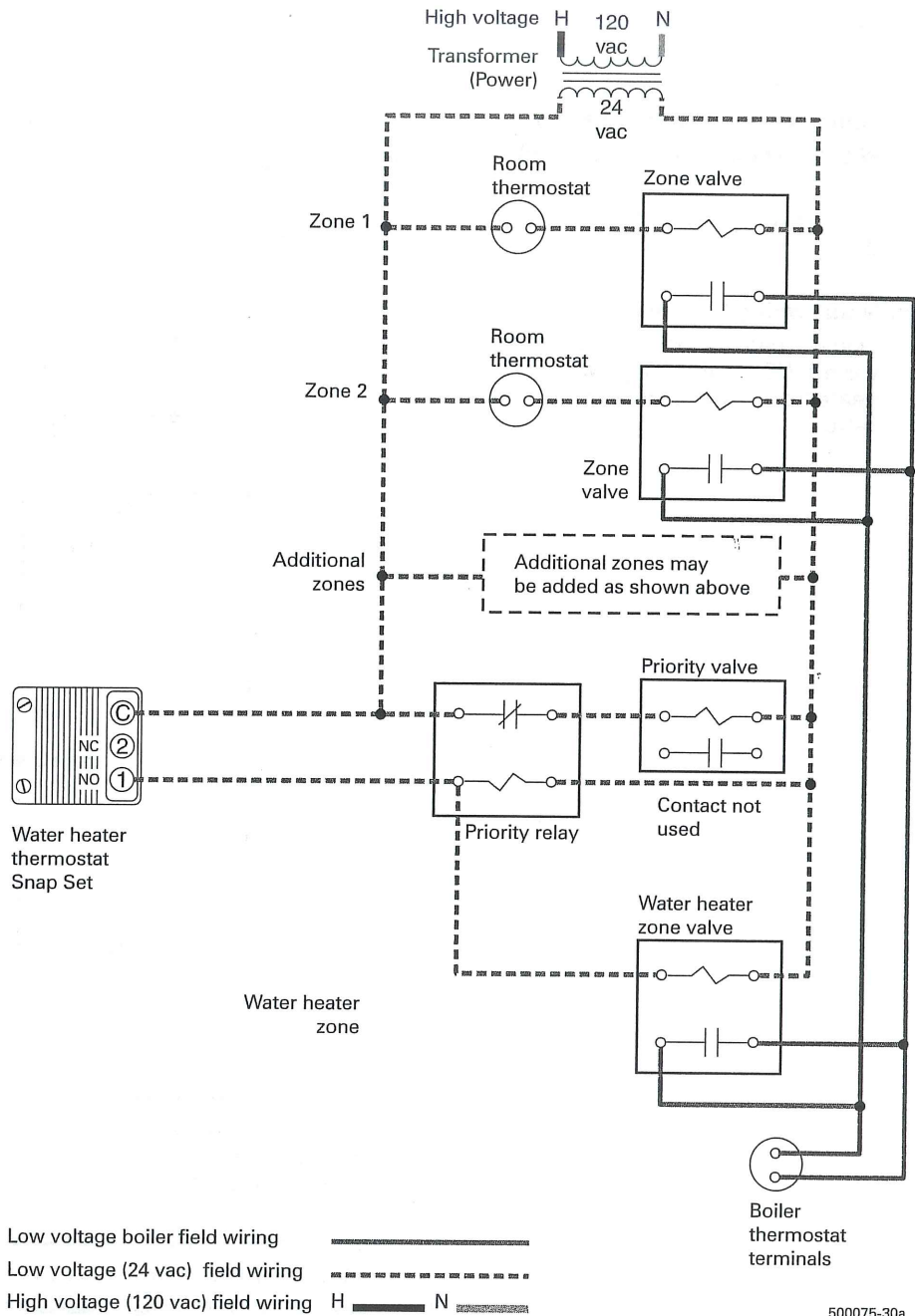
Figure 26

Typical wiring:

- Zoning with 4-wire zone valves
- Domestic priority with 2-way priority valve
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9 (using 2-way water heater zone valve and 2-way priority valve)



500075-30a

Notes

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2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

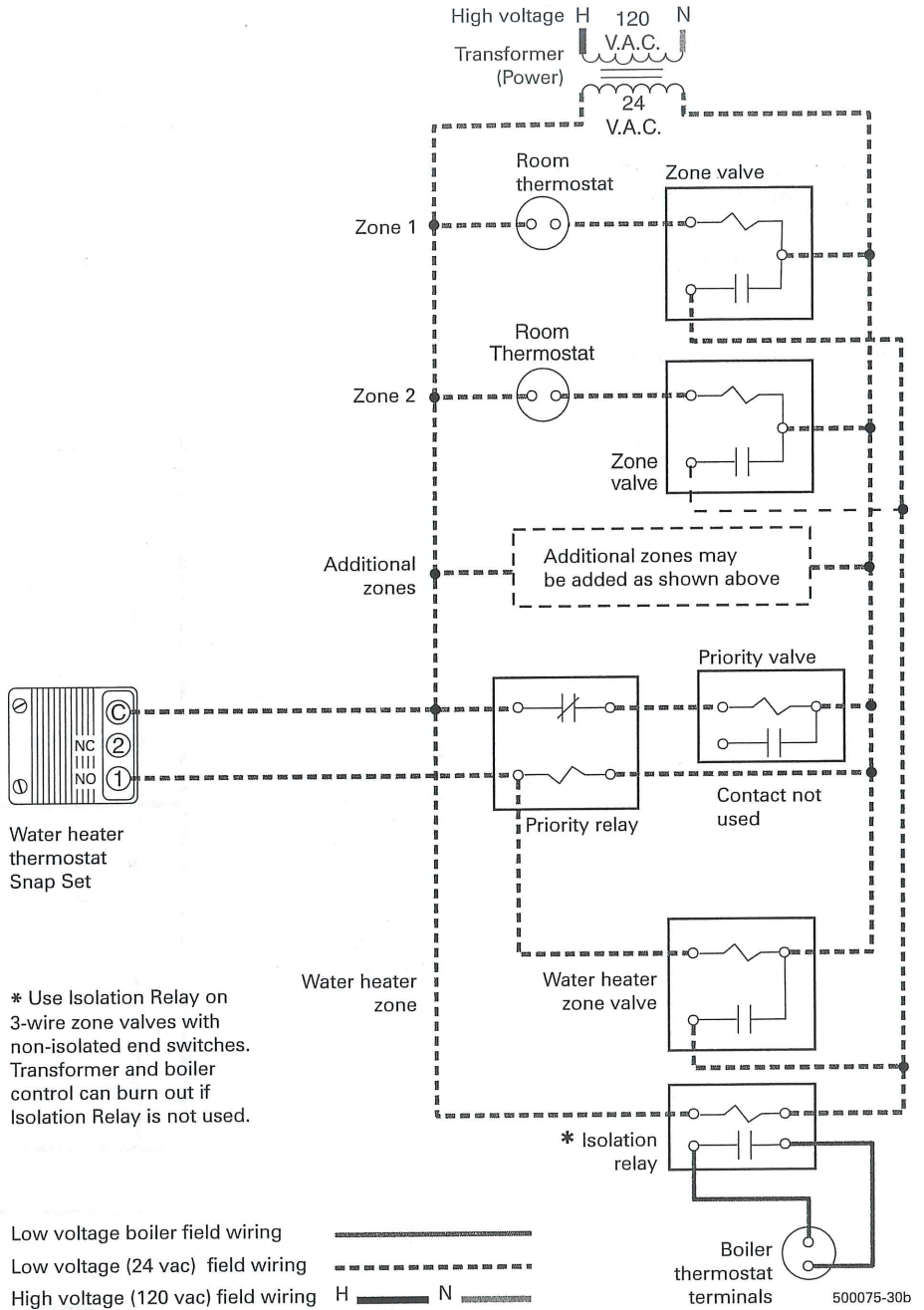
Figure 27

Typical wiring:

- Zoning with 3-wire zone valves
- Domestic priority with 2-way priority valve
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 9, page 18 (using 2-way water heater zone valve and 2-way priority valve)



Notes

1. These drawings are conceptual only. They show representative piping components and layout. Manufacturer does not represent that the drawings meet any particular mechanical or building codes. The installer is responsible for inclusion of all required safety devices, or other miscellaneous piping hardware not shown on drawings. The installer is responsible for proper sizing/selection of all hardware shown on this diagram.
2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

10 Wiring appendix continued

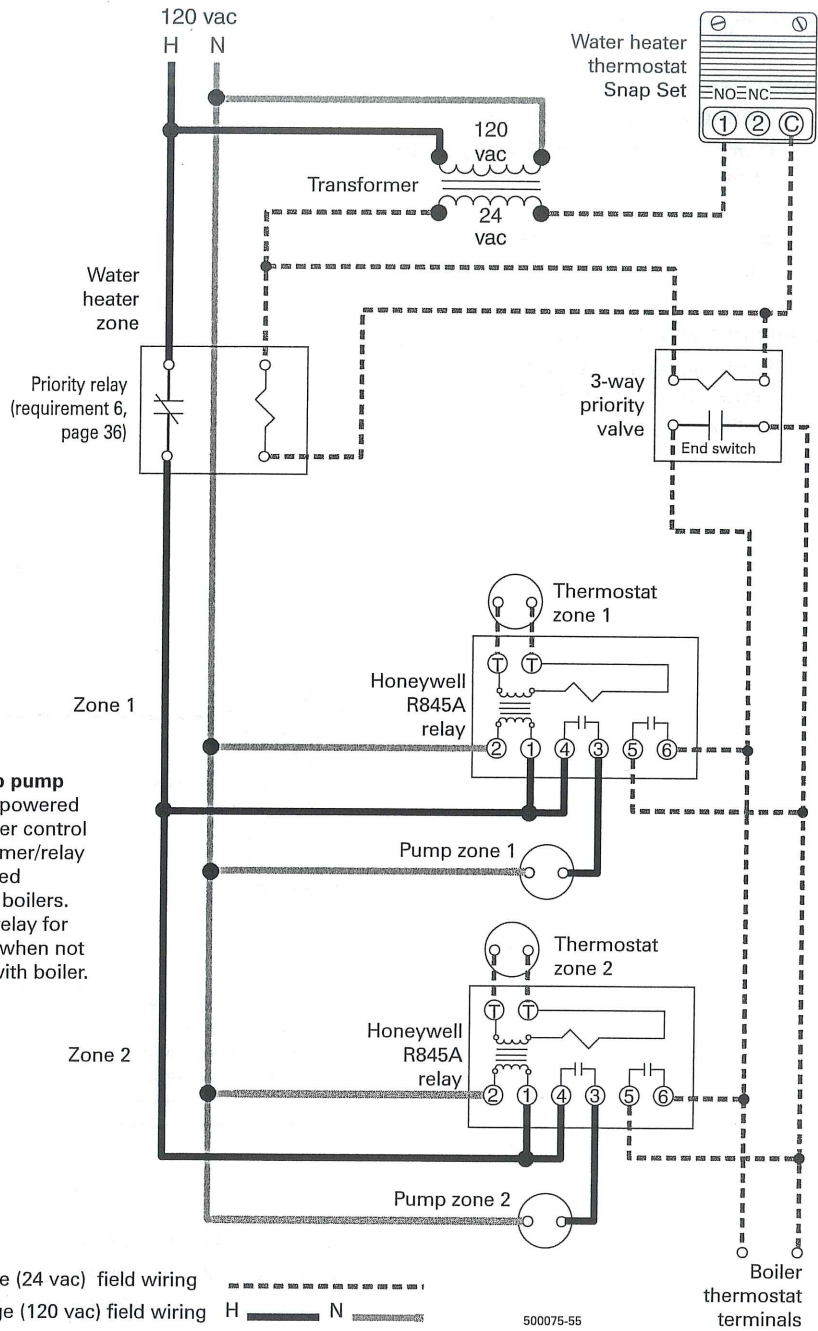
Figure 28

Typical wiring:

- Zoning with pumps
- Pump relays
- Domestic priority with 3-way priority valve and priority relay
- Refer to *Wiring requirements* on page 26.

Apply this wiring to systems in:

- Figure 10, page 19



NOTE -
Boiler loop pump should be powered by the boiler control or transformer/relay for packaged residential boilers. Provide a relay for this pump when not provided with boiler.

Notes

1. These drawings are conceptual only. They show representative piping components and layout. Manufacturer does not represent that the drawings meet any particular mechanical or building codes. The installer is responsible for inclusion of all required safety devices, or other miscellaneous piping hardware not shown on drawings. The installer is responsible for proper sizing/selection of all hardware shown on this diagram.
2. Follow component manufacturer's instructions for installation of all items shown.
3. See manufacturer's installation instructions for specific details on installing the boiler.

Manufacturer's Limited Warranty for DHW Indirect-Fired Water Heaters

◆ RESIDENTIAL HEATER WARRANTY—Limited Lifetime

NOTE: The residential warranty does not cover residential indirect-fired water heaters installed in buildings other than one or two family dwelling units, unless they are buildings with individual indirect-fired water heaters for each dwelling unit.

First Year (for Indirect-Fired Water Heaters):

Manufacturer warrants that its indirect-fired water heaters are free from defects in material and workmanship for one year from the date of installation. If any parts are found to be defective in manufacture, the manufacturer will provide replacement of such defective parts.

Second Year and Beyond (for Tank Assembly Only):

Manufacturer warrants that the tank assembly components of its indirect-fired water heaters are free from defects in material and workmanship for the second year from the date of installation and beyond. If, during such time periods, a leak in the tank assembly should occur, the manufacturer will provide replacement for the original tank assembly.

This warranty is subject to the condition that the indirect-fired water heater must have been installed by a heating contractor whose principal occupation is the sale and installation of plumbing, heating and/or air conditioning equipment.

These warranties do not cover:

1. Components that are part of the indirect-fired water heater system but were not furnished by the manufacturer as a part of the indirect water heater.
2. The workmanship of any installer of the manufacturer's indirect-fired water heater. In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation.
3. Any costs for labor for removal and installation of the alleged defective part, transportation to the manufacturer, if necessary, and any other materials necessary to perform the exchange.
4. Any indirect-fired water heater that does not have installed a new temperature-pressure relief valve bearing the listing of the American Society of Mechanical Engineers (A.S.M.E.) at the time of the water heater installation.

5. Any indirect-fired water heater that has a failure or malfunction resulting from improper or negligent operation, accident, abuse, freezing, misuse, unauthorized alteration or improper repair or maintenance.

6. Any indirect-fired water heater that has a failure or malfunction resulting from a) failure to keep the tank full of potable water; b) failure to assure that water in the tank is free to circulate at all times; or c) failure to keep the tank free of water sediment or scale deposits.

7. Any indirect-fired water heater that has potable water in the unit with a chloride or chlorine content higher than 80 mg/liter.

8. Any indirect-fired water heater that is installed in a residence containing any type of water softener system that is not installed and maintained in accordance with the manufacturer's specifications.

9. Any indirect-fired water heater installation where non-metallic piping products without an oxygen barrier are used.

10. Any indirect-fired water heater that is used for non-potable application such as pool or process heating.

This warranty extends only to the first retail purchaser of the indirect-fired water heater and only to an indirect-fired water heater that has not been moved from its original installation site.

THIS WARRANTY DESCRIBED ABOVE IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY. THE MANUFACTURER EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT OR PUNITIVE DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY.

For prompt product warranty claims, notify the installer who, in turn, will notify the distributor from whom he purchased the indirect-fired water heater. If this action does not result in warranty resolution, contact WT Manufacturing, 8201 West Calumet Road, Milwaukee, WI 53223, with details in support of the warranty claim. Alleged defective part or parts must be returned through trade channels in accordance with the manufacturer's procedure currently in force for handling returned goods for the purpose of inspection to determine cause of failure. The manufacturer will furnish new part(s) to an authorized distributor who, in turn will furnish the new part(s) to the heating contractor who installed the indirect-fired water heater. If you have any questions about the coverage of this warranty, contact the manufacturer at the address below.

W T Manufacturing
8201 West Calumet Road, Milwaukee, WI 53223
Phone: 1-800-736-BEST ○ Fax: 1-414-354-2623

Part No. 635-500-142(0402)