

To the Installer:

Please attach these instructions next to the water heater.

To the Consumer:

Please read these and all component instructions and keep for future reference.

Installation and Operation Instructions Manual



Commercial Electric Water Heater

Models: CE050, CE080, CE119



*Warranty, Registration Card and Parts List are included.
Owner: Please remember to return the Registration Card!*

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause serious injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer or service agency.

⚠ CAUTION

The recommended water temperature for normal residential use is 120°F/49°F. Outlet water temperatures may exceed the thermostat setting. Measure water temperature at the tap nearest to the water heater.

⚠ WARNING

Hotter water increases the risk of scald injury. Before adjusting the water temperature setting, read this instruction manual. Temperatures at which injury occurs vary with the person's age and the length of exposure.

The slower reaction time of children, elderly, and physically or mentally challenged persons increases the scalding hazard to them. It is recommended that lower water temperatures be used where these exposure hazards exist. Such households may require a temperature setting less than 120°F to prevent accidental contact with hot water.

To lower water temperature use point-of-use temperature limiting devices.

⚠ WARNING

Water heater blankets are not recommended and will void the warranty.

CAUTION

This water heater is not intended for space heating applications.

THIS MANUAL HAS BEEN PREPARED TO ACQUAINT YOU WITH THE INSTALLATION, OPERATION, AND MAINTENANCE OF YOUR WATER HEATER AND TO PROVIDE IMPORTANT SAFETY INFORMATION.

INSTALLER RESPONSIBILITIES

Please read all instructions thoroughly before installing or placing the heater into service. This unit must be installed by licensed or authorized installers, or technical personnel that service water heating equipment. The heater must be installed in accordance with all local codes and ordinances.

FAILURE TO FOLLOW THESE INSTRUCTIONS OR ALL APPLICABLE BUILDING CODES AND REGULATIONS VOIDS THE WARRANTY ON THIS WATER HEATER.

Local plumbing and electrical codes must be followed in the installation of this water heater. In the absence of a local code use the UNIFORM PLUMBING CODE and the National Electric Code, NFPA 70, or the Canadian Electrical Code CSA C22.1. Local codes may supersede instructions in this installation manual.

These instructions are a guide for the correct installation of the water heater. The manufacturer will not be liable for damages caused by failure to comply with the installation and operating instructions outlined on the following pages.

HANDLING

Before uncrating, check for shipping damage. Report any damage to your carrier. Note damage on bill of lading or delivery receipt and file a claim.

IMPORTANT SAFETY INSTRUCTIONS

The proper installation, use and servicing of this water heater is very important to your safety and the safety of others.

- ▲ This is the safety alert symbol. Statements following this symbol contain important safety information. Obey all safety messages that follow this symbol to avoid possible injury or death.

Important safety information will be preceded by the safety alert symbol and the words **DANGER, WARNING, CAUTION, OR NOTICE.**

- ▲ **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
- ▲ **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.
- ▲ **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE calls attention to observe a specified procedure.

SAVE THESE INSTRUCTIONS

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SECTION I: SPECIFICATIONS

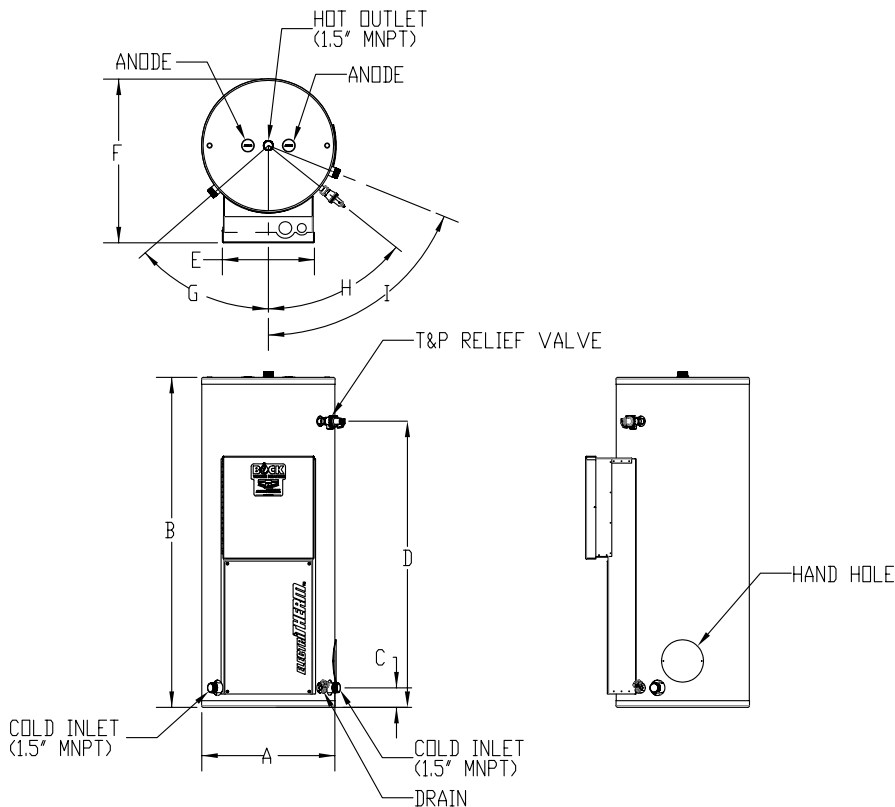


Figure 1: All Models

Table 1: Dimensions

Model	Number of Elements	Nominal Storage Capacity gallons (liters)	Actual Storage Capacity gallons (liters)	A inches (cm)	B inches (cm)	C inches (cm)	D inches (cm)	E inches (cm)	F inches (cm)	G degrees	H degrees	I degrees	Shipping Weight lbs (kg)
CE050-*#	based on input - see Table 3	50 (189)	46 (174)	24.00 (61)	49.70 (126)	3.54 (9)	41.91 (106)	17.84 (45)	29.89 (76)	58	57	92	273 (124)
CE080-*#		80 (303)	76 (288)	26.00 (66)	64.50 (164)	3.81 (10)	55.94 (142)	17.84 (45)	32.00 (81)	54	53	72	395 (179)
CE119-*#		119 (450)	108 (409)	30.00 (76)	64.82 (165)	3.79 (10)	55.91 (142)	17.84 (45)	36.80 (93)	50	41	57	521 (236)

* - denotes input (kW) with a number (1-9), see Input Designations table
- denotes voltage (V) with a letter (A-D), see Voltage Designations table

Input Designations

Number	Input (kW)								
	13.5	15.0	18.0	24.0	27.0	30.0	36.0	45.0	54.0
1	2	3	4	5	6	7	8	9	

Voltage Designations

Letter	Voltage (V)			
	208	240	277	480
A	B	C	D	

Table 2: Approved Elements

Approved Element Ratings				
Input Rating (kW)	Voltage Rating (V)			
	208	240	277	480
4.0	x	x	x	x
4.5	x	x	x	x
5.0	x	x	x	x
6.0	x	x	x	x

CAUTION

Heating elements with input and voltage rating combinations that are not listed in Table 2 shall not be used with this water heater. All heating elements in this water heater must contain the same ratings.

SECTION I: SPECIFICATIONS (cont.)

Table 3: Recovery Capacities

Input (kW)	Input (BTU/hr)	Number of Elements	Element Wattage (kW)	Recovery (GPH & LPH) at Temperature Rise (°F & °C)															
				°F	40	50	60	70	80	90	100	110	120	130	140				
				°C	22.2	27.8	33.3	38.9	44.4	50.0	55.6	61.1	66.7	72.2	77.8				
13.5	46,062	3	4.5	GPH	135	108	90	77	68	60	54	49	45	42	39				
				LPH	513	410	342	293	256	228	205	186	171	158	147				
15.0	51,180	3	5.0	GPH	151	120	100	86	75	67	60	55	50	46	43				
				LPH	570	456	380	326	285	253	228	207	190	175	163				
18.0	61,416	3	6.0	GPH	181	145	120	103	90	80	72	66	60	56	52				
				LPH	684	547	456	391	342	304	274	249	228	210	195				
24.0	81,888	6	4.0	GPH	241	193	161	138	120	107	96	88	80	74	69				
				LPH	912	729	608	521	456	405	365	332	304	281	260				
27.0	92,124	6	4.5	GPH	271	217	181	155	135	120	108	99	90	83	77				
				LPH	1026	821	684	586	513	456	410	373	342	316	293				
30.0	102,360	6	5.0	GPH	301	241	201	172	151	134	120	109	100	93	86				
				LPH	1140	912	760	651	570	507	456	414	380	351	326				
36.0	122,832	9	4.0	GPH	361	289	241	206	181	161	145	131	120	111	103				
				LPH	1368	1094	912	781	684	608	547	497	456	421	391				
45.0	153,540	9	5.0	GPH	452	361	301	258	226	201	181	164	151	139	129				
				LPH	1709	1368	1140	977	855	760	684	622	570	526	488				
54.0	184,248	9	6.0	GPH	542	434	361	310	271	241	217	197	181	167	155				
				LPH	2051	1641	1368	1172	1026	912	821	746	684	631	586				

SECTION II: GENERAL INFORMATION

OVERVIEW

This manual covers three, six, and nine element commercial electric water heaters. All models are wired for connection to a three phase delta branch circuit and contain factory supplied internal fusing. Please reference the installation section of this manual for single phase applications. All models are UL listed to UL 143 and CAN/CSA C22 No. 11094.

WATER TREATMENT & FILTRATION

In areas where poor water conditions are suspected (i.e. lime, iron, and other minerals), it is essential that the water be tested and appropriate action taken to prevent damage to the water heater and ensure the quality of the water.

TEMPERATURE CONTROL

All models are equipped with a digital temperature control that is programmed with a setpoint range from 100°F - 182°F and a fixed, manual reset high limit set at 200°F. Operating differentials (subtractive) are 8°F for the setpoint and 10°F for the high limit. The temperature control monitors tank temperature by means of two thermistors located in a single immersion well, which is located slightly above the highest heating element. Each thermistor is connected to the back of the temperature control board. The setpoint is factory set to 120°F to reduce the risk of scald injury.

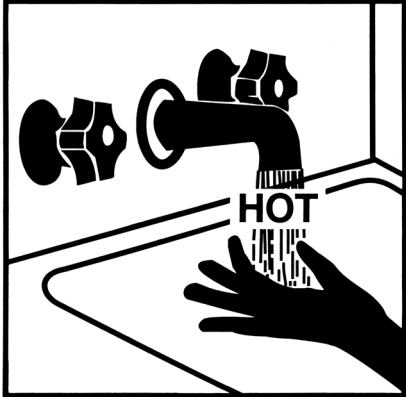
⚠ CAUTION: Hot water in excess of 120°F can cause scalding!

Bock recommends a thermostatic mixing valve be installed and used according to the manufacturer’s directions to prevent scalding. Many state and local codes now require installation of these devices. Point of use temperature may be hotter than the setting on the water heater thermostat. The mixing valve will ensure potable water temperatures at the desired set point with a higher degree of accuracy.

Table 4: Scald Temperature/Time Relationships

APPROXIMATE TEMPERATURE/TIME RELATIONSHIPS TO SCALDING	
120°F	More than 5 minutes
125°F	1 ½ to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 ½ seconds
155°F	About 1 second

⚠ DANGER



Water temperature over 125°F can cause severe burns instantly or death from scalds.

Children, disabled and elderly are at highest risk of being scalded.

See instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

SECTION II: GENERAL INFORMATION (cont.)

ANODE RODS

The anode rods are used as sacrificial elements within the volume of the storage tank. The purpose of the rods is to protect the inside of the tank against corrosion. Anode rods should be inspected twice in the first year and at least yearly once a time interval for inspection has been developed. Water conditions will influence the consumption rate of the anode rods. Please see the Maintenance section of this manual for instructions on how to change the anode rods in your water heater.

⚠ CAUTION

Hydrogen gas is produced in a hot water system served by the heater that has not been used for a long period of time (2 weeks or more). Hydrogen gas is extremely flammable. To reduce the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. When hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. There should be no smoking or open flame near the faucet at the time it is open.

TEMPERATURE AND PRESSURE RELIEF VALVE (T&P)

⚠ CAUTION

To reduce the risk of excessive pressures and temperatures in this water heater, install temperature and pressure protective equipment required by local codes and 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 set pressure not to exceed the marked maximum working pressure of the water heater. Install the valve in an opening provided and marked for this purpose in the water heater, and orient it or provide tubing so that any discharge from the valve exits only within 6 inches above, or at any distance below, the structural floor, and does not contact any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances.

The T&P valve is factory installed. A discharge drain tube must be installed (responsibility of the installer) and shall terminate plain, not threaded, 6 inches above the floor drain. The drain tube material must be approved for temperatures of 120°F or greater and a pressure of 150 PSI or greater.

BACKFLOW PREVENTER (CLOSED LOOP SYSTEM)

Some local municipal codes and ordinances require the use of these devices on potable (domestic) water lines. Where backflow preventers are required, it will be necessary to install a **thermal expansion tank** (designed for use with potable water) in order to prevent pressure build up in the water heater and associated piping, which could cause the T&P valve to discharge. Follow the expansion tank manufacturer's recommendations when selecting a tank for your hot water system.

Note: Working pressure of the water heater is 150 PSI. Do not exceed 150 PSI.

SECTION III: PRE-INSTALLATION

LOCATION

⚠ CAUTION

This water heater must be located in an area where leakage of the tank, water line connections, or the temperature and pressure relief valve will not result in damage to the area adjacent to the water heater or to lower floors of the structure. When such location cannot be avoided, a suitable drain pan must be installed under the water heater. The drain pan depth must be suitable for draining and collecting water. The drain pan can be purchased from your plumbing professional. The drain pan must be piped to an adequate drain and all drain piping must be at least 0.75" in diameter and pitched for proper drainage.

⚠ CAUTION

DO NOT store or use gasoline or other flammable, combustible, or corrosive vapors and/or liquids in the vicinity of the water heater or any other appliance.

IF YOU SMELL GAS:

- DO NOT try to light any appliance.
- DO NOT touch any electric switch; do not use any telephone in your building.
- Immediately call your gas supplier from a telephone in another building. Follow your gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

DO NOT OPERATE THE APPLIANCE UNTIL THE LEAKAGE IS CORRECTED!

⚠ CAUTION

Do not drop water heater or lay heater down on its side. Move the water heater into position by sliding or using an appropriately sized hand truck.

The water heater must be installed indoors. Locate the water heater as close as practical to the water piping system and leave sufficient clearances for servicing the heater. This water heater may be installed on combustible flooring. DO NOT install this water heater on carpeting.

See Tables 5 and 6 for combustible and service clearances.

Table 5: Clearance from Combustible Materials

Top	Sides	Front	Rear
0"	0"	0"	0"

Table 6: Recommended Service Clearances

Top	Sides (non-piping)	Side (T&P Relief Valve)	Front	Rear
36"	4"	8"	24"	0"

SECTION IV: INSTALLATION

WATER CONNECTIONS

CAUTION

This water heater incorporates fittings that contain a nonmetallic lining. **DO NOT** apply heat to these fittings when making sweat connections to the heater. Sweat tubing to an adapter before securing adapter to any fittings on water heaters.

ALL PIPING SHOULD CONFORM TO LOCAL CODES AND ORDINANCES. It is highly recommended that unions and shut-off valves are installed at the potable water connections to allow for isolation and/or movement during service. In addition, all piping should be adequately insulated with an approved material to minimize heat loss.

CAUTION

THE WATER HEATER MUST BE FILLED WITH WATER BEFORE CONNECTING ELECTRIC POWER.

- 1) Close the main water supply valve before continuing with the installation. After the main water supply is shut-off, relieve the water line pressure by opening a faucet. Once the pressure has been relieved, close the faucet. The “Cold” and “Hot” potable water connections are labeled on the water heater.
- 2) Install a union and shut-off valve on both the cold and hot water sides of the water heater.
- 3) If a backflow preventer is required in the cold water supply, a properly sized expansion tank must be installed to control thermal expansion. Do not operate the water heater in a closed system without installing a thermal expansion tank. Follow the expansion tank manufacturer’s recommendations when selecting a tank for your system.
- 4) Following installation of the water lines, open the main water supply valve and fill the water heater. Open several hot water faucets to relieve air from the system. After water is flowing through the faucets and the system is void of air, close the faucets and check for water leaks in the system.
- 5) Finally, before connecting electric power, remove the element access cover and check for leaks around all heating elements and plugs (as applicable). Remove the insulation in order to view the heating elements. All insulation must be repositioned to its original location upon completion.

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

Piping connections for all models are shown in Figures 2.

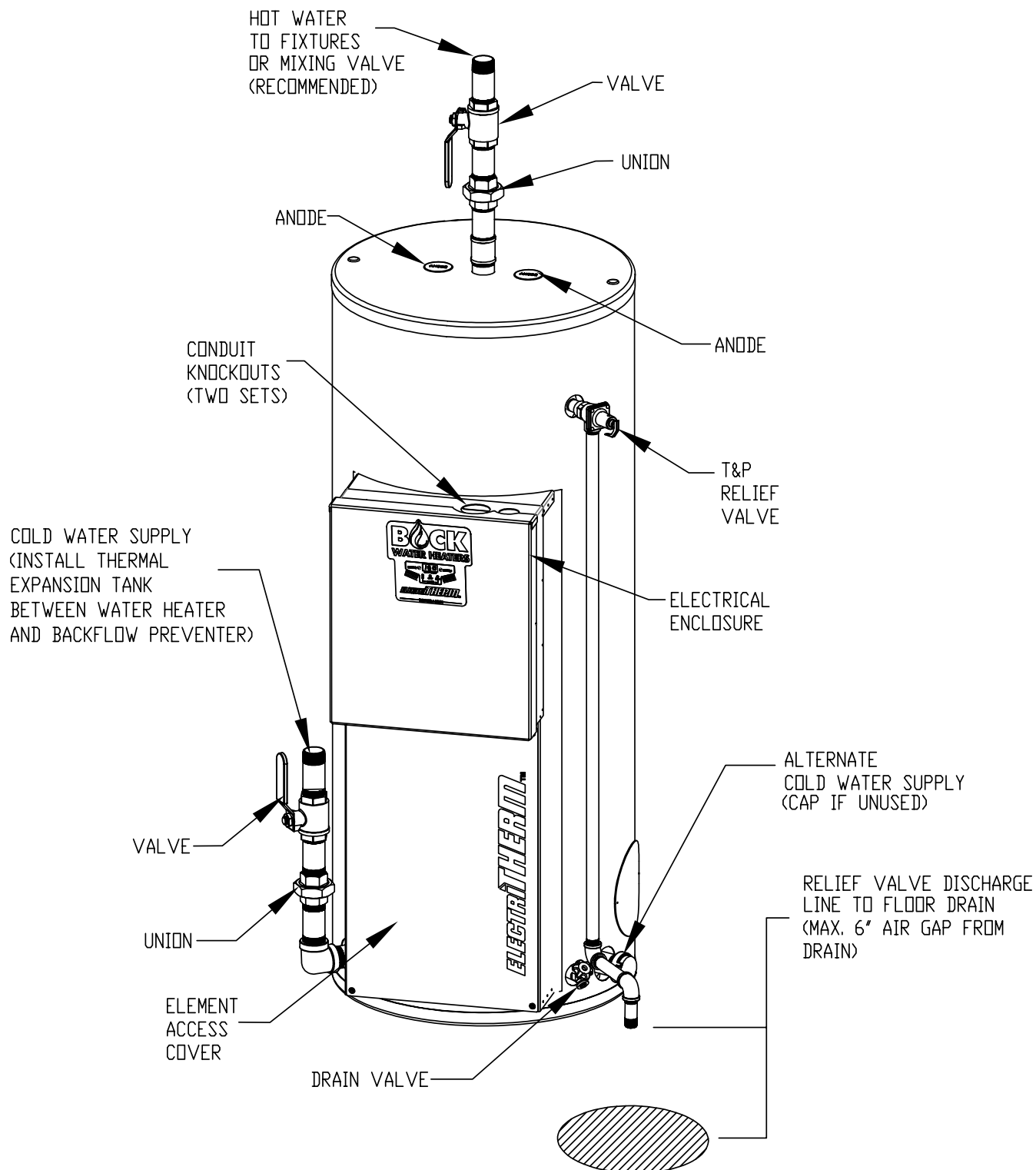


Figure 2: Piping Connections

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

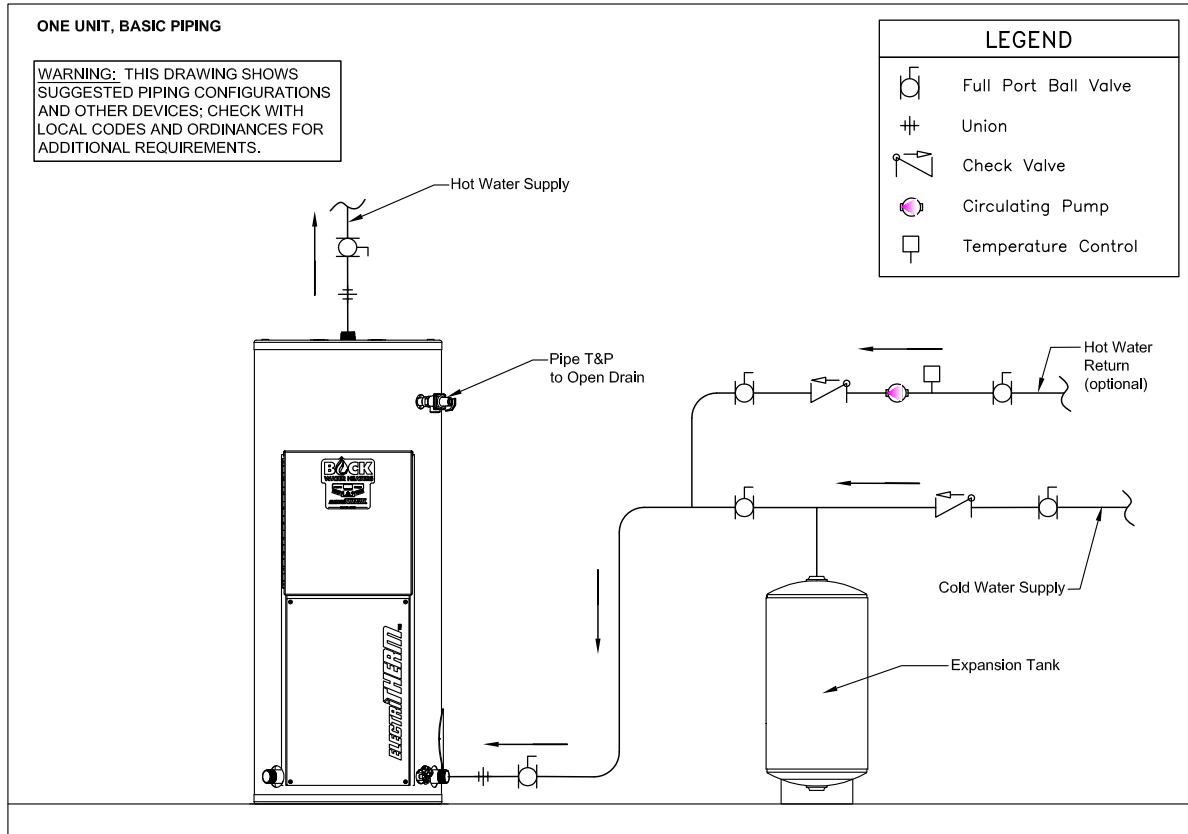


Figure 3: One Unit

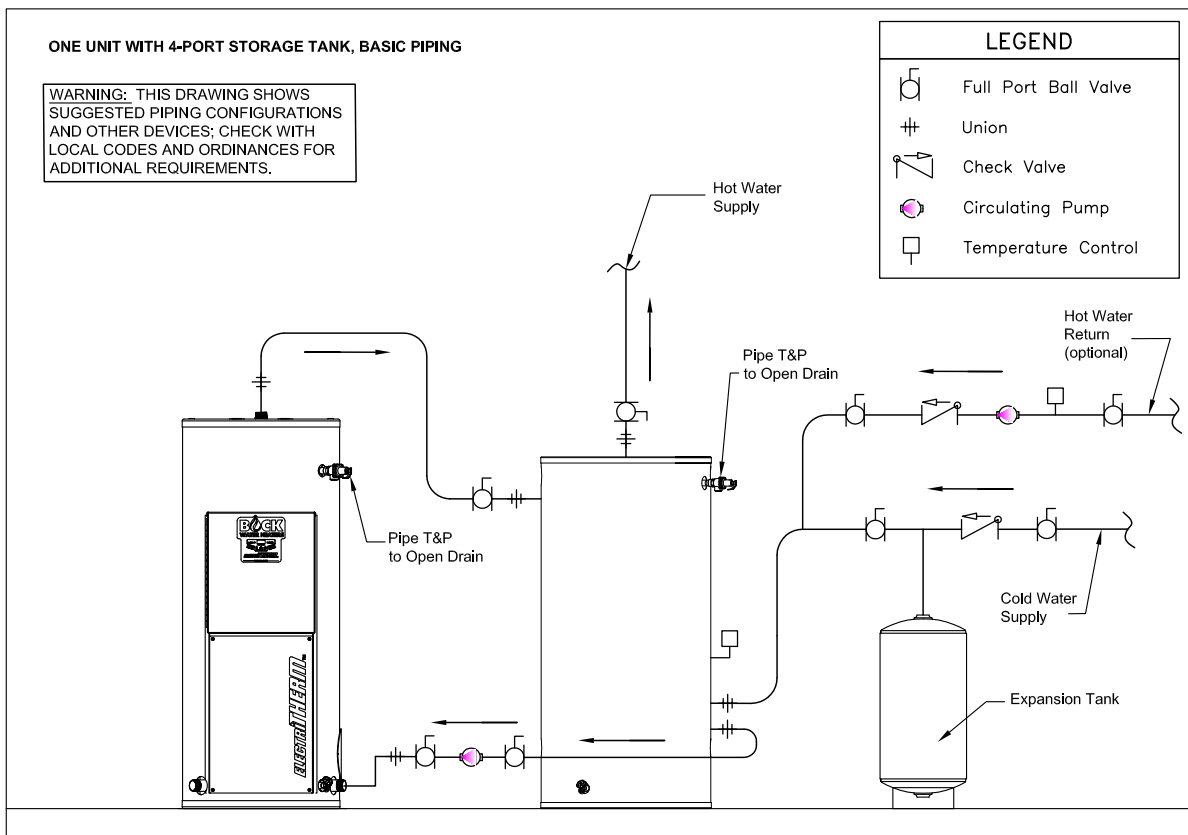


Figure 4: One Unit with 4-port Storage Tank

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

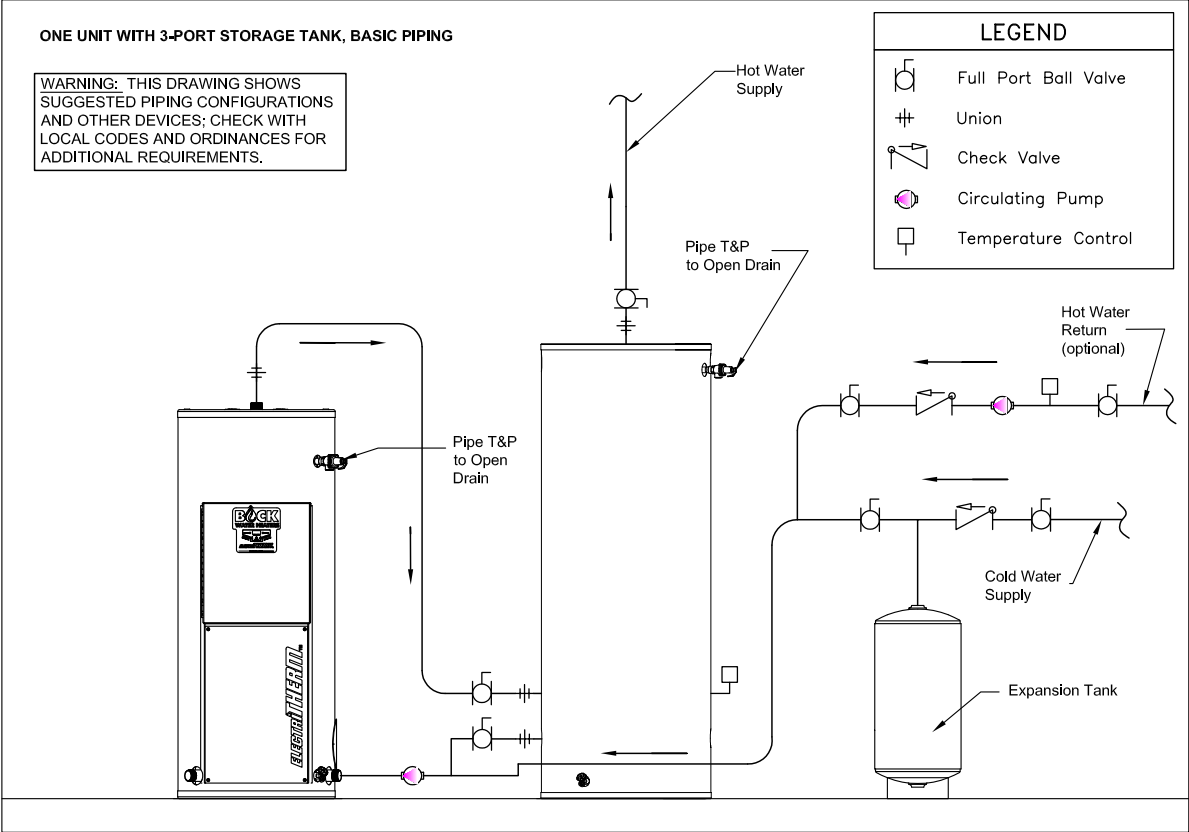


Figure 5: One Unit with 3-port Storage Tank

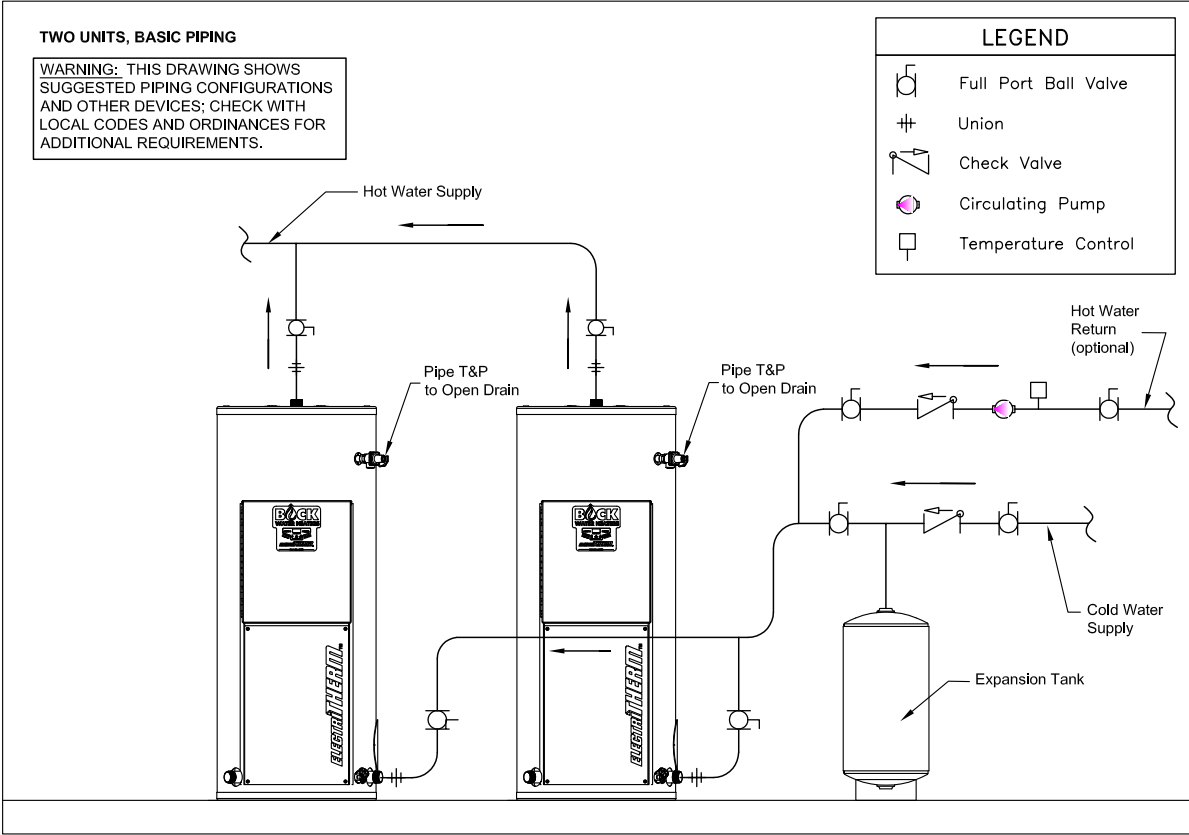


Figure 6: Two Units

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

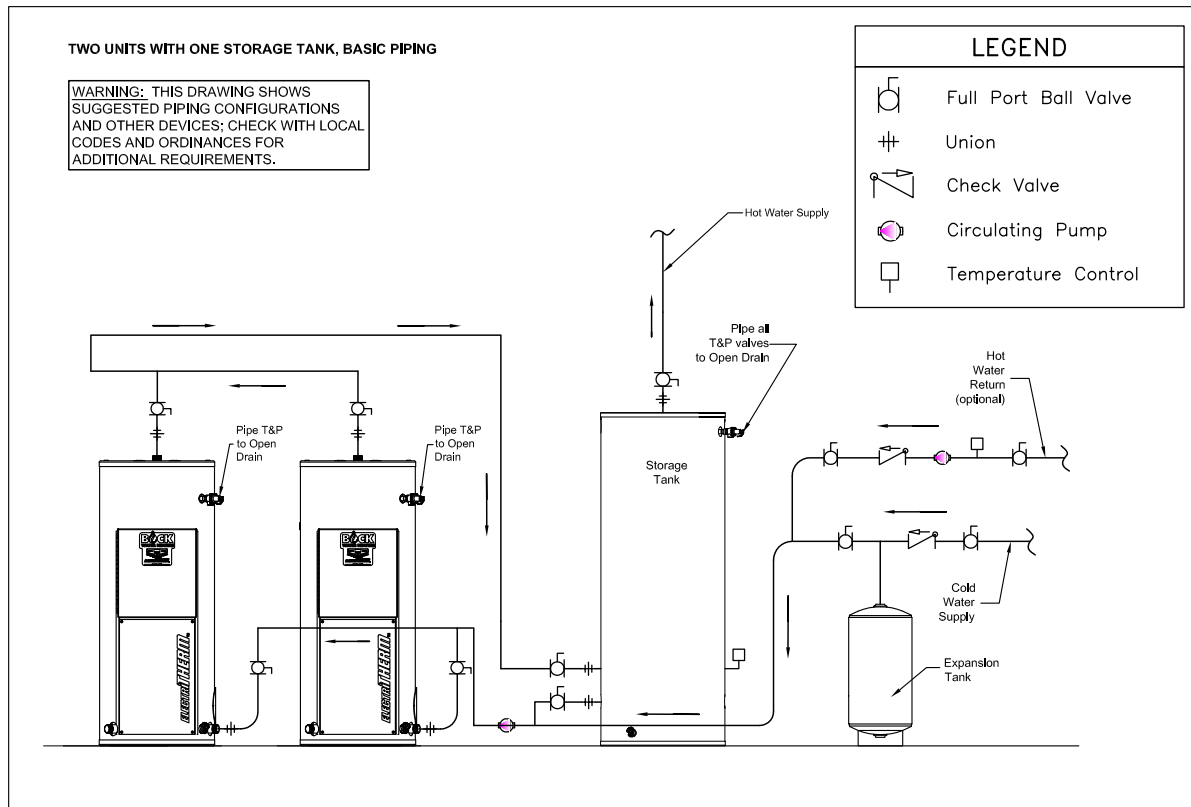


Figure 7: Two Units with 3-port Storage Tank

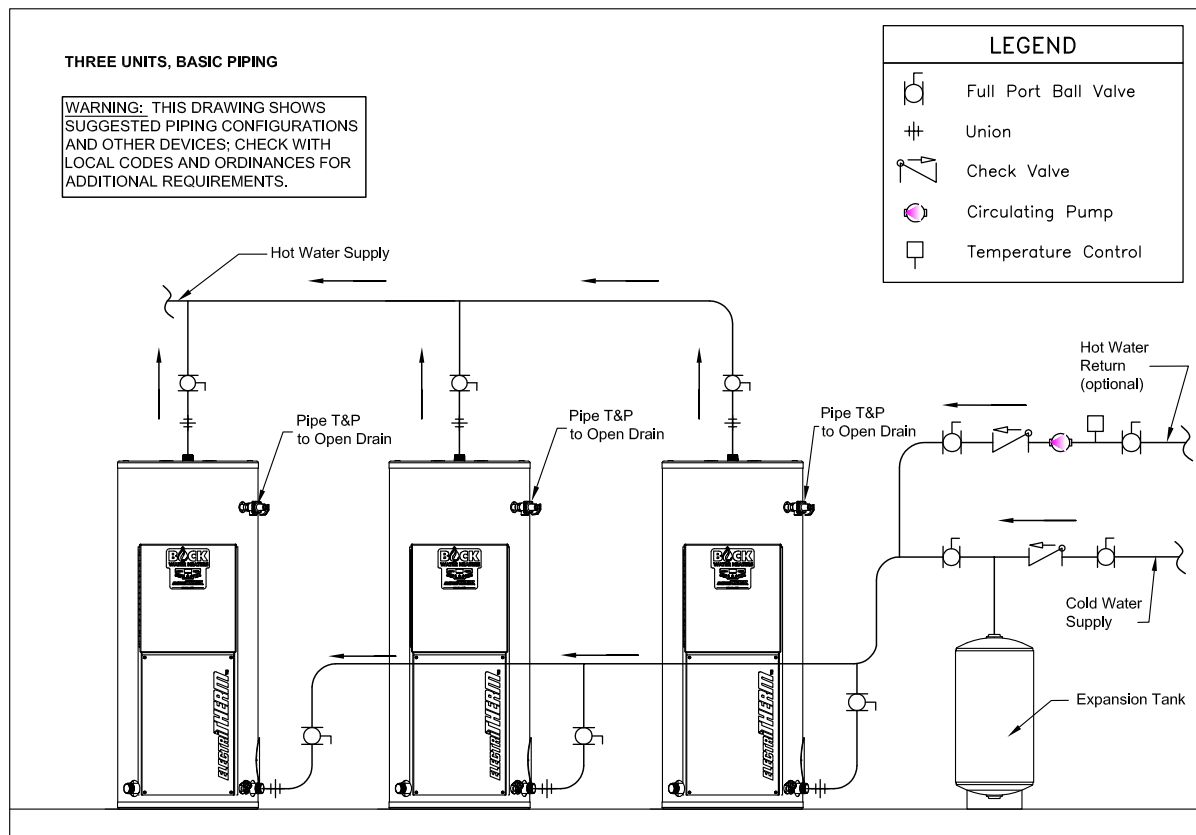


Figure 8: Three Units

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

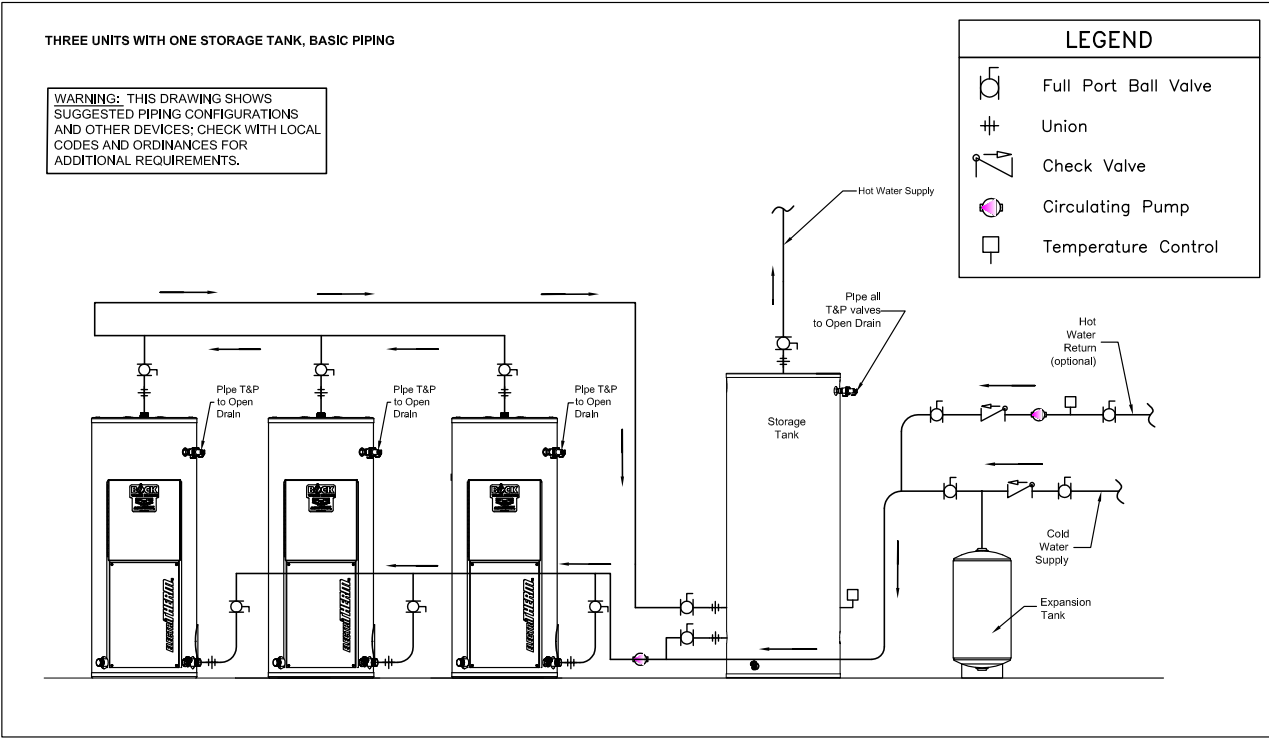


Figure 9: Three Units with 3-port Storage Tank

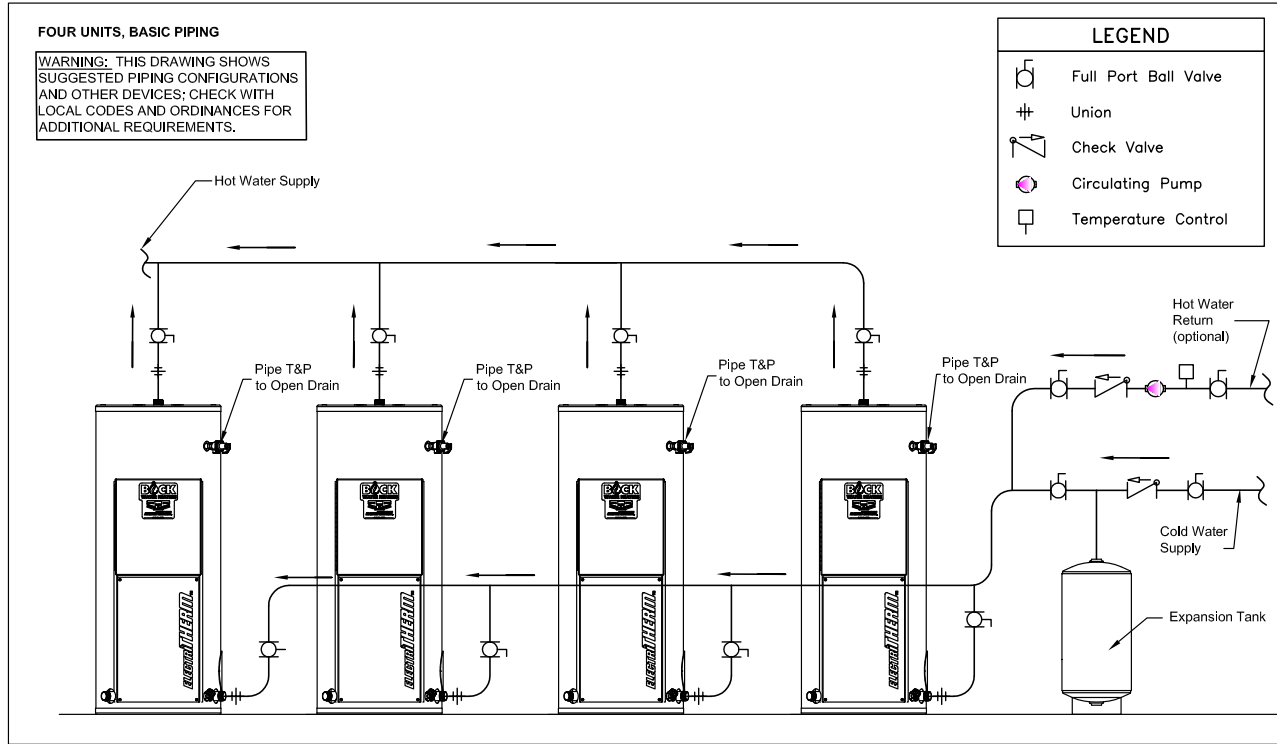


Figure 10: Four Units

SECTION IV: INSTALLATION (cont.)

PIPING DIAGRAMS

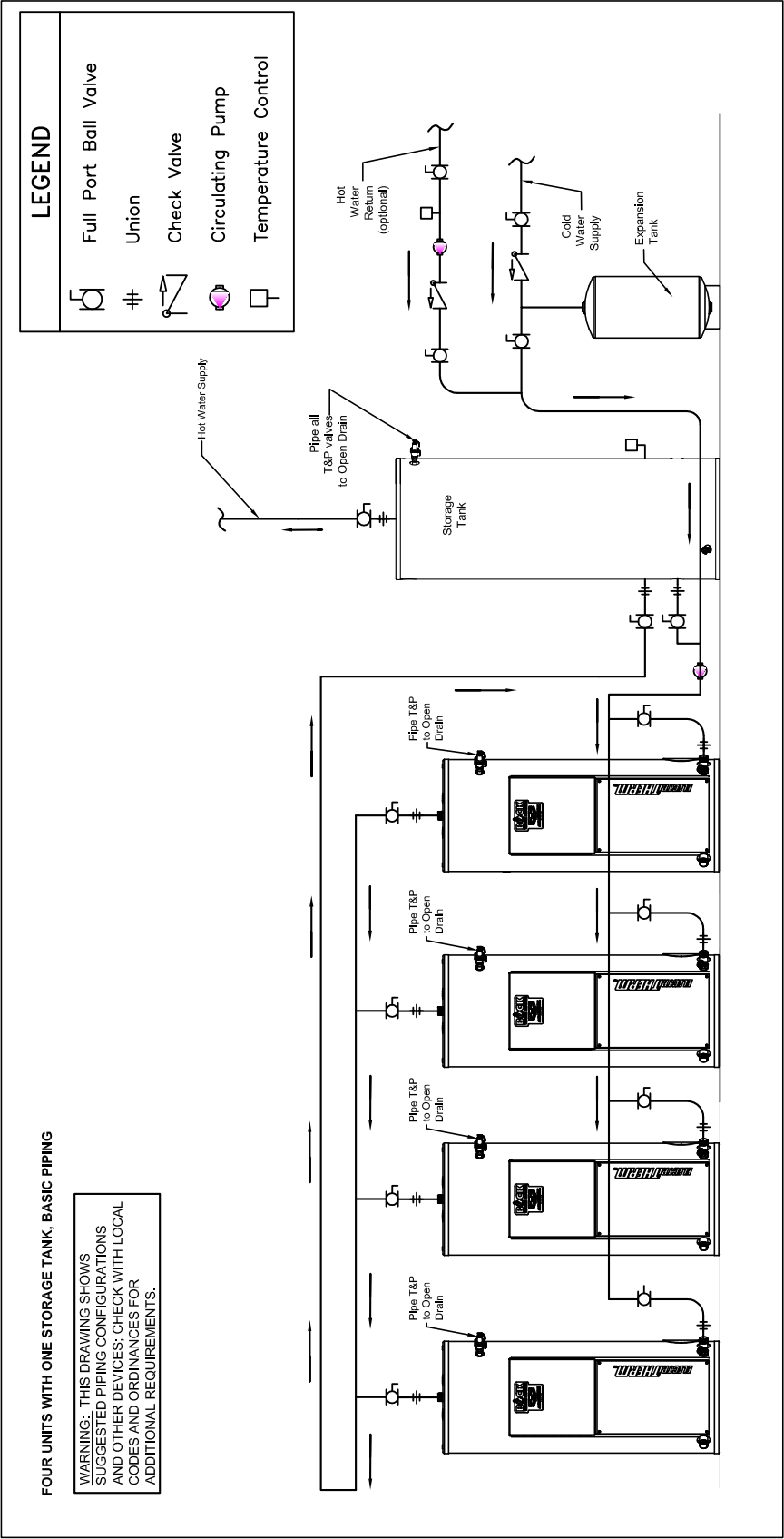


Figure 11: Four Units with 3-port Storage Tank

SECTION IV: INSTALLATION (cont.)

ELECTRICAL CONNECTIONS

DANGER

Confirm that all electrical connections are unpowered before installing or servicing electrical components/connections within the water heater.

WARNING

The water heater must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electric Code, NFPA 70, or the Canadian Electrical Code, CSA C22.1.

Failure to properly wire electrical connections may result in serious physical harm.

THE WATER HEATER MUST BE FILLED WITH WATER BEFORE CONNECTING ELECTRIC POWER.

All electrical connections on the water heater must be made with copper conductors only. A separate branch circuit with copper conductors, overcurrent protection, and means for disconnection must be provided by qualified service personnel. The total wattage load and voltage requirements for the water heater are specified on the rating label located on the front of the heater.

The terminal block, internal fusing, contactors, heating elements, and control circuit are pre-wired at the factory. The electrical enclosure accommodates 1/2" - 2" trade size electrical conduit connectors. Factory wiring connections may loosen during shipment. Inspect for loose wires prior to turning on the power supply.

See Figure 12-14 for factory wiring diagrams. Converting from three to single phase may be done in the field by a qualified service agency. Element conversion (i.e. changing voltage and wattage) must be done with a UL listed, factory supplied, conversion kit. Contact Bock Water Heaters for ordering information.

GROUNDING INSTRUCTIONS

A grounding lug is located adjacent to the power supply terminal block. Please refer to Figure 12-14 for wiring diagrams.

BRANCH CIRCUIT SIZING AND WIRE SIZE

The branch circuit must conform to local code requirements. In the absence of local codes, compliance to the current editions of the National Electric Code (NFPA 70) or the Canadian Electrical Code (CSA C22.1) is required. Table 7 provides full load current and recommended overcurrent protection for every voltage, wattage, and phase combination.

CONVERTING TO SINGLE PHASE

Models are factory wired for operation on a three phase circuit. If operation on a single phase circuit is required, the conversion shall be performed by a qualified installer or service agency. Prior to connecting electric power, open the enclosure door and locate the power supply terminal block. Move the blue wires from L3 to L1 (red wires) and the yellow wires from L3 to L2 (black wires). Refer to the wiring diagrams on the following pages or on the inside of the enclosure door. 208V/54kW models shall not be converted to single phase.

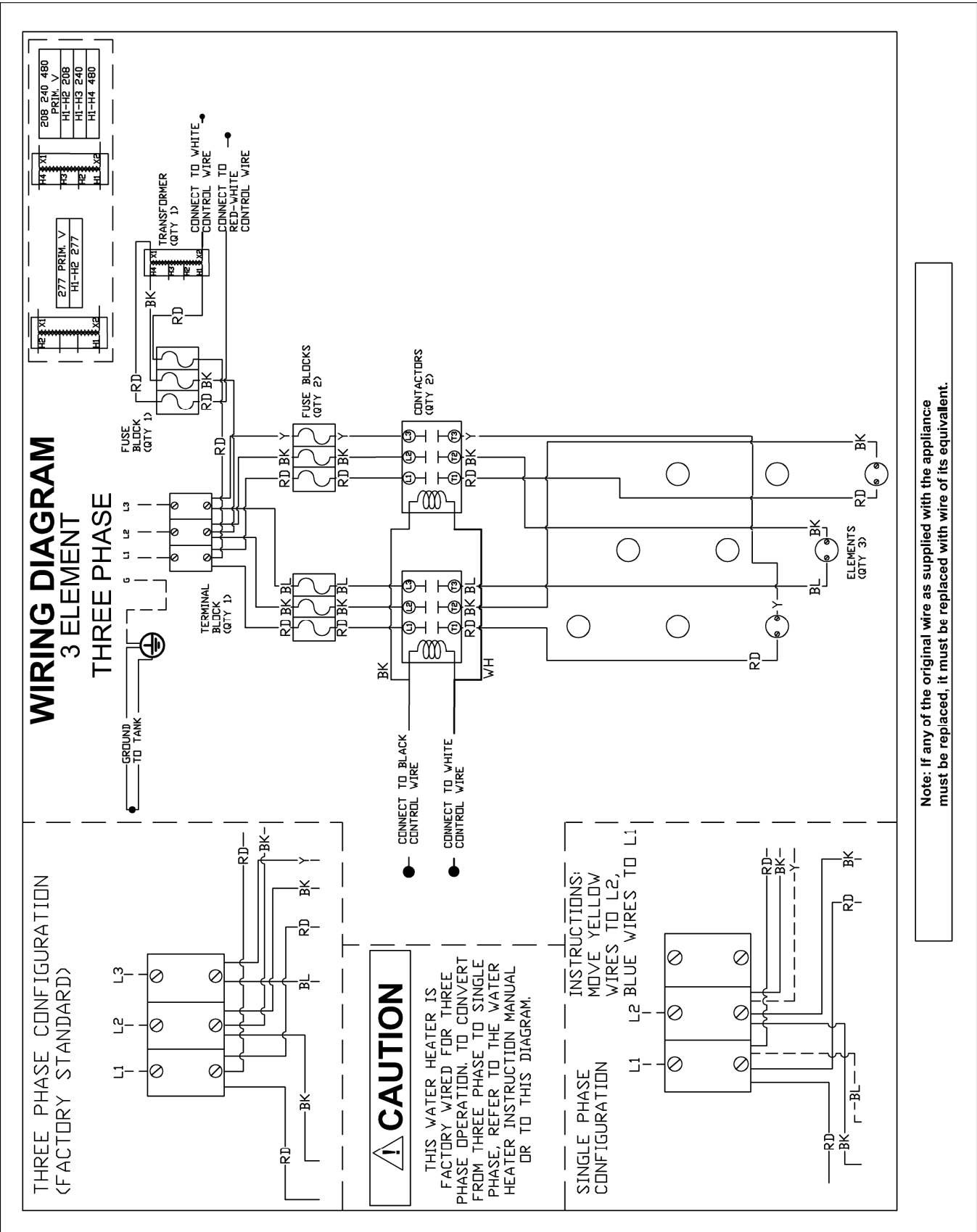
NOTICE: If the unit was converted for operation on a single phase circuit, it must be noted on the lower right corner of the rating label.

SECTION IV: INSTALLATION (cont.)

Table 7: Full Load Current and Overcurrent Protection

			kW	13.5	15.0	18.0	24.0	27.0	30.0	36.0	45.0	54.0
			# of elements	3	3	3	6	6	6	9	9	9
			Element Wattage	4.5	5.0	6.0	4.0	4.5	5.0	4.0	5.0	6.0
208 V	1 ϕ	Full Load Current (Amps)		64.9	72.1	86.5	115.4	129.8	144.2	173.0	216.3	n/a
		Recommended Overcurrent Protection Rating (Amps)		90	100	110	150	175	200	225	300	n/a
	3 ϕ	Full Load Current (Amps)		37.5	41.6	50.0	66.7	75.0	83.3	100.0	125.0	150.0
		Recommended Overcurrent Protection Rating (Amps)		50	60	70	90	100	110	125	175	200
240 V	1 ϕ	Full Load Current (Amps)		56.2	62.5	75.0	100.0	112.5	125.0	150.0	187.5	225.0
		Recommended Overcurrent Protection Rating (Amps)		80	80	100	125	150	175	200	250	300
	3 ϕ	Full Load Current (Amps)		32.5	36.1	43.4	57.8	65.0	72.2	86.7	108.3	130.0
		Recommended Overcurrent Protection Rating (Amps)		45	50	60	80	90	100	110	150	175
277 V	1 ϕ	Full Load Current (Amps)		48.7	54.1	64.0	86.6	97.4	108.3	129.9	162.4	194.9
		Recommended Overcurrent Protection Rating (Amps)		70	70	80	110	125	150	175	225	250
480 V	1 ϕ	Full Load Current (Amps)		28.1	31.2	37.5	50.0	56.2	62.5	75.0	93.7	112.5
		Recommended Overcurrent Protection Rating (Amps)		40	40	50	70	80	80	100	125	150
	3 ϕ	Full Load Current (Amps)		16.2	18.0	21.6	28.9	32.5	36.1	43.3	54.1	65.0
		Recommended Overcurrent Protection Rating (Amps)		25	25	30	40	45	50	60	70	90

SECTION IV: INSTALLATION (cont.)



SECTION IV: INSTALLATION (cont.)

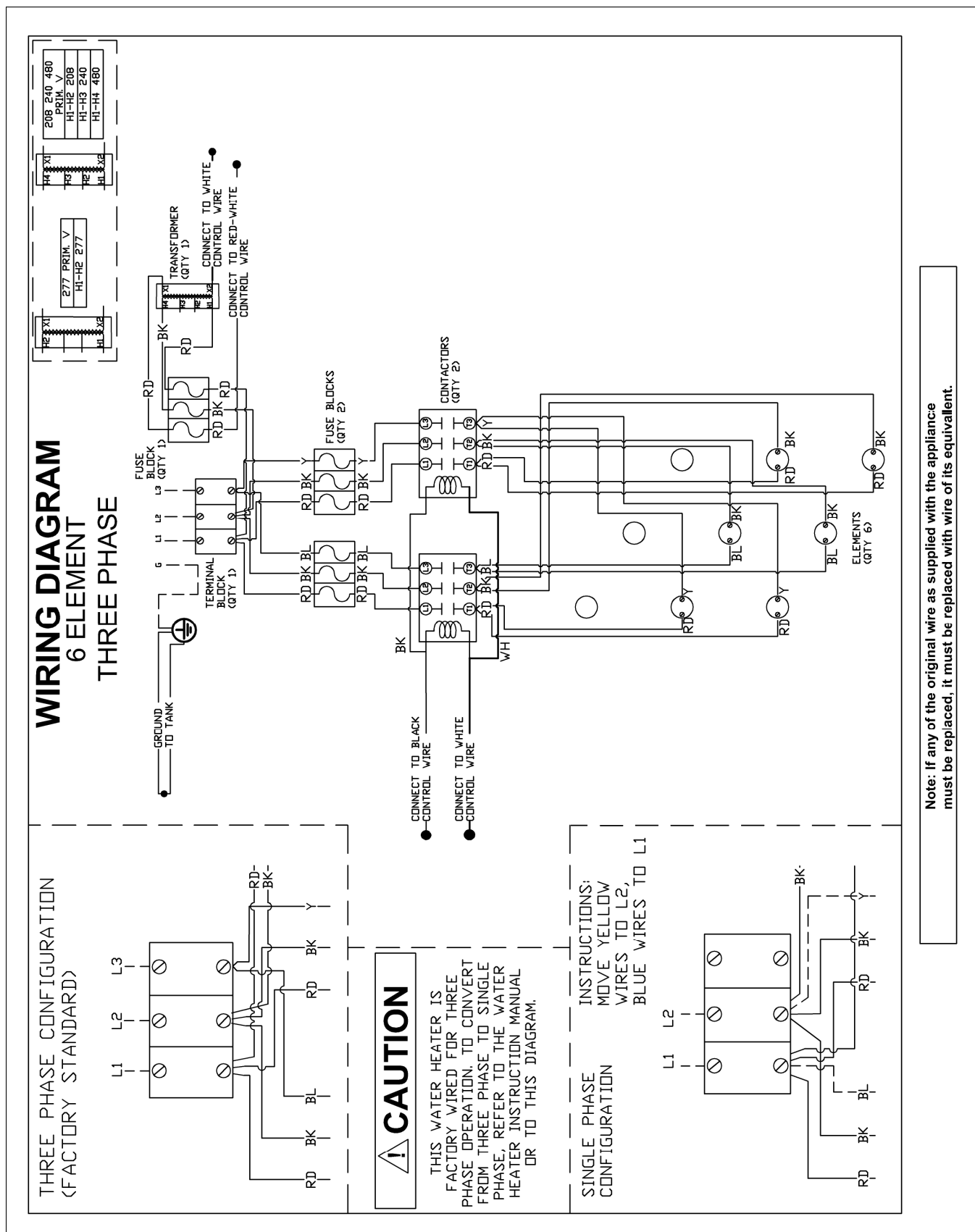


Figure 13: Wiring Diagram for 6 Element Model

SECTION IV: INSTALLATION (cont.)

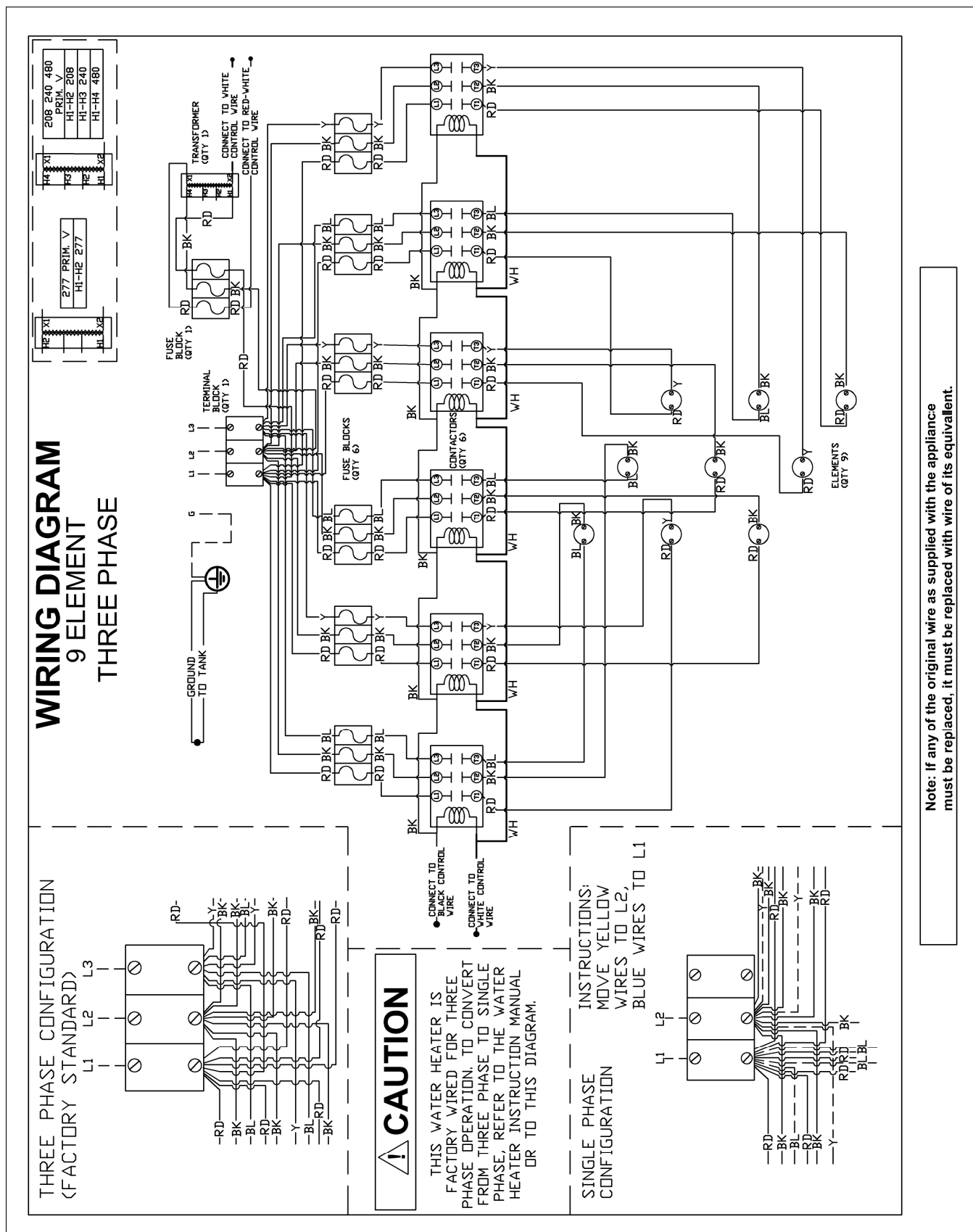


Figure 14: Wiring Diagram for 9 Element Model

SECTION V: OPERATION

CAUTION

THE WATER HEATER MUST BE FILLED WITH WATER BEFORE CONNECTING ELECTRIC POWER.

When the branch circuit disconnect switch is closed and electric power is applied to the water heater, the operation of the water heater will be automatic. The temperature control is factory set to 120°F.

OPERATING THE TEMPERATURE CONTROL

The digital temperature control contains a display, diagnostic LED's and three buttons. Refer to the Troubleshooting section for LED codes and detailed explanations of operation modes.

The default display mode will show the setpoint temperature. To display the sensor temperature or change the setpoint, refer to the Figure 15.

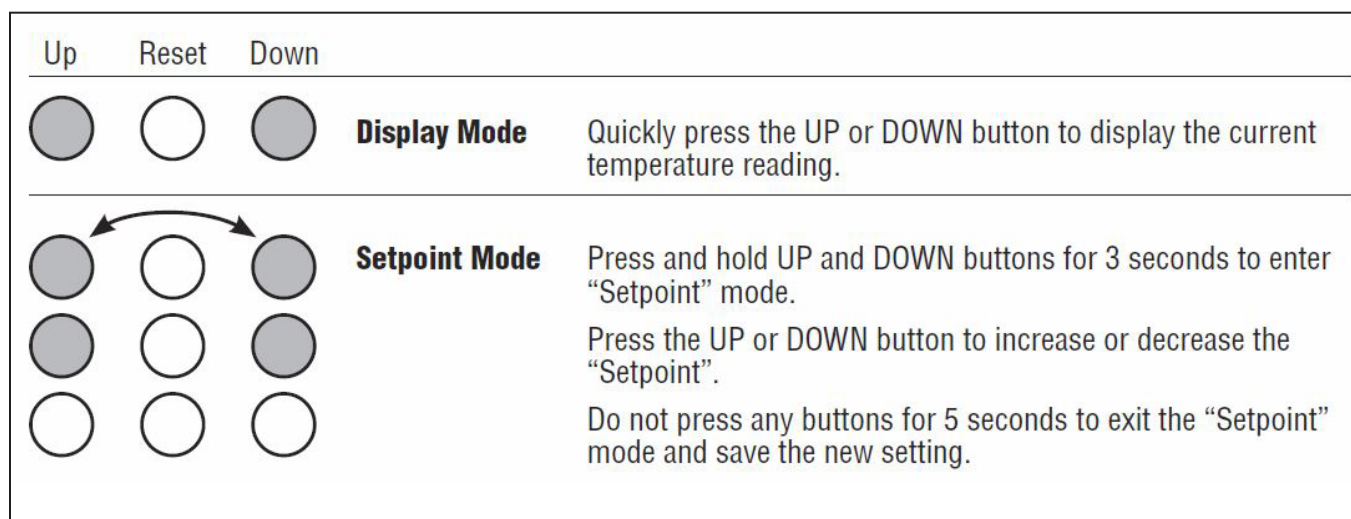


Figure 15: Adjusting the Temperature Control

CAUTION

Hot water in excess of 120°F can cause scalding! The temperature at which injury occurs varies with the person's age and the time of exposure. The slower response time of disabled persons increases the hazards to them. NEVER allow small children to use a hot water tap. NEVER leave a child or disabled person unattended in a bathtub or shower.

SECTION VI: MAINTENANCE

NOTICE TO THE OWNER: If you are having a problem with your water heater, contact your service company or installer.

WATER PIPING

On an annual basis, all piping should be checked for leakage at joints, shut-off valves, and unions.

T&P RELIEF VALVE

On an annual basis, the temperature and pressure relief valve should be checked for proper operation. First, attach a drain line to the valve to direct the water discharge to an open drain. This is very important because the temperature of the discharge could be very hot. Second, lift the lever at the end of the valve several times. The valve should operate freely and return to its original position properly. If water does not flow out of the valve, remove and inspect for corrosion or obstructions. Replace with a new valve if necessary. Do not repair the faulty valve as this may cause improper operation.

ANODE RODS

Anode rods should be inspected twice in the first year and at least yearly once a time interval for inspection has been developed. It is recommended to check the rod(s) six months after the heater is installed. If the anode rod had reduced in size by two-thirds of its original diameter of 3/4" or shows signs of pitting, it is time for replacement. Take the following steps when changing the anode rod(s):

1. Shut off water supply.
 2. Open any faucet to relieve tank pressure.
 3. Run a hose from the drain valve to the nearest floor drain. Open the drain valve and empty the hot water distribution piping above the water heater.
 4. Remove caps on water heater top; push insulation aside.
 5. Use a 1 1/16" six-sided socket wrench and a breaker bar. Snap hard to break the anode rod seal.
 6. Remove rod(s) and replace with new rod(s).
 7. Turn water supply back on and leave faucet open until air is out of line.
 8. Turn faucet off and check that new rod(s) doesn't leak.
 9. Snap caps back into place.
-

FLUSH THE TANK

Elements in the water may accumulate in the heater. It is recommended that the tank be drained and flushed thoroughly once a year to prevent buildup in the tank.

SECTION VI: MAINTENANCE (cont.)

HEATING ELEMENTS

On an annual basis, check each heating element for leaks. **Prior to checking, turn off the power supply.** Remove the access cover and the insulation behind the cover. Use a flashlight to inspect around each element for leaks. After inspection, replace all insulation and the access cover to its original location.

It is normal for lime scale to accumulate on the heating elements. Hot water usage, temperature, and water characteristics all play roles in the rate of accumulation. Lime scale may lead to noise during heating element operation and reduce the rate of hot water recovery.

At least one heating element should be periodically inspected for lime scale. It is recommended to remove the lowest element, so the bottom of the tank can be checked for sediment. Sediment buildup around a heating element can lead to element failure. Flush and drain the tank to remove the sediment at the bottom of the tank.

Take the following steps to inspect a heating element:

1. Turn off the power supply to the water heater.
2. Drain the water heater – shut off the water supply, open a faucet to relieve the tank pressure, connect a hose to the drain valve and run it to the nearest floor drain, and open the drain valve.
3. Remove the access cover (from the bottom half of the electrical enclosure) and the insulation.
4. Disconnect two wires from a heating element.
5. Use a 1-1/2" deep well (6-pt) socket and ratchet to remove the heating element and gasket.
6. If lime scale needs to be removed, cleaning may be accomplished by:
 - a. Brushing or scraping loose scale, and/or
 - b. Soaking in a deliming solution. **DO NOT** use muriatic or hydrochloric acid deliming solutions. After soaking, rinse the cleaned end of the heating element with water to remove the deliming solution. **DO NOT** allow the delimer or water to contact the electrical terminals on the heating element.
7. Remove and clean the other heating elements.
8. If draining the tank did not remove enough sediment from the bottom of the tank, additional access for cleaning can be obtained through the hand hole at the bottom, right side of the water heater.
9. Replace the gasket on each heating element.
10. Install the elements back into the tank. Tighten to approximately 50 ft*lbs.
11. Attach the element wiring to its original location.
12. Follow the instructions on page 9 to refill the tank.
13. After the tank is full of water, check each heating element for leaks.
14. Install the access cover and insulation to its original location.

SECTION VII: TROUBLESHOOTING

In the event that the water heater is not working properly, contact a qualified service agency.

WARNING

Turn off power supply before servicing the water heater. Failure to do this could result in death, serious injury, or property damage.

Table 8: Troubleshooting

PROBLEM	CAUSE	SOLUTION
No hot water at faucet	Temperature control display is blank.	Check wiring and confirm power to/from the transformer.*** Replace transformer or temperature control as necessary.
	Temperature control display is in lockout or latchup.	Note the displayed error code and refer to the error code table (Figure 18). To exit lockout or latchup, refer to the instructions in Figure 17.
	Improper temperature control setting.	Adjust the temperature control to a safe setting.
	Electrical problem	Check for loose wiring.
		Confirm the correct supply voltage***; check the AC disconnect and external overcurrent protection.
		Check internal and external fusing. Check for proper voltage at contactors.***
Insufficient hot water	Improper temperature control setting.	Adjust the temperature control to a safe setting.
	Peak use of hot water is greater than delivery capability of water heater.	Determine peak usage, compare to water heater delivery, add additional water heating capacity.
	Faulty temperature sensor or temperature control.	Measure resistance across each pair of thermistor wires. At 77°F, resistance shall be 10 kΩ. Verify that a call for heat (demand) occurs at the setpoint minus differential value (8°F) by monitoring the temperature sensor reading on the temperature control.
	Excessive lime/mineral buildup on heating elements.	Clean/replace heating elements.
	Failed electrical components	Inspect contactors, fuses, and heating elements.
Water at faucet too hot	Temperature control setting is too high.	Lower temperature control setting.
	Thermostatic mixing valve is not properly adjusted.	Check valve manufacturer's instructions.
Scale, hard water particles from faucets, popping sound from tank	Water hardness above 7 grains (120 ppm); excessive lime/mineral buildup.	Check or add water treatment system (water softener, etc.). Remove and clean the heating elements.
Rust staining; bad taste and odor in water	Iron/minerals in water supply	Filtration and/or water treatment.
Rotten egg odor	Hydrogen sulfide	Flush tank with chlorine solution and install aluminum anode rods.
Air from hot water fixture	Electrolysis or air introduced by water supply.	Properly ground piping & replace anode rods. Check well pump system.
Inlet/Outlet fitting corrosion	Galvanic corrosion of dissimilar metals and/or electrolysis.	Install dielectric unions. Properly ground piping.
T&P valve dripping water	Excessive water pressure (above 150 PSI)	Check water supply pressure. Closed systems require a properly sized expansion tank. Replace T&P if necessary.
T&P gushing water	Excessive water temperature (above 210°F)	Check temperature sensor & control for proper operation. Replace T&P if necessary.

*** - Indicates item that requires power supply to be on. A qualified service agency must perform this service.

SECTION VII: TROUBLESHOOTING (cont.)

Figure 16 describes various temperature control display conditions. Unless the up or down button is pressed, or the control is in lockout or latching, the display will show the setpoint temperature. The diagnostic LED's are used to indicate the operating mode of the water heater.

Refer to Figure 17 for a detailed description of each operation mode.

LEGEND			
	●	○	☼
	ON	OFF	BLINKING
(R) [] [] []	(A)		Power Off
(R) [1] [2] [5]	(A)		Power On
(R) [1] [2] [5]	(A)		No Call for Heat
(R) [1] [2] [5]	(A)		Call for Heat
(R) [E] [0] [1]	(A)		Lockout
(R) [E] [0] [1]	(A)		Latchup, red flashes every 2 seconds
(R) [1] [2] [5]	(A)		Primary Relay Warning, red flashes every 5 seconds

Figure 16: Temperature Control LED's

WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation Modes

Power, Off – (No power is applied to the red-white wire)

- All lights and screen will be off.

Power, On – (Power applied to red-white wire)

- System will power on and enter NORMAL OPERATION MODE

Self-test – When power is applied, the control performs a self-test, checking sensor(s) and microprocessor and verifying limit contacts are open. The power-up test lasts from 3 to 5 seconds. The control continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).

Call for Heat (Demand) – When the temperature at the operating sensor is at or below setpoint minus fixed differential, the control closes the operating relay contacts.

Stand By – When operating sensor reaches setpoint temperature or above, temp control will open the operating relay contacts.

Normal Operation (Mode) – (Initial starting mode)

- The control will display the setpoint.

Display – (How to enter = Pressing UP or DOWN key in NORMAL MODE)

- In DISPLAY MODE, the control will display the current temperature reading for 5 seconds, then return to NORMAL OPERATION.

Setting – (How to enter = Hold up and down buttons for 3 seconds while in NORMAL OPERATION)

- In SETTING MODE, the user is able to adjust the setpoint temperature. Once in this mode, the display will begin flashing the current setpoint. The display will increase one degree per UP or DOWN button push or 10 degrees per second when the button is held.

Diagnostic – (How to enter = Power up the system with the UP and DOWN buttons depressed. Once buttons are released, the system will move into diagnostic mode)

- DIAGNOSTIC MODE displays recorded error codes. When powered in this mode, the display will show the newest recorded error code. As the DOWN key is pressed, the system will display error codes from newest to the oldest. When there are no more codes to display, the

control will show a "E _ _" to indicate end of error codes. If the user continues to push the down button, the system will go back to the newest error code and begin displaying the error codes again from newest to oldest. The only way to exit this mode is to power cycle the system. To clear error codes (while in diagnostic mode), push and hold RESET button for 3 seconds.

High Limit Temp – Fixed temp where the control will soft lockout and display "HL" if the system has detected a high temp condition and the operating relay contacts are open. Or, if the fixed temp is reached while the operating contacts are closed the control will lockout (red LED will be ON) and require manual reset.

High Limit Test – (How to enter = In NORMAL OPERATION, hold RESET, UP and DOWN buttons for 3 seconds)

- During this operation, the current temperature reading followed by higher temperatures will flash until the high limit temperature is reached. The Red LED will turn on (Solid = Lockout; Blinking = Latchup) and the E05 error code will display. Press the reset button for 3 seconds, if in lockout, or 30 seconds if in Latchup, to return to normal operation.

Soft Lockout – (When any temperature sensor goes out of range or the system has detected a high temp condition and the operating relay contacts are open)

- When in this state, it will display error code or "HL" but will leave the lockout LED off. If the condition that caused the soft lockout clears, the system will return to normal operation.

Lockout – (Numerous Error Codes)

- The control will enter this state when an unsafe condition has occurred and the user must intervene and put the system in a safe state. Lockout can be cleared by pressing the RESET button for 3 seconds.

Latchup – (Occurs after 3 LOCKOUTs have been detected)

- The system will enter a safe mode and will not exit the mode without user intervention. You can exit latchup mode by depressing the RESET button for thirty seconds. By exiting this way, the system will reset the lockout count back to zero.

Setpoint – The target temperature of the water heater.

Figure 17: Water Heater Operation Modes

SECTION VII: TROUBLESHOOTING

The display will show an error code when the water heater is in lockout or latchup. Refer to Figure 18 for a list of error codes and descriptions.

Error Code	Reason	Error Code	Reason
01	Primary (K2) relay is welded on. Note: If the control is reset from error code 01, the red LED will flash every 5 seconds indicating the control must be replaced.	20	Temp sensor 1 out of range failure
02	Primary & Safety relays (K1 and K2) on. The control cannot be reset from error code 02 and must be replaced.	21	Temp sensor 2 out of range failure
03	Primary & Safety relays (K1 and K2) are off. Note: If this error is detected, the control will show error code 03 and enter soft lockout two times to try and resolve the issue. If the problem persists the control will enter hard lockout.	22	High limit temp sensor out of range failure
05	Simulated High Temp lockout	23	Temp sensor 1 pin is open
06	Temp is above set high temp but below thermistor high (250°F)	24	Temp sensor 2 pin is open
		25	High limit temp sensor is open
10, 11, 12, 13, 14, 15		Internal hardware safety failure – unit should be replaced.	

Figure 18: Error Codes

SECTION VIII: PARTS LIST

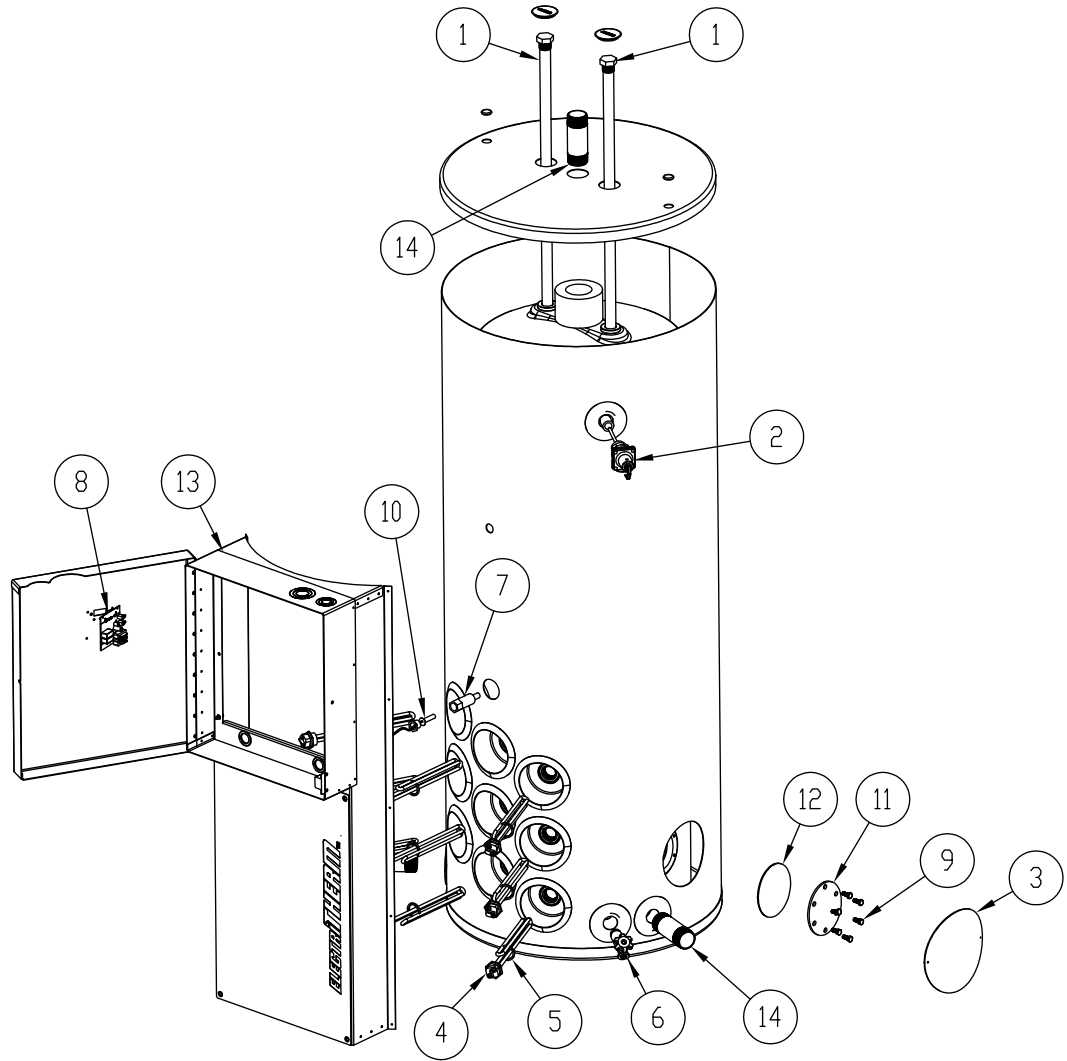


Figure 19: All Models

Table 9: Parts List - All Models

Part Description	
1	Anode Rod
2	T&P Relief Valve
3	Hand Hole Access Cover
4	Heating Element*
5	Heating Element Gasket
6	Drain Valve
7	Immersion Well
8	Temperature Control PCB
9	Bolts (for Hand Hole Assembly)
10	Thermistor
11	Hand Hole Cover Plate
12	Hand Hole Gasket
13	Electrical Enclosure**
14	1-1/2" NPT Pipe Nipple

* Denotes quantity may change based on input rating. For three and six element configurations, plugs (with gaskets) will be substituted for heating elements.

** Denotes design is specific to storage capacity.

SECTION VIII: PARTS LIST (cont.)

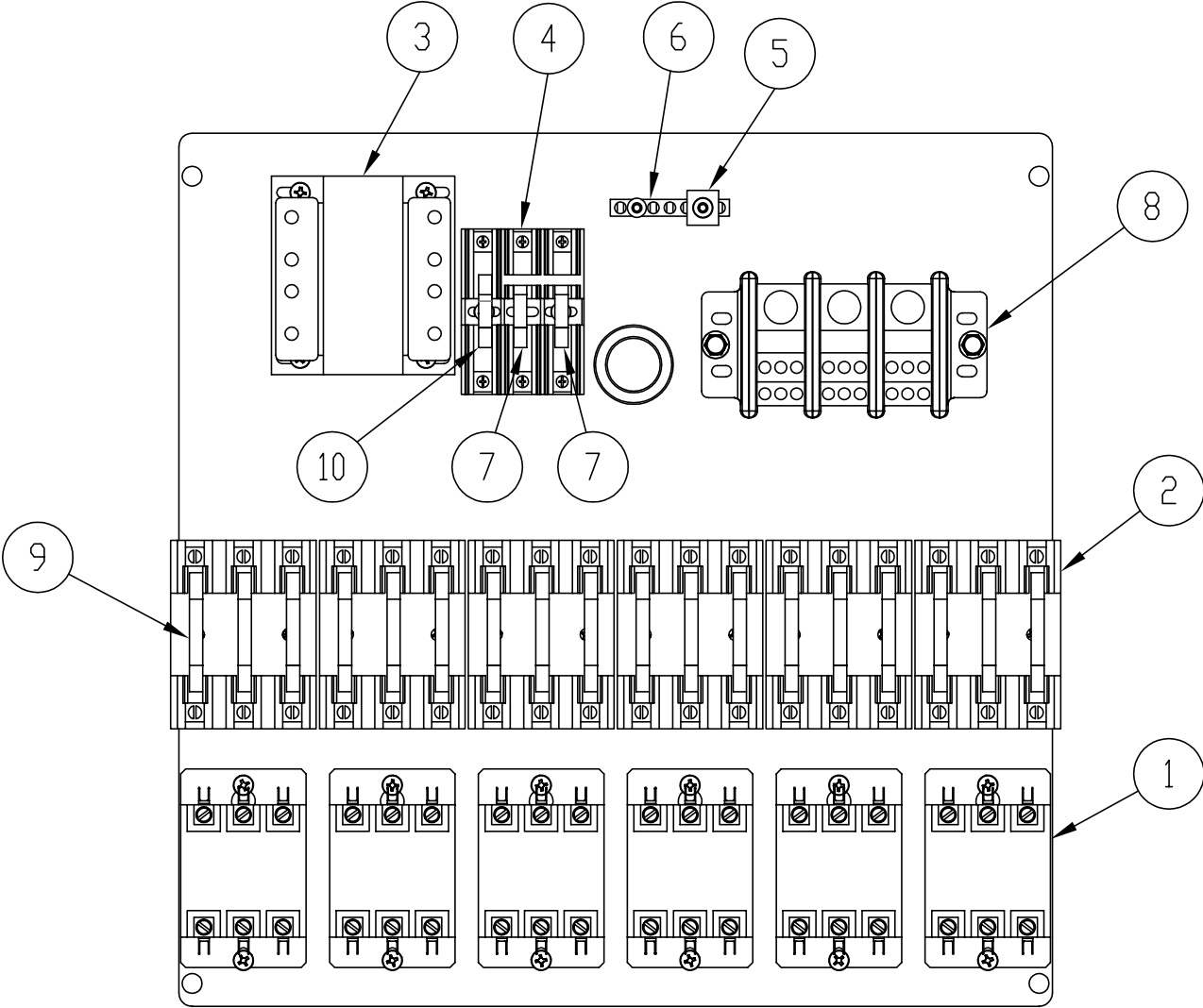


Figure 20: Electric Panel

Table 10: Parts List - Electric Panel

Part Description	
1	Contactor*
2	Element Fuse Block*
3	Transformer, 120V (208/240/480V or 277V Primary)
4	Transformer Fuse Block
5	Grounding Lug
6	Grounding Bar
7	Transformer Fuse (Primary Side)
8	Terminal Block
9	Element Fuse*
10	Transformer Fuse (Secondary Side)

* Denotes quantity may change based on input rating.

SECTION IX: WARRANTY

LIMITED WARRANTY FOR ELECTRIC WATER HEATER

Bock Water Heaters, Inc.

110 S. Dickinson Street

Madison, WI 53703

Phone: 608-257-2225

WHAT DOES THIS LIMITED WARRANTY COVER?

This limited warranty applies only to the original consumer purchaser.

General Defects and Malfunctions: This warranty covers defections and malfunctions in your new water heater for a period of one year from the original installation date. We will repair or replace, at our option, any defective or malfunctioning component of the water heater. This limited warranty will terminate if you sell or otherwise transfer the water heater, or the water heater is installed at a location different from its original installation location.

Tank: We also warrant that the tank will not leak due to defective materials or workmanship for five years from the date of original installation or from date of manufacture in the event the Limited Warranty Registration Card was not completed and returned to manufacturer. If the tank is leaking and we have verified that the leak is due to a defect in materials and workmanship, we will replace the tank with a tank that is the nearest Bock model available at the time of replacement. If a replacement tank is provided, it will remain warranted under this section as if it were the original tank. For example, if we send you a replacement tank under this limited warranty two years after the original installation date, then the replacement tank will remain warranted for the remaining three years after the original installation date.

HOW DO YOU GET SERVICE UNDER THE LIMITED WARRANTY?

In order for the warranty period to begin on the date of installation, you must return the warranty registration card attached below within 30 days of purchasing the water heater. You may also register your water heater online at www.bockwaterheaters.com. You must have a copy of the original sales receipt at the time you request service. Failure to return the warranty registration card and provide a copy of the sales receipt will result in the warranty period beginning from the date of manufacture.

To get service under this limited warranty you should contact either the dealer or installer. If dealer or installer is unknown you can contact us via e-mail at warranty@bockwaterheaters.com or call us Monday through Friday between the hours of 8 o'clock a.m. to 5 o'clock p.m. Central Time at the following number: 1-608-257-2225.

You can also write us at the following address:

Bock Water Heaters, Inc.

Warranty Support Group

110 S. Dickinson Street

Madison, WI 53703

We will respond not later than ten days after we have received your request for service.

SECTION IX: WARRANTY (cont.)

WHAT DOES THIS LIMITED WARRANTY NOT COVER?

This limited warranty does not cover water heaters that are or were:

- Incorrectly installed, especially where the installation violates state or local plumbing, housing or building codes.
- Operated at inappropriate settings, excessive pressures or temperatures.
- Exposed to adverse local conditions and specifically sediment or lime precipitation in the tank or corrosive elements in the atmosphere or unacceptable water quality.
- Installed outside the United States or Canada.
- Accidentally damaged.

Also, we will not cover the following charges, costs and losses:

- Any freight or delivery charges.
- Any removal or installation charges.
- Charges to return the water heater or part to the manufacturer.
- Water damage, loss or damage to property, inconvenience or loss of use.

WHAT WILL VOID THE LIMITED WARRANTY?

If you do any of the following, you will void this limited warranty:

- Fail to return the warranty registration card within 30 days.
- Fail to retain an original copy of your sales receipt.
- Fail to retain the actual rating plate from the water heater.
- Alter or remove the serial number.
- Transfer or sell the water heater.
- Remove the water heater from its original location and install it somewhere else.
- Fail to follow the care and maintenance instructions provided with the water heater.
- Remove the anode rods.
- Fail to inspect and replace the anode rods (you must retain and present your paid receipts as proof of anode rod replacement).

HOW DOES STATE LAW RELATE TO THIS LIMITED WARRANTY?

This is a limited warranty. WE MAKE NO OTHER EXPRESS WARRANTIES WITH RESPECT TO THIS WATER HEATER. We will not assume, nor authorize any person to assume for us any other liability in connection with the sale or operation of this water heater. ANY IMPLIED WARRANTIES, INCLUDING MECHANICALITY OR FITNESS FOR A PARTICULAR APPLICATION, IMPOSED ON THIS SALE UNDER THE LAWS OF THE STATE OF SALE ARE LIMITED TO ONE YEAR. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

WE WILL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR TORT. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.

Bock Water Heaters, Inc. • 110 South Dickinson Street • Madison, WI 53703
Telephone 608 -257-2225 • Fax 608 -257- 5304
www.bockwaterheaters.com