

COMMERCIAL ELECTRIC WATER HEATER



500 Tennessee Waltz Parkway
Ashland City, TN 37015



Thank you for buying this energy efficient water heater.
We appreciate your confidence in our products.



WARNING



Read and understand this instruction manual and the safety messages herein before installing, operating or servicing this water heater.

Failure to follow these instructions and safety messages could result in death or serious injury.

This manual must remain with the water heater.

WARNING

If the heater becomes immersed in water up to or above the level of the bottom of the element doors, the heater should be examined by a qualified service agency before it is placed in operation, see Page 2.

PLACE THESE INSTRUCTIONS ADJACENT TO HEATER AND NOTIFY OWNER TO KEEP FOR FUTURE REFERENCE.

TABLE OF CONTENTS






This manual contains the operating instructions for the commercial electric Xi control. It is intended to be used in conjunction with the water heater instruction manual.

TABLE OF CONTENTS	2	Closed Water Systems	13
SAFE INSTALLATION, USE AND SERVICE	3	Thermal Expansion.....	13
Important Definitions.....	3	ELECTRICAL	13
GENERAL SAFETY INFORMATION	4	General	13
Precautions	4	Branch Circuit.....	13
Hydrogen Gas (Flammable).....	4	Heater Circuits	13
GENERAL SAFETY INFORMATION	5	ELECTRICAL AND RECOVERIES DATA.....	14
APPROVALS	6	Control Circuits.....	14
MODEL AND RATING	6	Power Circuit.....	14
INTRODUCTION	7	WIRING DIAGRAMS	15
Abbreviations Used	7	OPERATION	18
Preparing for the Installation.....	7	General	18
DIMENSIONS AND CAPACITIES DATA.....	8	Initial Start Up.....	18
FEATURES AND COMPONENTS	9	Draining The Water Heater	18
FEATURES AND COMPONENTS	10	TEMPERATURE REGULATION	19
LOCATING THE NEW WATER HEATER	11	High Temperature Limit Controls (Eco)	19
Facts to Consider About the Location	11	Thermostat Controls	19
REQUIRED ABILITY.....	11	Temperature Adjustment.....	19
General	11	CONTROL SYSTEM OPERATION	20
Chemical Vapor Corrosion	11	MAINTENANCE	32
INSTALLATION	11	General	32
Circulating Pump	12	TROUBLESHOOTING CHECKLIST	35
Insulation Blankets	12	WARRANTY	36
Temperature-Pressure Relief Valve	12	NOTES.....	37-39

SAFE INSTALLATION. USE AND SERVICE

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

Many safety-related messages and instructions have been provided in this manual and on your own water heater to warn you and others of a potential injury hazard. Read and obey all safety messages and instructions throughout this manual. It is very important that the meaning of each safety message is understood by you and others who install, use, or service this water heater.

	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	DANGER indicates an imminently hazardous situation which, if not avoided, will result in injury or death.
	WARNING indicates a potentially hazardous situation which, if not avoided, could result in injury or death.
	CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
	CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in property damage.

All safety messages will generally tell you about the type of hazard, what can happen if you do not follow the safety message, and how to avoid the risk of injury.

IMPORTANT DEFINITIONS

- **Qualified Installer or Service Agency:**

Installation and service of this water heater requires ability equivalent to that of a Qualified Agency (as defined by ANSI below) in the field involved. Installation skills such as plumbing and electrical supply are required in addition to electrical testing skills when performing service.

- **ANSI Z223.1 2006 Sec. 3.3.83:**

“Qualified Agency” - “Any individual, firm, corporation or company that either in person or through a representative is engaged in and is responsible for (a) the installation, testing or replacement of gas piping or (b) the connection, installation, testing, repair or servicing of appliances and equipment; that is experienced in such work; that is familiar with all precautions required; and that has complied with all the requirements of the authority having jurisdiction.”

GENERAL SAFETY INFORMATION

PRECAUTIONS

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN EXPOSED TO FLOODING OR WATER DAMAGE. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system which has been under water.

If the unit is exposed to the following, do not operate heater until all corrective steps have been made by a qualified service technician.

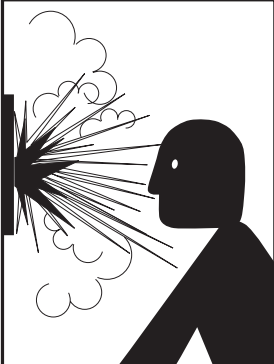
1. External fire.
2. Damage.
3. Firing without water.

GROUNDING INSTRUCTIONS

This water heater must be grounded in accordance with the National Electrical Code and/or local codes. These must be followed in all cases. Failure to ground this water heater properly may also cause erratic control system operation on ELECTRONIC CONTROL models.

This water heater must be connected to a grounded metal, permanent wiring system, or an equipment grounding conductor must be run with the circuit conductors and connected to the equipment grounding terminal or lead on the water heater.

HYDROGEN GAS (FLAMMABLE)




⚠ WARNING

Explosion Hazard

- Flammable hydrogen gases may be present.
- Keep all ignition sources away from faucet when turning on hot water.

Hydrogen gas can be produced in a hot water system served by this heater that has not been used for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To reduce 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. If hydrogen is present there will probably be an unusual sound such as air escaping through the pipe as water begins to flow. THERE SHOULD BE NO SMOKING OR OPEN FLAME NEAR THE FAUCET AT THE TIME IT IS OPEN.

When servicing this unit, verify the power to the unit is turned off prior to opening the control cabinet door.

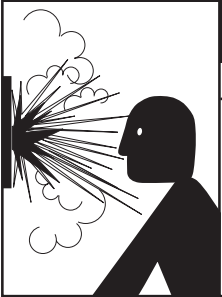


⚠ WARNING

Read and understand this instruction manual and the safety messages herein before installing, operating or servicing this water heater.

Failure to follow these instructions and safety messages could result in death or serious injury.

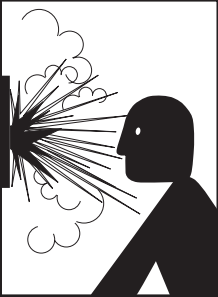
This manual must remain with the water heater.



⚠ WARNING

Explosion Hazard


- Flammable hydrogen gases may be present.
- Keep all ignition sources away from faucet when turning on hot water.



⚠ WARNING

Explosion Hazard

- Overheated water can cause water tank explosion.
- Properly sized temperature and pressure relief valve must be installed in opening provided.



⚠ WARNING

- Before removing any access panels or servicing the water heater, make sure the electrical supply to the water heater is turned "OFF".
- Failure to do this could result in death, serious bodily injury, or property damage.

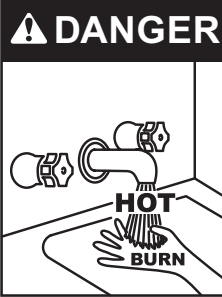
CAUTION

Improper installation, use and service may result in property damage.

- Do not operate water heater if any part has been exposed to flooding or water damage.
- Inspect anode rods regularly, replace when significantly depleted.
- Install in location with drainage.
- Fill tank with water before operation.
- Properly sized thermal expansion tanks are required on all closed water systems.

Refer to this manual for installation and service.

⚠ DANGER



Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly and the physically or mentally disabled are at highest risk for scald injury.


Feel water before bathing or showering.

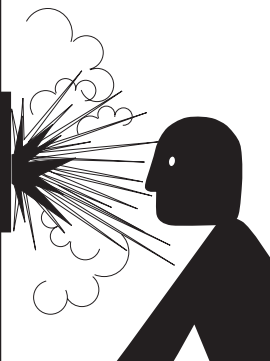
Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.

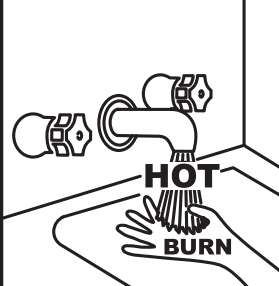
GENERAL SAFETY INFORMATION

When servicing this unit, verify the power to the unit is turned off prior to opening the control cabinet door.

	⚠ WARNING
	Read and understand this instruction manual and the safety messages herein before installing, operating or servicing this water heater.
	Failure to follow these instructions and safety messages could result in death or serious injury. This manual must remain with the water heater.

	⚠ WARNING
	<ul style="list-style-type: none">• Before removing any access panels or servicing the water heater, make sure the electrical supply to the water heater is turned "OFF".
	<ul style="list-style-type: none">• Failure to do this could result in death, serious bodily injury, or property damage.

	⚠ WARNING
	Explosion Hazard
	<ul style="list-style-type: none">• Overheated water can cause water tank explosion.• Properly sized temperature and pressure relief valve must be installed in opening provided.

	⚠ DANGER
	Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.
	Children, the elderly and the physically or mentally disabled are at highest risk for scald injury. Feel water before bathing or showering. Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.

CAUTION
Improper installation, use and service may result in property damage.
<ul style="list-style-type: none">• Do not operate water heater if any part has been exposed to flooding or water damage.• Inspect anode rods regularly, replace when significantly depleted.• Install in location with drainage.• Fill tank with water before operation.• Properly sized thermal expansion tanks are required on all closed water systems. <p>Refer to this manual for installation and service.</p>

APPROVALS



All models are listed
by Underwriters
Laboratories Inc.

MODEL AND RATING

		AUTOMATIC ELECTRIC WATER HEATER					
LISTED 799T							
Complies with current edition of ASHRAE / IESNA 90.1							
MODEL NUMBER		SERIAL NUMBER			ITEM ID		
PHASE	NZ	AMPERES	VOLTS AC	NO. OF ELEMENTS	WATTS EACH	WATTS TOTAL	
	50/60						
USE ON A.C. CURRENT ONLY							
CAPACITY		MAX WORKING PRESSURE					
LITERS	U.S. GAL.	MPA	PSI				
FOR SUPPLY CONNECTION USE WIRE SUITABLE FOR AT LEAST 70°C							
MADE IN THE USA STATE INDUSTRIES, INC ASHLAND CITY, TN USA							
Model Number				Serial Number			

09876798	
model #: 18 DIGIT MODEL NO.	
item id: XXXXXXXXXX	
serial #: K07R000489	
lot: 3	gas type: 0

INTRODUCTION

Thank You for purchasing this water heater. Properly installed and maintained, it should give you years of trouble free service.

ABBREVIATIONS USED

Abbreviations found in this Instruction Manual include :

- ANSI - American National Standards Institute
- ASME - American Society of Mechanical Engineers
- NEC - National Electrical Code
- NFPA - National Fire Protection Association
- UL - Underwriters Laboratory
- CSA - Canadian Standards Association
- AHRI - Air Condition, Heating and Refrigeration Institute

PREPARING FOR THE INSTALLATION



⚠ WARNING

- Before removing any access panels or servicing the water heater, make sure the electrical supply to the water heater is turned "OFF".
- Failure to do this could result in death, serious bodily injury, or property damage.

1. Read the "General Safety" section of this manual first and then the entire manual carefully. If you don't follow the safety rules, the water heater may not operate safely. It could cause DEATH, SERIOUS BODILY INJURY AND/OR PROPERTY DAMAGE.

This manual contains instructions for the installation, operation, and maintenance of the water heater. It also contains warnings throughout the manual that you must read and be aware of. All warnings and all instructions are essential to the proper operation of the water heater and your safety. **READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO INSTALL OR OPERATE THE WATER HEATER.**

General outline diagrams are in this manual. These diagrams will serve to provide the installer with a reference for basic installation of this product. **IT IS NECESSARY THAT ALL WATER PIPING AND THE ELECTRICAL WIRING BE INSTALLED AND CONNECTED AS SHOWN IN THE DIAGRAMS.**

Be sure to turn off power when working on or near the electrical system of the water heater. Never touch electrical components with wet hands or when standing in water. When replacing fuses always use the correct size for the circuit. Use same size and type of fuse when replacing.

Detailed installation diagrams are in this manual. These diagrams will serve to provide the installer with a reference for the materials and method of piping suggested. **IT IS NECESSARY THAT ALL WATER PIPING AND THE ELECTRICAL WIRING BE INSTALLED AND CONNECTED AS SHOWN IN THE DIAGRAMS.**

The principal components of the heater are identified on pages 9 and 10. The model and rating plate on page 7 interprets certain markings into useful information. Both of these references should be used to identify the heater, its components and optional equipment.

2. The installation must conform with these instructions and the local code authority having jurisdiction and the requirements of the power company. In the absence of local codes, the installation must comply with the current editions of the National Electrical Code, NFPA 70 or the Canadian Electrical Code CSA C22.1. The National Electrical Code may be ordered from: National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269. The Canadian Electrical Code is available from the Canadian Standards Association, 8501 East Pleasant Valley Road, Cleveland, OH 44131.
3. If after reading this manual you have any questions or do not understand any portion of the instructions, call the toll free number on the back cover for further assistance.

A sample rating plate and barcode tag are shown on page 6 of this manual. In order to expedite your request, please have the serial number and item ID from the barcode tag available for the technician.

4. Carefully plan your intended placement of the water heater. Examine the location to ensure the water heater complies with the "Locating the New Water Heater" section in this manual.

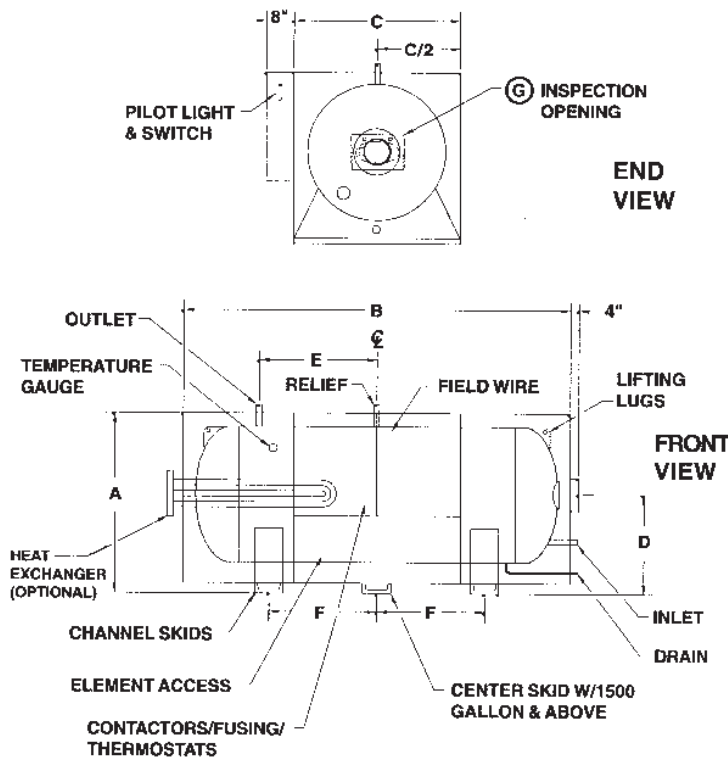
Clearance must be maintained so that the coil bundle may be removed for servicing after installation.

Installation and service of this water heater requires ability equivalent to that of a licensed tradesman or qualified agency (page 3) in the field involved. Plumbing and electrical work are required.

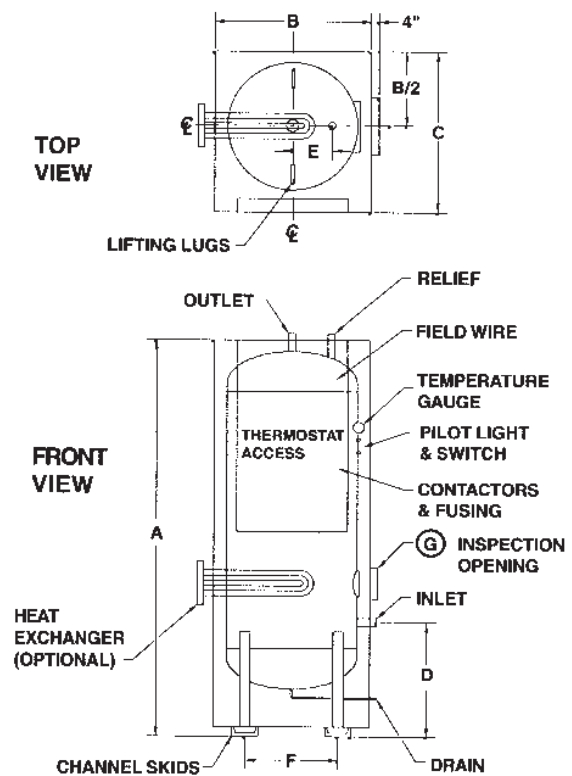
5. For installation in California this water heater must be braced or anchored to avoid falling or moving during an earthquake. See instructions for correct installation procedures. Instructions may be obtained from California Office of the State Architect, 1102 Q Street, Suite 5100, Sacramento, CA 95811.
6. Massachusetts Code requires this water heater to be installed in accordance with Massachusetts 248-CMR 2.00: State Plumbing Code and 248-CMR 5.00.

DIMENSIONS AND CAPACITIES DATA

HORIZONTAL MODELS



VERTICAL MODELS



ALL DIMENSIONS IN INCHES

Model*	Nominal Gallon Capacity	Maximum KW Input	Height A	Width (Length) B	Depth C	D	E	Skid Spacing F	Inspection Opening G	Inlet Outlet Opening	Drain Opening	Relief Valve Opening**
HORIZONTAL ELECTRIC STORAGE HEATER												
SEH-200	200	180	38-1/2	77	36	10-1/2	17-1/2	18	Optional	1-1/2	3/4	3/4
SEH-250	250	240	38-1/2	91	36	10-1/2	24	24		1-1/2	3/4	1
SEH-300	300	300	44-1/2	81	42	8-1/4	17	18		2	3/4	1
SEH-350	350	330	44-1/2	93	42	8-1/4	23	24		2	3/4	1
SEH-400	400	390	44-1/2	100	42	8-1/4	26-1/2	27-1/2		2	3/4	1
SEH-500	500	480	51	94	48	14	24	24	4" X 6" Handhole	2	1-1/4	1
SEH-600	600	600	51	109	48	14	32	32		2	1-1/4	1
SEH-700	700	690	51	121	48	14	38	38		2	1-1/4	1
SEH-800	800	780	57	111	54	16-1/2	32	32	11" x 15" Manhole	2	1-1/2	1
SEH-1000	1000	990	61	111	60	16-1/2	29-1/2	29-1/2		3	1-1/2	1
SEH-1250	1250	1200	61	138	60	16-1/2	43	43		3	1-1/2	1
SEH-1500	1500	1500	61	150	60	16-1/2	50	49		3	1-1/2	1
SEH-2000	2000	1980	70	177	66	20	60	60 74		3	2	1-1/4
SEH-3000	3000	3000	76	211	72	20	72-1/2	115		3	2	1-1/2
SEH5000	5000	3000	82	296	78	20-1/2	113-1/2	115		3	2	1-1/2
SEH-7500	7500	3000	94	317	90	21-1/2	121	119		4	2	1-1/2
SEH-10,000	10,000	3000	106	345	102	22	132	130		4	2	1-1/2
VERTICAL ELECTRIC STORAGE HEATER												
SEV-150	150	150	83-1/2	30	37	16	6	17	Optional	1-1/4	3/4	3/4
SEV-150L	150	150	59-1/2	36	43	17-1/2	6	21		1-1/4	3/4	3/4
SEV-200	200	180	79-1/2	36	43	17-1/2	6	21		1-1/2	3/4	3/4
SEV-250	250	240	93	36	43	17-1/2	6	21		1-1/2	3/4	1
SEV-300	300	300	83-1/2	42	49	19	6	25-1/2		2	3/4	1
SEV-350	350	330	95-1/2	42	49	19	6	25-1/2	2	3/4	1	
SEV-400	400	390	102-1/2	42	49	19	6	25-1/2	2	3/4	1	
SEV-500	500	480	97	48	55	21	6	30	4" X 6" Handhole	2	1-1/4	1
SEV-600	600	600	112	48	55	21	6	30		2	1-1/4	1
SEV-700	700	690	124	48	55	21	6	30		2	1-1/4	1
SEV-800	800	780	116	54	61	23	8	34	11" x 15" Manhole	2	1-1/2	1
SEV-1000	1000	990	116	60	67	24-1/2	10	38		3	1-1/2	1
SEV-1250	1250	1200	143	60	67	24-1/2	10	38		3	1-1/2	1
SEV-1500	1500	1500	155	60	67	24-1/2	10	38		3	1-1/2	1
SEV-2000	2000	1980	183	66	73	25	12	42-1/2		3	2	1
SEV-3000	3000	3000	217	72	79	27-1/2	14	47		3	2	1-1/2
SEV-5000	5000	3000	309	78	85	30	14	51		3	2	1-1/2
SEV-7500	7500	3000	330	90	97	30	14	59-1/2		4	2	1-1/2
SEV-10,000	10,000	3000	358	102	109	30	14	68		4	2	1-1/2

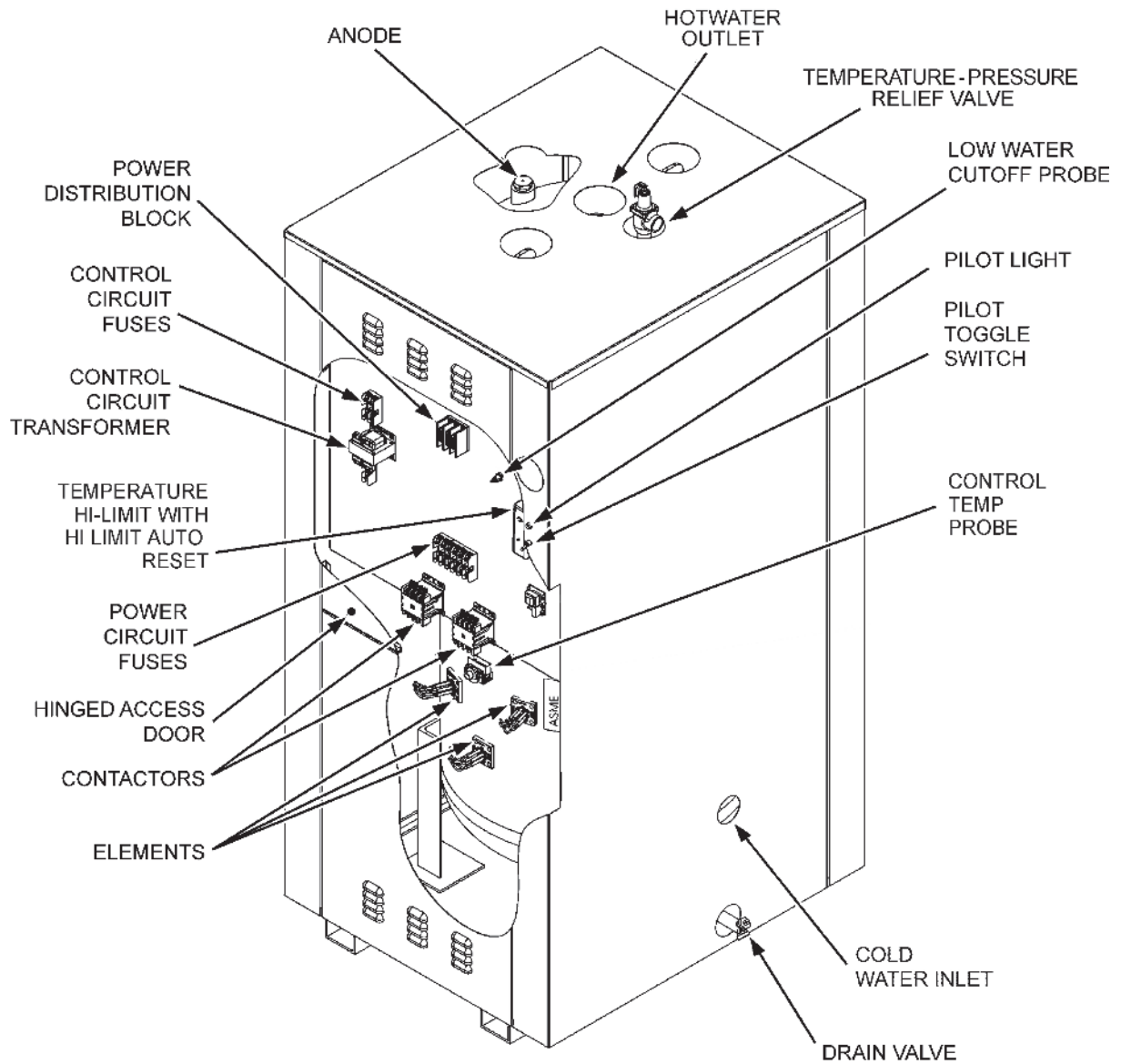
*Complete Model Number includes the desired KW at end, e.g.: DVE-500-120 when KW= 120.

**Size may vary according to KW input.

Minimum installation clearances required: 30" from front, 12" from top, and 24" from right side.

FEATURES AND COMPONENTS

NOTE: Your actual configuration may vary.

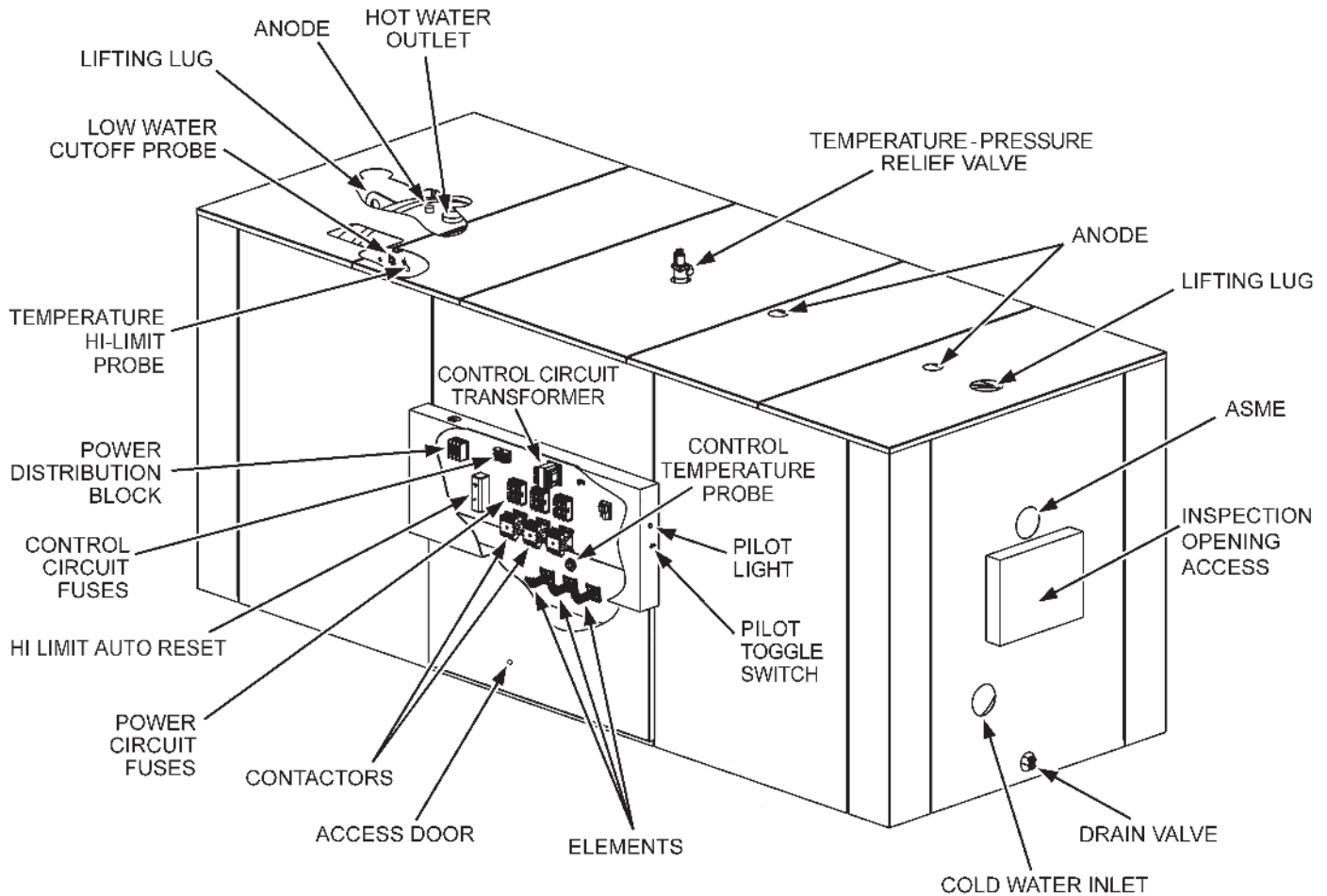


SEV

Vertical Water Heater (typical).

FEATURES AND COMPONENTS

NOTE: Your actual configuration may vary.



SEH
Horizontal Water Heater (typical).

LOCATING THE NEW WATER HEATER

FACTS TO CONSIDER ABOUT THE LOCATION

CAUTION

Property Damage Hazard

- All water heaters eventually leak.
- Do not install without adequate drainage.

Carefully choose a location for the new water heater. The placement is a very important consideration for the safety of the occupants in the building and for the most economical use of the appliance.

Whether replacing an old water heater or putting the water heater in a new location, the following critical points must be observed. The water heater must be located:

1. On a level surface. Shim the channel type skid base as necessary if levelling is required.
2. Near a floor drain. The heater should be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the heater or to lower floors of the structure.

When such locations cannot be avoided, a suitable drain pan should be installed under the heater.

The pan should be at least 2 inches deep, have a minimum length and width of at least 2 inches greater than the

dimensions of the water heater and should be piped to an adequate drain.

The discharge opening of the relief valve should always be piped to an open drain.

3. Close to the point of major hot water usage and the power supply.

Hot water piping and branch circuit wiring should be as short as possible.

Insulate hot and cold water piping where heat loss and condensation may be a problem.

Heater construction permits installation, maintenance, and service work to be performed through the front and right side openings.

Suggested clearances from adjacent surfaces are 12 inches on top, 30 inches in front and 24 inches on right side for access to the unit.

The heater may be installed on or against combustible surfaces. The left side and back may be placed flush against adjacent surfaces. Be sure to place the cover plates over the rear crating couplings before locating vertical model heaters. The heater may be installed in a confined space if adequate ventilation is provided.

The temperature of the space in which the water heater is installed must not go below 32°F or above 122°F.

INSTALLATION

REQUIRED ABILITY

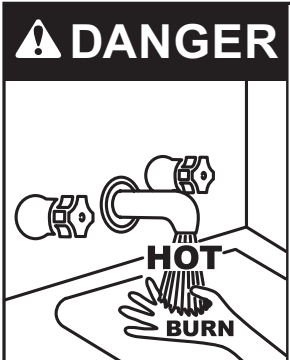
INSTALLATION AND SERVICE OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A QUALIFIED AGENCY (PAGE 3) IN THE FIELD INVOLVED. PLUMBING AND ELECTRICAL WORK IS REQUIRED.

GENERAL

The installation must conform to these instructions and local code authority having jurisdiction. Grounding and electrical wiring connected to the water heater must also conform to the National Electrical Code, NFPA 70. This publication is available from The National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

Do **NOT** test electrical system before heater is filled with water, follow the START UP procedure in the OPERATION section of this manual.

The principal components of the heater are identified in the Features and Components illustrations on pages 9 and 10.



⚠ DANGER

Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering.

Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.

MIXING VALVE USAGE:

Water heaters are intended to produce hot water. Water heated to a temperature which will satisfy space heating, clothes

washing, dish washing, cleaning and other sanitizing needs can scald and permanently injure you upon contact. Some people are more likely to be permanently injured by hot water than others. These include the elderly, children, the infirm, or the physically / developmentally disabled. If anyone using hot water in your home fits into one of these groups or if there is a local code or state law requiring a maximum water temperature at the hot water tap, then you must take special precautions. In addition to using the lowest possible temperature setting that satisfies your hot water needs, a means such as a MIXING VALVE, should be used at the hot water taps used by these people or at the water heater.

MIXING VALVES for reducing point of use temperature are available. Consult a qualified installer or service agency. Follow all manufacturer's Instructions for installation of these valves. Before changing the factory setting on the thermostat, read the "Temperature Regulation" section in this manual, see Page 19.

⚠ WARNING

Toxic Chemical Hazard

- Do not connect to non-potable water system.

CHEMICAL VAPOR CORROSION

This water heater shall not be connected to any heating system(s) or component(s) used with a non-potable water heating appliance.

Toxic chemicals, such as those used for boiler treatment shall not be introduced into this system.

Water heater corrosion and component failure can be caused by the heating and breakdown of air borne chemical vapors. Spray can propellants, cleaning solvents, refrigerator and air conditioning

refrigerants, swimming pool chemicals, water softener chemicals, calcium and sodium chloride, waxes, and process chemicals are typical compounds which are potentially corrosive. These materials are corrosive at very low concentration levels with little or no odor to reveal their presence.

Products of this sort should not be stored near the heater. Also, air which is brought in contact with the water heater should not contain any of these chemicals. If necessary, uncontaminated air should be obtained from remote or outside sources.

CIRCULATING PUMP

Field installed circulating pumps should be of all bronze constructions.

To optimize the total storage capacity of a horizontal vessel, particularly under low draw conditions, it is recommended to utilize a pump and recirculation line sized to turn the entire storage capacity of the tank once each hour (i.e., a 600 gallon tank would require a 10 gpm pump).

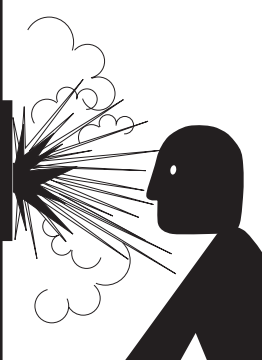
INSULATION BLANKETS

Insulation blankets are available to the general public for external use on electric water heaters but are not necessary with this product. The purpose of an insulation blanket is to reduce the standby heat loss encountered with storage tank heaters. Your water heater meets or exceeds the EPACT and ASHRAE/IES 90.1 standards with respect to insulation and standby loss requirements, making an insulation blanket unnecessary.

Should you choose to apply an insulation blanket to this heater, you should follow these instructions below. Failure to follow these instructions can result in fire, serious personal injury, or death.

- Do not cover the temperature and pressure relief (T & P) valve with an insulation blanket.
- Do not cover the instruction manual. Keep it on the side of the water heater or nearby for future reference.
- Do obtain new warning and instruction labels for placement on the blanket directly over the existing labels.

TEMPERATURE-PRESSURE RELIEF VALVE



! WARNING

Explosion Hazard

- Temperature-pressure relief valve must comply with ANSI Z21.22 and ASME code.
- Properly sized temperature and pressure relief valve must be installed in opening provided.
- Failure to install relief valve can result in overheating and excessive tank pressure.
- Failure to follow these instructions can cause serious injury or death.

This water heater is provided with a properly rated/sized and certified combination temperature - pressure relief valve by the manufacturer. The valve is certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment of materials as meeting the requirements for Relief Valves for Hot Water Supply Systems, ANSI Z21.22 • CSA 4.4, and the code requirements of ASME.

If replaced, the new valve must meet the requirements of local codes, but not less than a combination temperature and pressure relief valve rated/sized and certified as indicated in the above paragraph. The new valve must be marked with a maximum set pressure not to exceed the marked hydrostatic working pressure of the water heater (150 psi = 1,035 kPa) and a discharge capacity not less than the water heater Btu/hr or KW input rate as shown on the water heater's model rating plate.

For safe operation of the water heater, the temperature and pressure relief valve must not be removed from its designated opening nor plugged. The temperature-pressure relief valve must be installed directly into the fitting of the water heater designed for the relief valve. Install discharge piping so that any discharge will exit only within 6 inches (15.2 cm) above, or external to the structure. Do not pipe the discharge to a crawl space. Be certain that no contact is made with any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances. Excessive length, over 30 feet (9.14 m), or use of more than four elbows can cause restriction and reduce the discharge capacity of the valve.

No valve or other obstruction is to be placed between the relief valve and the tank. Do not connect discharge piping directly to the drain unless a 6" (15.2 cm) air gap is provided. To prevent bodily injury, hazard to life, or property damage, the relief valve must be allowed to discharge water in adequate quantities should circumstances demand. If the discharge pipe is not connected to a drain or other suitable means, the water flow may cause property damage.

CAUTION

Water Damage Hazard

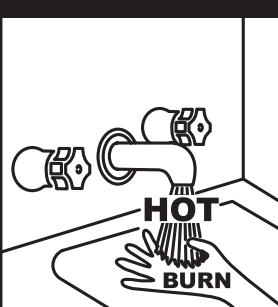
- Temperature-pressure relief valve discharge pipe must terminate at adequate drain.

The Discharge Pipe:

- Shall not be smaller in size than the outlet pipe size of the valve, or have any reducing couplings or other restrictions.
- Shall not be plugged or blocked.
- Shall not be exposed to freezing temperatures.
- Shall be of material listed for hot water distribution.
- Shall be installed so as to allow complete drainage of both the Temperature-Pressure Relief Valve and the discharge pipe.
- Must terminate a maximum of six inches above a floor drain or external to the building. In cold climates, it is recommended that the discharge pipe be terminated at an adequate drain inside building.
- Shall not have any valve or other obstruction between the relief valve and the drain.

The temperature-pressure relief valve must be manually operated at least once a year. Caution should be taken to ensure that (1) no one is in front of or around the outlet of the temperature-pressure relief valve discharge line, and (2) the water manually discharged will not cause any bodily injury or property damage because the water may be extremely hot. If after manually operating the valve, it fails to completely reset and continues to release water, immediately close the cold water inlet to the water heater, follow the draining instructions in this manual, and replace the temperature-pressure relief valve with a properly rated/sized new one.

If you do not understand these instructions or have any questions regarding the temperature-pressure relief valve call the toll free number listed on the back cover of this manual for technical assistance.



! DANGER

Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering.

Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.

Read instruction manual for safe temperature setting.

CLOSED WATER SYSTEMS

Water supply systems may, because of code requirements or such conditions as high line pressure, among others, have installed devices such as pressure reducing valves, check valves, and back flow preventers. Devices such as these cause the water system to be a closed system.

THERMAL EXPANSION

As water is heated, it expands (thermal expansion). In a closed system the volume of water will grow when it is heated. As the volume of water grows there will be a corresponding increase in water pressure due to thermal expansion. Thermal expansion can

cause premature tank failure (leakage). This type of failure is not covered under the limited warranty. Thermal expansion can also cause intermittent temperature-pressure relief valve operation: water discharged from the valve due to excessive pressure build up. This condition is not covered under the limited warranty. The temperature-pressure relief valve is not intended for the constant relief of thermal expansion.

A properly sized thermal expansion tank must be installed on all closed systems to control the harmful effects of thermal expansion. Contact a local plumbing service agency to have a thermal expansion tank installed.

ELECTRICAL

GENERAL

Check the water heater model and rating plate information against the characteristics of the branch circuit electrical supply. Do not connect the heater to an improper source of electricity.

Voltage applied to the heater should not vary more than +5% to -10% of the model and rating plate marking for satisfactory operation.

Do **NOT** energize the branch circuit for any reason before the water heater tank is filled with water. Doing so may cause the heating elements to fail.

The factory wiring is attached to a terminal block on the unit. The branch circuit is connected to the block through an opening provided on the heater. Factory terminal block has 500 MCM maximum copper wire size capacity in each opening. If apparent field wire size is over 500 MCM multiple terminal blocks will be furnished. If other opening sizes are desired they should be specified when unit is ordered.

The installation must conform with these instructions and the local code authority having jurisdiction and the requirements of the power company. In the absence of local codes, the installation must comply with the current editions of the National Electrical Code, NFPA 70 or the Canadian Electrical Code CSA C22.1.

BRANCH CIRCUIT

The branch circuit wire size should be established through reference to the **NEC (National Electrical Code)** or other locally approved sources in conjunction with the water heater amperage rating.. Wire rated at 75°C should be used. For convenience, portions of the wire size tables from the Code are reproduced in Table 1. It is suggested the electrician size the branch circuit at 125 percent of the heater rating and further increase wire size as necessary to compensate for voltage drop in long runs. Voltage drop should not exceed 3% at the water heater.

HEATER CIRCUITS

The water heater's electrical components are pictured and identified by the Features and Components illustrations on pages 9 and 10. The model and rating plate illustration identifies the heater electrical characteristics. The heater has two electrical circuits:

Control Circuit: 120V circuit containing all safety and control devices. The control circuit operates the contactors in the power circuit.

Power Circuit: High voltage, single or three phase circuit that carries the heating element load.

The following section and pages describe the water heater circuits and includes wiring diagrams.

Portion of Table 310-16		Portion of Table 310-16	
Allowable Ampacities of Insulated Copper Conductors		Allowable Ampacities of Insulated Aluminum and Copper-Clad Aluminum Conductors	
Not More than Three Conductors in Raceway or Cable or Direct Burial (Based on Ambient Temperature of 86°F (30°C)).		Not More than Three Conductors in Raceway or Cable or Direct Burial (Based on Ambient Temperature of 86°F (30°C)).	
Size	Temperature Rating of the Conductor, see Table 310-13 in the NEC.	Size	Temperature Rating of the Conductor, see Table 310-13 in the NEC.
AWG MCM	167°F (75°C)	AWG MCM	167°F (75°C)
	TYPES RH, RHW, RUH (14-2); THW, THWN, XHHW, USE		TYPES RH, RHW, RUH (12-2); THW, THWN, XHHW, USE
18	-----	12	15
16	-----	10	25
14	15	8	40
12	20	6	50
10	30	4	65
8	45	3	75
6	65	2	90
4	85	1	100
3	100	1/0	120
2	115	2/0	135
1	130	3/0	155
1/0	150	4/0	180
2/0	175	250	205
3/0	200	300	230
4/0	230	350	250
250	255	400	270
300	285	500	310
350	310	600	340
400	335	700	375
500	380	750	385
600	420	800	395
700	460	900	425
750	475	1000	445
800	490	1250	485
900	520	1500	520
1000	545	1750	545
1250	590	2000	560
1500	625	These ampacities relate only to conductors described in Table 310-13 of the NEC. For ambient temperatures over 30°C, see Correction Factors, Note 13 in the NEC.	
1750	650		
2000	665		

TABLE 1. BRANCH CIRCUIT WIRE SIZE.

CONTROL CIRCUITS

The heater is equipped with one of the following control circuits, resulting in:

- A. Thermostats (mechanical)... where all of the heating elements are switched on/off by one or more thermostats. Heaters with thermostat control are adjusted as described in TEMPERATURE REGULATION section of this manual, see Page 19.
- B. Step controlled element operation...where elements are staged on/off individually or in groups rotationally by the controller. An optional feature is modulation which operates in conjunction with the staged on/off element operation.
- C. Sequencer... operates in conjunction with a thermostat (mechanical). The sequence is activated by a thermostat then the sequence switches on the heater elements in 3 sequences (multiple elements and contactors are required).

Additional instructional literature is provided with heaters equipped with modulating solid state step control or a sequencer.

All control circuits are operated on single-phase 120 volt current.

Control circuit wiring is 14 Awg, AWM (Appliance Wiring Material) type, rated 600 volts, 105°C.

Standard equipment includes control circuit fusing.

POWER CIRCUIT

Power circuit wiring is type THHN (or equivalent) rated 600 volts, 105°C, sized as necessary.

The following wiring diagrams are included in this manual to show typical arrangements of electrical components in the control and power circuits by voltage and phase characteristics. They are to be used as a reference by the installer or servicer in performing their work. An actual diagram of the water heater wiring is furnished with the heater.

ELECTRICAL AND RECOVERIES DATA

STANDARD KW INPUTS

Standard KW Ratings	Number of Immersion Heaters	BTU Input	GPH Recovery 100°F Rise	Number of 50A Contactors		Amperage Draw			
				Three-Phase	Three-Phase	Three-Phase			
				208V, 240V	480V, 600V	208V	240V	480V	600V
15	1-15KW	51,195	61	1	1	42	37	19	15
24	2-12KW	81,912	98	2	1	67	58	27	23
30	2-15KW	102,390	123	2	1	83	72	36	29
36	3-12KW	122,868	147	3	1	100	87	43	35
45	3-15KW	153,585	184	3	2	126	109	54	44
60	4-15KW	204,720	246	4	2	167	145	72	58
75	5-15KW	255,975	307	5	3	208	181	90	72
90	6-15KW	307,170	369	6	3	250	217	109	87
105	7-15KW	358,365	430	7	4	292	253	127	101
120	8-15KW	409,560	492	8	4	333	289	145	115
150	10-15KW	511,950	615	10	5	416	361	180	144
180	12-15KW	614,340	738	12	6	499	433	217	173
210	14-15KW	716,730	861	14	7	583	505	253	202
240	16-15KW	819,120	984	16	8	666	577	289	231
270	18-15KW	921,510	1,107	18	9	750	650	325	260
300	20-15KW	1,023,900	1,230	20	10	832	722	361	289
330	22-15KW	1,126,290	1,353	22	11	916	794	397	318
360	24-15KW	1,228,680	1,476	24	12	999	866	433	346
390	26-15KW	1,331,070	1,599	26	13	1,083	938	469	375
420	28-15KW	1,433,460	1,722	28	14	1,166	1,010	505	404
450	30-15KW	1,535,850	1,845	30	15	1,249	1,083	542	433
480	32-15KW	1,638,240	1,968	32	16	1,332	1,155	578	462
510	34-15KW	1,740,630	2,091	34	17	1,416	1,227	613	491
540	36-15KW	1,843,020	2,214	36	18	1,499	1,299	650	520
570	38-15KW	1,945,410	2,337	38	19	1,582	1,371	686	548
600	40-15KW	2,047,800	2,460	40	20	1,664	1,443	722	577
630	42-15KW	2,150,190	2,583		21	↑ Not Recommended ↓	↑ Not Recommended ↓	758	606
660	44-15KW	2,252,580	2,706		22			794	635
690	46-15KW	2,345,970	2,829		23			830	664
720	48-15KW	2,457,360	2,952		24			866	693
810	54-15KW	2,764,530	3,321		27			974	779
900	60-15KW	3,071,700	3,690		30			1,083	866
990	66-15KW	3,378,870	4,059		33			1,191	953
1080	72-15KW	3,686,040	4,428		36			1,299	1,039
1170	78-15KW	3,993,210	4,797		39			1,408	1,126
1260	84-15KW	4,300,380	5,166		42			1,516	1,213
1350	90-15KW	4,607,550	5,535		45	1,624	1,300		
1440	96-15KW	4,914,720	5,904		48	1,732	1,386		
1530	102-15KW	5,221,890	6,273		51	1,841	1,473		
1620	108-15KW	5,529,060	6,642		54	1,949	1,559		
1800	120-15KW	6,141,600	7,380		60	2,170	1,732		
1980	132-15KW	6,757,740	8,118		66	2,382	1,905		
2040	136-15KW	6,962,520	8,364		68	2,454	1,963		
2220	148-15KW	7,576,860	9,102		74	2,670	2,136		
2250	150-15KW	7,679,250	9,225		75	2,707	2,165		
2400	160-15KW	8,188,800	9,840		80	2,887	2,310		
2640	176-15KW	9,010,320	10,824		88	3,175	2,540		
2820	188-15KW	9,624,660	11,562		94	3,392	2,714		
3000	200-15KW	10,236,000	12,300		100	3,608	2,887		

Not Recommended

Not Recommended

TABLE 2.

WIRING DIAGRAMS

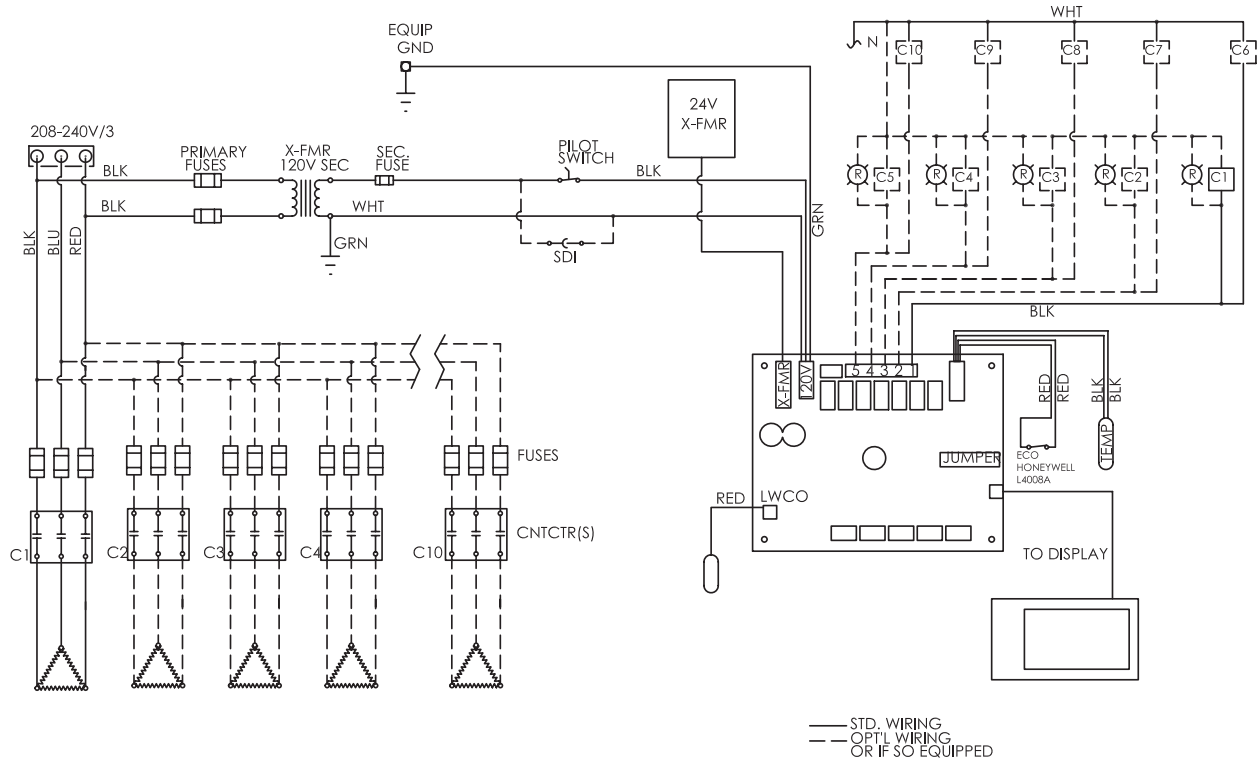


DIAGRAM 1. LARGE COMMERCIAL WIRE DIAGRAM 208-240V / 3PH W/O SLAVES

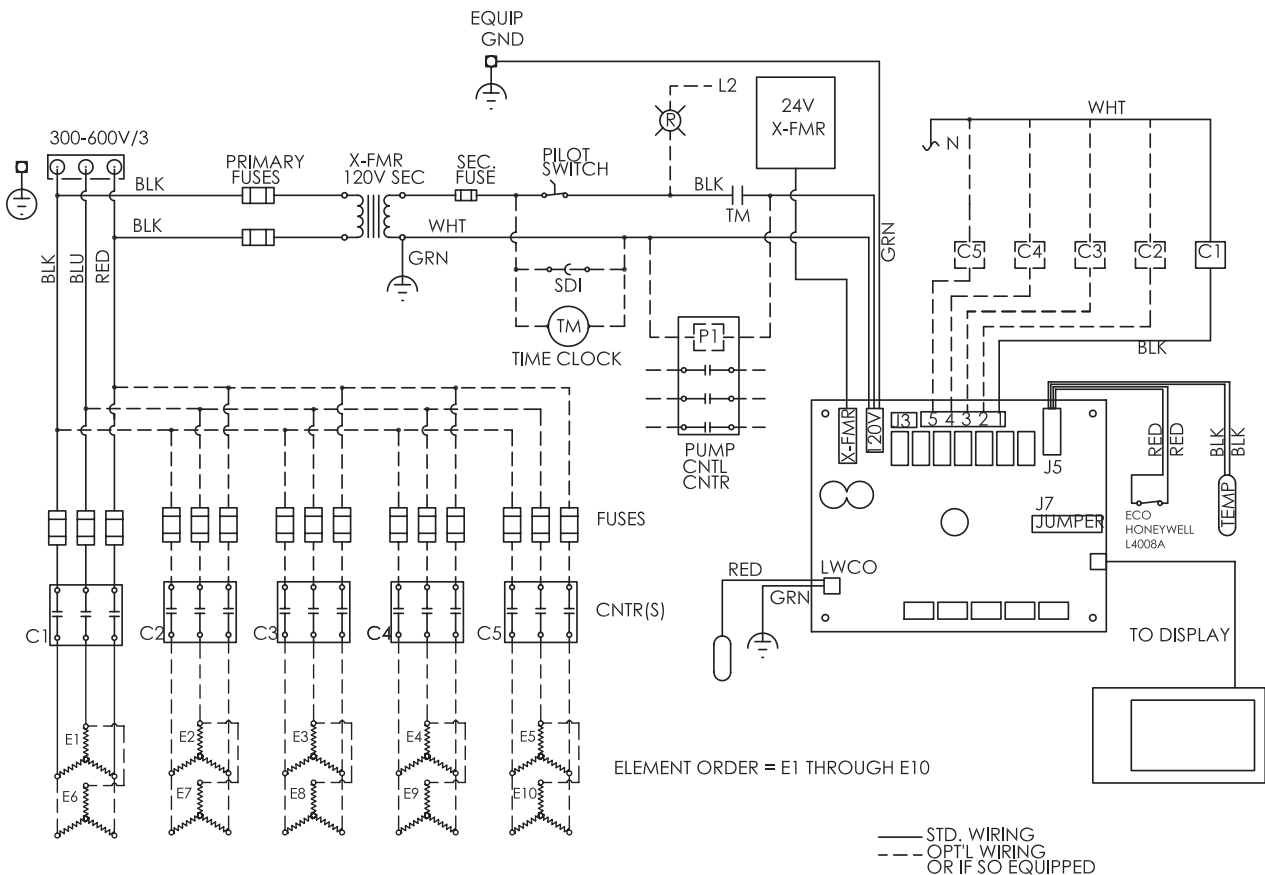


DIAGRAM 2. LARGE COMMERCIAL WIRE DIAGRAM 300-600V/3PH W/O SLAVES

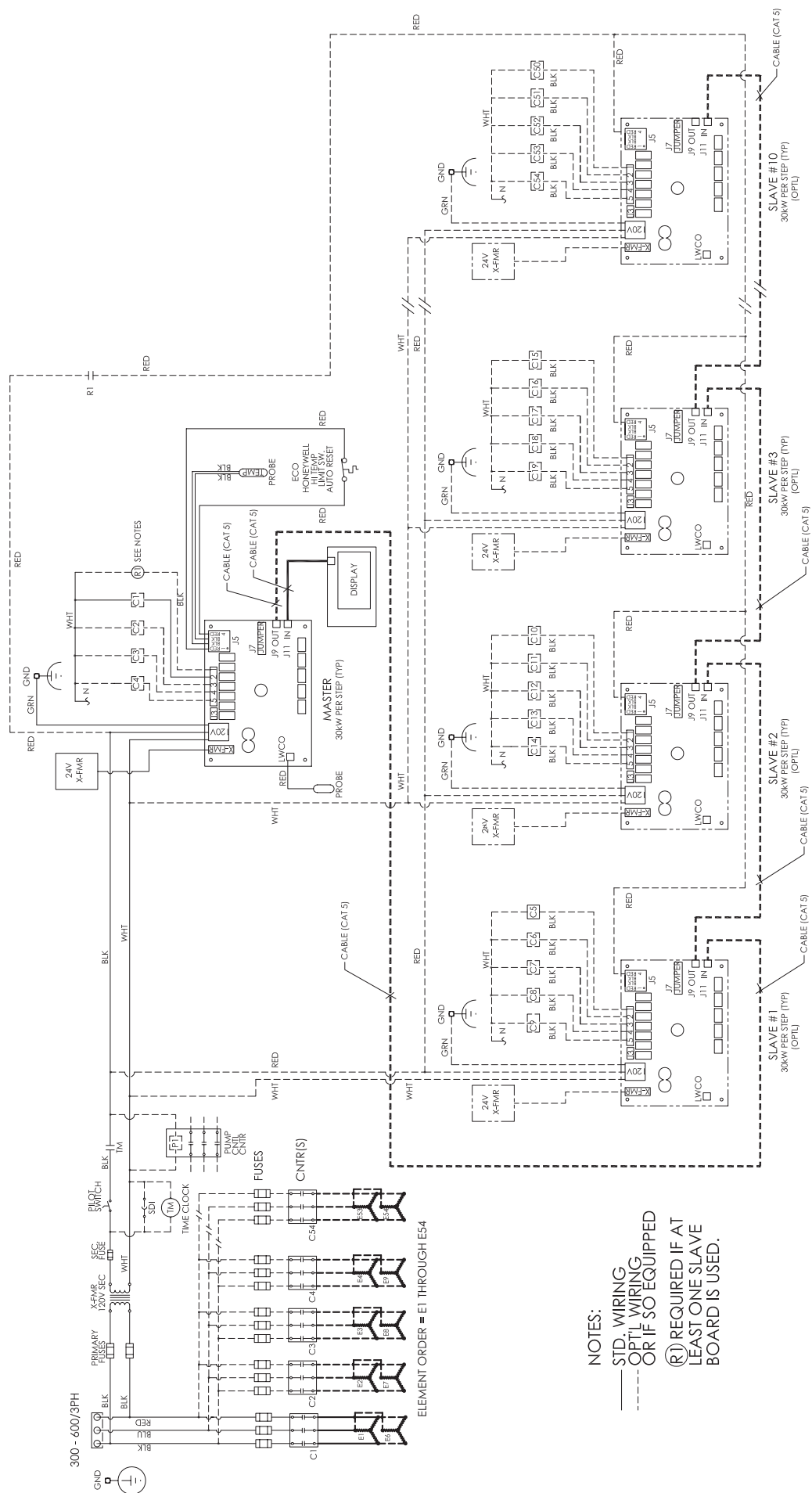


DIAGRAM 3: LARGE COMMERCIAL WIRE DIAGRAM (WYE) 300V - 600V/3PH WITH SLAVES.

OPERATION

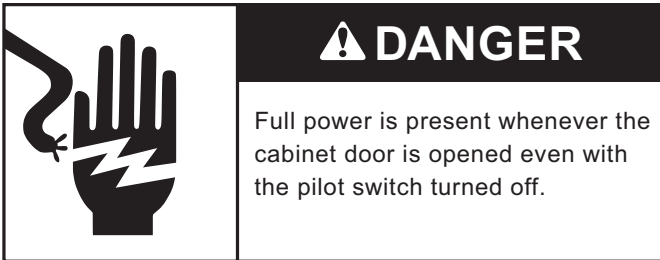
GENERAL

Refer to the Features and Components section of this manual (pages 9 & 10) for the location of components mentioned in the instructions that follow.

NEVER operate the heating elements without being certain the water heater is filled with water, and a temperature and pressure relief valve is installed in the relief valve opening on top of the heater.

An electric type low water cutoff is provided on all heaters as standard equipment. The water probe is installed near the top of the tank to monitor the presence of water. The control circuit is opened if the water level is below this point.

The pilot switch (power on/off toggle switch) on the cabinet front permits the heater to be turned on and off without having to operate the electrical disconnect switch.



Optional manual override switches on the cabinet front allow elements to be manually de-energized if full capacity is not needed.

FILLING THE WATER HEATER



To fill the water heater with water:

1. Turn off the electrical disconnect switch.
2. Turn off pilot toggle switch.
3. Close the heater drain valve.
4. Open a nearby hot water faucet to allow the air in the system to escape.
5. Fully open the cold water inlet valve, filling the heater and piping.
6. Close the hot water faucet when water starts to flow from the faucet. Leave the cold water inlet valve fully open. The heater is now ready for start up and temperature regulation.

7. Close the cabinet door and perform start up checks listed below before turning on the electricity.

INITIAL START UP

The following checks should be made by the installer when the water heater is placed into operation for the first time:

1. Check all factory and field made water and electrical connections for tightness. Also check connections on top of the heater. Repair water leaks and tighten electrical connections as necessary.
2. Turn on the electrical disconnect switch and pilot toggle switch. The pilot toggle switch is located on cabinet.
3. Observe the operation of the electrical components during the first heating cycle. **USE CARE AS THE ELECTRICAL CIRCUITS ARE ENERGIZED.**

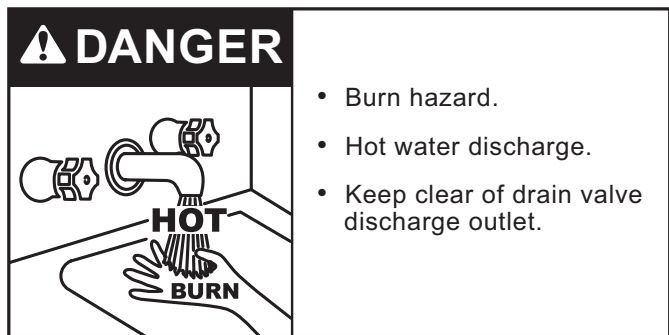
Temperature control and contactor operation should be checked by allowing heater to come up to temperature and shut off automatically. **USE CARE AS THE ELECTRICAL CIRCUITS ARE ENERGIZED.**

DRAINING THE WATER HEATER

The water heater must be drained if it is to be shut down and/or exposed to freezing temperatures. Maintenance and service procedures may also require draining the heater.

1. Turn off the electrical disconnect switch.
2. Turn off pilot toggle switch.
3. Close the cold water inlet valve to heater.
4. Open a nearby hot water faucet to vent the system.
5. Open drain valve.
6. If the heater is being drained for an extended shutdown, it is suggested the drain valve be left open during this period.

Follow FILLING instructions when restoring hot water service, see the list above.

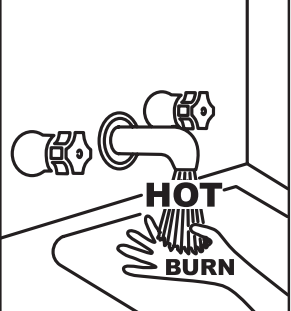


TEMPERATURE REGULATION

HIGH TEMPERATURE LIMIT CONTROLS (ECO)

If a HWL L4008A series high limit is used in place of the ECO in the probe it (HWL L4008A) should not be set above 190°F/88°C.

When the ECO switch contacts open (activate) the electronic control system locks out and displays a Fault message. Voltage to the contactor coils and heating elements is terminated to prevent further heating operation. Should the ECO activate, the water temperature must drop below 120°F/49°C before the control system can be reset. Once the water temperature has cooled below this point the power supply to the water heater must be turned off and on again to reset the control system.



⚠ DANGER

Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death. Children, the elderly and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering. Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.

Read instruction manual for safe temperature setting.


THERMOSTAT CONTROLS

The water heaters covered in this instruction manual are equipped with adjustable thermostat controls to control water temperature. Hot water temperatures required for automatic dishwasher and laundry use can cause scald burns resulting in serious personal injury and/or death. The temperature at which injury occurs varies with the person's age and duration of exposure. The slower response time of children, the elderly or disabled persons increases the hazards to them. Never allow small children to use a hot water tap or draw their own bath water. Never leave a child or disabled person unattended in a bathtub or shower. The water heater should be located in an area where the general public does not have access to set temperatures.

Setting the water heater temperatures at 120°F will reduce the risk of scalds. Some States require settings at specific lower temperatures.

The following table shows the approximate time-to-burn relationship for normal adult skin.

TEMPERATURE ADJUSTMENT



⚠ DANGER

Full power is present whenever the cabinet door is opened even with the pilot switch turned off.

The water heaters covered in this instruction manual are equipped with an electronic control system. The control system senses temperature from a factory installed immersion temperature probe – see the Features and Components illustrations at the beginning of this manual for location. The “Operating Set Point” is adjusted to control water temperature. This is an adjustable user setting in the control system’s “Temperatures Menu.” This and all control system menus are accessed through the UIM (User Interface Module) located on the front panel of the water heater. See Figure 1.

The Operating Set Point is adjustable from 90°F/42°C to 190°F/88°C. The factory setting is 120°F/49°C. See the Control System Operation section of this manual for instructions on how to adjust the Operating Set Point and other user settings.

Set the Operating Set Point at the lowest setting which produces an acceptable hot water supply. This will always give the most energy efficient operation.

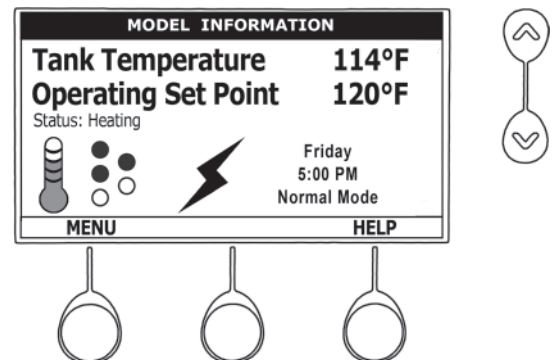


FIGURE 1. UIM (User Interface Module).

Water Temperature °F	Time for 1st Degree Burn (Less Severe Burns)	Time for Permanent Burns 2nd & 3rd Degree (Most Severe Burns)
110	(normal shower temp.)	
116	(pain threshold)	
116	35 minutes	45 minutes
122	1 minute	5 minutes
131	5 seconds	25 seconds
140	2 seconds	5 seconds
149	1 second	2 seconds
154	instantaneous	1 second

(U.S. Government Memorandum, C.P.S.C., Peter L. Armstrong, Sept. 15, 1978)

CONTROL SYSTEM OPERATION

HEATING ELEMENT OPERATION

Progressive Sequencing: Elements are energized and de-energized according to adjustable (1 to 20°F) Differential set points for each element. Element Rotation - first element on is rotated with each successive call for heat. First On/First Off - the first heating element energized at the beginning of a heating cycle is the first element de-energized at the end of the heating cycle. Successive heating cycles would progress as follows on a model equipped with 3 heating elements:

- First heating cycle: Elements come on [1, 2, 3] and cycle off [1, 2, 3].
- Second heating cycle: Elements come on [2, 3, 1] and cycle off [2, 3, 1].
- Third heating cycle: Elements come on: [3, 1, 2] and cycle off [3, 1, 2].
- Fourth heating cycle: pattern repeats - same as first.

CONTROL SYSTEM FEATURES

Advanced Diagnostics

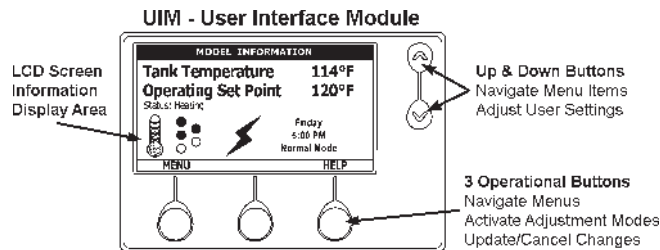
Plain English text and animated icons display detailed operational and diagnostic information. LCD screen on the front of the water heater displays the Sequence of Operation in real time. Fault or Alert messages are displayed when operational problems occur. Advanced Service menu displays a list of possible causes for current Fault and Alert conditions to aid in servicing.

Economy Mode Operation

Control system automatically lowers the Operating Set Point by a programmed value during user defined time periods. Helps reduce operating costs during unoccupied or peak demand periods.

CONTROL SYSTEM NAVIGATION

The UIM (User Interface Module) is located on the front cabinet of the water heater. All operational information and user settings are displayed and accessed using the UIM. The UIM includes five snap acting (momentary) user input buttons; an Up, Down and 3 Operational Buttons.



Up & Down Buttons

Used to navigate (up and down) and to select (highlight) menu items. Also used to adjust or change (increase/decrease, on/off, set time) various user settings.

Operational Buttons

The 3 Operational Buttons are multifunctional. Their current function is defined by the text that appears directly above each button on the LCD screen. The function will change depending on what menu is currently displayed or what menu item is selected. When no text

appears on the LCD screen above an Operational Button there is no function assigned.

THE DESKTOP SCREEN

The illustration below shows the control system "Desktop Screen." This is the default screen. If there are no active Fault or Alert conditions and no user input for approximately 10 minutes the control system will return to this screen automatically.

Model Information: Model information and menu titles are shown in the black bar at the top of the Desktop Screen.

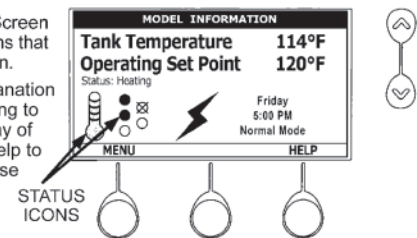
Tank Temperature: Current water temperature as sensed from the immersion Temperature Probe.

Operating Set Point: Temperature at which the control system will maintain tank (water) temperature in the Normal Mode. This line of text will read Economy Set Point whenever the control system is operating in the Economy Mode.

Status: The Operating State of the control system is displayed beneath the Operating Set Point.

Service Note: The Desktop Screen displays text and animated icons that convey operational information.

Review the Status Icons explanation in Table 3 on page 10. Learning to use this real time visual display of the operating sequence will help to quickly and accurately diagnose operational problems.



Menu: The left Operational Button is pressed to enter the Main Menu where all control system menus are accessed. See Table 3 on page 10 for a list of control system menus.

Help: The right Operational Button is pressed to access instructions and explanations for user settings, Operating States, Status Icons, manufacturer's web address, technical support phone number and service agent contact information.

Day/Time/Operating Mode: The current time and day are also displayed on the Desktop Screen. "Clock Not Set" will be displayed until the time clock has been initially set. Day and Time are adjusted in the Economy Mode Setup menu. The current Operating Mode, either Normal Mode or Economy Mode, is displayed beneath the day and time.

Discreet Menu Contact Information: From the Desktop Screen press and hold down the middle (unmarked) Operational Button for 30 seconds and then release it. This will launch a discreet menu where personalized contact information can be entered. Installing contractors and/or service agents can enter their company name and telephone number. This contact information will be displayed with all Fault and Alert messages.

TABLE 1 - STATUS ICONS







ICON	DESCRIPTION
	Water temperature in the tank has fallen. Shaded area of the animated thermometer icon will rise and fall in response to water temperature in the storage tank as sensed from the immersion Temperature Probe.
	Water temperature in the tank has reached the Operating Set Point. Shaded area of the animated thermometer icon will rise and fall in response to water temperature in the storage tank as sensed from the immersion Temperature Probe.
	The control is unable to initiate a heating cycle. This will happen whenever a Fault condition is detected by the control system or when either of the two Enable/Disable circuits are open circuits.
	The control system is in Heating Mode and has energized the electromagnetic contactor coils for at least one heating element. This animated icon DOES NOT indicate current has been sensed from the heating elements, only that there is a call for heat present and the control system has initiated heating element operation.
	The control has detected/declared a Fault Condition. Fault message details can be viewed in the Current Fault menu. Heating operation is discontinued (locked out) until the condition that caused the fault is corrected. Power to the water heater must be cycled off and on to reset the control system. Note; cycling power will not reset the control system if the condition that caused the fault has not been corrected.
	The control has detected/declared an Alert Condition. The water heater will continue to operate during an Alert Condition but there is an operational condition that requires the attention of a Qualified Service Agent. Alert message details can be viewed in the Current Alert menu.

TABLE 2 - OPERATING STATES

STATE	DESCRIPTION
Standby	The water heater is not in an active heating cycle. This usually indicates the temperature in the tank has reached the Operating Set Point and the control system has terminated the heating cycle.
Heating	The control system is in the Heating Mode. At least one heating element has been energized.
Alert	The control system has detected/declared an Alert Condition. The controls system will continue heating operation. However, a Qualified Service Agent should be contacted to check/service the water heater.
Fault	The control system has detected/declared a Fault Condition. The control system will discontinue heating operation and "lock out." Power to the water heater must be cycled off and on to reset the control system. Note; cycling power will not reset the control system until the condition that caused the fault has been corrected.

TABLE 3 - CONTROL SYSTEM MENUS

MENUS	DESCRIPTION
Temperatures	Most commonly accessed menu. Operating Set Point, Differential settings, Tank Temperature and Tank Probe Offset are located in this menu.
Heater Status	Current Operating State/Mode (heating/standby etc) and status (open/closed - on/off - yes/no) of monitored water heater functions and components are displayed in this menu.
Economy Mode Setup	Seven day 24 hour time clock with temperature set back capability to reduce operating costs during unoccupied or reduced demand periods.
Alarm Output Setup	The control system's CCB (Central Control Board - see wiring diagrams) features on board SPDT (single pole double throw) relay contacts for building EMS (Energy Management System) notification of operational conditions such as Fault Conditions and heating mode status. This menu features a list of user definable conditions for relay activation.
Display Settings	Temperature units (°F or °C), appearance (brightness contrast) and backlight delay user adjustable settings are located in this menu.
Heater Information	Elapsed time of operation, total heating cycle time, heating cycle count, heating element(s) cycle count and on time along with UIM and CCB software revisions can be viewed in this menu.
Current Fault/Alert	Displays any current Alert or Fault messages.
Fault History	Retains 9 event history of Fault/Alert messages with time stamp. The Fault History is useful when dealing with intermittent operational problems or when the customer has reset the control system prior to a service agent's arrival.
Fault Occurrence	Total accumulated number each individual Fault condition has occurred is displayed in this menu. This running total of Fault Occurrences can be useful in determining which (if any) operational problems have been persistent.
Restore Factory Defaults	This control system feature allows the user to restore control system user settings to their factory default settings. Alarm Output Setup and Display Settings menu items ARE NOT changed when factory defaults are restored.
Help Menu	Accessible by pressing the corresponding Operational Button from most menus and screen displays. This menu provides access to instructions and explanations for user settings, Operating States, Status Icons, manufacturer's web address, technical support phone number and service agent contact information.

TEMPERATURES MENU

Operating Set Point

User adjustable setting 90°F to 190°F range; factory default is 120°F. When the water temperature sensed by the control system from the immersion Temperature Probe reaches the Operating Set Point the control system will end the heating cycle. A call for heat will be activated again when the water temperature drops below the Operating Set Point minus the 1st Differential Setting.

Example: Operating Set Point is 120°F, the 1st Differential Setting is 2°F (factory default). A call for heat will be activated when the sensed water temperature drops to 118°F.

Temperatures	
Operating Set Point	120°F
1st Differential	2°F
2nd Differential	2°F
3rd Differential	2°F
Tank Temperature	105°F
Tank Probe Offset	0°F
CHANGE	BACK HELP

Differential Settings

Adjustable user setting(s) 1°F to 20° range; factory default is 2°F. The water heaters covered in this manual will have between 1 and 5 heating elements. There is at least one Differential Setting on all models. There will be additional Differential Settings for each additional heating element installed.

Operating Sequence

On a water heater equipped with 3 heating elements, with an Operating Set Point of 120°F and all Differential settings at 2°F the On/Off sequencing of heating elements would be as follows:

ELEMENT NUMBER	DIFFERENTIAL SETTING	TURN ON TEMP	TURN OFF TEMP
Element 1	2°F	118°F	120°F
Element 2	2°F	116°F	118°F
Element 3	2°F	114°F	116°F

Tank Temperature

Non adjustable information display. Current water temperature as sensed by the control system from the immersion Temperature Probe.

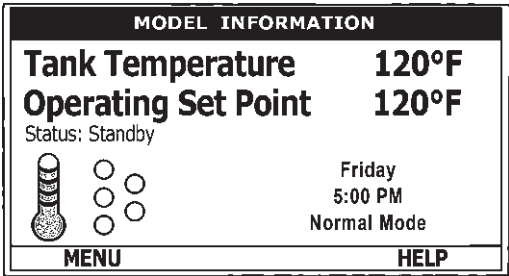
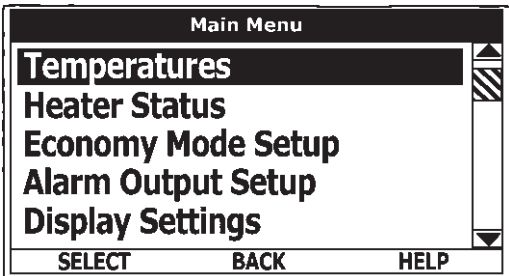
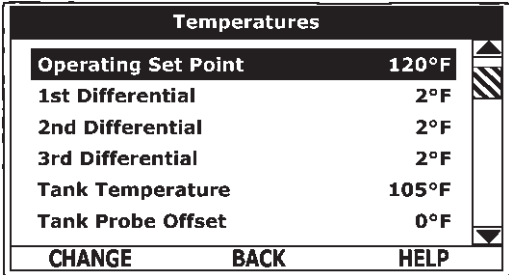
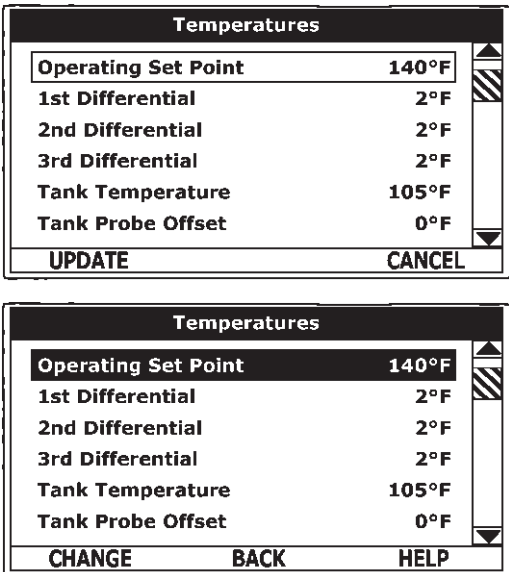
Tank Probe Offset

User adjustable setting -5°F to +5°F range; factory default is 0°F. If the current Tank Temperature is sensed (from the immersion Temperature Probe) at 120°F and the offset is adjusted to -5°F the control system would calibrate or “offset” the Tank Temperature to 115°F. Heating cycles would then start/stop based on the calibrated Tank Temperature.

Used to calibrate for slight differences in control system temperature sensing. This can improve the precision of temperature control in the storage tank and at points of use. This feature can also be used to compensate for building recirculation loops (hot water returning to the storage tank) that may cause the heating cycle to terminate prematurely.

Temperature Settings

The Operating Set Point and the Differential Settings are adjusted in the Temperatures Menu. The following instructions explain how to adjust these user settings and navigate the control system menus.

ACTION	DISPLAY
<p>From the Desktop Screen, press the Operational Button underneath "MENU" to enter the Main Menu.</p> <p>Notice how the text above the Operational Buttons on the display changes as you navigate through the various menus and screens.</p>	
<p>With Temperatures selected (highlight in black) in the Main Menu, press the Operational Button underneath "SELECT" to enter the Temperature Menu.</p> <p>If Temperatures is not selected use the Up and Down buttons to select this menu item.</p>	
<p>With the Operating Set Point selected (highlighted in black) in the Temperatures Menu, press the Operational Button underneath "CHANGE" to activate the adjustment mode for this menu item.</p>	
<p>Press the Up and Down buttons to adjust the Operating Set Point to the desired setting.</p> <p>Press the Operational Button underneath "UPDATE" to confirm the new setting. Press the Operational Button underneath "CANCEL" to discard the new setting and retain the previous setting.</p> <p>The new Operating Set Point value should now be displayed as the current value.</p> <p>NOTE: Use this same procedure to adjust the Differential settings and the Tank Probe Offset in the Temperatures Menu.</p> <p>This same procedure is used to change user settings in other control system menus.</p>	

WATER HEATER STATUS MENU

This menu displays non adjustable operational information. Use the Up & Down Buttons to navigate to the bottom of this menu.

Top of Menu

Heater Status	
Status	Heating
Elements On	1
ECO Contact	Closed
Enable / Disable 1	Closed
Enable / Disable 2	Closed
Element 1 On	Yes
Element 2 On	No
BACK HELP	

Bottom of Menu

Heater Status	
Enable / Disable 2	Closed
Element 1 On	Yes
Element 2 On	No
Element 3 On	No
Tank Full	Yes
Alarm Condition	No
Alarm Relay Output	Open
BACK HELP	

Status

Displays the current Operating State of the control system. IE: Heating, Standby, Fault.

Elements On

Displays the number of heating elements the control system has energized.

ECO Contact

Displays the current state of the ECO high temperature limit switch contacts.

Enable / Disable 1 & 2

Displays the current state, open or closed, of the two Enable/Disable circuits (J7 socket on the CCB - see wiring diagrams on page 6) provided for external supervisory controls such as building EMS (Energy Management System). Both of these Enable/Disable circuits must be closed to "enable" heating operation. If either Enable/Disable circuit is open for any reason heating operation will be "disabled." There is a plug with two jumper wires installed from the factory in the CCB J7 socket to enable heating operation when external controls are not in use.

Service Note: If a supervisory control(s) is used to enable/disable heating operation, install field wiring between the J7 socket on the CCB and a set of "dry contacts" on the external control per all applicable building codes. This is a switching circuit only: DO NOT apply any external voltage or connect any load (IE: relay coil) to either circuit.

Element # On

Displays the on/off status of each heating element. Yes = On, No = Off.

Tank Full

Displays the status of the optional LWCO (Low Water Cut Off) device. Yes = water level is acceptable, No = water level is low.

Alarm Condition

Displays the status of the user definable Alarm Output function - see Alarm Output Setup Menu. Yes = alarm condition has been met, No = alarm condition has not been met.


Alarm Relay Output

Displays the state of the normally open contacts of the Alarm Output relay. This relay (J3 contacts on the CCB - see wiring diagrams) is used for building EMS (Energy Management System) notification of operational conditions such as Fault conditions.

ECONOMY MODE SETUP MENU

This menu contains settings used to establish an "Economy Set Point" and "Economy Mode" operating periods. This control system feature can help reduce operating costs during unoccupied, low load, or peak demand periods.

Desktop Screen During Economy Mode

MODEL INFORMATION	
Tank Temperature	120°F
Economy Set Point	100°F
Status: Standby	
	Friday 5:00 PM Economy Mode
MENU HELP	

Economy Mode Setup Menu

Economy Mode Setup	
Setpoint Adjustment	20
Current Time	Mon 5:00 PM
Heater In Economy Mode	No
Sun	Economy Mode All Day
Mon	Normal 7:30 AM to 8:00 PM
Tue	Normal All Day
Wed	Normal All Day
CHANGE BACK HELP	

Setpoint Adjustment

Adjustable user setting (2°F to 50°F - factory default is 20°F) the control system uses to calculate the "Economy Set Point." The Economy Set Point = normal Operating Set Point minus the programmed Setpoint Adjustment value.

The Economy Set Point is the water temperature the control system maintains during programmed Economy Mode time periods. "Economy Set Point" is displayed instead of "Operating Set Point" and "Economy Mode" appears beneath the current time on the Desktop Screen during Economy Mode time periods.

Current Time

Seven Day 24 hr clock. Use this menu item to set the current time and day of the week. Current day and time are not set from the factory. "Clock Not Set" will be displayed on the Desktop until the time/day has been initially set. Note: the time will not self adjust for Daylight Savings time.

Heater In Economy Mode

Displays whether the control system is currently operating in Economy Mode or not.

Daily Operating Mode (Sun - Mon - Tue - Wed - Thu - Fri - Sat)

Seven daily sub menus are listed at the bottom of the Economy Mode Setup menu. There are 3 Operating Modes in each sub menu; "Normal Operation All Day" - "Economy Mode All Day" and "Normal Operation Between." Only one Operating Mode can be active, the factory default is Normal Operation All Day.

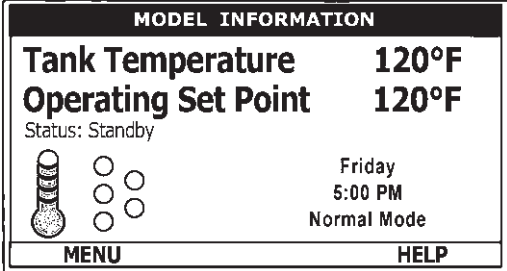
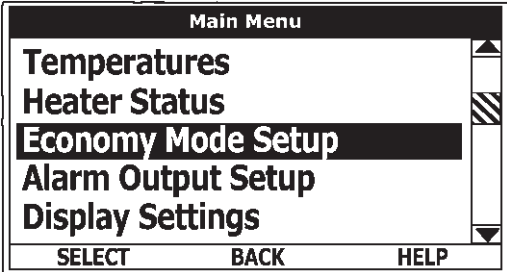
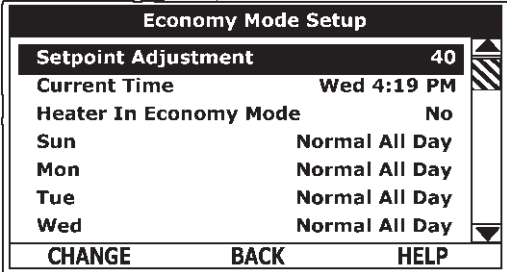
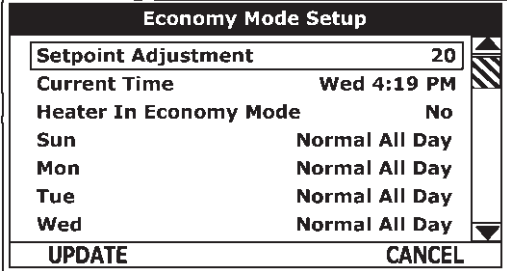
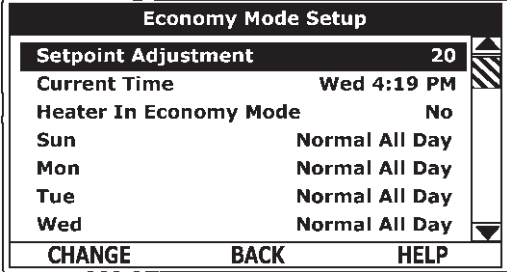
Normal Operation All Day: When this operating mode is active the normal Operating Set Point is used for the entire day.

Economy Mode All Day: When this operating mode is active the Economy Set Point is used for the entire day.

Normal Operation Between: When this operating mode is active there will also be start and stop times to program. The normal Operating Set Point is used between the programmed start and stop times and the Economy Set Point will be in effect during the rest of the day. There is one start time and one stop time event per day.

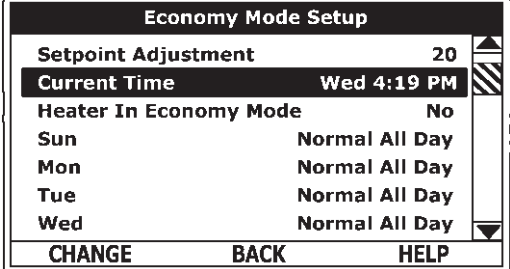
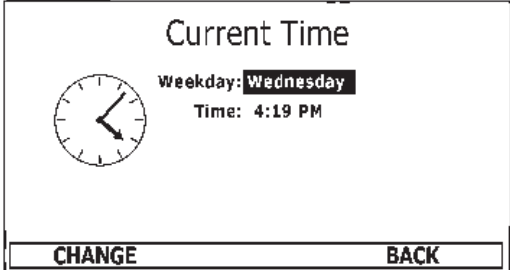
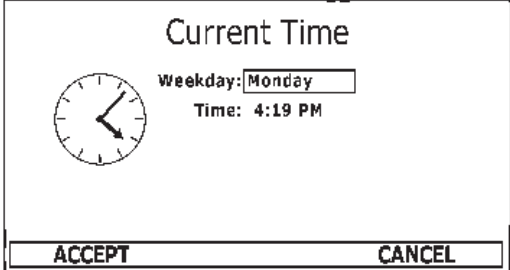
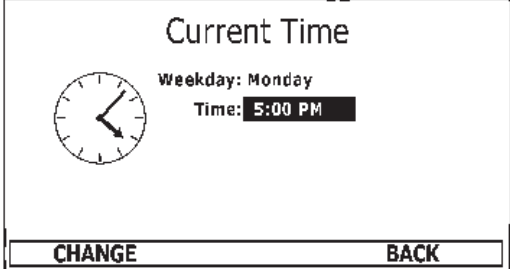
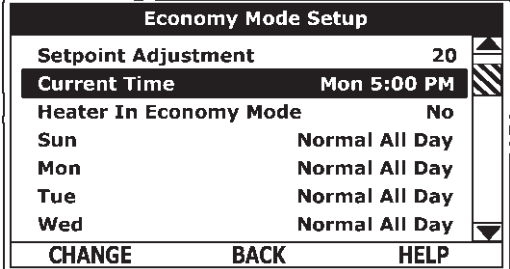
ECONOMY MODE SETTINGS

Setpoint Adjustment Value

ACTION	DISPLAY
<p>From the Desktop screen, press the Operational Button underneath "MENU" to enter the Main Menu.</p> <p>Notice how the text above the Operational Buttons on the display changes as you navigate through the various menus and screens.</p>	
<p>Use the Up/Down buttons to select (highlight in black) the Economy Mode Setup menu from the Main Menu. Press the Operational Button underneath "SELECT" to enter the Economy Mode Setup menu.</p>	
<p>Use the Up/Down buttons to select (highlight in black) Setpoint Adjustment. Press the Operational Button underneath "CHANGE" to activate the adjustment mode for the Setpoint Adjustment value.</p>	
<p>Use the Up/Down buttons to change the Setpoint Adjustment to the desired value. The Setpoint Adjustment value is adjustable from 2°F to 50°F. The factory default is 20°F.</p> <p>Notice how the text above the Operational Buttons on the display changes to "UPDATE" & "CANCEL" when the adjustment mode is activated and how the current value is outlined rather than highlighted in black.</p> <p>Press the Operational Button underneath "UPDATE" to enter and confirm the new value. Pressing the Operational Button underneath "CANCEL" would discard the new value and retain the previous value.</p>	
<p>The new Setpoint Adjustment value should now be displayed as the current value.</p>	

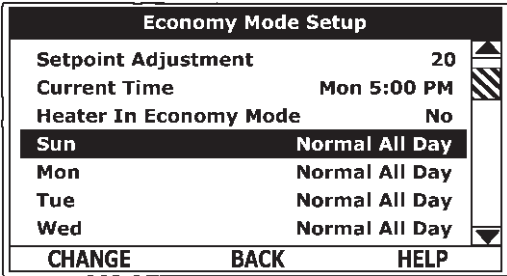
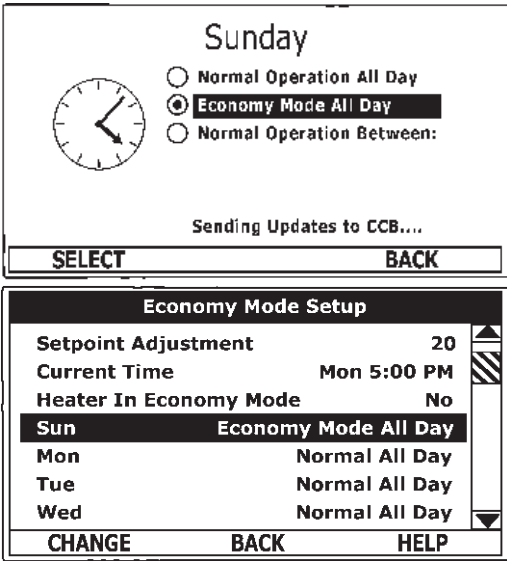
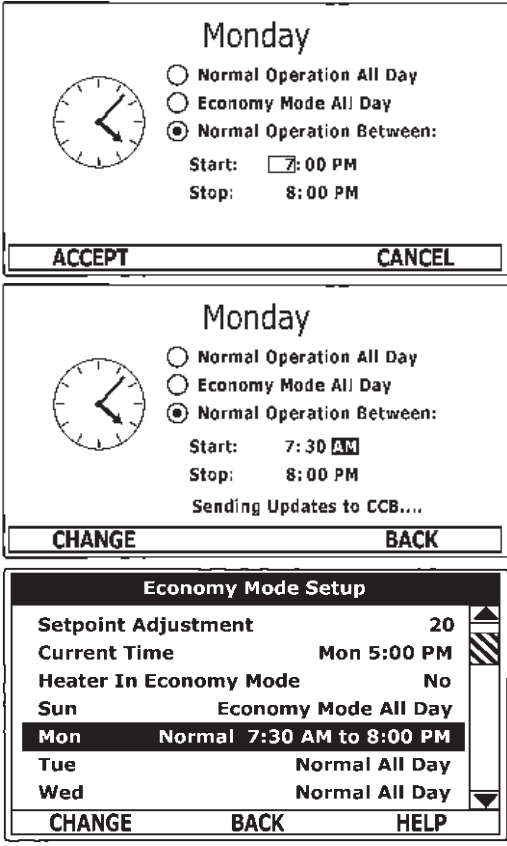
ECONOMY MODE SETTINGS

Time Clock Settings

ACTION	DISPLAY
<p>From the Desktop Screen navigate to the Economy Mode Setup menu.</p> <p>Use the Up/Down buttons to select (highlight in black) Current Time sub menu. Press the Operational Button underneath "CHANGE" to enter the Current Time sub menu.</p>	
<p>Use the Up/Down buttons to select the "Weekday" setting.</p> <p>Press the Operational Button underneath "CHANGE" to activate the adjustment mode for this setting.</p>	
<p>Press the Up/Down buttons to adjust the Weekday setting to the current day.</p> <p>Notice how the text above the Operational Buttons on the display changes to "ACCEPT" & "CANCEL" when the adjustment mode is activated and how the current setting is outlined rather than highlighted in black.</p> <p>Press the Operational Button underneath "ACCEPT" to enter and confirm the new setting. Pressing the Operational Button underneath "CANCEL" would discard the new setting and retain the previous setting.</p>	
<p>Use the Up/Down and the CHANGE/ACCEPT Operational Buttons to individually select and change the remaining time settings (Hour, Minutes, AM/PM) to the current time in the same way as outlined above.</p> <p>When finished making changes press the Operational Button underneath "BACK" to confirm all new settings and update the control system. The display will automatically return to the Economy Mode Setup menu.</p>	
<p>The new settings should be displayed as the Current Time.</p>	

ECONOMY MODE SETTINGS

Daily Operating Mode Settings

ACTION	DISPLAY
<p><u>Economy Mode All Day:</u></p> <p>From the Economy Mode Setup menu use the Up/Down buttons to select (highlight in black) the Daily sub menu for "Sun." Press the Operational Button underneath "CHANGE" to enter this menu.</p>	
<p>Use the Up/Down buttons to select (highlight in black) the "Economy Mode All Day" setting.</p> <p>Press the Operational Button underneath "SELECT" to change from the factory default Normal Operation All Day setting to the Economy Mode All Day setting.</p> <p>Press the Operational Button underneath "BACK" to confirm the new setting and update the control system. You will be returned to the Economy Mode Setup menu. The new setting should now be displayed for Sun.</p>	
<p><u>Normal Operation Between:</u></p> <p>From the Economy Mode Setup menu Use the Up/Down and CHANGE buttons to enter the Mon sub menu as described above.</p> <p>Use the Up/Down buttons to select (highlight in black) the "Normal Operation Between" setting. Press the Operational Button underneath "SELECT" to change the operating mode for Monday to Normal Operation Between. Note that when this setting is selected Start and Stop time user settings appear on the display.</p> <p>Use the Up/Down buttons to navigate between the Start and Stop time Hour, Minutes and AM/PM settings.</p> <p>With each item selected press the Operational Button underneath "CHANGE" to activate the adjustment mode for each setting. Use the Up/Down buttons to change the value to the desired setting.</p> <p>Press the Operational Button underneath "ACCEPT" to enter the new setting or "CANCEL" to discard the new setting and retain the previous setting.</p> <p>Press the Operational Button underneath "BACK" when finished to confirm the new settings and update the control system. The display will return to the Economy Mode Setup menu with the new settings shown for Mon.</p>	

ALARM OUTPUT SETUP MENU

Permits user to set the condition (from a list of options) for when the CCB's integral alarm output relay will be energized. Alarm relay connections (common, normally open, normally closed) are located on the J3 terminal strip on the CCB - see wiring diagrams. Alarm output relay contacts are capable of switching **1 amp maximum at 120 VAC**.

Alarm Output Setup	
Output Function	Fault
Alarm SP	120°F
CHANGE BACK HELP	

Alarm Output Setup	
Output Function	Temp < Alarm SP
Alarm SP	120°F
CHANGE BACK HELP	

The alarm relay operates in the background according to the settings in this menu and is not capable of disabling water heater operation. The alarm relay is used for external notification/verification of various operational conditions such as fault conditions and heating mode status. This relay can be used with building EMS (Energy Management System) and other external supervisory controls.

Output Function

Adjustable user setting. Available options for the Alarm Output Function setting are:

Heating Mode: Used for heating mode on/off status notification.

Enable / Disable Closed: Used for notification and/or verification of the enable/disable circuits open/closed status. There are two enable/disable circuits available for external supervisory control(s) at the J7 socket on the CCB - see wiring diagrams on page 6. Enable/disable circuit(s) status can be viewed in the Heater Status Menu.

Temp < Heater SP: Used for external notification when current tank temperature drops below Operating Set Point.

Temp < Alarm SP: Used for external notification when current tank temperature drops below programmable Alarm SP.

Fault or Alert: Used for external notification whenever a Fault or Alert condition is active.

Fault: Used for notification whenever a Fault condition is active.

Disabled: Disables the Alarm Relay Output Function.

Alarm SP

Adjustable user setting (90°F to 190°F) the control system uses for the "Temp < Alarm SP" function described above. This setting has no effect with any other Alarm Output functions.

Alarm Output Settings

Changing the user settings in this menu is done using the same methods for changing the Operating Set Point.

Service Note: Adjustable user settings in the Alarm Output Setup menu are unaffected by Restore Factory Defaults.

DISPLAY SETTINGS MENU

Permits user to set display options for viewing information on the UIM's LCD screen.

Display Settings	
Temperature Units	°F
Backlight Delay	30s
Contrast	20%
CHANGE BACK HELP	

Temperature Units

Adjustable user setting that changes temperature units display to Celsius °C or Fahrenheit °F.

Backlight Delay

Adjustable user setting that determines how long the UIM's LCD backlight remains illuminated after a key has been pressed. Available settings are; Always Off, 10, 30 or 60 seconds and Always On.

Contrast

Adjustable user setting to adjust the UIM's LCD screen contrast between text and background.

Display Settings

Changing the user settings in this menu is done using the same methods for changing the Operating Set Point.

Service Note: Adjustable user settings in the Display Settings menu are unaffected by Restore Factory Defaults.

HEATER INFORMATION MENU

This menu displays non adjustable operational information.

Top of Menu

Heater Information	
Elapsed Time	7 days 18 hrs 35 mins
Total Heating Time	2 days 46 mins
Cycle Count	00000042
Element 1 Cycles	00000035
Element 1 On Time	
BACK HELP	

Bottom of Menu

Heater Information	
Element 2 On Time	1 day 4 hrs 44 mins
Element 3 Cycles	00000025
Element 3 On Time	8 hrs 30 mins
CCB Version	0.00
UIM Version	0.00
<div>BACK</div> <div>HELP</div>	

Elapsed Time

Total accumulated time the control system (water heater) has been energized.

Total Heating Time

Total accumulated time the control system has been in the heating mode. IE: any heating elements have been energized.

Element # Cycles

Total accumulated count of heating cycles for each heating element.

Element # On Time

Total accumulated heating on time for each heating element.

CCB Version

Software version for Central Control Board.

UIM Version

Software version for User Interface Module

CURRENT FAULT / ALERT MENU

This menu displays non adjustable operational information. With the Fault History sub menu selected in Main Menu; press the Operational Button underneath "SELECT" to display the current Fault or Alert message. If there is not a Fault or Alert condition currently active "(none)" is displayed to the right of this menu.

Main Menu - Current Fault Selected

Main Menu	
Heater Information	
Current Fault (45)	
Fault History	
Fault Occurrence	
Restore Factory Defaults	
<div>SELECT</div> <div>BACK</div> <div>HELP</div>	

FAULT HISTORY MENU

This menu displays non adjustable operational information. The control system records and stores the last 9 Fault and Alert

messages in chronological order in this menu. The most recent will be at the top of the list. A time stamp is displayed below each listed Fault and Alert message showing when the Fault or Alert condition occurred.

The Fault History is useful when dealing with intermittent operational problems or when the customer has reset the control system prior to a service agent's arrival.

With a Fault or Alert item selected press the Operational Button underneath "VIEW" to display the details for the Fault or Alert message. The Fault/Alert message screen displays a brief description of the condition, contact information and access to the Advanced service information sub menu.

Fault History Menu

Fault History	
1:	No Current Detected (40D) 1 days 5 hrs 45 mins ago
2:	Energy Cut Out (ECO) (A5) 1 days 6 hrs 20 mins ago
3:	Temp Probe Short (45) 2 days 1 hrs 10 mins ago
4:	No Current Detected (40D)
<div>VIEW</div> <div>BACK</div> <div>HELP</div>	

Current/History Fault Message

Temp Probe Short	
Fault occurred 14 mins ago	
There is a problem with the temperature probe.	
Call a service professional: Paul Stewart (XXX) XXX - XXXX	
(press [DOWN] for more.....)	
<div>BACK</div> <div>ADVANCED</div>	

FAULT OCCURRENCE MENU

Total accumulated number each individual Fault condition has occurred is displayed in this menu. This running total of Fault Occurrences can be useful in determining which (if any) operational problems have been persistent.

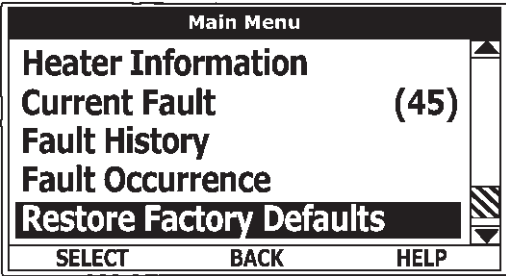
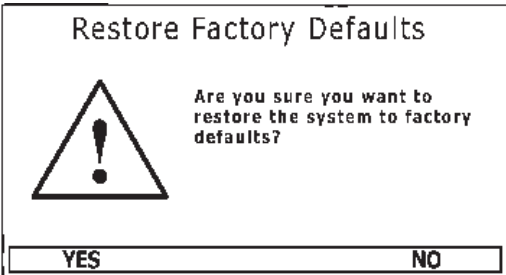
Fault Occurrence Menu

Fault Occurrence	
ECO	1
No Current Detected	3
LWCO	2
Tank Temp Probe	1
Powered Anode Fail	1
CCB Hardware	0
Model Faults	0
<div>BACK</div> <div>HELP</div>	

RESTORE FACTORY DEFAULTS MENU

This control system menu allows the user to restore most of the control system’s user settings to their factory default settings. **User settings in the Alarm Output Setup and Display Settings menus are unaffected by executing Restore Factory Defaults.**

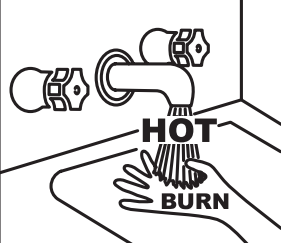
Restore Factory Defaults

ACTION	DISPLAY
<p>From the Main Menu use the Up/Down buttons to select (highlight in black) the “Restore Factory Defaults” menu.</p> <p>Press the Operational Button underneath “SELECT.” The Restore Factory Defaults menu will be displayed.</p>	
<p>From the Restore Factory Defaults menu press the Operational Button underneath “YES.” The display will show text confirming the factory default settings have been restored.</p> <p>Press the Operational Button underneath “BACK” to exit the Restore Factory Defaults menu.</p>	

MAINTENANCE

GENERAL

⚠ DANGER



- Burn hazard.
- Hot water discharge.
- Keep clear of drain valve discharge outlet.

Periodically the drain valve should be opened and the water allowed to run until it flows clean. This will help to prevent sediment buildup in the tank bottom.

Periodically check the temperature and pressure relief valve to ensure that it is in operating condition. Lift the lever at the top of the valve several times until the valve seats properly and operates freely.

Water heater maintenance includes periodic tank flushing and cleaning, and removal of lime scale from the heating element.

The heater tank is equipped with an anode rod to aid in corrosion control and should be inspected periodically (see Anode Rod Inspection).

ANODE ROD INSPECTION

CAUTION

Property Damage Hazard

- All water heaters eventually leak.
- Do not install without adequate drainage.

Each water heater contains at least one anode rod, which will slowly deplete (due to electrolysis) prolonging the life of the water heater by protecting the glass-lined tank from corrosion. Adverse water quality, hotter water temperatures, high hot water usage, hydronic heating devices, and water softening methods can increase the rate of anode rod depletion. Once the anode rod is depleted, the tank will start to corrode, eventually developing a leak.

Certain water conditions will cause a reaction between the anode rod and the water. The most common complaint associated with the anode rod is a "rotten egg smell" produced from the presence of hydrogen sulfide gas dissolved in the water. **IMPORTANT:** Do not remove this rod permanently as it will void any warranties. A special anode rod may be available if water odor or discoloration occurs. **NOTE:** This rod may reduce but not eliminate water odor problems. The water supply system may require special filtration equipment from a water conditioning company to successfully eliminate all water odor problems.

Artificially softened water is exceedingly corrosive because the process substitutes sodium ions for magnesium and calcium ions.

The use of a water softener may decrease the life of the water heater tank.

The anode rod should be inspected after a maximum of three years and annually thereafter until the condition of the anode rod dictates its replacement.

NOTE: Artificially softened water requires the anode rod to be inspected annually.

The following are typical (but not all) signs of a depleted anode rod:

- The majority of the rods diameter is less than 3/8".
- Significant sections of the support wire (approx. 1/3 or more of the anode rod's length) are visible.

If the anode rod show signs of either or both it should be replaced. **NOTE:** Whether re-installing or replacing the anode rod, check for any leaks and immediately correct if found.

In replacing the anode:

1. Turn off electric supply to the water heater.
2. Shut off the water supply and open a nearby hot water faucet to depressurize the water tank.
3. Drain approximately 5 gallons of water from tank. (Refer to "Draining and Flushing" for proper procedures). Close drain valve.
4. Remove old anode rod.
5. Use Teflon® tape or approved pipe sealant on threads and install new anode rod.
6. Turn on water supply and open a nearby hot water faucet to purge air from water system. Check for any leaks and immediately correct any if found.
7. Restart the water heater as directed in this manual. See the Repair Parts Illustration for anode rod location.

FLUSHING THE WATER HEATER

1. Turn off the electrical supply to the water heater at the breaker or disconnect switch.
2. Ensure the cold water inlet valve is open.
3. Open a nearby hot water faucet and let the water run until the water is no longer hot. Then close the hot water faucet.
4. Connect a hose to the water heater drain valve and terminate it to an adequate drain.
5. Ensure the drain hose is secured before and during the entire flushing procedure. Flushing is performed with system water pressure applied to the water heater.
6. Open the water heater drain valve to flush the storage tank.
7. Flush the water heater storage tank to remove sediment and allow the water to flow until it runs clean.
8. Close the water heater drain valve when flushing is completed.
9. Remove the drain hose.
10. Fill the water heater – see the Filling The Water Heater section in this manual.
11. Turn on the electrical supply to the water heater.
12. Place the water heater back in operation. Allow the water heater to complete several heating cycles to ensure it is operating properly.

SEDIMENT REMOVAL

Water borne impurities consist of fine particles of soil and sand which settle out and form a layer of sediment on the bottom of the tank. In time, if not removed, the level of sediment might reach the heating elements and cause their failure.

For convenience, sediment removal and element lime scale removal should be performed at the same time as follows.

LIME SCALE REMOVAL

Lime scale accumulations on the heating elements is a normal condition, common to all immersion type elements. Factors which affect the amounts of this formation are:

1. Amount of hot water used. As the volume of water heated increases, more scale results.
2. Water temperature. As the temperature of the water is increased, more scale is deposited on the elements.
3. Characteristics of water supply.

Regardless of water treatment, the elements should be examined regularly.

Lime scale accumulations may cause noises to occur during operation.

It is recommended that a heating element be removed periodically for examination. If it is scaled, all of the elements should be removed and cleaned. If the tank bottom has an accumulation of sediment it should be cleaned.

Lime scale should be removed by dissolving the accumulation in UN•LIME® delimer. Do not use muriatic or hydrochloric acid base deliming solutions to remove lime scale from the elements.

THE PROCESS FOR LIME SCALE REMOVAL IS AS FOLLOWS:

1. Turn off electrical disconnect switch.
2. Drain the heater following DRAINING instructions.
3. Open front panel.
4. Disconnect the element wiring. Try not to disturb the wiring unnecessarily and reconnection will be easier.
5. Unscrew each element.
6. Remove the elements and gaskets from the openings.
 - Use a twisting, pulling action to remove elements scaled beyond the size of the tank openings.
 - Brush loose scale from elements.
7. Lime scale removal:
 - Place limed ends of heating elements into UN•LIME delimer and allow scale to dissolve. Do not permit delimer or water to contact heating element electrical terminals.
 - Silicates, sulfates, and aluminates must be removed by scraping or other mechanical means. Lime scale dissolvents will not remove these types of scale which are occasionally encountered.

Call the toll free phone number on the back cover of this Instruction Manual to purchase UN-LIME and heating element gaskets.

OTHER SCALE REMOVAL:

1. Flush cleaned ends of elements with water when deliming or cleaning is completed.
2. Remove sediment and scale from the tank bottom through the access provided by the element openings or drain valve opening.
 - The cold water inlet valve and drain valve may be opened to aid the cleanout process.
3. Clean remaining gasket material from tank and element flanges. Do not reuse original element gaskets.
4. Put new gaskets on each element and install into tank openings.
 - Uniformly tighten element bolts. Torque to approximately 32 ft./lbs.
5. Attach element wires to connection points from which they were removed.
6. Follow FILLING instructions to restore hot water service.
 - Check for water leaks around elements and proper operation when heater is filled.
 - Close the front panel.

TROUBLESHOOTING CHECKLIST

CHECKLIST

Before calling for service, check the following points to see if the cause of trouble can be identified and corrected. Reviewing this checklist may eliminate the need of a service call and quickly restore hot water service.



WARNING

- Before removing any access panels or servicing the water heater, make sure the electrical supply to the water heater is turned "OFF".
- Failure to do this could result in death, serious bodily injury, or property damage.

NOT ENOUGH OR NO HOT WATER

1. Be certain the electrical disconnect switch serving the water heater is in the ON position. The pilot toggle switch on the cabinet should be ON.

In some areas water heater electrical service may be limited by the power company. If the heater operates on a controlled circuit, heater recovery may be affected.

The optional manual override switches on the cabinet front may be turned off, de-energizing the elements.

2. Check the fuses.
The electrical disconnect switch usually contains fuses.
The water heater has fuses located behind the cabinet front door, see the Features and Components section of this manual for their location.
3. If the water was excessively hot, and is now cold, the ECO high limit switch may have activated.
 - See the Temperature Regulation section of this manual for more information on how to reset the ECO high limit controls.Repeated activation of the ECO high limit switch should be investigated by a Qualified Service Agent.
4. The storage capacity and/or recovery rate of the water heater may have been exceeded by a large demand for hot water.
Large demands require a recovery period to restore water temperature.
5. Cold incoming water temperature will lengthen the time required to heat water to the desired temperature.
If the heater was installed when incoming water temperature was warm, colder water creates the effect of less hot water.
7. Sediment or lime scale may be affecting water heater operation.

WATER IS TOO HOT

Refer to the TEMPERATURE REGULATION section of this manual.

WATER HEATER MAKES STRANGE SOUNDS

1. Sediment or lime scale accumulations on the elements causes sizzling and hissing noises when the heater is operating.

The sounds are normal, however, the tank bottom and elements should be cleaned. Refer to MAINTENANCE section of this manual for details.

2. Some of the electrical components of the water heater make sounds which are normal ie. contactors will "Click" or snap as the heater starts and stops.

LEAKAGE CHECKPOINTS

1. Check to see if the drain valve is tightly closed.
2. The apparent leakage may be condensation which forms on cool surfaces of the heater and piping.
3. If the outlet of the relief valve is leaking it may represent:

Excessive water pressure.

Excessive water temperature.

Faulty temperature and pressure relief valve.

Excessive water pressure is the most common cause of relief valve leakage. Water supply systems may, because of code requirements or such conditions as high line pressure, among others, have installed devices such as pressure reducing valves, check valves, and back flow preventers. Devices such as these cause the water system to be a closed system.

As water is heated, it expands (thermal expansion). In a closed system the volume of water will grow when it is heated. As the volume of water grows there will be a corresponding increase in water pressure due to thermal expansion. Thermal expansion can cause intermittent temperature-pressure relief valve operation: water discharged from the valve due to excessive pressure build up. This condition is not covered under the limited warranty. The temperature-pressure relief valve is not intended for the constant relief of thermal expansion.

A properly sized thermal expansion tank should be installed on all closed systems to control the harmful effects of thermal expansion. Contact a local qualified service agency to have a thermal expansion tank installed.

4. Examine the flange area of the elements for gasket leakage.

Tighten the bolts or, if necessary, follow the WATER AND LIME SCALE REMOVAL procedure in the MAINTENANCE section of this manual to replace the gaskets.

IF YOU CANNOT IDENTIFY OR CORRECT THE SOURCE OF MALFUNCTION:

1. Place the water heater electrical disconnect switch in the OFF position.
2. Close the cold water inlet valve to the heater.
3. Contact a Qualified Service Agency in your area.

REPLACEMENT PARTS

Call the toll free phone number listed on the warranty sheet of this Instruction Manual for assistance in locating replacement parts. When ordering parts, specify complete model no., serial no., (see rating plate), quantity and name of part desired. Standard hardware items should be purchased locally.

COMMERCIAL WATER HEATER LIMITED WARRANTY



EFFECTIVE

For 3 Years, in the event of a tank leak, we will repair or, at our discretion, replace the defective water heater.

For 1 Year, in the event of part failure, we will repair or, at our discretion, replace the defective part.

We warrant this product against defects in materials or workmanship as described in this document if installed within the United States or Canada and provided the product remains at its original place of installation.

Warranty coverage begins the date of installation OR the date of manufacture if installation cannot be verified.

WHAT'S COVERED

Subject to these terms, in the event of defect in materials and/or workmanship resulting in a **tank leak** during the **first three years**, we will:

- Replace the water heater should the tank leak.

Subject to these terms, in the event of a defect in materials and/or workmanship appearing during the **first year**, we will:

- Repair or, at our discretion, replace any part of the water heater covered under this limited warranty excluding parts subject to normal maintenance (Example: non-electronic anode rod, filter, etc)

Service/labor, shipping, delivery, installation, handling or any other costs are not covered at any time under this warranty.

Any replacement part or product will be warranted only for the unexpired portion of the original water heater's limited warranty period.

If an identical model is no longer available due to a change in law, regulation, or standard, we will replace the product with one having comparable capacity and input. In these instances, the owner will have the option of paying the difference between what was paid for the original model and the new model with the additional features, or receiving a refund of the portion of the purchase price, on a pro-rata basis allocable to the unexpired portion of the warranty.

WHAT'S NOT COVERED

- Problems caused by improper: gas supply line sizing, gas type, venting, connections, combustion air, voltage, wiring, or fusing
- Failure to follow applicable codes
- Failure to follow printed instructions
- Abuse, misuse, accident, fire, flood, Acts of God
- Improper installation, sizing, delivery, or maintenance
- Claims related to rust, noise, smell, or taste of water
- Failure to conduct authorized factory start up if required
- Alterations to the water heater
- Non-outdoor heaters installed outdoors
- Damages due to a failure to allow for thermal expansion
- Heat exchanger failure due to lack of adequate / proper supply of water
- Heaters moved from their original location
- Service trips to explain proper installation, use, or maintenance of the product/unit or to describe compliance requirements under applicable codes and regulations
- Charges related to accessing your heater including but not limited to door/wall removal, equipment rental, etc.
- Replacement parts after expiration of this warranty

LIMITATIONS

NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, THIS IS YOUR SOLE AND EXCLUSIVE WARRANTY. ALL OTHER WARRANTIES INCLUDING A WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES. TOTAL LIABILITY ARISING AT ANY TIME SHALL NOT EXCEED THE PURCHASE PRICE PAID WHETHER BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER LEGAL THEORY.

SERVICE INQUIRIES:

For service inquiries call the telephone number listed below. Be prepared to provide the following information: name, address, and telephone number; the model and serial number of the water heater; proof of installation; and a clear description of the problem.

For your records, fill in the product:

Serial: _____

Model: _____

U.S. Customers:

State Water Heaters
500 Tennessee Waltz Parkway
Ashland City, Tennessee 37015
800-365-0024
www.staterwaterheaters.com

NOTES

NOTES

NOTES



500 Tennessee Waltz Parkway, Ashland City, TN 37015
Technical Support: 800-365-8170 • Parts: 800-821-2017
www.statewaterheaters.com