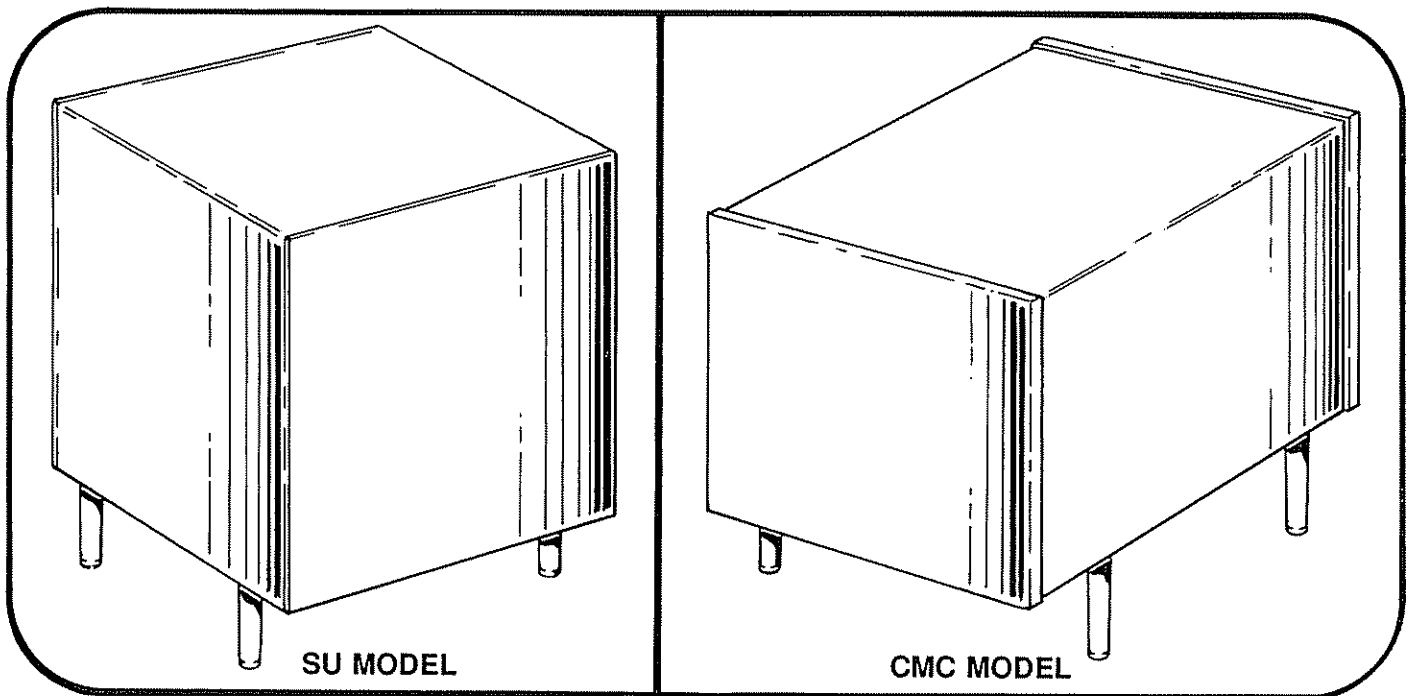


Dura-Power™

ELECTRIC BOOSTER HEATERS

MODELS
CMC AND SU

- installation
- operation
- maintenance
- limited warranty
- checklist



FLOOD 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 COMPETENT SERVICE PERSON BEFORE IT IS PLACED IN OPERATION.

A.O. SMITH
PRODUCT SERVICE
DIVISION

A DIVISION OF A. O. SMITH CORPORATION
SEATTLE, WASHINGTON

Limited Warranty

A O Smith Corporation, the warrantor, extends the following LIMITED WARRANTY to the owner of this water heater

1 THE TANK

If the glass-lined tank in this water heater shall prove upon examination by the warrantor to have leaked due to natural corrosion from potable water therein, during the first THREE years after initial installation, the warrantor will supply a complete new A O Smith water heater of equivalent size and then current model. Some government agencies are requiring energy efficient standards for water heaters. In the event regulations prohibit sale of a model of equivalent size and construction, A O Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required. The warranty on the replacement water heater will be limited to the unexpired term of the original warranty.

2 ALL OTHER PARTS

If within ONE year after initial installation of this water heater, any part or portion shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor will repair or replace such part or portion at its option.

3 CONDITIONS AND EXCEPTIONS

This warranty shall apply only when the water heater is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices. In addition, a temperature and pressure relief valve, certified and approved by the American Society of Mechanical Engineers, must have been installed.

a This warranty shall apply only when the heater is used:

- (1) at temperatures not exceeding the maximum setting of its thermostat;
- (2) at water pressure not exceeding the working pressure shown on the water heater;
- (3) when operated free from the damaging effects of uncontrolled water hammer;
- (4) when filled with potable water, free to circulate at all times;
- (5) with factory approved anode(s) installed;
- (6) in the United States, its territories or possessions, and Canada.

b Any accident to the water heater, any misuse, abuse (including freezing) or alteration of it, any operation of it in a modified form, any use of insulation blankets, or any attempt to repair tank leaks will void this warranty.

c This warranty is void if a device acting as a backflow prevention device (check valves etc.) is installed in the cold water supply the heater is connected to, unless an effective method of controlling thermal expansion is also installed at the heater(s) and operational at all times. The relief valve installed on the heater is not an acceptable method.

4 SERVICE AND REPAIR EXPENSES

Under the limited warranty the warrantor will provide only a replacement water heater or part thereof. The owner is responsible for all other costs. Such costs may include but are not limited to:

- a Labor charges for service removal, repair or reinstallation of the water heater or any component part;
- b Shipping, delivery, handling, and administrative charges for forwarding the new heater or replacement part from the nearest distributor and returning the claimed defective heater or part to such distributor;
- c All cost necessary or incidental for any material and/or permits required for installation of the replacement heater or part.

5 LIMITATIONS ON IMPLIED WARRANTIES

Implied warranties, including the warranty of merchantability imposed on the sale of this heater under state law are limited to one (1) year duration for the heater or any of its parts. Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

6 CLAIM PROCEDURE

Any claim under the warranty should be initiated with the dealer who sold the heater, or with any other dealer handling the warrantor's products. If this is not practicable, the owner should contact:

U.S. Customers

A O Smith Corporation
5621 West 115th Street
Alsip, IL 60482
Telephone: 1-800-323-2636

Canadian Customers

A O Smith Enterprises Ltd
P O Box, 310 - 768 Erie Street
Stratford, Ontario N5A 6T3
Telephone: (519) 271-5800

- a The warrantor will only honor replacement with identical or similar water heater or parts thereof which are manufactured or distributed by the warrantor.
- b Dealer replacements are made subject to in-warranty validation by warrantor.

7 DISCLAIMERS

NO OTHER EXPRESS WARRANTY HAS BEEN OR WILL BE MADE IN BEHALF OF THE WARRANTOR WITH RESPECT TO THE HEATER OR THE INSTALLATION, OPERATION, REPAIR OR REPLACEMENT OF THE HEATER. THE WARRANTOR SHALL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY OR OTHER CONSEQUENTIAL DAMAGE. THE WARRANTOR SHALL NOT BE LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR DAMAGE TO ANY PERSONS OR PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR IN TORT.

- a Some states do not allow the exclusion or limitation of the incidental or consequential damage, so the above limitations or exclusions may not apply to you.
- b This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Fill in the following for your own reference. Keep it. Registration is not a condition of warranty. The model and serial number are found on the heater's rating plate.

Model No _____ Serial No _____ Date Installed _____

Dealer's Name _____

Dealer's Address _____

City and State _____ Phone No _____

Zip _____

KEEP THIS WARRANTY POSTED ADJACENT TO
THE HEATER FOR FUTURE REFERENCE

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RECOVERY CAPACITY

RECOVERY CAPACITY IN GALLONS AT TEMPERATURE RISE OF: (DEGREES)*

Standard KW Input	BTU/Hour	30	40	50	60	70	80	90	100	110	120	130	140
6	20,478	82	62	49	41	35	31	27	25	22	21	19	18
9	30,717	123	92	74	62	53	46	41	37	34	31	28	26
12	40,956	164	123	98	82	70	61	55	49	45	41	38	35
15	51,195	205	154	123	102	88	77	68	61	56	51	47	44
18	61,434	246	184	148	123	105	92	82	74	67	62	57	53
20	68,260	273	205	164	137	117	102	91	82	74	68	63	58
24	81,912	328	246	197	164	140	123	109	98	90	82	76	70
30	102,390	410	307	246	205	176	154	137	123	112	102	95	88
36	122,868	492	369	295	246	211	184	164	148	134	123	113	105
45	153,585	615	461	369	307	263	230	205	184	168	154	142	132
54	184,302	738	554	443	359	316	277	246	221	201	185	170	158

* Figured at 1 KW (3413 Btu) = 4.1 Gallons at 100°F temperature rise.
To determine recovery rate per minute, divide recovery rate per hour by 60.
NSF ratings can be obtained by multiplying above figures by 0.98.

APPROVALS



All models bear the National Sanitation Foundation seal of approval.



All models are listed by Underwriters' Laboratories, Inc.

ASME

For "CMC" and "SU" models

MODEL AND RATING PLATE

A.O. SMITH WATER PRODUCTS CO.
P.O. BOX 3675 SEATTLE, WASH. 98124

ELECTRIC BOOSTER WATER HEATER

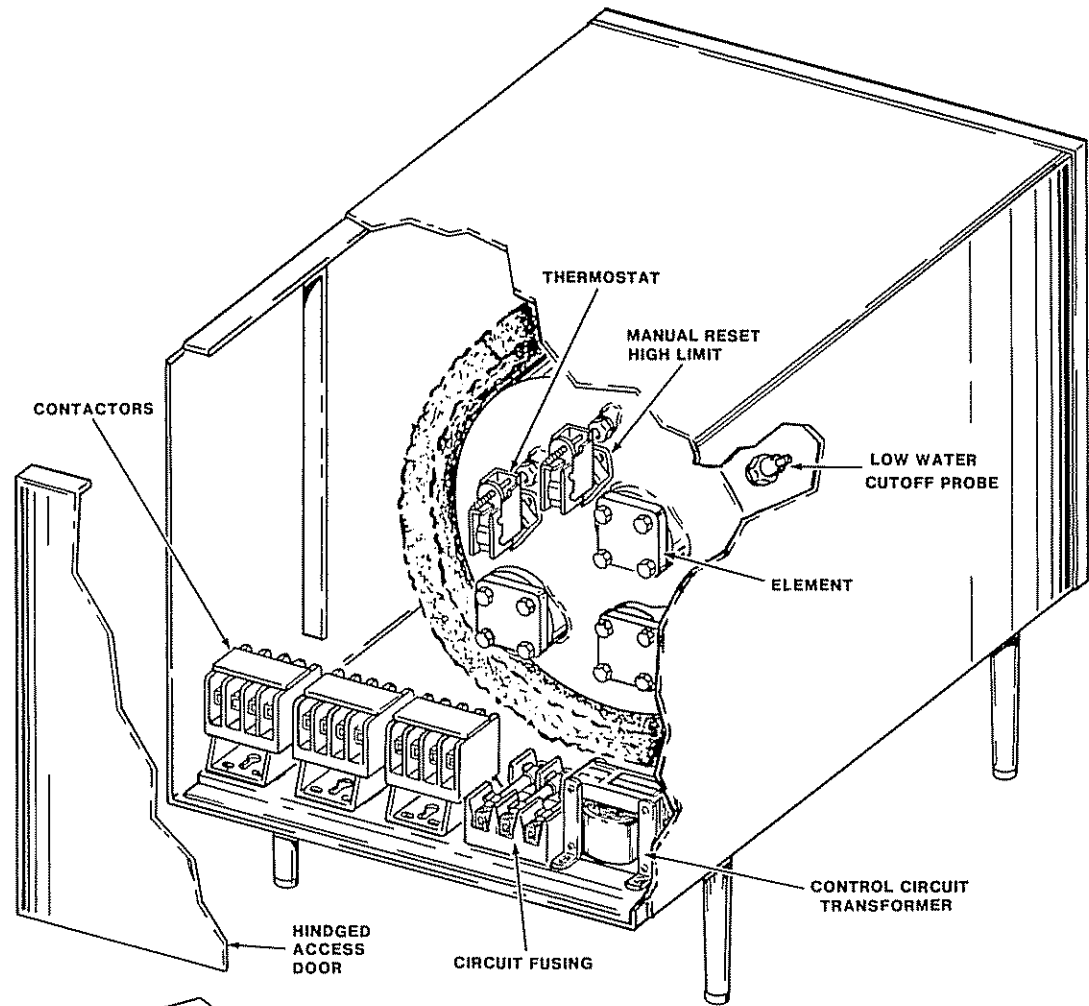
MODEL NO.	ASME NO.	RH.	CY.	AMP.	VOLTS
STORAGE CAPACITY	GAL.				
NO. ELEMENTS	WATTS EA.				TOTAL WATTS.
WORKING PRESSURE	150 P.S.I.	TEST PRESSURE	150 P.S.I.		

USE ON A.C. CURRENT ONLY
FOR SUPPLY CONNECTIONS, USE WIRE SUITABLE FOR AT LEAST 75°C.

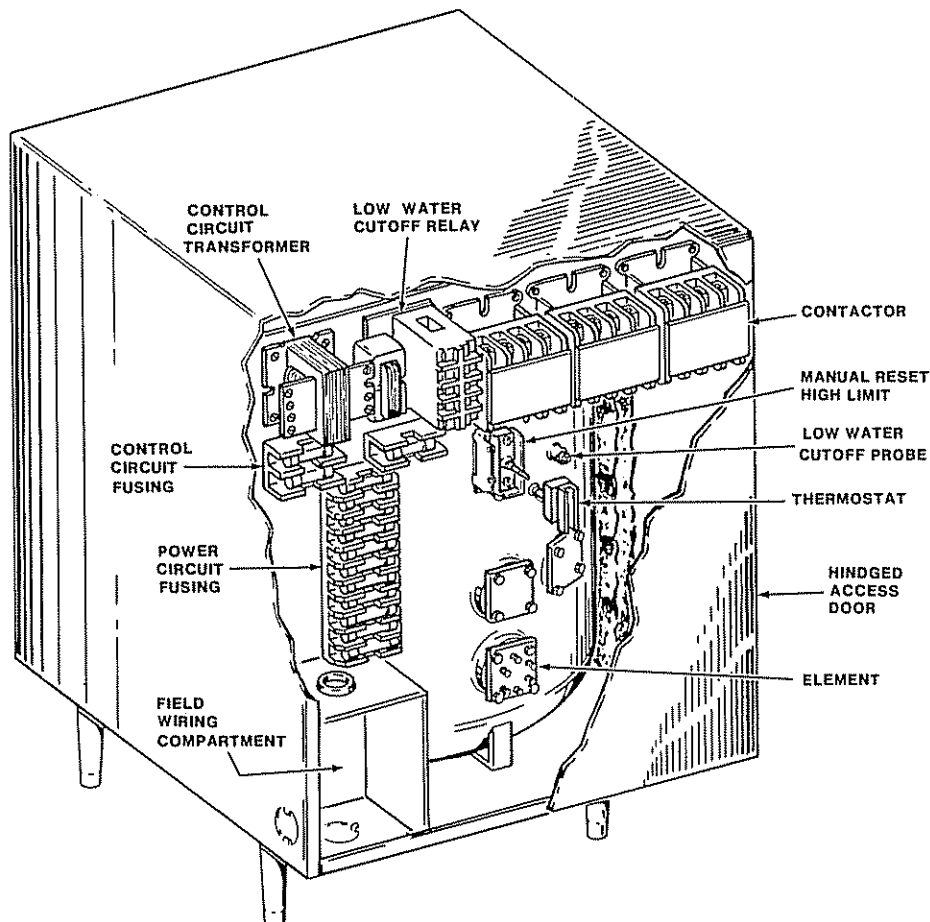
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FEATURES

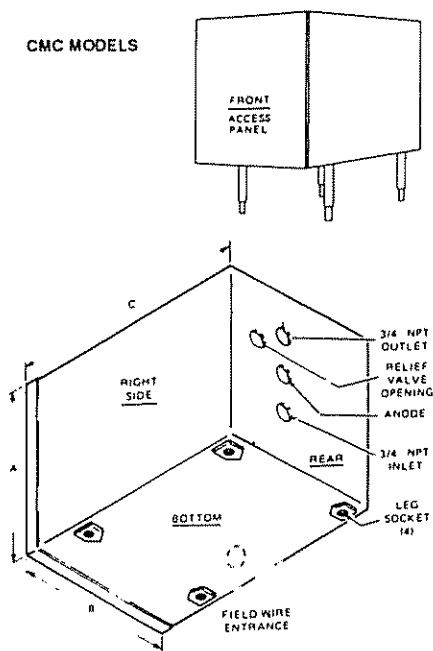
CMC MODEL



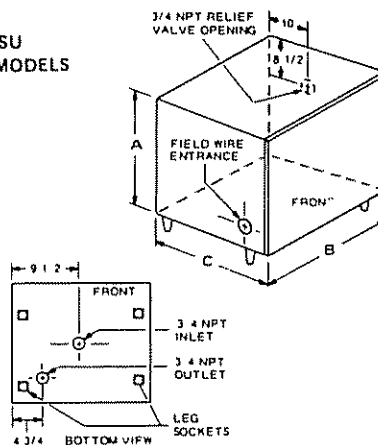
SU MODEL



ROUGH-IN DIMENSIONS



SU MODELS



ALL DIMENSIONS IN INCHES

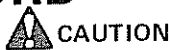
Model Number	Capacity (Gallon)	Height A	Width B	Depth C	Inlet/Outlet	Approx. Ship. Wt. (Lbs.)
CMC 6 thru 18	5	13 3/4	13	21 3/4	3/4	80
CMC 20 thru 54	5	12	16	23 1/2	3/4	86
SU 6 thru 54	20	25	22 1/4	23	3/4	200

KW Input	Available Model Numbers		Number Of Immersion Heaters**	Immersion Heater Wattage	Full Load Current In Amperes						
	CMC Series	SU Series			Single Phase			Three Phase			
					208V	240V	277V	480V	208V	240V	480V
6	CMC-6	SU-6	1	6,000	28.8	25.0	21.7	12.5	16.7	14.4	7.2
9	CMC-9	SU-9	1	9,000	43.3	37.5	32.5	18.8	25.0	21.7	10.8
12	CMC-12	SU-12	1	12,000	57.7	50.0	43.3	25.0	33.3	28.9	14.4
15	CMC-15	SU-15	1	15,000	72.1	62.5	54.2	31.3	41.6	36.1	18.0
18	CMC-18	SU-18	1	18,000	86.5	75.0	65.0	37.5	50.0	43.3	21.7
20	CMC-20	SU-20	2	10,000	96.2	83.3	72.2	41.7	55.5	48.1	24.1
24	CMC-24	SU-24	2	12,000	115.4	100.0	86.6	50.0	66.6	57.7	28.9
30	CMC-30	SU-30	2	15,000	144.2	125.0	108.3	62.5	83.3	72.2	36.1
36	CMC-36	SU-36	2	18,000	173.1	150.0	130.0	75.0	99.9	86.6	43.3
45	CMC-45	SU-45	3	15,000	216.3	187.5	162.5	93.8	124.9	108.3	54.1
54	CMC-54	SU-54	3	18,000	N/A	225.0	194.9	112.5	149.9	129.9	65.0

* 208V models use one additional immersion heater

** Each immersion heater contains three electric elements

FOREWORD



CAUTION

TEXT OUTLINED OR PRINTED IN RED CONTAINS INFORMATION RELATIVE TO YOUR SAFETY. PLEASE READ THOROUGHLY BEFORE USING APPLIANCE.

THIS HEATER IS NOT INTENDED TO BE USED FOR SPACE HEATING OR POOL APPLICATIONS.

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.

Particular attention should be given to the installation of thermometers at the locations indicated in the diagrams as these are necessary for checking the operation of the heater.

In addition to these instructions, the equipment shall be

installed in accordance with those installation regulations in force in the local area where the installation is to be made. Authorities having jurisdiction shall be consulted before installations are made.

BE SURE TO TURN OFF POWER WHEN WORKING ON OR NEAR THE ELECTRICAL SYSTEM OF THE HEATER. NEVER TOUCH ELECTRICAL COMPONENTS WITH WET HANDS OR WHEN STANDING IN WATER. WHEN REPLACING FUSES ALWAYS USE THE CORRECT SIZE FOR THE CIRCUIT. SEE PAGE 8.

DO NOT TEST ELECTRICAL SYSTEM BEFORE HEATER IS FILLED WITH WATER, FOLLOW START UP PROCEDURE ON PAGE 11.

The principal components of the heater are identified on page 4. The model and rating plate on page 3 interprets certain markings into useful information. Both of these references should be used to identify the heater, its components and optional equipment.

INSTALLATION

REQUIRED ABILITY

INSTALLATION OR SERVICE OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING AND ELECTRICAL WORK ARE INVOLVED.

GENERAL

The installation must conform to these instructions and the local code authority having jurisdiction. Grounding and electrical wiring connected to the water heater must also conform to the latest version of the NATIONAL ELECTRICAL CODE NFPA-70. Copies of this code may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018

WARNING

Insulation blankets available to the general public for external use on electric water heaters are not approved for use on your A. O. Smith water heater. The purpose of an insulation blanket is to reduce the standby heat loss encountered with storage tank water heaters. Your A. O. Smith water heater meets or exceeds the National Appliance Energy Conservation Act standards with respect to insulation and standby loss requirements, making an insulation blanket unnecessary. The use of insulation blankets in conjunction with an A. O. Smith water heater will also void the Smith warranty for the following reasons:

1. Insulation blankets cover important operating instructions and safety labels.
2. Insulation blankets will cover electrical components, and can result in a fire hazard.

LOCATION

These heaters can be installed on a floor.

It is recommended that when the unit is to be floor mounted, it be raised 6 inches off the floor using the legs provided.

CMC units are ideally constructed for undercounter mounting.

For proper installation, the heater should be installed on a level surface or adjust the legs to level the unit.

LOCATE IT NEAR A FLOOR DRAIN. THE HEATER SHOULD BE LOCATED IN AN AREA WHERE LEAKAGE FROM THE HEATER OR CONNECTIONS WILL NOT RESULT IN DAMAGE TO THE ADJACENT AREA OR TO LOWER FLOORS OF THE STRUCTURE.

WHEN SUCH LOCATIONS CANNOT BE AVOIDED, A SUITABLE DRAIN PAN SHOULD BE INSTALLED UNDER THE HEATER. Such pans should be fabricated with sides at least 2" deep, with length and width at least 2" greater than the diameter of the heater and must be piped to an adequate drain. Drain pans suitable for these heaters are available from your distributor or Water Products Company, 5621 West 115th Street, Alsip, IL 60482.

Locate the heater close to the point of major hot water usage and the power supply.

- Try to make hot water piping and branch circuit wiring as short as possible.
- Insulate hot and cold water piping where heat loss and condensation may be a problem.

THE HEATER SHOULD NOT BE LOCATED IN AN AREA WHERE IT WILL BE SUBJECT TO FREEZING.

Suggested clearances from adjacent surfaces are 18" for Model CMC and 24" for Model SU in front for access to the controls and elements. The heater may be installed on or against combustible surfaces.

CHEMICAL VAPOR CORROSION

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

CONNECTIONS

The heater water inlet and outlet connections are located on the bottom for Model SU and at the rear for Model CMC. See page 5.

Booster piping and heater wiring diagrams are included in this manual.

DRAIN VALVE

A drain valve must be installed into the heater piping when connecting the unit.

RELIEF DEVICES

An unplugged 3/4" relief valve opening is provided for installing temperature and pressure relief valve.



CAUTION

TO REDUCE THE RISK OF EXCESSIVE PRESSURES AND TEMPERATURES IN THIS WATER HEATER, INSTALL TEMPERATURE AND PRESSURE PROTECTIVE EQUIPMENT REQUIRED BY LOCAL CODES but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for relief valve devices for hot water supply systems, ANSI Z21.22 (latest version).

This valve must be marked with a maximum set pressure not to exceed the marked maximum working pressure of the water heater. INSTALL THE VALVE INTO AN OPENING PROVIDED AND MARKED FOR THIS PURPOSE IN THE WATER HEATER, AND ORIENT IT OR PROVIDE TUBING SO THAT ANY DISCHARGE FROM THE VALVE WILL EXIT ONLY WITHIN 6 INCHES ABOVE, OR AT ANY DISTANCE BELOW THE STRUCTURAL FLOOR AND CANNOT CONTACT ANY LIVE ELECTRICAL PART. THE DISCHARGE OPENING MUST NOT BE BLOCKED OR REDUCED IN SIZE UNDER ANY CIRCUMSTANCES.

The pressure setting of the relief valve should not exceed the pressure capacity of any component in the system. The temperature setting of the relief valve should not exceed 210°F.

TEMPERATURE LIMITING CONTROL

The heater control circuit contains a high temperature cutoff switch which operates if excessive water temperatures are reached. The reset button is located in the control compartment at the front of the heater. Disconnect the power before removing the cover to push the reset button.

TEMPERATURE REGULATION



WARNING

HOT WATER AT TEMPERATURES DESIRED FOR AUTOMATIC DISHWASHER AND LAUNDRY USE CAN CAUSE PAINFUL SCALDING WITH POSSIBLE SERIOUS AND PERMANENT INJURY. TEMPERATURES AT WHICH INJURY OCCURS VARIES WITH THE PERSON'S AGE AND THE LENGTH OF EXPOSURE. THE SLOWER RESPONSE TIME OF CHILDREN, AGED OR HANDICAPPED PERSONS INCREASE THE HAZARD TO THEM.

IT IS RECOMMENDED THAT LOWER WATER TEMPERATURES BE USED WHERE POSSIBILITY OF EXPOSURE SUCH AS ABOVE EXIST.



CAUTION

THE CONSUMER PRODUCT SAFETY COMMISSION RECOMMENDED TEMPERATURES OF 130°F OR LOWER

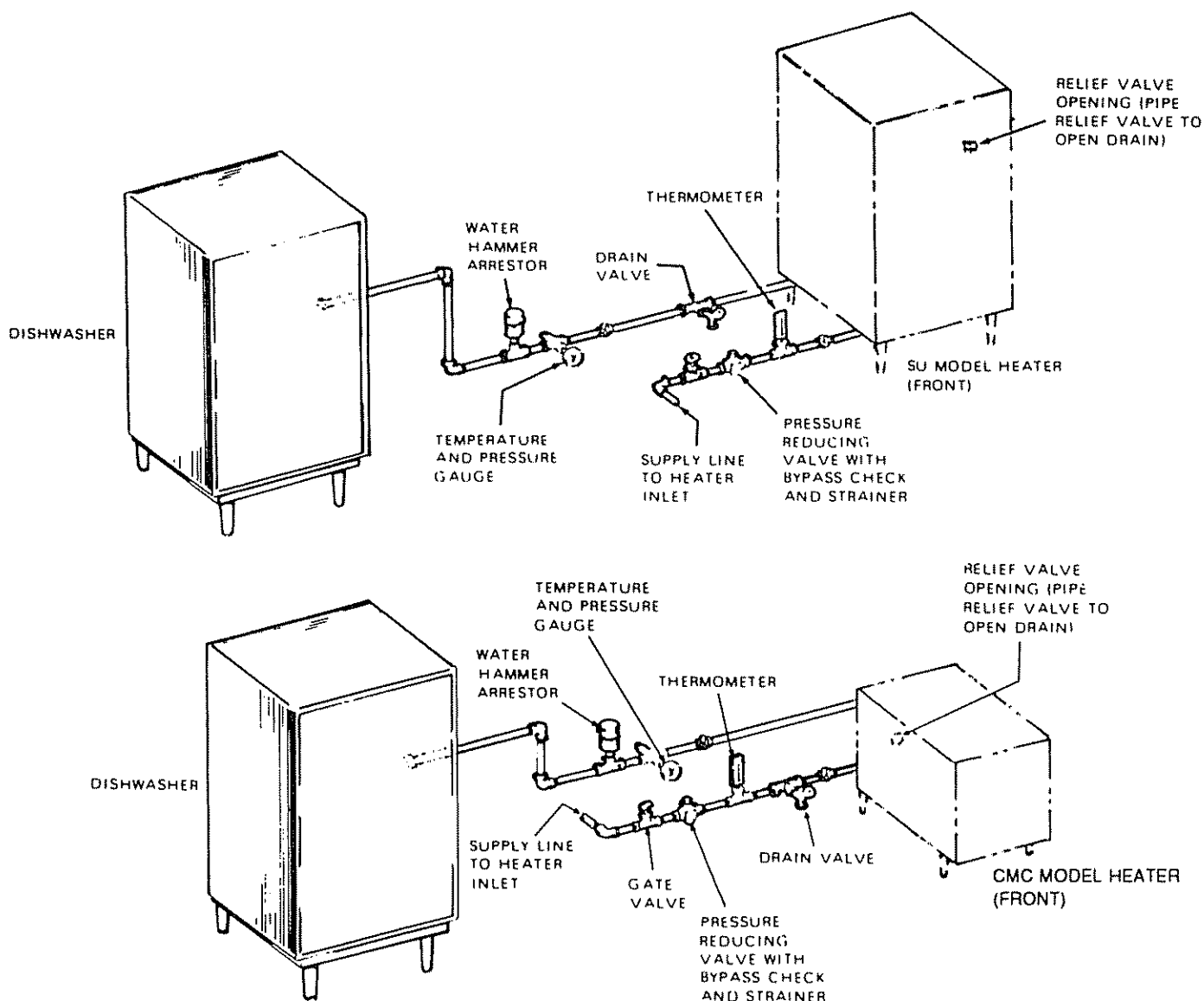
HYDROGEN GAS (FLAMMABLE)



CAUTION

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 the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. THERE SHOULD BE NO SMOKING OR OPEN FLAME NEAR THE FAUCET AT THE TIME IT IS OPEN.

PIPING DIAGRAMS



ELECTRICAL

GENERAL

The installation must conform to these instructions, the local code authority having jurisdiction, and the requirements of the power company. In the absence of code requirements follow the latest version of The National Electrical Code which may be ordered from: American Standards Institute, 1430 Broadway, New York, NY 10018.



WARNING

AN ELECTRICAL GROUND IS REQUIRED TO REDUCE RISK OF ELECTRIC SHOCK OR POSSIBLE ELECTROCUTION. The water heater should be connected to a separate grounded branch circuit with overcurrent protection and disconnect switch. The water heater should be grounded in accordance with national and local codes.

Check the 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.** Contact the heater supplier for conversion information if necessary.

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 HEATER TANK IS FILLED WITH WATER. DOING SO WILL CAUSE THE HEATING ELEMENTS TO BURN OUT.

The branch circuit is connected to the heater wiring through an opening provided on the heater.

BRANCH CIRCUIT

The branch circuit wire and fuse size should be established through reference to the latest version of the National Electrical Code or other locally approved source in conjunction with the heater amperage rating. Branch circuit wires should be 75°C temperature rated. For convenience, portions of the wire size tables from the Code are reproduced here. It is suggested the electrician size the branch circuit at 125 percent of the heater ampere rating and further increase wire size as necessary to compensate for voltage drop in long runs. Branch circuit voltage drop should not exceed 3% at the heater.

TABLE 310-16 Allowable Ampacities of Insulated Conductors
Not More Than Three Conductors in Raceway or Cable or Earth
(Directly Buried), Based on Ambient Temperature of 30°C (86°F)

Size	Temperature Rating of Conductor, See Table 310-13								Size
	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	85°C (185°F)	90°C (194°F)	
AWG MCM	TYPES RUW, T TW, UF	TYPES FEPW, RH, RHW, RUH, THW, THWN, XHHW, USE, ZW	TYPES V, MI	TYPES TA, TBS, SA, AVB, SIS, †FEP, †FEPB, †RHH, †THHN, †XHHW*	TYPES RUW, T, TW, UF	TYPES RH, RHW, RUH, THW, THWN, XHHW, USE	TYPES V, MI	TYPES TA, TBS, SA, AVB, SIS, †RHH, †THHN, †XHHW*	AWG MCM
COPPER					ALUMINUM OR COPPER-CLAD ALUMINUM				
18			22	21					
16			25	25					
14	15	15	25	25	15	15	25	25	12
12	20	20	30	30	25	25	30	30	10
10	30	30	40	40	30	40	40	40	8
8	40	45	50	50					
6	55	65	70	70	40	50	55	55	6
4	70	85	90	90	55	65	70	70	4
3	80	100	105	105	65	75	80	80	3
2		115	120	120	75	90	95	95	2
1		130	140	140		100	110	110	1
0		150	155	155		120	125	125	0
00		175	185	185		135	145	145	00
000		200	210	210		155	165	165	000
0000		230	235	235		180	185	185	0000
250		255	270	270		205	215	215	250
300		285	300	300		230	240	240	300
350		310	325	325		250	260	260	350
400		335	360	360		270	290	290	400
500		380	405	405		310	330	330	500
CORRECTION FACTORS									
Ambient Temp, °C	For ambient temperatures over 30°C, multiply the ampacities shown above by the appropriate correction factor to determine the maximum allowable load current.								Ambient Temp, °F
31-40	82	88	90	91	82	88	90	91	86-104
41-50	58	75	80	82	58	75	80	82	105-122
51-60		58	67	71		58	67	71	123-141
61-70		35	52	58		35	52	58	142-158
71-80			.30	.41			.30	.41	159-176

† The load current rating and the overcurrent protection for these conductors shall not exceed 15 amperes for 14 AWG, 20 amperes for 12 AWG and 30 amperes for 10 AWG copper; or 15 amperes for 12 AWG and 25 amperes for 10 AWG aluminum and copper-clad aluminum.

* For dry locations only. See 75°C column for wet locations.

AMPERAGE TABLE/OVERCURRENT PROTECTION

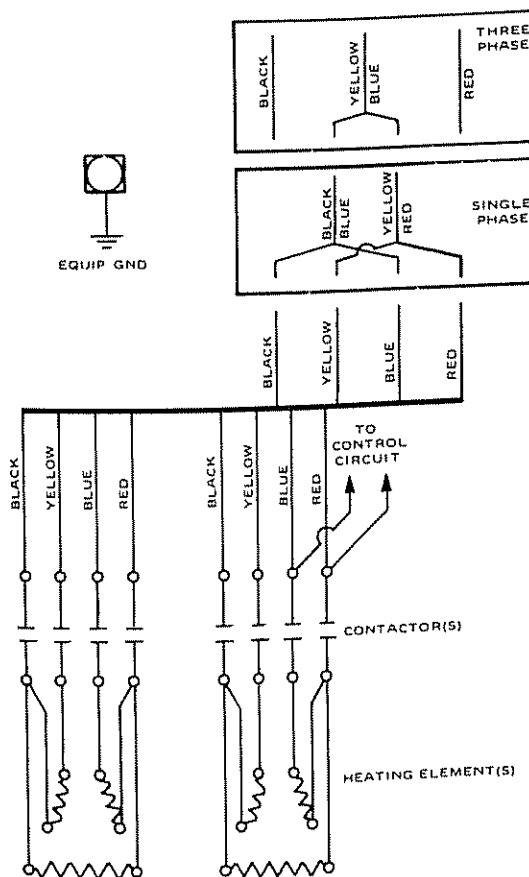
This table provides the total connected heating element load in amperes for branch circuit conductor and overcurrent protection sizing. Single-phase heaters are two wire circuits. Three-phase heaters are three wire circuits. In addition to the foregoing a ground conductor may be required.

The rating of the overcurrent protection should be computed on the basis of 125 percent of the total connected load amperage. Where the standard ratings and settings do not correspond with this computation, the next higher standard rating or setting should be selected.

Model Number	KW	Amperage Draw			
		Single Phase		Three Phase	
		208	236	208	236 480
CMC-6, SU-6	6	28	26	17	15 8
CMC-9, SU-9	9	43	38	25	22 12
CMC-12, SU-12	12	58	51	33	30 16
CMC-15, SU-15	15	72	64	42	37 20
CMC-18, SU-18	18	87	76	50	44 24
CMC-20, SU-20	20	96	85	56	49 26
CMC-24, SU-24	24	115	102	67	59 32
CMC-30, SU-30	30	144	127	83	74 40
CMC-36, SU-36	36	173	153	100	89 47
CMC-45, SU-45	45	216	191	125	111 59
CMC-54, SU-54	54	---	229	150	133 65

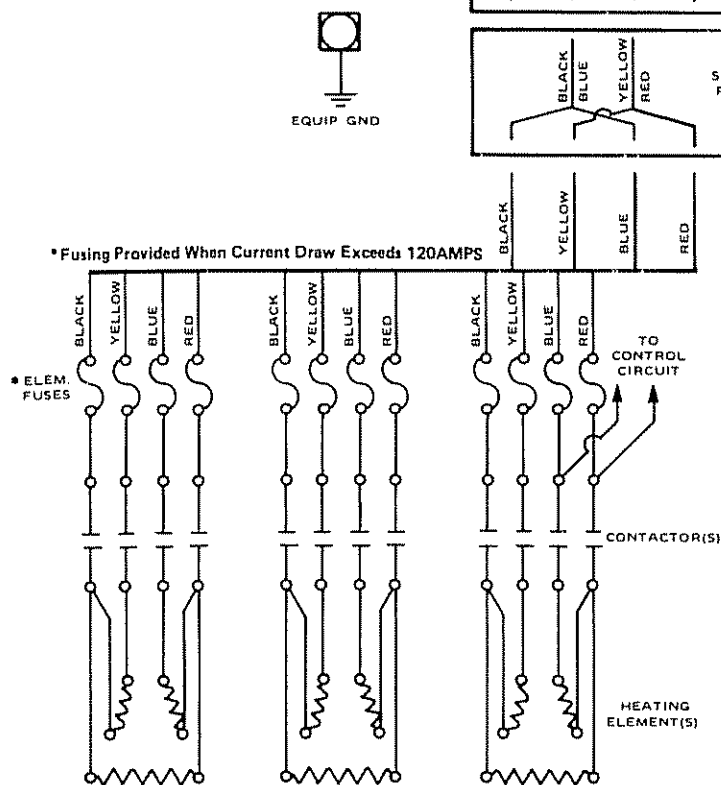
HEATER CIRCUITS

The water heater's electrical components are pictured and identified on page 4.



WATER HEATER WIRING DIAGRAM
208 THRU 240V, 1 OR 3 PHASE
24KW AND BELOW

POWER CIRCUITS



WATER HEATER WIRING DIAGRAM
208V THRU 240V, 1 PHASE
(CONVERTIBLE TO 3 PHASE AS SHOWN)

The following describes the heater circuits and includes wiring diagrams. All heater circuits are designed for 60 hertz alternating current.

POWER CIRCUIT

Power circuit wiring is rated 600 volts, 75°C.

CONTROL CIRCUIT

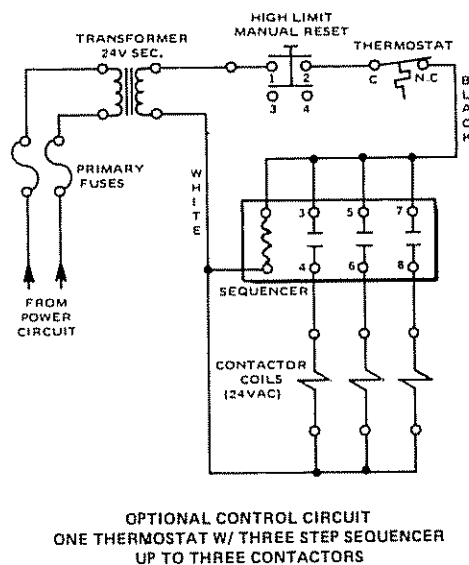
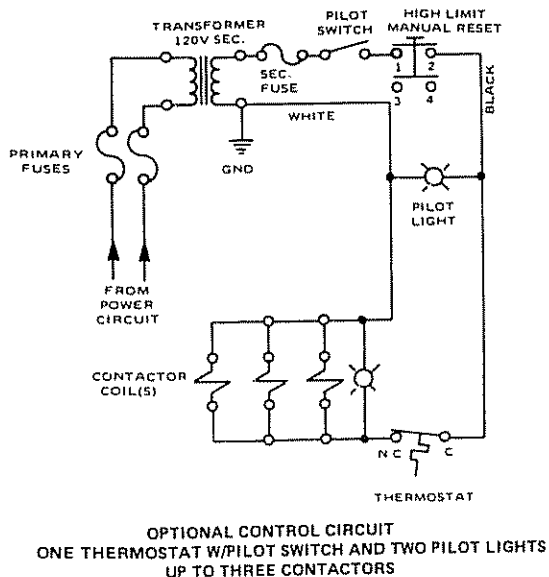
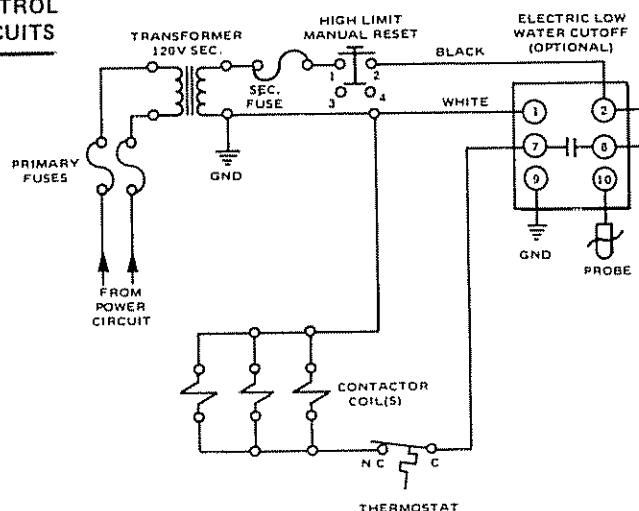
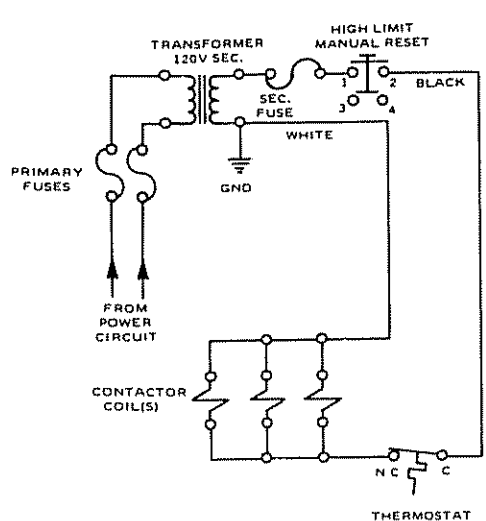
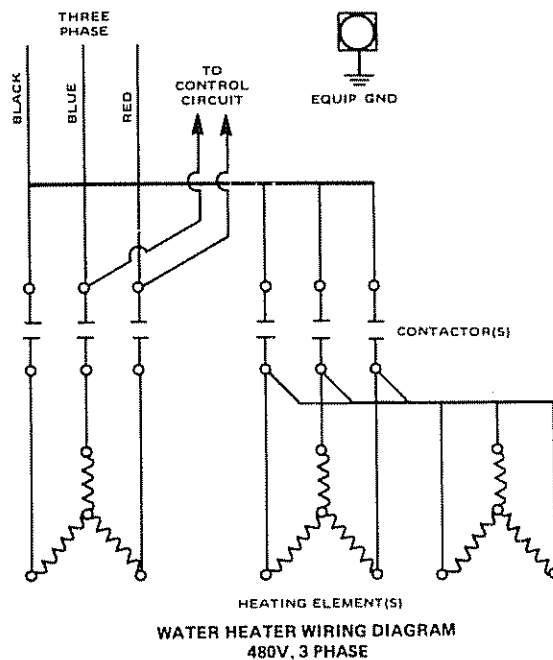
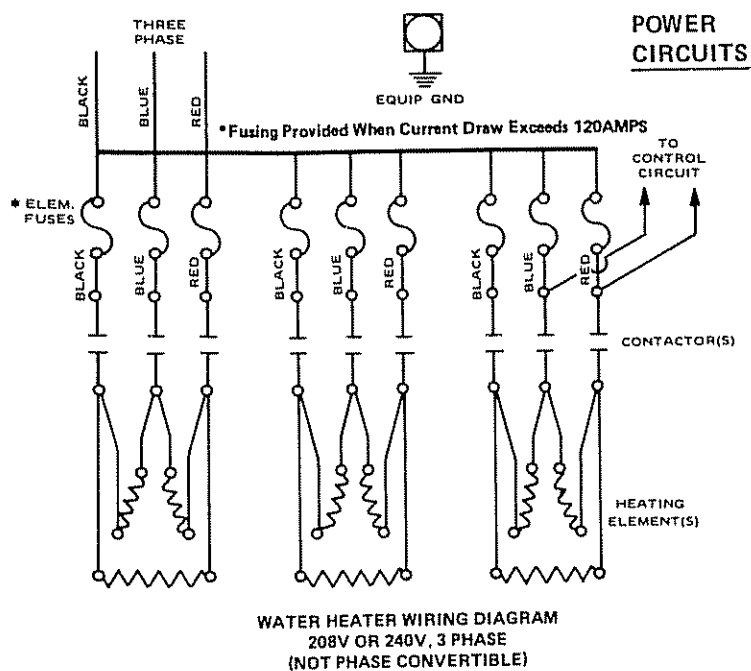
The heater is equipped with a 120 volt control circuit where all of the heating elements are switched on and off together. This is the standard circuit and may be used with up to three elements.

The control circuit wiring is 14 AWG, rated 600 volts, 105°C.

A low water cutoff switch is available as an optional safety device to protect the elements from damage due to lack of water in the heater.

WIRING DIAGRAMS

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 servicers in performing their work. An actual diagram of the water heater wiring is furnished with the heater.



CONNECTION TO SINGLE-PHASE

Heaters are shipped with from four to twelve wires in the field wiring compartment. Wires are color coated as follows: black, yellow, *blue, and red.

For single-phase connection:

1. Connect all black and blue wires to one incoming power conductor (field service wire).
2. Connect all yellow and red wires to the second incoming power conductor (field service wire).

CONNECTION TO THREE-PHASE

Heaters are shipped with from three to twelve wires in

the field wiring compartment. Wires are color coated as follows: black, yellow, *blue, and red.

For three-phase connection:

1. Connect all black wires to one incoming power conductor (field service wire).
2. Connect all yellow* and blue wires to the second incoming power conductor (field service wire).
3. Connect all red wires to the third incoming power conductor (field service wire).

*Yellow wire is not present in heaters designed for three-phase service only.

OPERATION

GENERAL

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.



WARNING

HOT WATER AT TEMPERATURES DESIRED FOR AUTOMATIC DISHWASHER AND LAUNDRY USE CAN CAUSE PAINFUL SCALDING WITH POSSIBLE SERIOUS AND PERMANENT INJURY. TEMPERATURES AT WHICH INJURY OCCURS VARIES WITH THE PERSON'S AGE AND THE LENGTH OF EXPOSURE. THE SLOWER RESPONSE TIME OF CHILDREN, AGED OR HANDICAPPED PERSONS INCREASES THE HAZARD TO THEM.

IT IS RECOMMENDED THAT LOWER WATER TEMPERATURES BE USED WHERE POSSIBILITY OF EXPOSURE SUCH AS ABOVE EXIST.



CAUTION

THE CONSUMER PRODUCT SAFETY COMMISSION RECOMMENDS TEMPERATURES OF 130°F OR LOWER

FILLING

1. TURN OFF THE ELECTRICAL DISCONNECT SWITCH.
2. Close the heater drain valve by turning the handwheel to right (clockwise).
 - NOTE: Heater drain valve is field furnished and installed.
3. Open the dishwasher rinse valve to allow the air in the system to escape.
4. Fully open the supply water inlet valve, filling the heater and piping.
5. Close the rinse valve as water starts to flow from the opening. Leave the water inlet valve fully open. The heater is now ready for START UP and TEMPERATURE REGULATION.

START UP

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

1. Open the hinged access door, check all water and electrical connections for tightness. Also check inlet and outlet connections.
 - Repair water leaks and tighten electrical connections as necessary.
2. Depress high temperature cutoff reset button.
3. Turn on the electrical disconnect switch.
4. Observe the operation of the electrical components during the first heating cycle. Use care as the electrical circuits are energized.
 - Thermostat and contactor operation should be checked by (a) manually operating thermostat and (b) allowing the heater to come up to temperature and shut off automatically.
 - The thermostat operates all contactor coils simultaneously.
5. Close the access door.

TEMPERATURE REGULATION

The thermostat factory setting is 180°F. The dial is adjustable through a range of 134°F to 194°F.

The thermostat is behind the front access door. TURN OFF THE ELECTRICAL DISCONNECT SWITCH BEFORE OPENING DOOR.

- It is suggested the thermostat be turned to the lowest setting which satisfies the hot water requirements of the system. This helps minimize water scale formations on the heating elements.
- The thermostat contacts close on about a 5°F (not adjustable) drop in water temperature.

Always close the front access door after making a temperature adjustment. Turn on electricity.

DRAINING

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

1. TURN OFF THE ELECTRICAL DISCONNECT SWITCH.
2. Close the supply water inlet valve to heater.
3. Open the dishwasher rinse valve to vent the system.

MAINTENANCE



THE WATER PASSING OUT OF THESE VALVES DURING THIS CHECKING OPERATION MAY BE EXTREMELY HOT.

DRAIN VALVE

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

RELIEF VALVE

Periodically check the temperature and pressure relief valve to insure 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.

FLUSHING

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

MAINTENANCE SCHEDULE

Component	Operation	Interval	Required
Tank	Flushing	Monthly	-
	Sediment Removal	As needed	-
Elements	Lime Scale Removal	As needed	UN•LIME® delimer and element gaskets. Part No 5109.

Tank flushing should be performed in accordance with the above schedule. Tank sediment removal and element lime scale removal must be performed when needed as determined by periodic inspections. Following are the instructions for performing recommended maintenance.

The water heater drain valve should be opened once a month to help prevent sediment buildup on the tank bottom.

1. TURN OFF THE ELECTRICAL DISCONNECT SWITCH.
2. Attach hose to outlet opening of drain valve and direct end to drain.
 - Open the drain valve by turning the handwheel to the left (counterclockwise). Allow water to flow until it runs clean.
 - If water does not flow from opened drain valve, follow instructions for sediment removal.

4. Attach hose to outlet opening of drain valve and direct end to drain. Open drain valve by turning the hand-wheel to the left (counterclockwise).
5. If the heater is being drained for an extended shut-down, it is suggested the drain valve be left open during this period. The hose may be removed.
 - Follow FILLING instructions when restoring hot water service.

3. When finished flushing:

- Close heater drain valve and remove hose.
- Turn on electricity.

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 amount 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. UN•LIME is a non-muriatic delimer, available from Water Products Company, 5621 West 115th Street, Alsip, IL 60482. Do not use muriatic or hydrochloric acid base deliming solutions to remove lime scale from the elements.

Replacement gaskets, part no. 5109, should be available at this time.

1. TURN OFF THE ELECTRICAL DISCONNECT SWITCH.
2. Drain the heater following DRAINING instructions.
3. Open front access door.
4. Disconnect the element wiring. Try not to disturb the wiring unnecessarily and reconnection will be easier.
5. Remove the bolts from each element.
6. Remove the elements 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.

Other scale removal:

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

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. The illustration on page 4 identifies the location of all of the heater components.

BE SURE TO TURN OFF THE ELECTRICITY WHEN CHECKING EQUIPMENT.

Not enough or no hot water

1. Be certain the electrical disconnect switch serving the water heater is in the ON position.
2. Check the fuses.
 - The electrical disconnect switch usually contains fuses.
3. If the water was excessively hot, and is now cold, the high temperature cutoff may have tripped.
 - To reset, open the front access door of the water heater and push the reset button.
 - Repeated operation of the high temperature cutoff should be investigated by your dealer.
4. The capacity of the heater may have been exceeded by a large demand for hot water.
 - Large demands require a recovery period to restore water temperature.
5. Cooler incoming water temperature will lengthen the time required to heat water to desired temperature.
6. Look for hot water wastage and leakage.
7. Sediment or lime scale may be affecting water heater operation. Refer to page 12 for details.
8. Pressure reducing valve may be set too high.

Water is too hot

1. Refer to TEMPERATURE REGULATION.

Water heater makes 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 page 12 for details.

2. Some of the electrical components of the water heater make sounds which are normal.

- Contactors will "click" or snap as the heater starts and stops.
- Contactors often hum.

Water leakage is suspected

1. Check to see if the heater drain valve is tightly closed.
2. If the outlet of the relief valve is leaking it may represent:
 - Excessive water temperature.
 - Faulty relief valve.
 - Excessive water pressure.
 - Excessive water pressure is the most common cause of relief valve leakage. It is often caused by a "closed system". A check valve in the inlet system will not permit the expanded hot water volume to equalize pressure with the main. A relief valve must release this water or the water heater or plumbing system will be damaged.

When such a condition is encountered, local codes or inspection agency should be consulted to determine which system is acceptable in your area. These may consist of:

- Installation of a second relief valve set at 25 PSI lower than the primary safety relief valve.
- An expansion tank of suitable pressure and provision to avoid water logging.

Removal of the check valve.

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 to replace the gaskets.

IF YOU CANNOT IDENTIFY OR CORRECT THE SOURCE OF MALFUNCTION:

1. Place the water heater electrical switch in the OFF position.
2. Close the supply water inlet valve to the heater.
3. Contact your dealer.