PLAINTIFF'S EXHIBIT

ASI-430

AMERICAN STANDARD

EP-7, -10, -14, -17 & 20

ELECTRIC BOILER

INSTRUCTION MANUAL

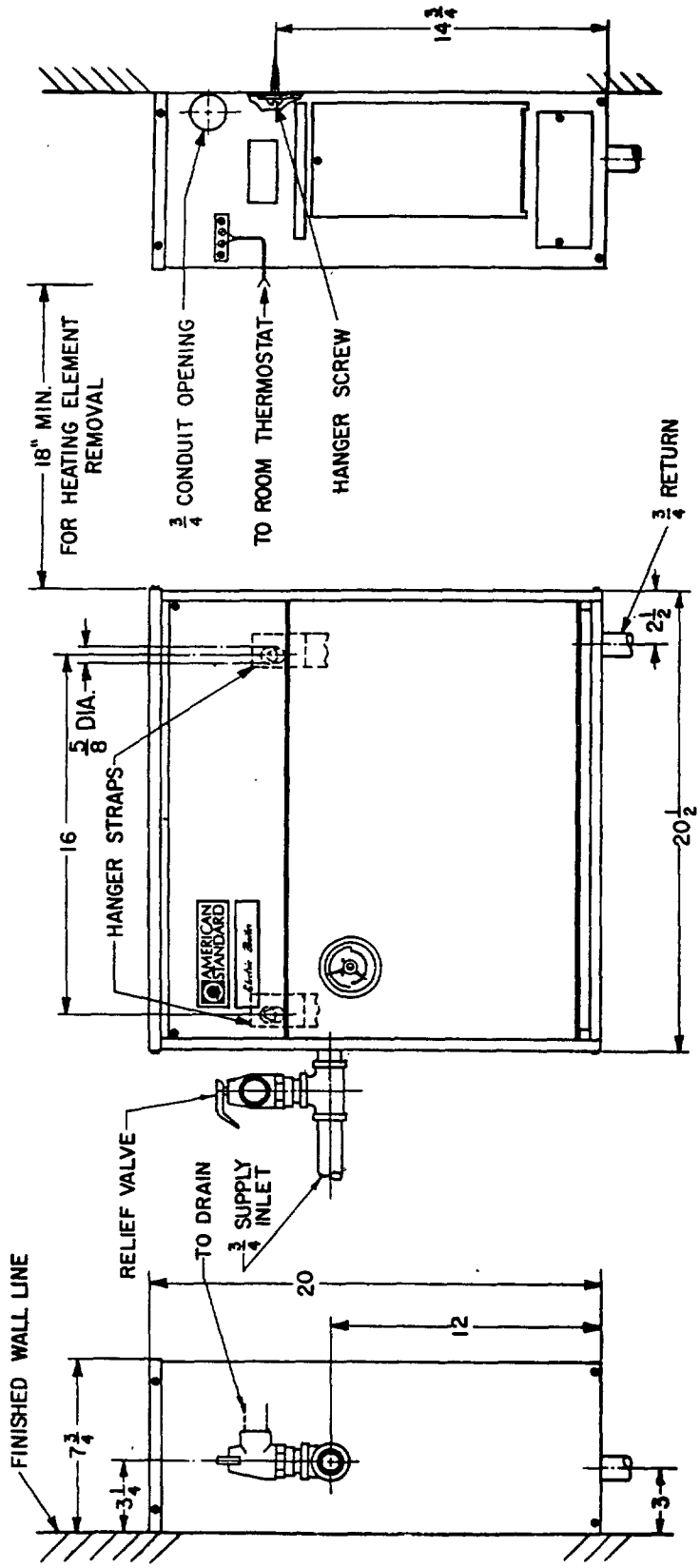
PACKAGED ELECTRO-HYDRONIC HEATING UNITS

NOTICE TO INSTALLER AND OPERATOR

THIS BOOKLET MUST BE AFFIXED ON OR ADJACENT TO THE HEATING EQUIPMENT.

PART NO. 28758 REV. 1-71

06866



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FIGURE 1

PACKAGING

The Model EP Electric Boiler is shipped as a completely factory-assembled unit in one carton. The shipping carton contains the following:

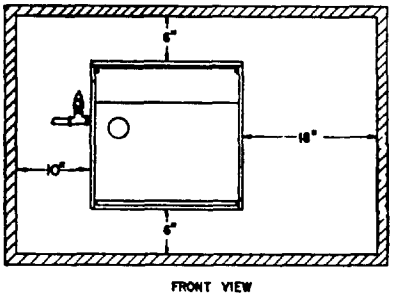
1 - Boiler
1 - "Jiffy" Bag of Accessories - (See Packing List in Bag for Contents)
1 - Installation Manual

INSTALLATION

Roughing-in dimensions are shown in Figure 1.

It is intended that the boiler be wall mounted using wood screws, lag screws, or other suitable devices from which the boiler may hang by the hanger straps mounted on the back of the boiler. To gain access to the hanger straps, remove the front panel.

The unit must be installed in accordance with applicable building and electrical codes. Authorities having jurisdiction should be consulted before installation is made.



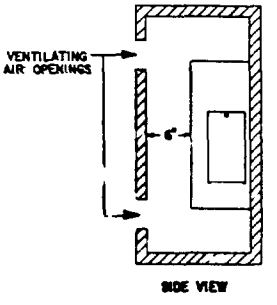


FIGURE 2

The minimum installation clearance shown in Figure 2 should be provided for service accessibility.

The boiler is suitable for closet installation with these same clearances from combustible material and with two air openings of 54 sq. inches (3 x 18") each.

WATER CONNECTIONS AND PIPING

The supply and return system connections are 3/4" NPT female and are located as shown in Figure 1.

A drain valve is provided at the bottom of the water vessel.

The outlet of the relief valve should be piped to a suitable drain.

Either a manual or automatic fill system may be used. The manual fill is recommended since a completely closed system is preferred; that is, if an automatic fill valve were called upon to function because of leaks, the leaks should be repaired.

If an automatic fill valve is installed, it is recommended that a bypass (with shutoff valve) be piped around the valve so that full water flow rates may be used to adequately purge the system of air on initial fill.

EXPANSION TANK

The boiler is factory equipped with a diaphragm-type expansion tank, which is precharged to 12 psig. The tank is fitted with a tire valve to be used if it is necessary to increase the initial air pressure in the tank with the system cold to insure adequate expansion volume.

AUTOMATIC AIR VENT

The boiler is factory equipped with an automatic air vent to bleed off entrained air in the heating system. The air vent is located on the top left end of the boiler. Before filling the system, screw down the cap on the air vent to prevent dirt and scale from fouling the valve in the air vent during the fill process.

After the system has been filled with water, loosen the air vent cap two turns so that the vent will operate properly.

ELECTRICAL HOOKUP

ALL HOOKUP WIRING MUST CONFORM WITH LOCAL AND NATIONAL CODES.

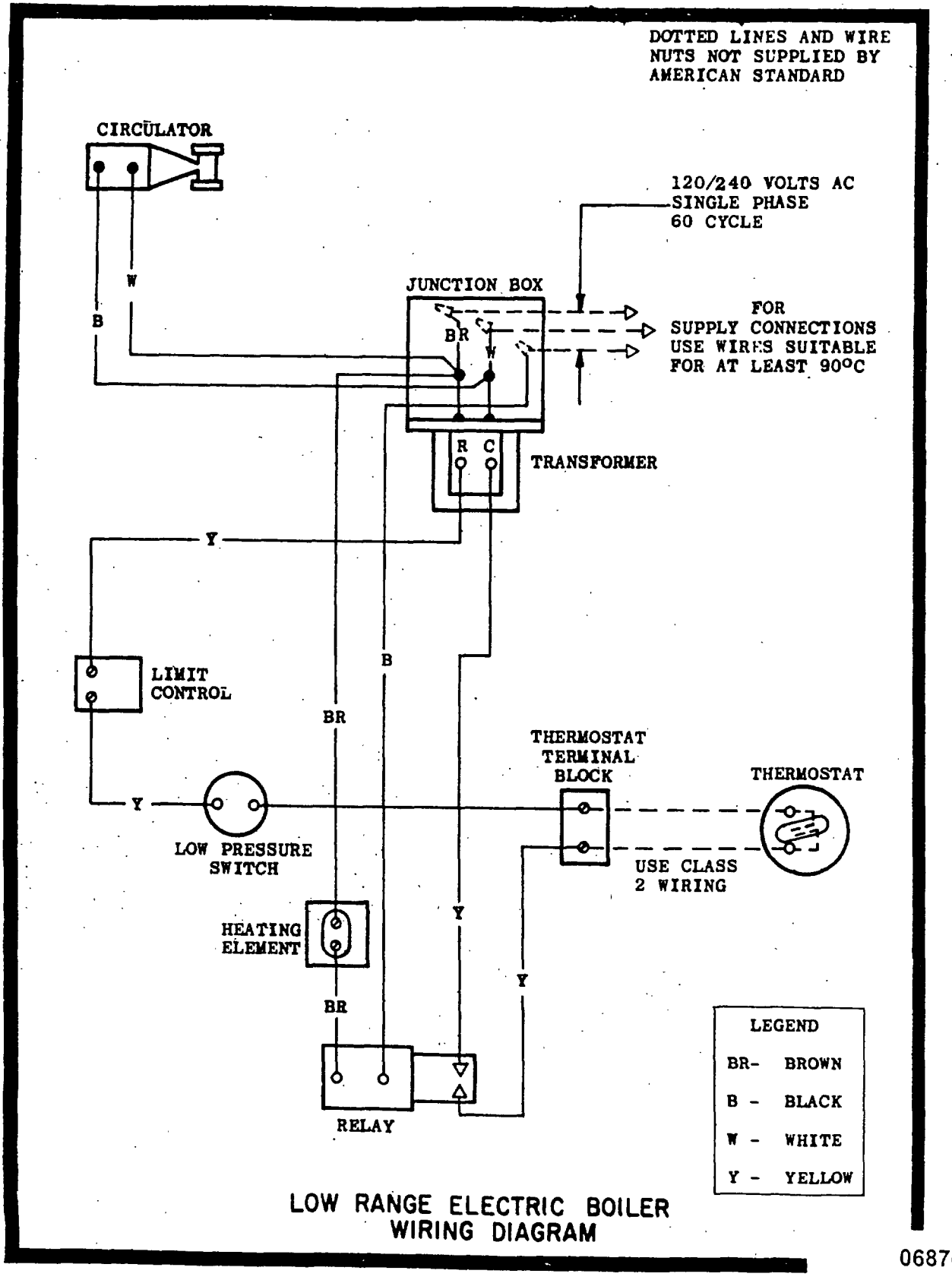
The boiler is prewired for constant circulator operation. Electrical service required is 240 volt a-c (nominal) three-wire, single-phase, 60-cycle.

An applicable wiring diagram is shown in Figure 3, and is affixed to the inside of the control compartment access door.

Service conductors should be suitable for at least 90 C (194 F) and of the minimum size shown in Table I.

TABLE I

Boiler Number	Conductor Size (AWG)	amps @ 240 Volts	Fuse
EP-7	14	8.34	15
EP-10	12	12.50	20
EP-14	12	16.67	20
EP-17	10	20.81	25
EP-20	8	25.00	35



LOW RANGE ELECTRIC BOILER
WIRING DIAGRAM

06870

FIGURE 2

The service conductors should be wired through a fused disconnect adequate to handle the amperage loads shown on Table I.

The low voltage wiring from the room thermostat should be connected to the terminal block on the outside of the boiler jacket on the right-hand end. The room thermostat provided has an adjustable heat anticipator, which should be set at 0.31 amps.

The jacket must be electrically grounded. A grounding screw is provided on the right-hand hanger bracket; however, local codes should be followed.

NOTE: DO NOT ATTEMPT TO ELECTRICALLY TEST THE BOILER UNTIL THE SYSTEM HAS BEEN FILLED WITH WATER.

CONTROLS

As shipped from the factory, the boiler control circuit is prewired and is composed of the following controls:

Operating Limit Control - Honeywell L4080D1002-1, 15 F Fixed differential and mechanical stop at 240 F.

Operating Control - General Electric #3ARR9C14 relay 240 volt - 24 volt coil.

Low-Pressure Switch - John W. Hobbs Model M-4440 set at 4 psig.

OPERATION

The Low Pressure Switch is provided to prevent the boiler from being energized unless pressure in the heating system is at least 4 psig. This prevents any chance of heating elements burning out should an attempt be made to operate the boiler without water.

The Operating Limit Control is adjustable to 240 F. The control setting should be based on the maximum design water temperature.

Temperature and pressure within the boiler are indicated by the combination temperature/pressure gauge located left end of boiler.

MAINTENANCE

The boiler has been designed to require minimum servicing. Before initial start-up and at the beginning of each heating season, the circulator should be oiled according to instructions shown on the circulator.

In the event of heating element burnout, replacement should be made with a square-flanged type having 2-1/2" bolt circle. The elements are of the low-density type (80 watts per square inch or less).

CAUTION: BE SURE TO SHUT OFF ELECTRIC POWER TO BOILER BEFORE OPENING CONTROL COMPARTMENT ACCESS DOOR.

Under normal conditions THE HEATING SYSTEM SHOULD NEVER BE DRAINED; however, if the boiler is not used during the winter months, and if adequate protection is not supplied to avoid the possibility of freezing anywhere in the system, the entire system should be drained.

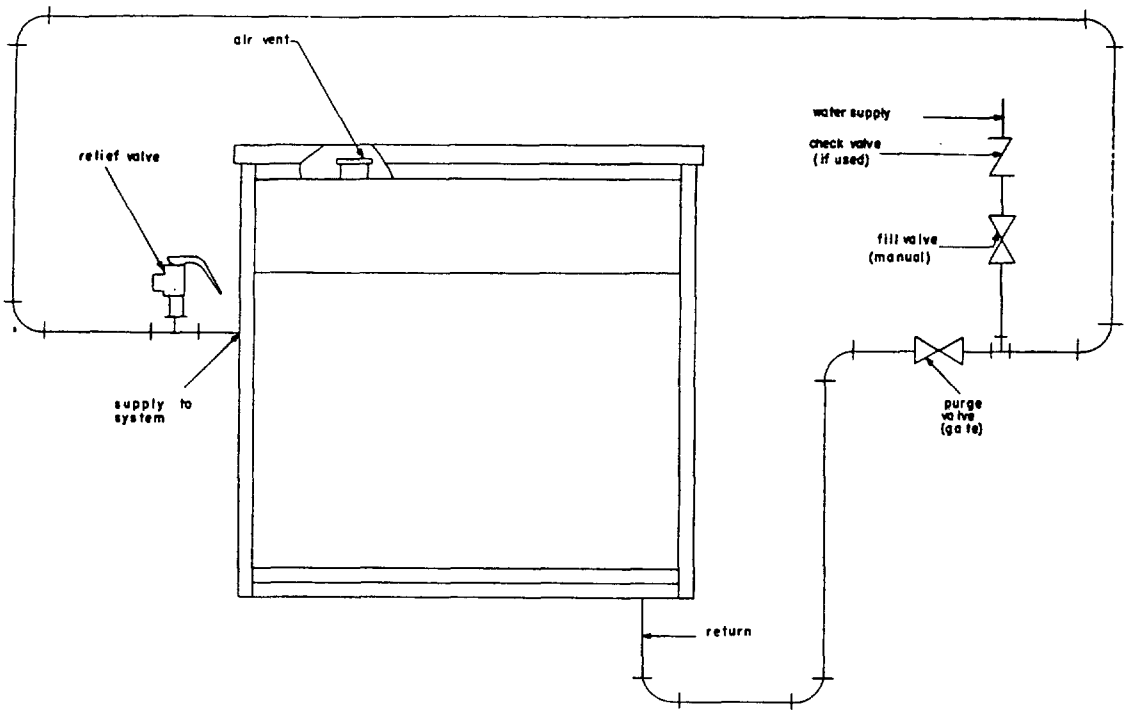


FIGURE 4

PROCEDURE FOR FILLING SERIES LOOP HEATRIM SYSTEM (see Figure 4)

1. Remove front access panel.
2. Screw down the cap on the automatic air vent.
3. Close the purge valve.
4. Open the relief valve.
5. Open the fill valve.
6. When water appears at the relief valve, release the lever and allow it to close.
7. Continue filling the system until the pressure gauge reads 12 psi without heat; close the fill valve.
8. Open tne purge valve.
9. Loosen the cap on the automatic air vent two turns so that the vent will operate properly.
10. For quietest operation, the system water pressure should be adjusted to 25 psig with the system at 200 F.

If an automatic fill valve is used, it may be necessary to readjust the setting of the valve to allow a higher fill pressure with the system cold to obtain desired pressure with the system at 200 F.

It may be necessary to increase the initital air pressure in the diaphragm-type expansion tank with the system cold to insure adequate expansion volume. The tank is fitted with a tire valve for this purpose.

DEALER'S NAME: _____

ADDRESS: _____

TELEPHONE NO.: _____

DATE OF INSTALLATION: _____

AMERICAN STANDARD
PLUMBING & HEATING DIVISION
40 WEST 40TH STREET • NEW YORK, N Y 10018

06874

AMERICAN STANDARD

EP-34, -51, -68 & -82 ELECTRIC BOILER

INSTRUCTION MANUAL

PACKAGED ELECTRO-HYDRONIC HEATING UNITS

NOTICE TO INSTALLER AND OPERATOR

THIS BOOKLET MUST BE AFFIXED ON OR ADJACENT TO THE HEATING EQUIPMENT.

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REV. 1-71

EP Electric Boiler

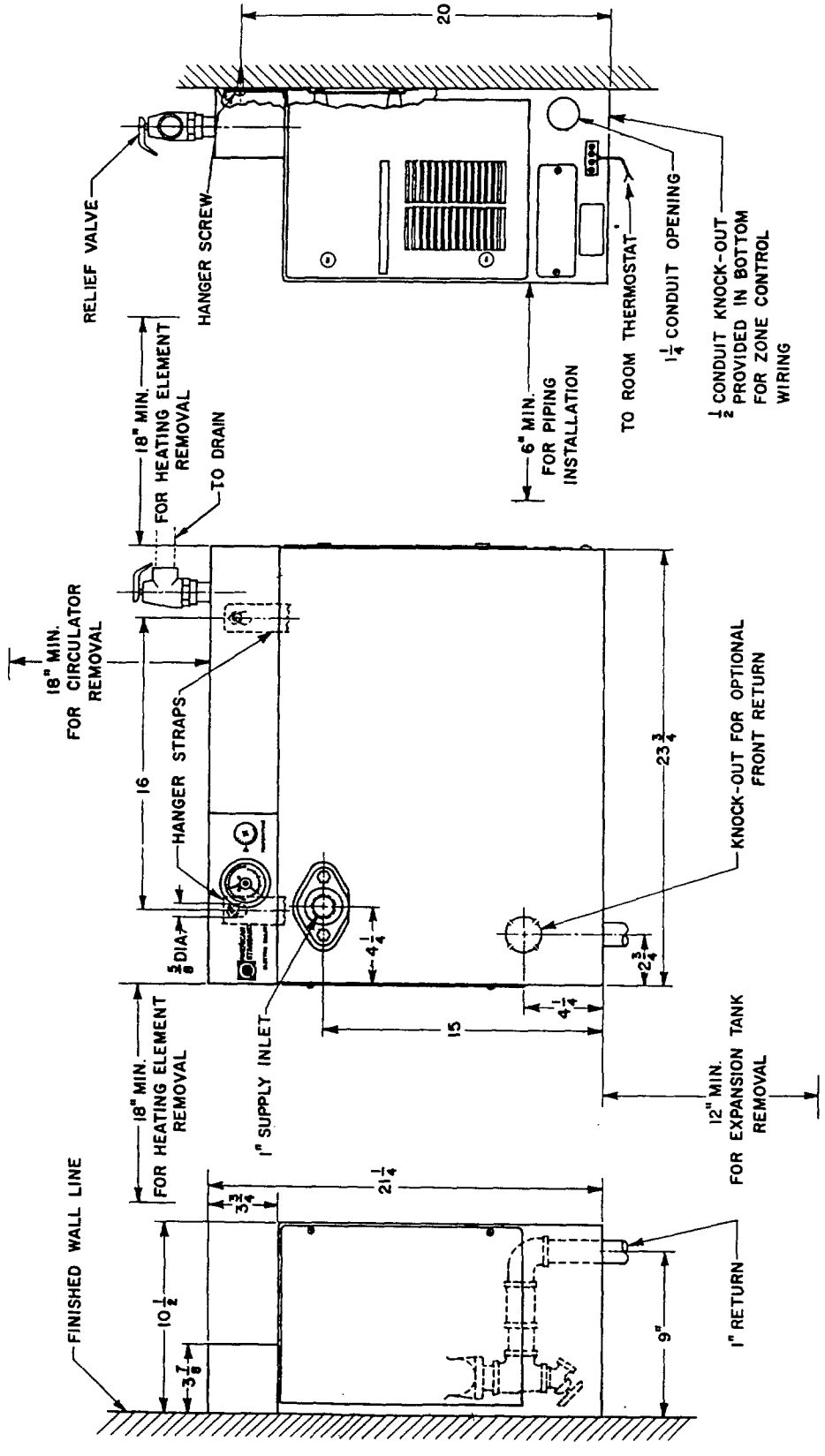


Figure 1

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PACKAGING

The Model EP Electric Boiler is shipped as a completely factory-assembled unit in one carton. The shipping carton contains the following:

1 - Boiler
1 - "Jiffy" Bag of Accessories - See Packing List in Bag for Contents.
1 - Installation Manual

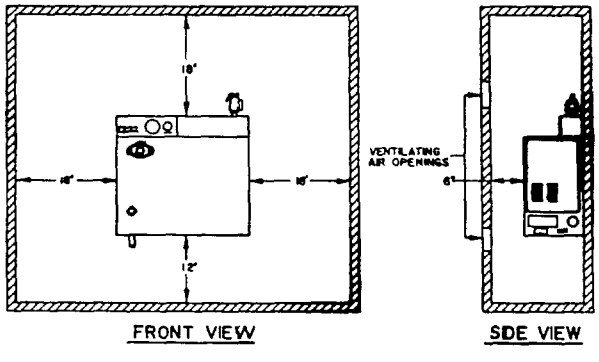
INSTALLATION

Roughing-in dimensions are shown in Figure 1.

It is intended that the boiler be wall mounted using wood screws, lag screws, or other suitable devices from which the boiler may hang by the hanger straps mounted on the back of the boiler. To gain access to the hanger straps, remove the circulator access panel and the decorative control cover from the top of the boiler.

The unit must be installed in accordance with applicable building and electrical codes. Authorities having jurisdiction should be consulted before installation is made.

EP Electric Boiler



The minimum installation clearances shown in Figure 2 should be provided for service accessibility.

The boiler has been approved for closet installation with these same clearances from combustible material and with two air openings of 108 sq. in. (6" x 18") each.

WATER CONNECTIONS AND PIPING

The supply and return system connections are 1" NPT female and are located as shown in Figure 1.

A drain valve with standard "garden" hose connection is provided at the bottom left end of the water vessel.

The relief valve supplied should be installed as shown in Figure 1.

The outlet of the relief valve should be piped to a suitable drain.

Either a manual or automatic fill system may be used. The manual fill is recommended since a completely closed system is preferred; that is, if an automatic fill valve were called upon to function because of leaks, the leaks should be repaired.

If an automatic fill valve is installed, it is recommended that a bypass (with shutoff valve) be piped around the valve so that full water flow rates may be used to adequately purge the system of air on initial fill.

EXPANSION TANK

The boiler is factory equipped with a diaphragm-type expansion tank, which is precharged to 12 psig. The tank is fitted with a tire valve to be used if it is necessary to increase the initial air pressure in the tank with the system cold to insure adequate expansion volume.

AUTOMATIC AIR VENT

The boiler is factory equipped with an automatic air vent to bleed off entrained air in the heating system. The air vent is located on the top left end of the boiler under the decorative control cover (see Figure 9). Before filling the system, screw down the cap on the air vent to prevent dirt and scale from fouling the valve in the air vent during the fill process.

After the system has been filled with water, loosen the air vent cap two turns so that the vent will operate properly.

ELECTRICAL HOOKUP

ALL HOOKUP WIRING MUST CONFORM WITH LOCAL AND NATIONAL CODES.

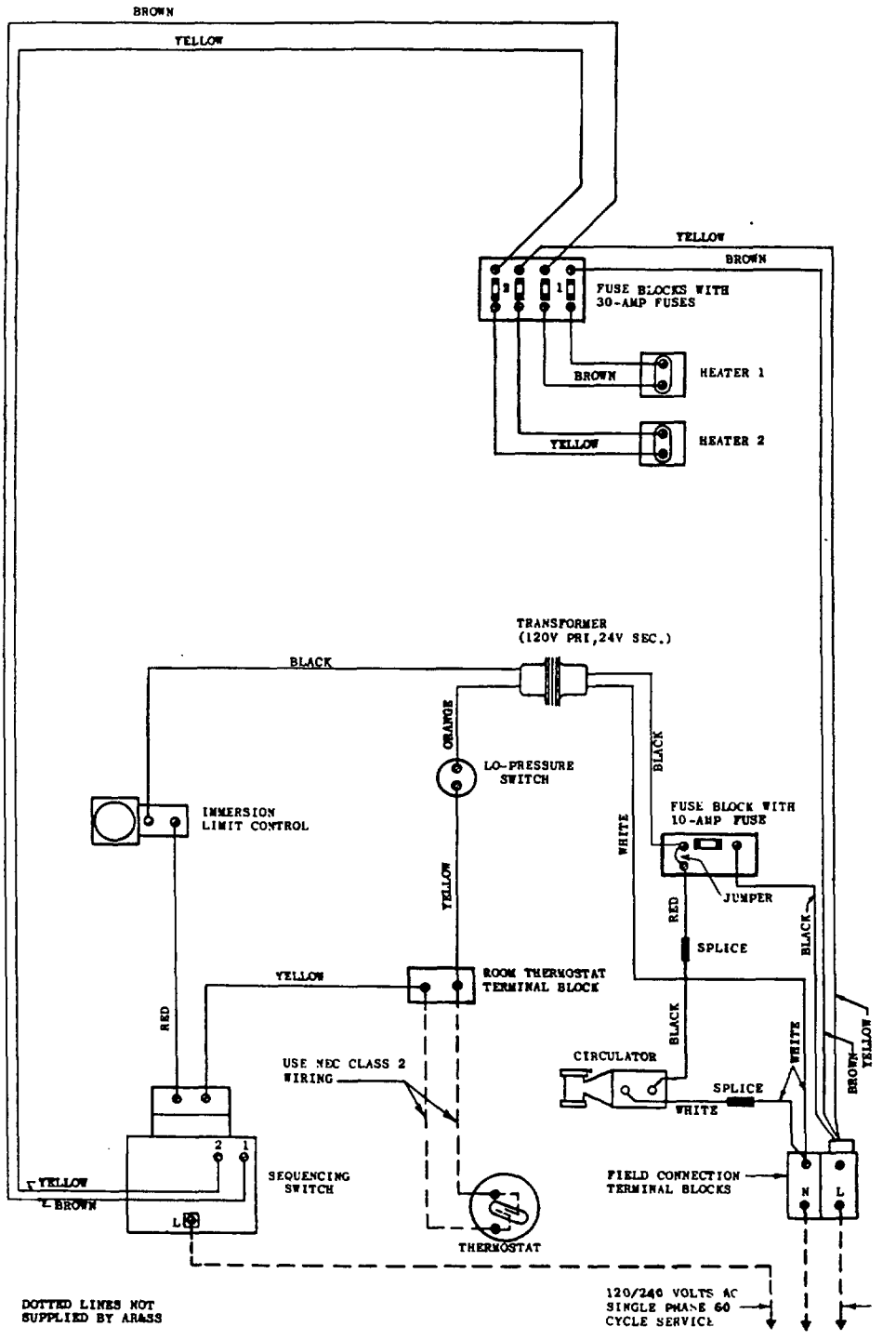
The boiler is prewired for constant circulator operation. Electrical service required is 240 volt a-c (nominal) three-wire, single-phase, 60-cycle. On the Models EP-68 and EP-82, the service conductors are connected to the "L" & "N" terminals provided in the control compartment on the right-hand end of the boiler. On the Models EP-34 and EP-51, one of the "hot" service conductors is connected to the pressure terminal on the Honeywell R8154 sequencing switch.

Applicable wiring diagrams are shown as follows:

Model EP-34 -- Figure 3
Model EP-51 -- Figure 4
Model EP-68 -- Figure 5
Model EP-82 -- Figure 6

A wiring diagram is affixed to the inside of the control compartment access door.

EP Electric Boiler

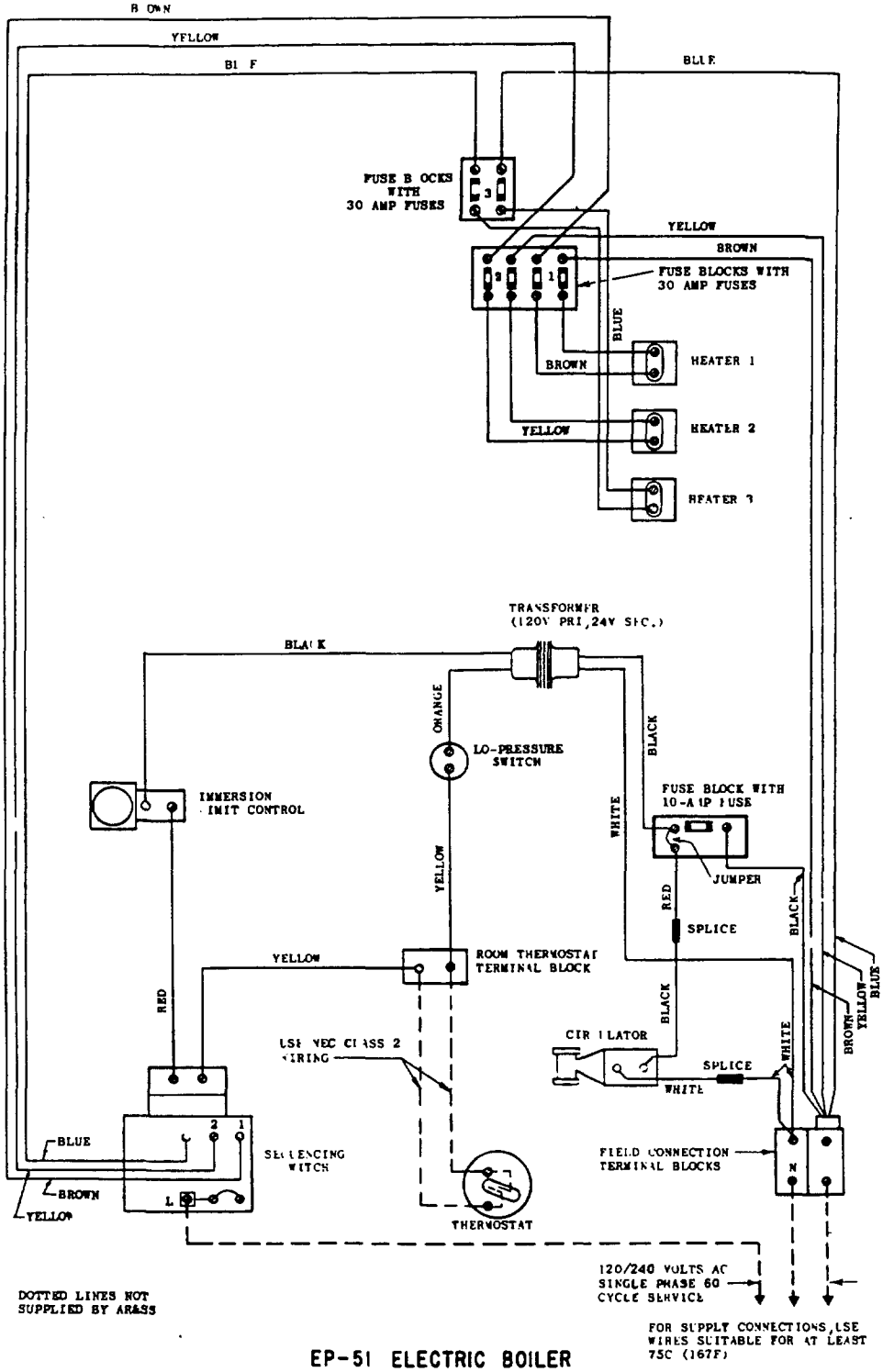


EP-34 ELECTRIC BOILER
WIRING DIAGRAM

Figure 3

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EP Electric B iler

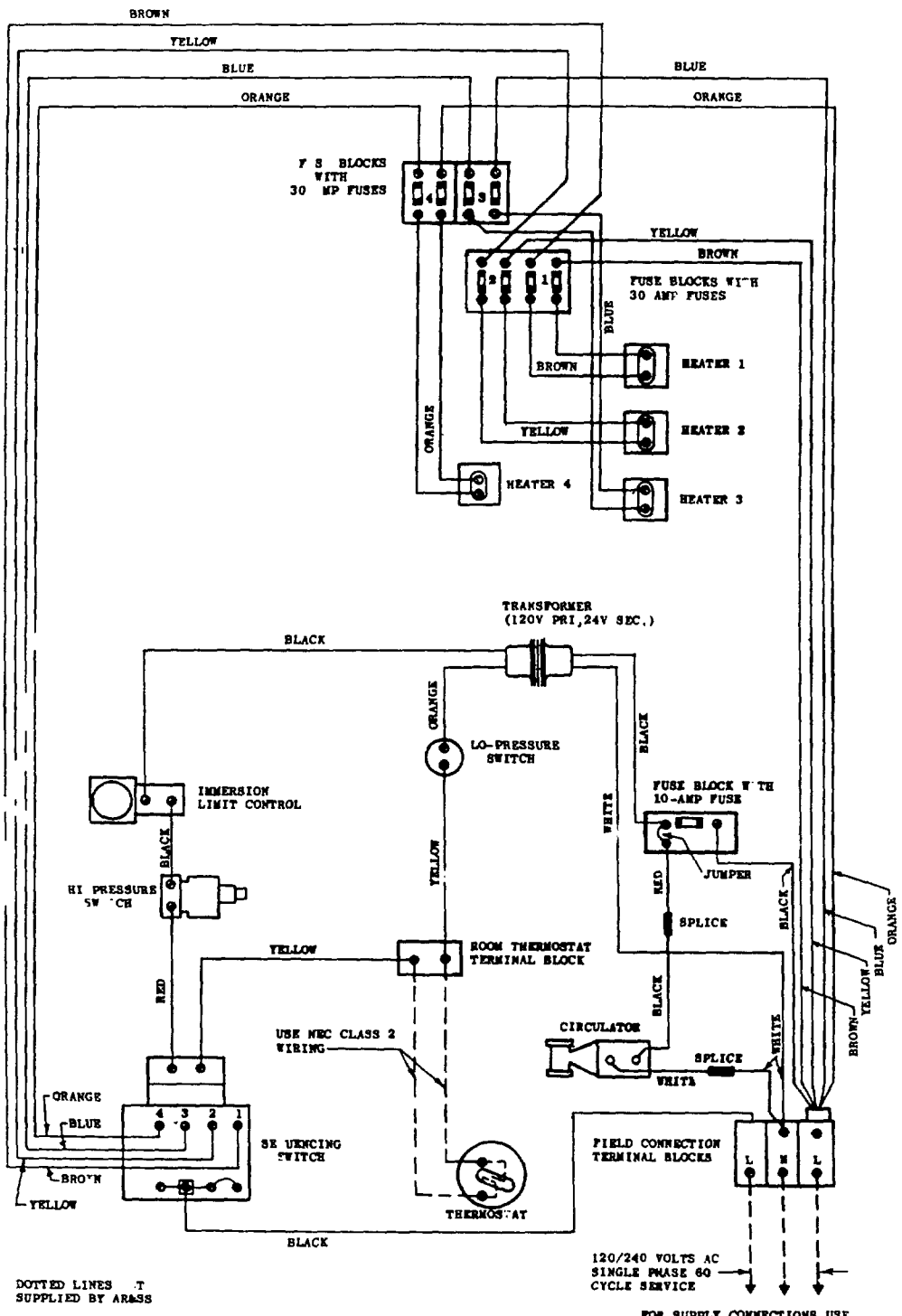


EP-51 ELECTRIC BOILER
WIRING DIAGRAM

Figure 4

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EP Electric Boil r

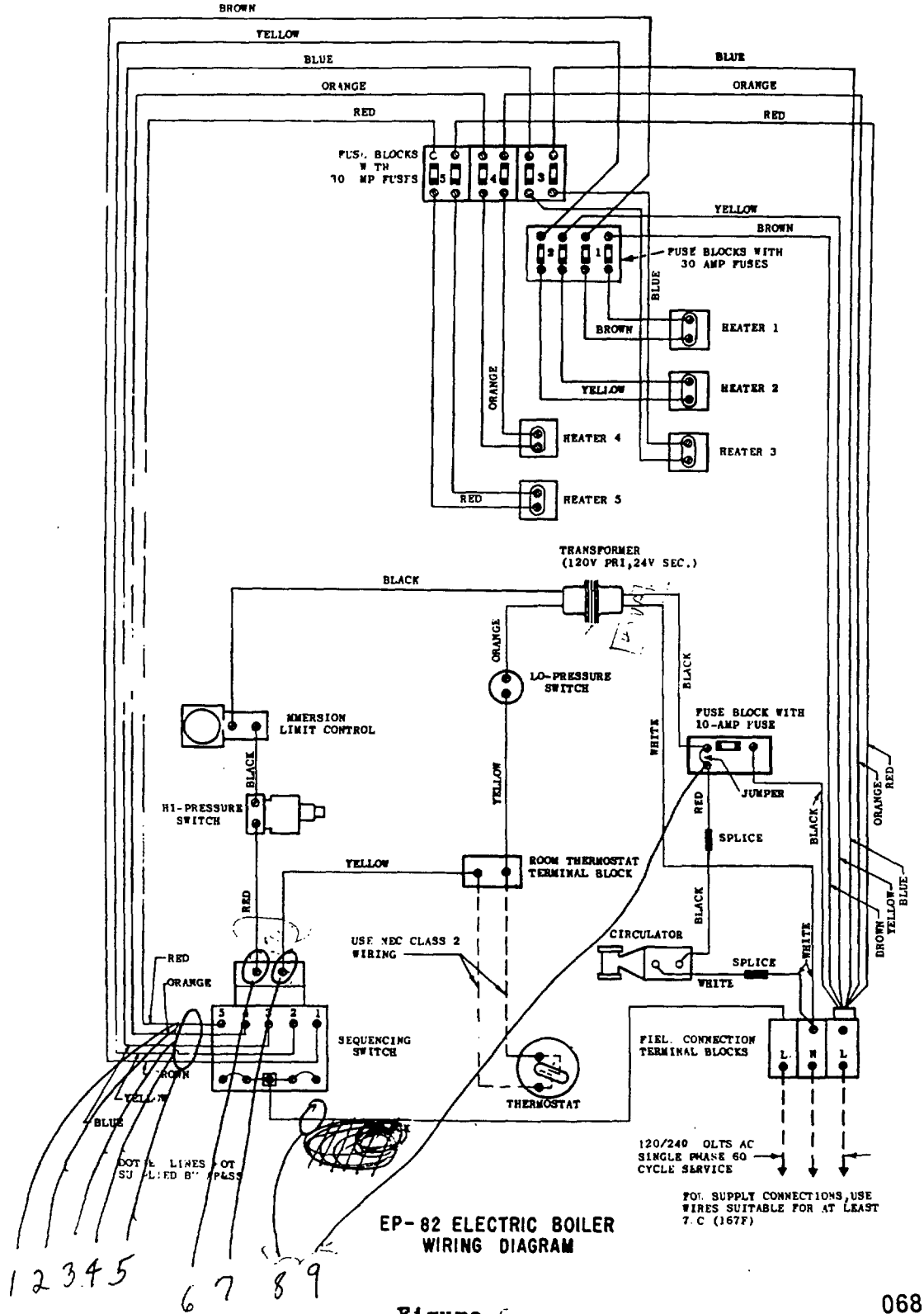


EP-68 ELECTRIC BOILER
W RING DIAGRAM

Figure 5

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EP Electric Boiler



Figure

06882

Service conductors should be suitable for at least 75 C (167 F) and of the minimum size shown in Table I.

TABLE I

Boiler Number	Conductor Size (AWG)	amps @ 240 Volts
EP-34	6	41.7
EP-51	4	62.4
EP-68	2	83.2
EP-82	1	100.0

The service conductors should be wired through a fused disconnect adequate to handle the amperage loads shown in Table I.

The low voltage wiring from the room thermostat should be connected to the terminal block on the outside of the boiler jacket on the right-hand end. The room thermostat provided has an adjustable heat anticipator, which should be set at 0.75 amps.

The jacket must be electrically grounded. A grounding screw is provided inside the wiring compartment below the field terminal blocks; however, local codes should be followed.

NOTE: DO NOT ATTEMPT TO ELECTRICALLY TEST THE BOILER UNTIL THE SYSTEM HAS BEEN FILLED WITH WATER.

ZONING

Wiring diagrams covering the hookup of multiple zone systems are shown in Figures 7 and 8.

Figure 7 - This shows zone valves representative of any two-wire zone valve employing an end switch. In this application the setting of the adjustable heat anticipator in the thermostat should match the amperage rating of the zone valve. With this hookup, the circulator supplied on the boiler operates constantly.

Figure 8 - This is the same zone valve system as in Figure 7, except that the circulator operation is intermittent and operates only when there is a call for heat. A 1/2" conduit knockout is provided in the bottom of the control compartment for convenience in running wiring to the motor-transformer fuse block.

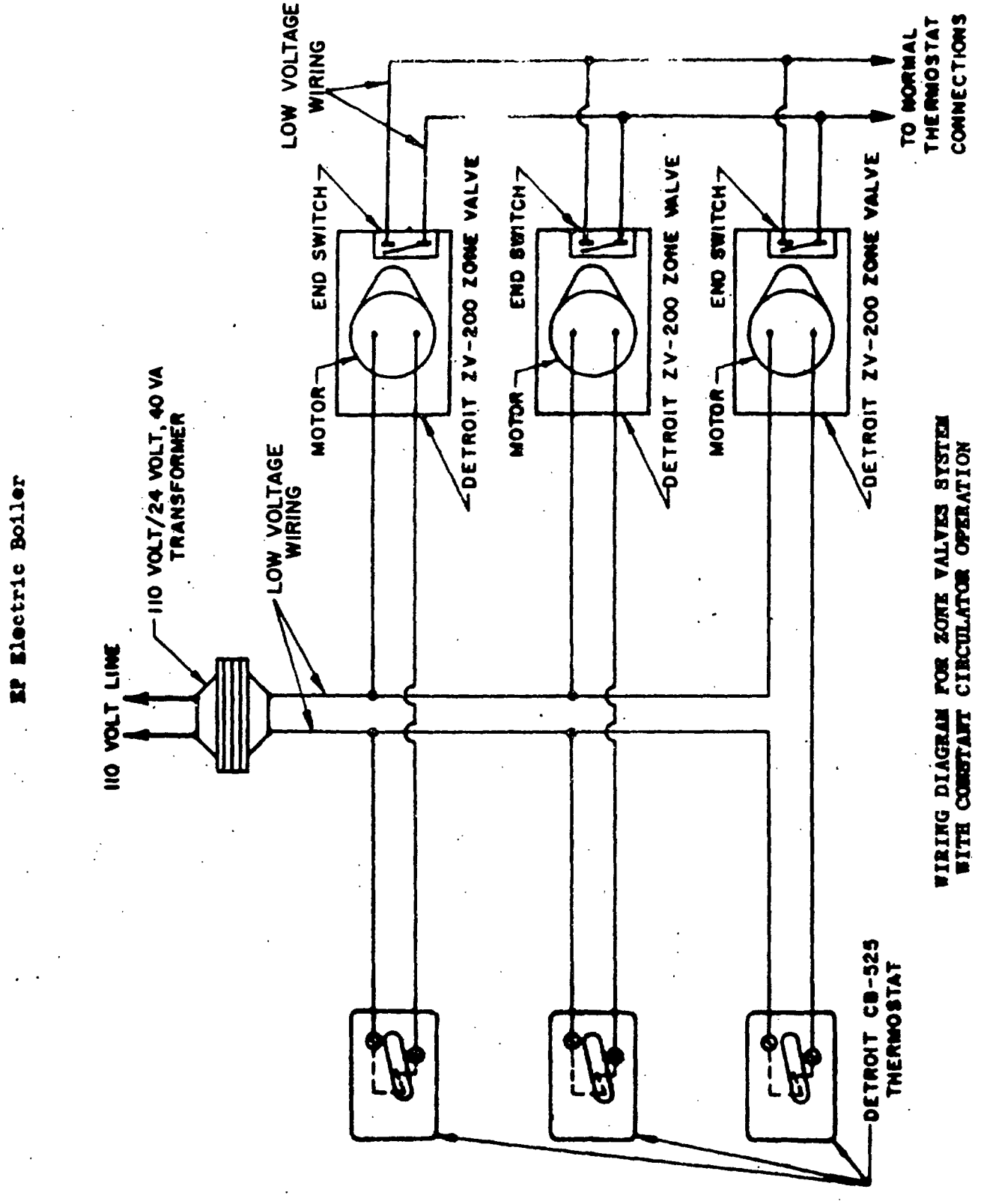
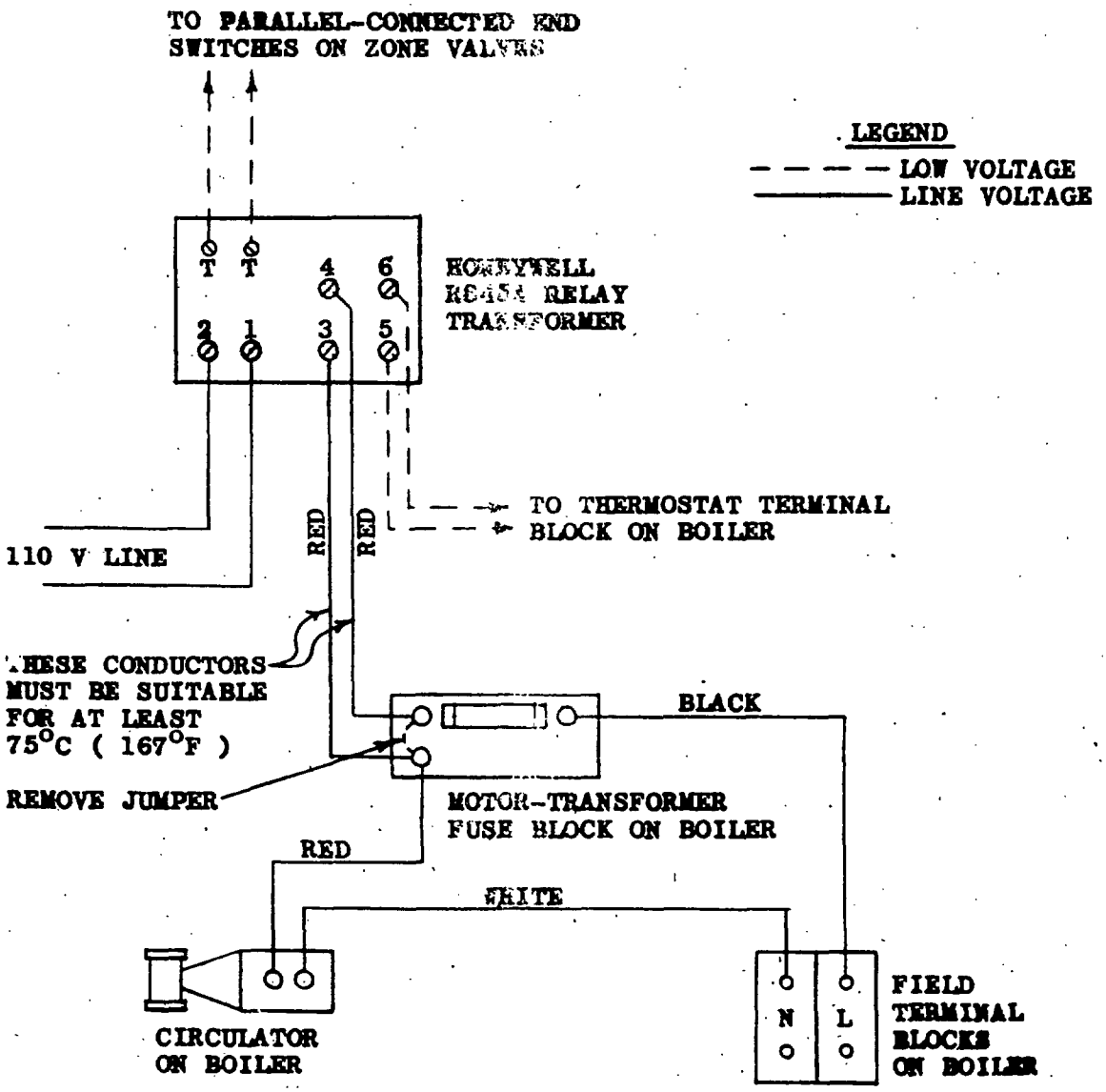


Figure 7

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EP Electric Boiler

WIRING DIAGRAM FOR ZONE VALVE SYSTEM WITH INTERMITTENT CIRCULATOR OPERATION

Figure 8

06885

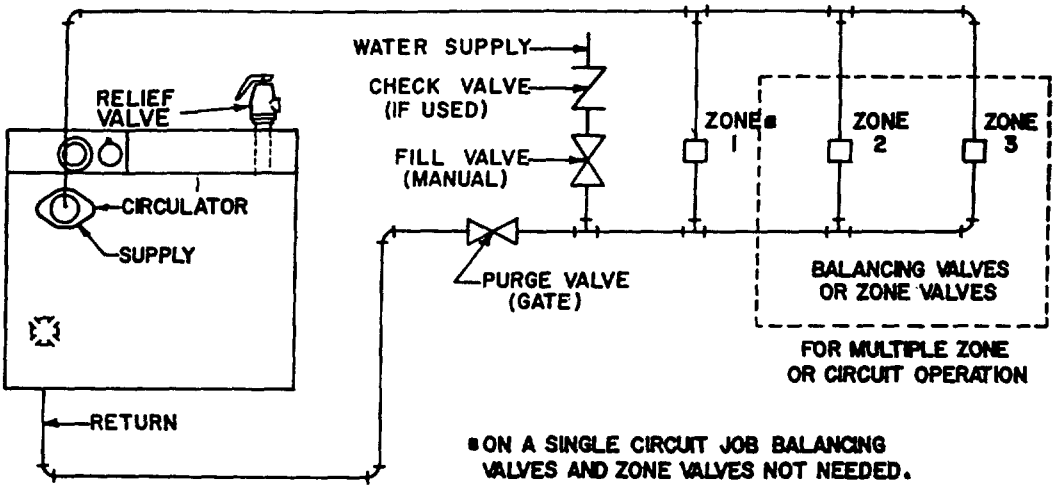


Figure 9

PROCEDURE FOR FILLING SERIES LOOP HEATRIM SYSTEM (see Figure 9)

1. Close all zone valves except the one for the zone to be filled with water and purged of air.
2. Screw down the cap on the automatic air vent.
3. Open the drain valve on the boiler.
4. Open the fill valve.
5. Close the purge valve.
6. Open the relief valve.
7. Open the valve to the second zone to be purged; then close the first. Repeat this step until all zones have been purged of air and filled with water; but always have one zone open. (Zones are purged and filled when water can be felt in the pipe at the end of the zone).
8. Close the drain valve.
9. When water appears at the relief valve, release the lever and allow it to close.
10. Continue filling the system until the pressure gauge reads 12 psi without heat; close the fill valve.
11. Open the purge valve.
12. Loosen the cap on the automatic air vent two turns so that the vent will operate properly.
13. For quietest operation, the system water pressure should be adjusted to 25 psig with the system at 200 F.

If an automatic fill valve is used, it may be necessary to readjust the setting of the valve to allow a higher fill pressure with the system cold to obtain desired pressure with the system at 200 F.

It may be necessary to increase the initial air pressure in the diaphragm-type expansion tank with the system cold to insure adequate expansion volume. The tank is fitted with a tire valve for this purpose.

NOTE 1: Where multiple circuits are used without zone valves, balancing valves should be installed. These can be shut off to purge each circuit individually.

NOTE 2: For a single loop Heatrim System, no additional vents, valves, drains or other accessories are required.

Following the completion of the installation, a thorough check should be made of the entire hydronic system to locate possible leaks.

CONTROLS

As shipped from the factory, the boiler control circuit is prewired and is composed of the following controls:

Operating Limit Control - Honeywell L4008 with 18" long capillary, 5 F fixed differential and mechanical stop at 220 F.

Sequencing Switch - Honeywell R8154A for Model EP-82.
Honeywell R8154B for Model EP-68.
Honeywell R8154C for Model EP-51.
Honeywell R8154D for Model EP-34.

Low-Pressure Switch - John W. Hobbs Model M-4440 set at 4 psig.

High-Pressure Switch - Allen Bradley No. 836 set at 27-1/2 psig.

OPERATION

The Low-Pressure Switch is provided to prevent the boiler from being energized unless pressure in the heating system is at least 4 psig. This prevents any chance of heating elements burning out should an attempt be made to operate the boiler without water.

The High-Pressure Switch de-energizes the control circuit instantly should the system pressure reach 28 psig. This switch provides positive protection if for any reason there is no water circulation while the boiler is energized.

The Operating Limit Control is adjustable to 220 F. The adjustment is made with a screwdriver through the front of the decorative cover on top of the boiler. The control setting should be based on the maximum design water temperature.

Temperature and pressure within the boiler are indicated by the combination temperature/pressure gauge located just to the left of the Operating Limit Control dial.

MAINTENANCE

The boiler has been designed to require minimum servicing. Before initial start-up and at the beginning of each heating season, the circulator should be oiled according to instructions shown on the circulator.

In the event of heating element burnout, replacement should be made with a square-flanged type having 2-1/2" bolt circle. All elements are of the low-density type (80 watts per square inch or less) and are rated at 5,000 watts each, except for one 4,000-watt element in the Model EP-82.

Both sides of each heating element are electrically sub-fused with Buss SC30 (Green Label) cartridge-type fuses. The circulator/transformer circuit is fused with a Buss SC10 (Blue Label) cartridge-type fuse. In the event fuse replacement is necessary, use same type as originally furnished.

CAUTION: BE SURE TO SHUT OFF ELECTRIC POWER TO BOILER BEFORE OPENING CONTROL COMPARTMENT ACCESS DOOR.

Under normal conditions THE HEATING SYSTEM SHOULD NEVER BE DRAINED; however, if the boiler is not used during the winter months, and, if adequate protection is not supplied to avoid the possibility of freezing anywhere in the system, the entire system should be drained.

DEALER'S NAME: _____

ADDRESS: _____

TELEPHONE NO.: _____

DATE OF INSTALLATION: _____

AMERICAN STANDARD

PLUMBING & HEATING DIVISION

40 WEST 40TH STREET • NEW YORK, N Y 10018

06889

PLAINTIFF'S EXHIBIT

ASI-431

AMERICAN STANDARD

PF-A-3 OIL BOILER

INSTRUCTION MANUAL

BOILER-BURNER UNITS

NOTICE TO INSTALLER AND OPERATOR
THIS BOOKLET MUST BE AFFIXED ON OR ADJACENT TO THE HEATING EQUIPMENT

FORM NO. BP-32237-03

SERIES NO. 1B-J2

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PFA-3

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ERAL INFORMATION

is manual on PFA-34 through PFA-38 forced-draft boiler-burner units ives the necessary information for the proper installation, operation maintenance, and service of the units. For special installation problems contact American Standard, Hydronics Department, 25 Rano Street, Buffalo, New York. The units are designed for use with the light oil burner Model 93-0-A/S. Ratings and data are given in Table I. Dimensional information is given in Figures 1, 2, and 3.

SETTING THE UNIT

The unit should be located in the boiler room so as to provide ease of venting and adequate clearance for maintenance, serviceability and installation of piping. A minimum clearance of 2 feet should be allowed on the right side and back of the unit for cleaning of flues.

Floor construction should have adequate load bearing characteristics to bear the weight of the boiler filled with water. A boiler foundation similar to the one shown in Figure 4 is recommended if the boiler room floor is weak or uneven or if a water condition exists.

If the boiler is set on a combustable floor, a 1" thick layer of foil-faced insulation or equivalent should be placed beneath the boiler foil side up.

CHIMNEY OR VENT

The PFA-3 series boiler is designed for forced-draft firing and may be used with a conventional natural draft stack or a stub vent (see Figure 5). See Table I for the proper vent size. Draft controls are not normally required, although they may be used on installations where a natural draft stack is used or on multiple boiler installations with a common stack. The boiler is provided with a breeching damper which should be secured in the open position unless high breeching draft makes burner adjustment difficult.

AIR SUPPLY

A sufficient air supply should be maintained at all times to the boiler room for proper performance of the unit. A permanent opening or duct should be provided such that the boiler input will not exceed 5,000 Btuh/in^2 of free area.

ALTITUDE CORRECTIONS

Ratings shown in Table I apply at altitudes up to 2000 feet. For altitudes above 2000 feet, the ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

SECTION ASSEMBLY

If the boiler was ordered with the sections assembled (standard arrangement), the assemblage should be set in the proper location. The tie rod nuts should then be loosened until finger tight. Assemble other components as outlined in the manual starting at the section entitled "Tankless Heater Installation."

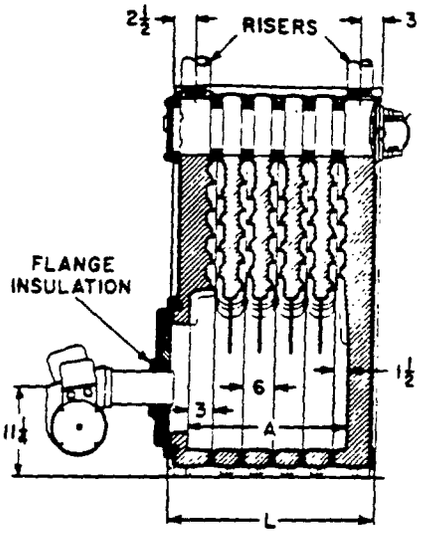
TABLE I

RATING - DATA

BUILT TO ASME SPECIFICATION

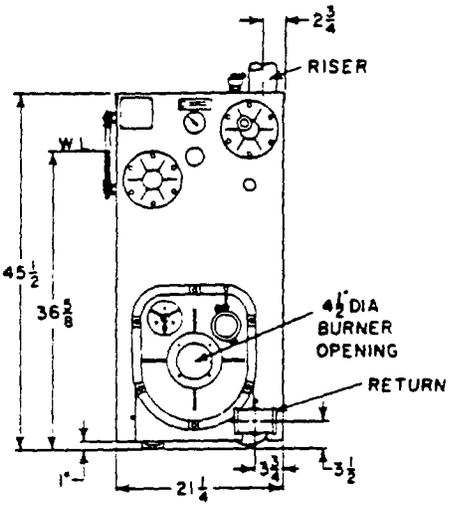
Boiler Model No.	Boiler H.P.	Gross I=B=R Output Mbh	Net I=B=R Rating Steam (Sq. Ft.)	Net I=B=R Rating Steam (Mbh)	Net I=B=R Rating Water (Mbh)	**I=B=R Burner Capacity Light Oil (GPH)	Heating Surface ($Ft.^2$)	Net Firebox Volume ($Ft.^3$)	***Pressure In Firebox (Inches Water Column)	Assembled Section Weight (Lbs.)	Water Content Full (Lbs.)	I=B=R Vent Diamete (Inches)
PFA-34	9.0	300	938	225.1	260.9	2.65	35.4	2.07	.480	800	276	8
PFA-35	11.2	375	1172	281.3	326.1	3.30	46.2	2.83	.447	1,000	335	8
PFA-36	13.4	450	1407	337.6	391.3	3.95	57.1	3.59	.413	1,200	402	8
PFA-37	15.7	526	1644	394.6	457.4	4.60	68.0	4.35	.380	1,400	465	8
PFA-38	17.9	600	1875	450.1	521.7	5.30	78.9	5.11	.346	1,600	531	8

*Suffix "S" indicates steam boiler - "W" indicates water boiler
**Model 93-0-A/S burner used with PFA-3 boilers.
***With positive pressure of 0.10 inches water column in boiler flue outlet.



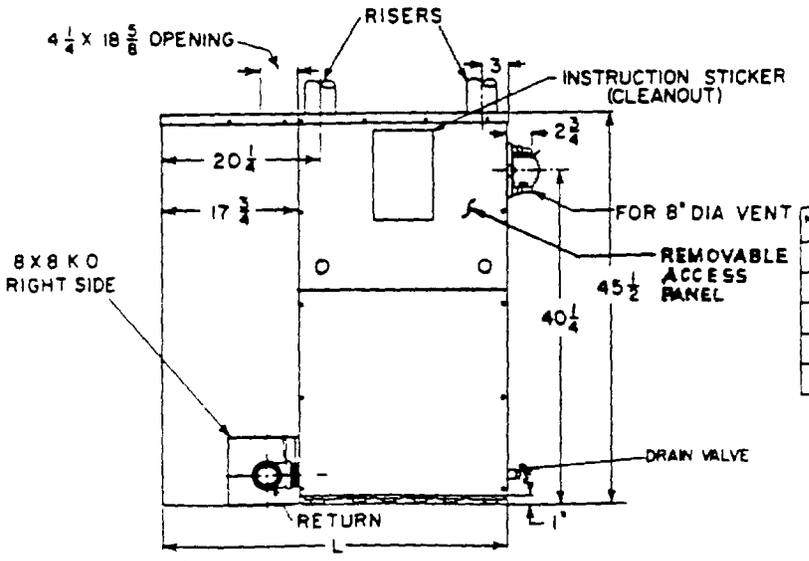
NUMBER OF SECTIONS	DIMENSIONS	
	A	L
4	16½	22½
5	22½	28½
6	28½	34½
7	34½	40½
8	40½	46½

FIGURE 1 - SECTION THRU BOILER WITH FLUSH JACKET



FRONT VIEW
FLUSH JACKET

FIGURE 2



NUMBER OF SECTIONS	DIMENSION L
4	40¼
5	46¼
6	52¼
7	58¼
8	64¼

SIDE VIEW EXTENDED JACKET

FIGURE 3

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L	NUMBER OF SECTIONS
32"	4
38"	5
44"	6
50"	7
56"	8

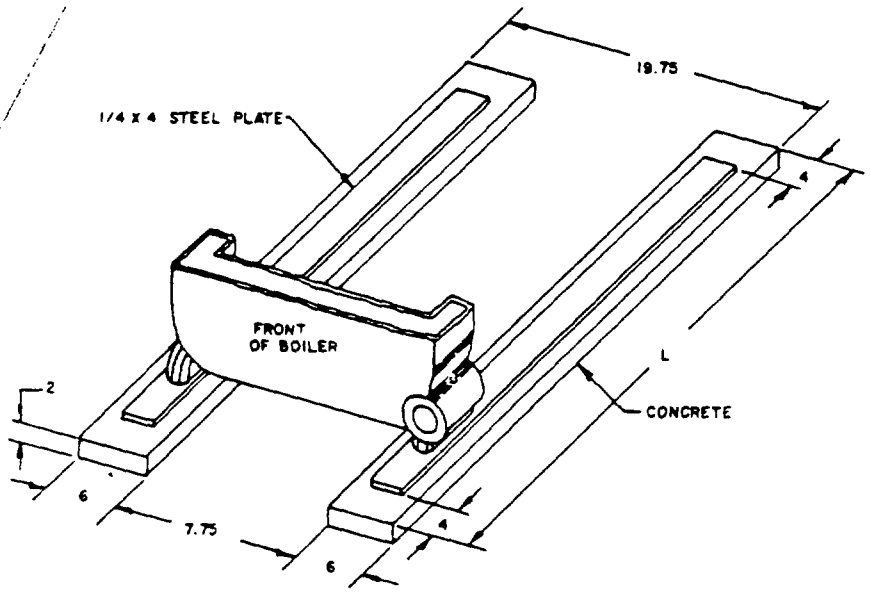


FIGURE 4 - SUGGESTED BOILER FOUNDATION

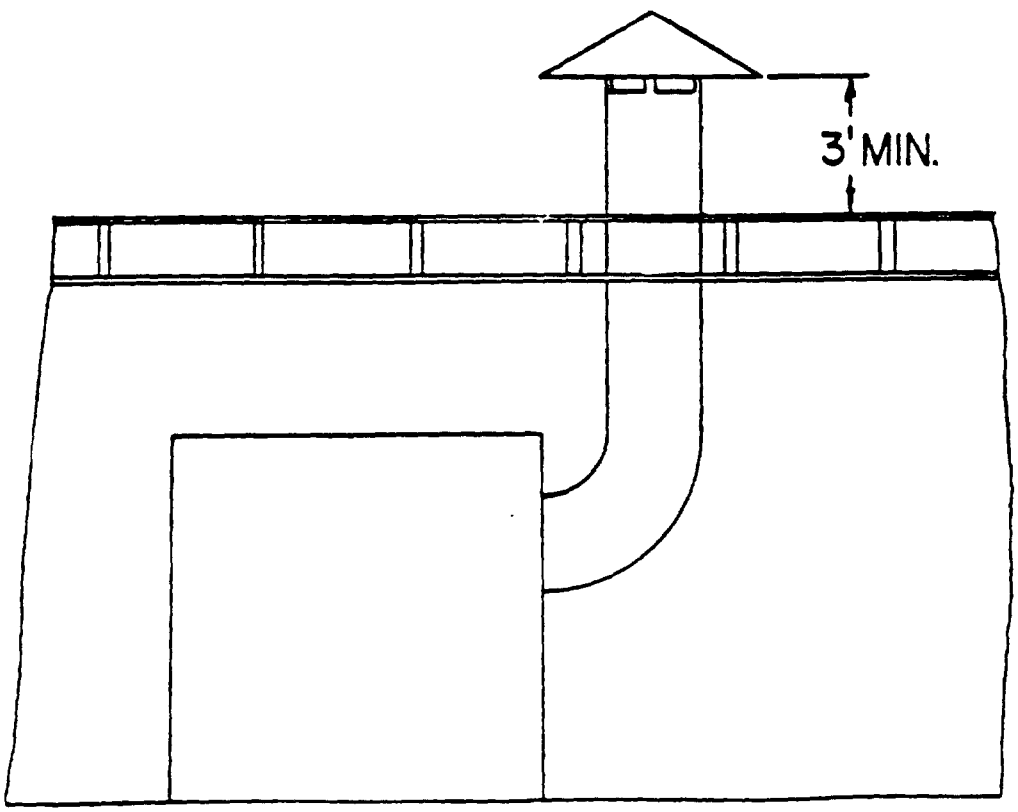


FIGURE 5 - ARRANGEMENT FOR STUB VENT

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he boiler was ordered with the assembly split or completely dis-
embled (optional arrangements), follow the assembling procedure out-
ned below:

A. Assembly of Sections

1. Place the back section in its approximate final location with regard to the chimney and support it with a suitable prop.

   Note: If the assembly was ordered split into two parts, then disregard instructions pertaining to the handling of individual sections.

2. Clean nipples and nipple openings with kerosene or gasoline and apply good lubrication oil. DO NOT USE PAINT, RED LEAD OR CEMENT.

3. Drive nipples squarely (thick end first) into section using block of wood and hammer, or preferably an aluminum headed hammer, if available.

4. Special nipple setting gauge is provided for the larger nipples. Gauge nipple in both directions to insure that it is driven to the proper depth into the nipple opening. Cut-out in gauge must rest on nipple, with legs of gauge touching finished face of section, when nipple is properly driven. See Figure 6.

   Use rule or suitable gauge for smaller nipples to insure that they are properly driven and project equally all around. Nipples must project 1/16" more than half their length outside of the finished face of the section.

   IMPORTANT - NIPPLES MUST BE DRIVEN AS DIRECTED TO INSURE TIGHT JOINTS. MOST NIPPLE LEAKS ARE CAUSED BY TILTED OR COCKED NIPPLES.

5. IMPORTANT - THIS IS A FORCED-DRAFT FIRED BOILER AND SEALANT MUST BE APPLIED WHERE SPECIFIED FOR PROPER PERFORMANCE.

   The grooves in the ground joint along the periphery of the section should be cleaned with a wire brush. Then, using a cartridge of 732RTV sealant in a caulking gun, apply a smooth, 1/4" diameter bead of sealant to the grooves. See Figure 7.

   IMPORTANT - SECTIONS MUST BE PULLED UP TIGHT WITHIN FOUR HOURS AFTER APPLICATION OF THE SEALANT.

6. Select a center section. Clean nipple openings and place section on nipples in back section.

7. Insert the three 3/4" tie rods through the nipple ports in the intermediate section extending them through the tapped holes in the back section. Place nuts and washers on the tie rods (back section side).

   Place large draw-up blocks on the upper rods and small draw-up block on the lower rod. Place nuts and washers on rods. See Figure 8.

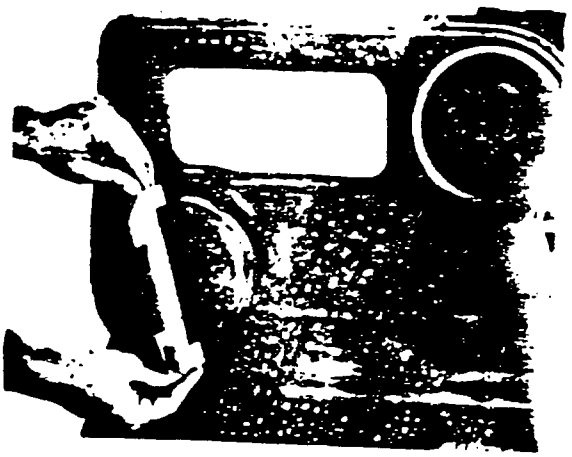


FIGURE 6 - SETTING OF NIPPLES

APPLY 1/4 INCH DIAMETER BEAD OF SEALANT TO GROOVES

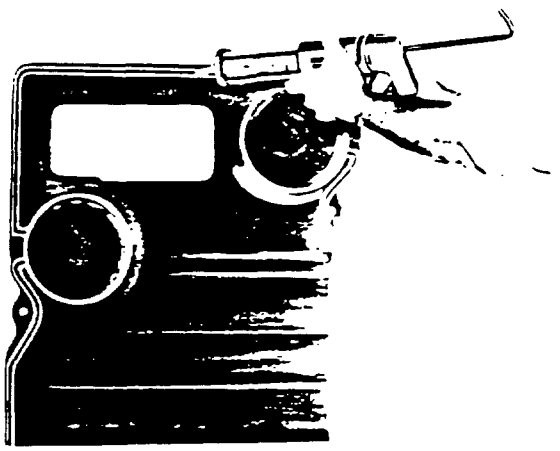


FIGURE 7 - APPLICATION OF SEALANT

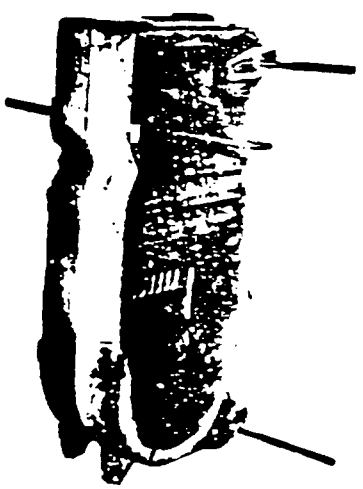


FIGURE 8 - PULL-UP ASSEMBLY

A. Assembly of Sections (Cont'd.)

8. Drive section in place with heavy block of wood, striking blows as squarely as possible over nipples. Draw-up evenly on all tie rod nuts starting with lower tie rods, but only after driving the section up at regular intervals with the heavy block of wood to relieve tension on the tie rod threads. Continue assembling sections in their respective order.

   NEVER ASSEMBLE MORE THAN ONE SECTION AT A TIME

   Be sure to apply the sealant to the groove in the ground joints between adjacent sections as the boiler operates with a positive pressure in the firebox and products of combustion will escape between sections unless the sections are properly sealed. The sealant should be applied before each section is placed on the assemblage.

   NOTE - AVOID DAMAGE TO THE TIE ROD THREADS WHILE DRAWING UP SECTIONS. APPLY OIL OR GREASE FREELY TO TIE ROD THREADS WHILE ASSEMBLING SECTIONS TO PREVENT STRIPPING OF THREADS ON ROD.

9. After the front section has been drawn-up to make contact at ground joint, remove 3/4" tie rods and insert 1/2" tie rods through tie rod lugs. Put on nuts and washers and tighten nuts until finger tight. See Figure 9 for boiler section assemblage to be equipped with built in water heater.

B. Tankless Heater Installation

1. If boiler is ordered with a tankless heater, it should be installed with gasket. The heater should be installed in the lower 5 inch nipple on steam boilers, and in the upper 5 inch nipple on water boilers. See Figure 9. Table II gives the heaters that may be used with each assemblage and the heater ratings.

Tankless Water Heater Ratings*
For PFA-3 Boilers (Steam and Water)

BOILER MODEL NUMBER	TANKLESS WATER HEATER NUMBER 226	232	445	PRESSURE DROP (PSI)
PFA-34	6.0			23
PFA-35	6.0	7.5		36
PFA-36	6.0	7.5	9.0	37
PFA-37	6.0	7.5	9.0	37
PFA-38	6.0	7.5	9.0	37

* Ratings are given in gallons per minute continuous draw of water heated from 40 F. to 140 F with 200 F boiler water.

TABLE II

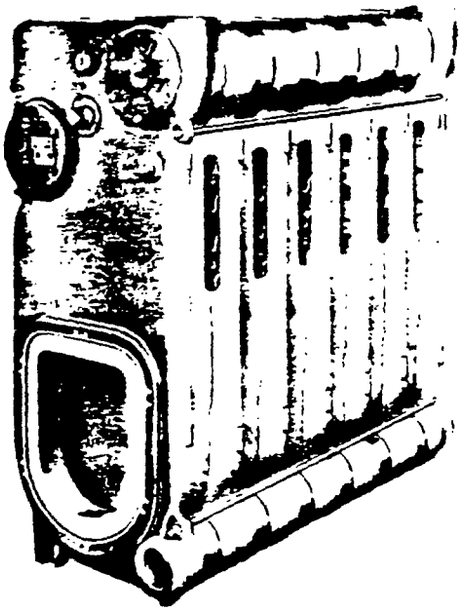


FIGURE 9 - SECTION ASSEMBLAGE
WITH TANKLESS WATER HEATER



FIGURE 10 - LOCATION OF CLEANOUT
COVER ANCHOR BOLTS

SECTION ASSEMBLY (Cont'd.)

C. Hydrostatic Test

1. When boiler sections have been assembled, it is essential that boiler be tested before platework, jacket or piping is installed.

2. Plug all boiler tappings and fill entirely with cold water. To protect and safeguard the accuracy of steam or water gauge supplied DO NOT INSTALL GAUGE UNTIL AFTER TESTING OF BOILER.

3. Testing pressure should be at least 10 pounds but should not exceed 50 pounds.

4. EXAMINE BOILER CAREFULLY, INSIDE AND OUTSIDE, to insure against leaks through concealed breakage caused in shipping and handling.

5. After making certain that there are no leaks, drain boiler and remove plugs for boiler trim and other connections. This precaution is for your protection and will simplify handling of necessary replacements and adjustment claims.

D. Assembly of Platework

1. Secure the cleanout covers to the boiler with the 1/4" diameter by 2-1/4" long bolts shipped with the covers. The bolts should be anchored to the slots in the cleanout openings with the head of the bolt and a washer inside and a washer and nut outside. See Figure 10. The covers are placed on the bolts and secured with washers and nuts.

2. Place the cleanout cover radiation shield, insulation side out, over the bolts protruding from the cleanout covers and secure in place with the nuts shipped with the radiation shield.

3. Next, assemble the flue collar to the back section. Place the collar on the back section and position the damper bracket on the collar as shown in Figure 11. Secure the collar with the 5/16" bolts provided.

4. The burner plate should be secured to the front section with the 5/16" diameter by 1" long bolts provided therefore. Draw-up the bolts until the burner plate makes contact with the front section. See Figure 12.

IMPORTANT - THIS BOILER REQUIRES NO COMBUSTION CHAMBER.

BOILER PIPING

Attach flow and return piping lines and insert plugs and bushings in sections as required. Flow and return piping arrangements are detailed in Figure 13. After filling, all piping elsewhere in the system should be checked for leaks.

ASSEMBLY OF JACKET

1. Place the bottom strip for the front panel in place below the burner plate.



FIGURE 11 - POSITIONING OF DAMPER BRACKET

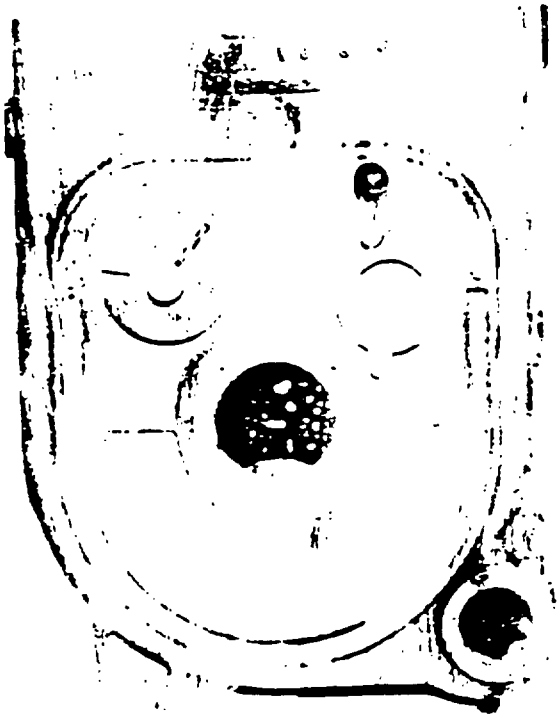
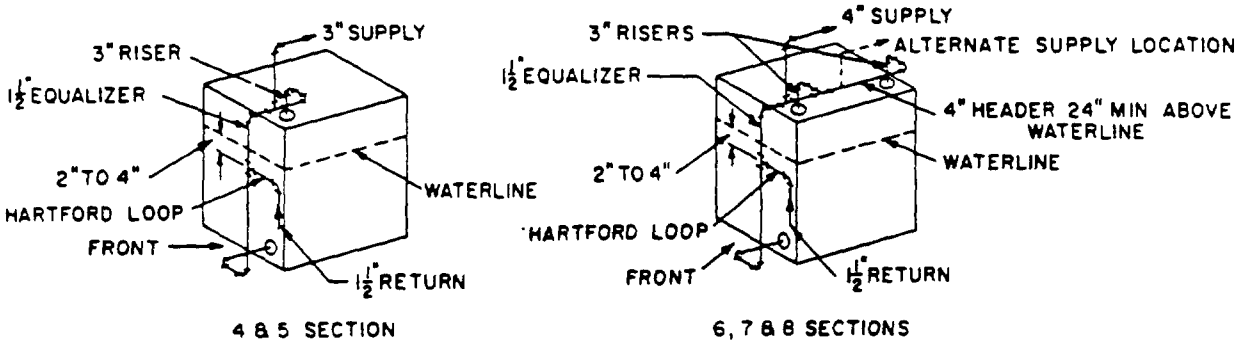
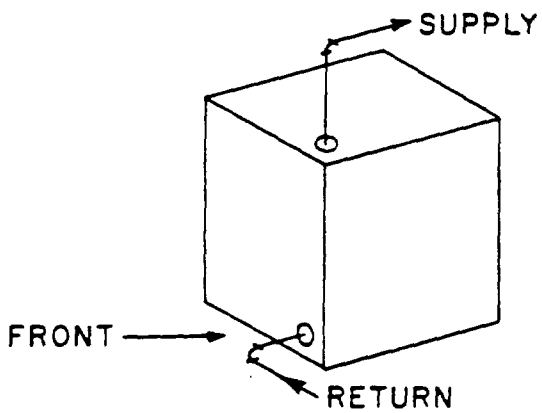


FIGURE 12 - LOCATION OF BURNER PLATE



MINIMUM PIPING RECOMMENDATIONS STEAM BOILERS

HOT WATER



NUMBER OF SECTIONS	PIPE SIZE (INCHES)	
	SUPPLY	RETURN
4 & 5	2	2
6, 7 & 8	2 1/2	2 1/2

MINIMUM PIPING RECOMMENDATIONS WATER BOILERS
(FORCED CIRCULATION)

FIGURE 13 - MINIMUM PIPING REQUIREMENTS

Install the number and series plate on the front jacket panel with #6 x 1/4" sheet metal screws provided. Install panel by sliding it down behind the flanges of the front burner plate. Attach the bottom strip to the front panel with two jacket screws. Figure 14 shows the front panel assembled to the boiler.

2. Assemble right and left side jacket panels to the front panel with #10 x 1/2" sheet metal screws. The design of the jacket provides for a one inch clearance of the jacket above the floor. It is recommended that a suitable support be placed under each side panel near the rear, and left in position until the jacket assembly is complete. Leave all jacket screws loose until the jacket is fully assembled, then tighten.

3. Assemble the back panel to the rear flange of the two side panels with #10 x 1/2" sheet metal screws.

4. Assemble the top panel to the side panels using #10 x 1/2" sheet metal screws. A "knockout" is provided in the top panel to permit assembly or removal after supply pipe is connected to the supply tapping.

5. If a circulator is to be installed in the return line and enclosed by a jacket extension (furnished on special order only), pipe fittings must be selected so that parts do not project beyond either side of the boiler. See Figure 15 for completely assembled jacket for boiler with water heater.

STEAM TRIM

Install the water column trim in the tappings provided on the left side of the boiler. Install the pressure-vacuum gauge, drain valve, safety valve, and controls as shown in Figure 16. Figure 17 shows front view of steam boiler assembled completely with water heater.

WATER TRIM

Install the combination pressure-temperature gauge, drain valve, pressure relief valve, and controls as shown in Figure 16. Figure 18 shown front view of water boiler assembled completely with water heater.

BURNER INSTALLATION

Refer to Burner Installation and Service Manual for proper installation, fuel piping, wiring, burner adjustment and service instructions. 1/4" nuts are provided with the burner for attachment of the burner to the burner plate.

BOILER WITH JACKET EXTENSION

Following are assembly operations for attaching jacket front extension to boiler after the regular (Flush Type) jacket is complete:

1. If not previously left loose, all jacket screws attaching side and top panels to the front panel must be loosened.

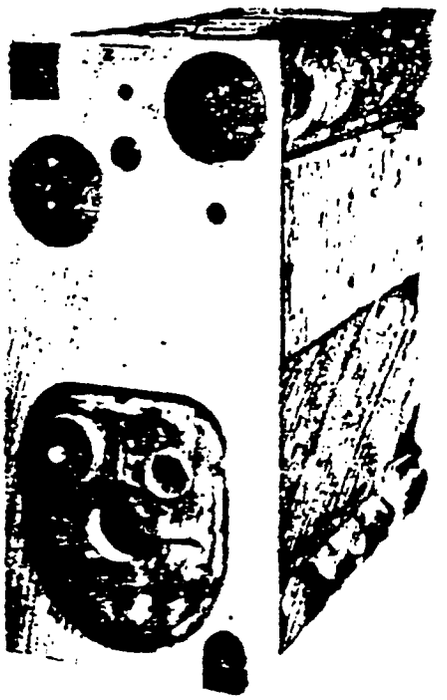


FIGURE 14 - FRONT PANEL IN POSITION

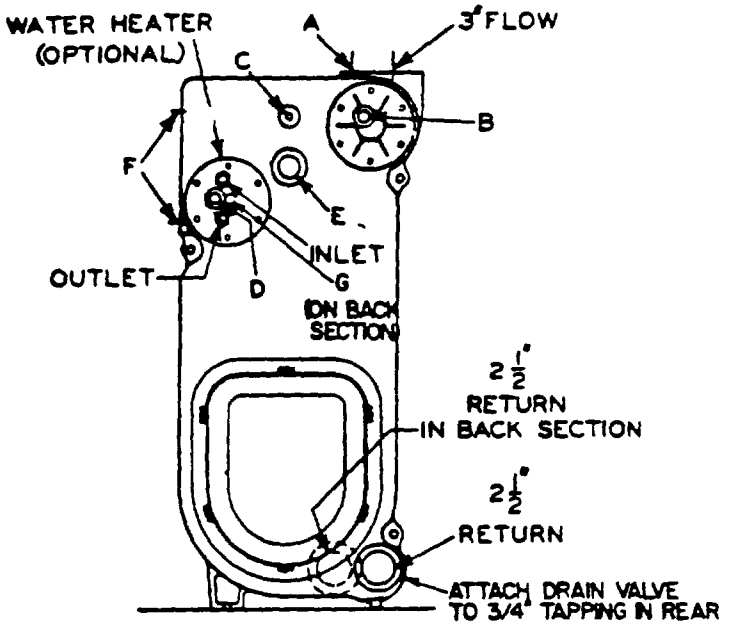


FIGURE 15 - COMPLETELY ASSEMBLED JACKET

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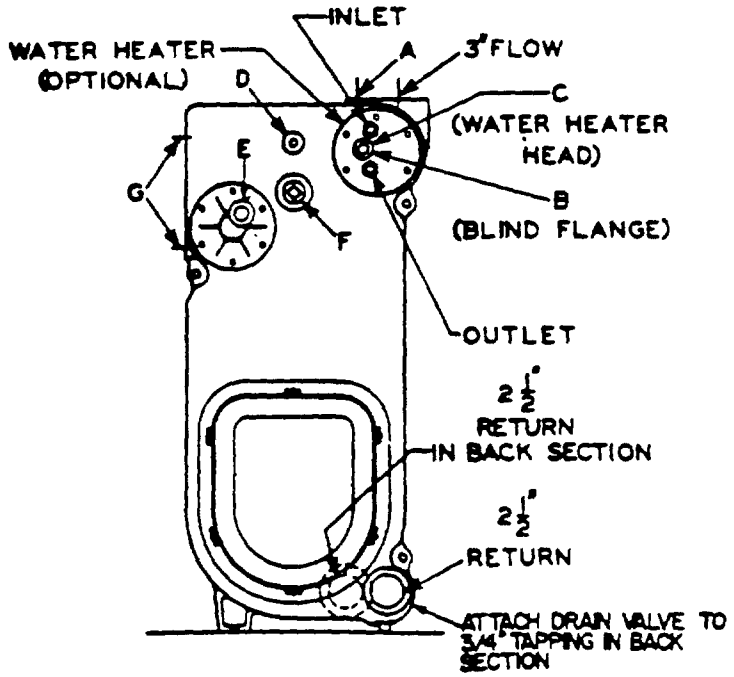
STEAM



FRONT VIEW-SHOWING CONTROL TAPPINGS ALL PURPOSE SECTION ARRANGED FOR STEAM

CONTROL TAPPINGS		
LOCATION	SIZE OF TAPPINGS	CONTROL USED
A	1	SAFETY VALVE
B	3/4	PRESSURE LIMIT CONTROL
C	1/4	PRESSURE GAUGE
D	3/4	IMMERSION OPERATING CONTROL (FOR INSTALLATIONS WITH TANKLESS WATER HEATER)
E	1 1/2	BLOW-OFF
F	1/2	GAUGE GLASS AND LOW WATER CUT-OFF
G	3/4	WATER FLOW CONNECTION FOR STEAM BOILER

HOT WATER



FRONT VIEW-SHOWING CONTROL TAPPINGS ALL PURPOSE SECTION ARRANGED FOR WATER

CONTROL TAPPINGS		
LOCATION	SIZE OF TAPPINGS	CONTROL USED
A	1	RELIEF VALVE
B	3/4	LIMIT CONTROL OR COMBINATION LIMIT AND REVERSE ACTING CONTROL (FOR INSTALLATIONS WITHOUT TANKLESS WATER HEATER)
C	3/4	IMMERSION CONTROL DOUBLE THROW SWITCH OR IMMERSION CONTROL RELAY COMBINATION (FOR INSTALLATIONS WITH TANKLESS WATER HEATER)
D	1/4	COMBINATION PRESSURE GAUGE AND THERMOMETER
E	3/4	AUXILIARY LIMIT CONTROL (WHEN REQUIRED)
F	1 1/2	NOT USED
G	1/2	NOT USED



FIGURE 17 - FRONT VIEW OF STEAM BOILER

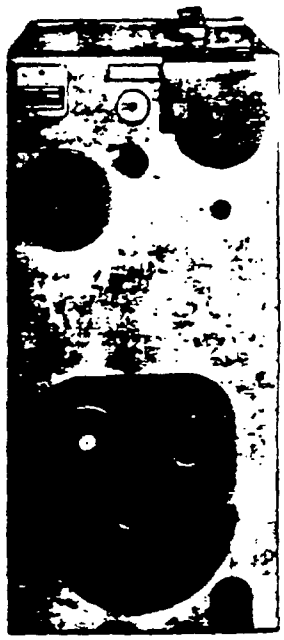


FIGURE 18 - FRONT VIEW OF WATER BOILER



FIGURE 19 - BOILER WITH JACKET EXTENSION

ER WITH JACKET EXTENSION (Cont'd.)

2. Assemble the two extension side panels with the notched edge inserted between the side and front panels. Tighten screws to hold panels in place.

3. Assemble the bottom front tie panel to the two side panels with #10 x 7/8" sheet metal screws provided.

4. Assemble the top extension panel with the rear edge inserted between the top and front panels on the regular jacket. It must also extend down over the side panels. Draw all screws up tight.

5. Install the front door panel by engaging the bottom flange first. Figure 19 shows boiler complete with jacket extension.

FILLING BOILER

IMPORTANT - BEFORE STARTING BURNER SEE THAT BOILER IS PROPERLY FILLED.

Steam boilers should be filled until gauge glass is approximately 1/2 full. After boiler is in operation, make-up water should be added slowly to maintain the water level.

Fill hot water systems as follows:

1. Open all radiator or convector valves, but keep vents at top of units closed.

2. Open fill valve. If an automatic fill valve is used, the water filling will stop automatically when proper pressure is reached. (Pressure should not exceed 50 pounds.)

3. Beginning with ground floor, vent each radiator or convector as directed above. It may be necessary to add water during this operation.

ATTENTION TO BOILER WHILE IN OPERATION

Keep water in steam boiler at proper level (gauge glass approximately 1/2 full).

On steam boilers - at the start of each heating season and once or twice during the season try SAFETY VALVE to be sure it is in working condition. To do this, fasten wire or cord to lever of valve and pull lever - standing safe distance away from valve.

ON A HOT WATER SYSTEM THE PRESSURE MUST NOT EXCEED 50 POUNDS. IF IT DOES, IT MUST BE RELIEVED IMMEDIATELY AND THE CAUSE OF RELIEF VALVE FAILURE INVESTIGATED AND CORRECTED, OTHERWISE PRESSURE MAY BUILD UP AND CAUSE DAMAGE TO HEATING SYSTEM.

DO NOT draw water from boiler while in use. When adding water while boiler is in operation, do not open supply valve fully but add water slowly.

CLEANING STEAM BOILERS

The grease used to lubricate the cutting tools during erection of new piping systems serves as a carrier for dirt, with the result that a scum of fine particles and grease accumulate on the surface of the water in all new boilers, while heavier particles may settle to the bottom of the boiler and form sludge. These impurities tend to cause foaming, preventing the generation of steam and causing an unsteady water line. This unavoidable accumulation of oil and grease should be removed by blowing-off the boiler as follows:

If not already provided, install a surface blow connection of at least 1-1/4" nominal pipe size in the tapping provided in the front section with outlet extended to within 18" of the floor or to sewer, inserting a valve in line close to boiler. Raise steam pressure and while burner is operating, open valve in blow-off line. When pressure recedes, close valve and repeat process adding water at intervals to maintain proper level. As a final operation, bring the pressure in the boiler to about 10 pounds, close blow-off, stop burner and open drain valve. After boiler has cooled, partly fill and flush out several times before filing it to proper water level for normal service. The use of soda or any alkali, vinegar or any acid is not recommended for cleaning heating boilers because of the difficulty of complete removal and the possibility of subsequent injury after the cleaning process has been completed.

ATTENTION TO BOILER WHILE NOT IN OPERATION

At the end of the heating season, clean boiler surfaces thoroughly. Access to boiler flue ways may be gained by removing the upper half of the right-hand side panel and then removing the radiation shield and cleanout covers. The access panel may be removed after unscrewing, by lifting and swinging out the bottom of the panel first, using the two finger holes provided in the panel.

Spray flue surfaces with light lubricating or crankcase oil using gun with extended stem so as to reach all corners.

Clean and remove smokepipe where feasible.

With steam boilers, at end of season add sufficient water to fill boiler to top of water column and leave it that way until fall when water should be drained again to proper level. If at this time boiler water is dirty, drain water, flush out boiler, and refill with clean water to prescribed water level.

On water boilers keep system filled with water. In other words, leave water alone. It is advisable in fall to drain a little water to remove sludge but not more than necessary.

IF BOILER IS NOT USED DURING WINTERTIME, IT MUST BE FULLY DRAINED TO PREVENT FREEZE DAMAGE.

GENERAL MAINTENANCE OF HEATING SYSTEM

1. Keep radiators and convectors clean.

2. Keep system in good repair. It is advisable to have it inspected by your heating contractor at least once a year.

ERAL MAINTENANCE OF HEATING SYSTEM (Con't.)

3. Clean boiler surfaces at regular intervals.

4. If a hot water radiator is hot at the bottom but not at the top, it indicates that air has accumulated inside and should be vented. To vent radiator; hold small cup under air vent (located near top of radiator), open vent until water escapes and then close.

5. If much water is added to system, it is advisable to heat system to a high temperature and vent again. This will make less venting necessary during the winter.

6. Where an expansion tank is used, make sure that neither the tank nor its drain pipe is exposed to freezing temperatures. Never place valves in piping leading to or from expansion tank.

REPAIR PARTS

GIVE BOILER MODEL NUMBER AND SERIES NUMBER WHEN ORDERING REPAIR PARTS.

The heat transfer surface of this boiler has been carefully designed to give optimum performance and reliability. However, the presence of contaminants such as scale or lime, sediment and boiler sealing compounds in the section waterways may cause premature failure of the sections.

If leaks occur in the system and are undetected or neglected, fresh water replaces the water lost through the leaks. Nearly all water contains dissolved minerals ("lime"). As water is heated in the boiler, the minerals are deposited, mostly at the bottom of the sections directly above the fire. No appreciable amount of lime is deposited in a system with no leaks; but when water is hard and makeup water must be added frequently and in large amounts, boiler waterways may be coated with a thick layer of lime within days or a few weeks of operation. Lime is an insulator, which causes overheating of boiler metal. If deposition of lime is not halted, the boiler will fail. To stop lime deposition, stop system leaks.

Leaks may occur occasionally in any system. These leaks are usually of such a nature that they can be prevented or corrected by good workmanship. Every effort should be mad to correct them without the use of boiler sealing compounds. If compounds are used, they should be used as sparingly as possible, and never in excess of manufacturers recommendations. Following use, the boiler must be flushed out thoroughly, or serious damage is likely to result.

Sediment which may accumulate in the boiler should be flushed out in accordance with recommended maintenance practices. Excessive use of water should be avoided because of the danger of lime and corrosion buildup.

Glycol anti-freeze is sometimes added to system water to protect against freezup. Although American Standard can not recommend this practice, we realize that glycol anti-freeze will occasionally be used. Heat transfer through glycol is poorer than through water: use no more than 50 percent glycol in the system. With any proportion of glycol, radiator output will be lower than with pure water at the same temperature.
It is always better, when possible, to drain the system rather than add anti-freeze; neither the heating system nor plumbing system water will freeze so long as the heating system continues to operate; and the plumbing system is not protected against freezeup when the heating system is off, whether or not the heating system contains anti-freeze.

Cast iron is highly resistant to corrosion. However, some propellants used in aerosol cans break down into poison gas and corrosive gas, at high temperatures. If aerosol mixtures are used near boilers, the aerosol will enter the boiler flame and will be heated. Continued use of aerosol cans near heating system boilers can result in severe boiler heating surface corrosion and possible danger to health.

The installer of this boiler is responsible for showing to the owner operator the location of all emergency shutoff devices, and instructing him in the use of each.