

# INSTALLATION MANUAL FOR

# ***BURNHAM BASE-RAY®***



## TABLE OF CONTENTS

PAGE	
2	I=B=R RATINGS
4	ASSEMBLY CHART
5	SYSTEM TYPES
6	SERIES LOOP SYSTEMS
7	SERIES LOOP DESIGN
8	INSTALLATION DETAILS
9	INSTALLATION INSTRUCTIONS
10	ASSEMBLY INSTRUCTIONS
14	SPECIAL APPLICATIONS
16	WARRANTY

Heating Contractor

Installation Date

Address

Phone Number





For Ratings at the following temperatures, multiply the 150° rating by the multiplier of the desired temperature.

Temperature – Multiplier		
150° - 1.0	130° - .68	110° - .42
	120° - .54	100° - .32
140° - .82		

**No. 9A Base-Ray® I=B=R Ratings – Steam and Hot Water (500 LBS/HR Flow Rate \*\*)**

Length in Lineal Feet*	Steam Rating Square Feet	Steam Rating B.T.U. Per Hr. At 215°F	HOT WATER RATINGS IN BTU PER HOUR AT 500 LBS./HR. (ONE G.P.M.) FLOW RATE** AT AVERAGE WATER TEMPERATURE OF								Pressure Drop in Inches of Water***
			230°F	220°F	210°F	200°F	190°F	180°F	170°F	150°F	
Per Lin. Ft.	3.40	820	890	830	770	710	650	590	520	390	
1.5	5.1	1230	1340	1250	1160	1070	980	890	780	585	.10
2.0	6.8	1640	1780	1660	1540	1420	1300	1180	1040	780	.10
2.5	8.5	2050	2230	2080	1930	1780	1630	1480	1300	975	.11
3.0	10.2	2460	2670	2490	2310	2130	1950	1770	1560	1170	.12
3.5	11.9	2870	3120	2910	2700	2490	2280	2070	1820	1365	.13
4.0	13.6	3280	3560	3320	3080	2840	2600	2360	2080	1560	.14
4.5	15.3	3690	4010	3740	3470	3200	2930	2660	2340	1755	.14
5.0	17.0	4100	4450	4150	3850	3550	3250	2950	2600	1950	.15
5.5	18.7	4510	4900	4570	4240	3910	3580	3250	2860	2145	.16
6.0	20.4	4920	5340	4980	4620	4260	3900	3540	3120	2340	.17
6.5	22.1	5330	5790	5400	5010	4620	4230	3840	3380	2535	.18
7.0	23.8	5740	6230	5810	5390	4970	4550	4130	3640	2730	.18
7.5	25.5	6150	6680	6230	5780	5330	4880	4430	3900	2925	.19
8.0	27.2	6560	7120	6640	6160	5680	5200	4720	4160	3120	.20
8.5	28.9	6970	7570	7060	6550	6040	5530	5020	4420	3315	.21
9.0	30.6	7380	8010	7470	6930	6390	5850	5310	4680	3510	.22
9.5	32.3	7790	8460	7890	7320	6750	6180	5610	4940	3705	.22
10.0	34.0	8200	8900	8300	7700	7100	6500	5900	5200	3900	.23
10.5	35.7	8610	9350	8715	8090	7460	6830	6200	5460	4095	.24
11.0	37.4	9020	9790	9130	8470	7810	7150	6490	5720	4290	.25
11.5	39.1	9430	10240	9550	8860	8170	7480	6790	5980	4485	.26
12.0	40.8	9840	10680	9960	9240	8520	7800	7080	6240	4680	.26
12.5	42.5	10250	11130	10380	9630	8880	8130	7380	6500	4785	.27
13.0	44.2	10660	11570	10790	10010	9230	8450	7670	6760	5070	.28
13.5	45.9	11070	12020	11210	10400	9590	8780	7970	7020	5265	.29
14.0	47.6	11480	12460	11620	10780	9940	9100	8260	7280	5460	.30
14.5	49.3	11890	12910	12040	11170	10300	9430	8550	7540	5655	.30
15.0	51.0	12300	13350	12450	11550	10650	9750	8850	7800	5850	.31
15.5	52.7	12710	13800	12870	11940	11010	10080	9150	8060	6045	.32
16.0	54.4	13120	14240	13280	12320	11360	10400	9440	8320	6240	.33
16.5	56.1	13530	14690	13700	12710	11720	10730	9470	8580	6435	.34
17.0	57.8	13940	15130	14110	13090	12070	11050	10030	8840	6630	.34
17.5	59.5	14350	15580	14530	13480	12430	11380	10330	9100	6825	.35
18.0	61.2	14760	16020	14940	13860	12780	11700	10620	9360	7020	.36
18.5	62.9	15170	16470	15360	14250	13140	12030	10920	9620	7215	.37
19.0	64.6	15580	16910	15770	14630	13490	12350	11210	9880	7410	.38
19.5	66.3	15990	17360	16190	15020	13850	12680	11510	10140	7605	.38
20.0	68.0	16400	17800	16600	15400	14200	13000	11800	10400	7800	.39
20.5	69.7	16810	18250	17020	15790	14560	13330	12100	10660	7995	.40
21.0	71.4	17220	18690	17430	16170	14910	13650	12390	10920	8190	.41
21.5	73.1	17630	19140	17850	16560	15270	13980	12690	11180	8385	.42
22.0	74.8	18040	19580	18260	16940	15620	14300	12980	11440	8580	.42

I=B=R Ratings are determined from tests made in accordance with the I=B=R Testing and Rating Code for Baseboard Type of Radiation, including an allowance of 15% for heating effect permitted by the Code.

Ratings based on active length. Active length same as total length.

\*\*The Hot Water Ratings at 500 lb. Flow Rate are based on a standard water flow rate of 500 lbs. per hour (one gallon per minute) through the Base-Ray. These ratings should be used for all installations except as noted under 2000 Lb. Flow Rate.

\*Add 1/2" to length for each bushing. Add 5" to length for each valve enclosure.

\*\*\*Based on 3/4" pipe connections.

For Ratings at the following temperatures, multiply the 150° rating by the multiplier of the desired temperature.

Temperature – Multiplier

150° - 1.0

140° - .82

130° - .68

120° - .54

110° - .42



**No. 9A Base-Ray® I=B=R Ratings – Steam and Hot Water (2000 LBS/HR Flow Rate \*\*)**

Length in Lineal Feet*	Steam Rating Square Feet	Steam Rating B.T.U. Per Hr. At 215°F	HOT WATER RATINGS IN BTU PER HOUR AT 2000 LBS./HR. (FOUR G.P.M.) FLOW RATE** AT AVERAGE WATER TEMPERATURE OF								Pressure Drop in Inches of Water***
			230°F	220°F	210°F	200°F	190°F	180°F	170°F	150°F	
Per Lin. Ft.	3.40	820	940	880	810	750	690	620	550	410	
1.5	5.1	1230	1410	1320	1220	1130	1040	930	830	615	1.29
2.0	6.8	1640	1880	1760	1620	1500	1380	1240	1100	820	1.39
2.5	8.5	2050	2350	2200	2030	1880	1730	1550	1380	1025	1.50
3.0	10.2	2460	2820	2640	2430	2250	2070	1860	1650	1230	1.61
3.5	11.9	2870	3290	3080	2840	2630	2420	2170	1930	1435	1.71
4.0	13.6	3280	3760	3520	3240	3000	2760	2480	2200	1640	1.82
4.5	15.3	3690	4230	3960	3650	3380	3110	2790	2480	1845	1.93
5.0	17.0	4100	4700	4400	4050	3750	3450	3100	2750	2050	2.03
5.5	18.7	4510	5170	4840	4460	4130	3800	3410	3030	2255	2.14
6.0	20.4	4920	5640	5280	4860	4500	4140	3720	3300	2460	2.25
6.5	22.1	5330	6110	5720	5270	4880	4490	4030	3580	2665	2.35
7.0	23.8	5740	6580	6160	5670	5250	4830	4340	3850	2870	2.46
7.5	25.5	6150	7050	6600	6080	5630	5180	4650	4130	3075	2.57
8.0	27.2	6560	7520	7040	6480	6000	5520	4960	4400	3280	2.68
8.5	28.9	6970	7990	7480	6890	6380	5870	5270	4680	3485	2.78
9.0	30.6	7380	8460	7920	7290	6750	6210	5580	4950	3690	2.89
9.5	32.3	7790	8930	8360	7700	7130	6560	5890	5230	3895	3.00
10.0	34.0	8200	9400	8800	8100	7500	6900	6200	5500	4100	3.10
10.5	35.7	8610	9870	9240	8510	7880	7250	6510	5780	4305	3.21
11.0	37.4	9020	10340	9680	8910	8250	7590	6820	6050	4510	3.32
11.5	39.1	9430	10810	10120	9320	8630	7940	7130	6330	4715	3.42
12.0	40.8	9840	11280	10560	9720	9000	8280	7440	6600	4920	3.53
12.5	42.5	10250	11750	11000	10130	9380	8630	7750	6880	5125	3.64
13.0	44.2	10660	12220	11440	10530	9750	8970	8060	7150	5330	3.74
13.5	45.9	11070	12690	11880	10940	10130	9320	8370	7430	5535	3.85
14.0	47.6	11480	13160	12320	11340	10500	9660	8680	7700	5740	3.96
14.5	49.3	11890	13630	12760	11750	10880	10010	8990	7960	5945	4.06
15.0	51.0	12300	14100	13200	12150	11250	10350	9300	8250	6150	4.17
15.5	52.7	12710	14570	13640	12560	11630	10700	9610	8530	6355	4.28
16.0	54.4	13120	15040	14080	12960	12000	11040	9920	8800	6560	4.38
16.5	56.1	13530	15510	14520	13370	12380	11390	10230	9080	6765	4.49
17.0	57.8	13940	15980	14960	13770	12750	11730	10540	9350	6970	4.60
17.5	59.5	14350	16450	15400	14180	13130	12080	10850	9630	7175	4.70
18.0	61.2	14760	16920	15840	14580	13500	12420	11160	9900	7380	4.81
18.5	62.9	15170	17390	16280	14990	13880	12770	11470	10180	7585	4.92
19.0	64.6	15580	17860	16720	15390	14250	13110	11780	10450	7790	5.03
19.5	66.3	15990	18330	17160	15800	14630	13460	12090	10730	7995	5.13
20.0	68.0	16400	18800	17600	16200	15000	13800	12400	11000	8200	5.24
20.5	69.7	16810	19270	18040	16610	15380	14150	12710	11280	8405	5.35
21.0	71.4	17220	19740	18480	17010	15750	14490	13020	11550	8610	5.45
21.5	73.1	17630	20210	18920	17420	16130	14840	13330	11830	8815	5.56
22.0	74.8	18040	20680	19360	17820	16500	15180	13640	12100	9020	5.67

I=B=R Ratings are determined from tests made in accordance with the I=B=R Testing and Rating Code for Baseboard Type of Radiation, including an allowance of 15% for heating effect permitted by the Code.

Ratings based on active length. Active length same as total length.

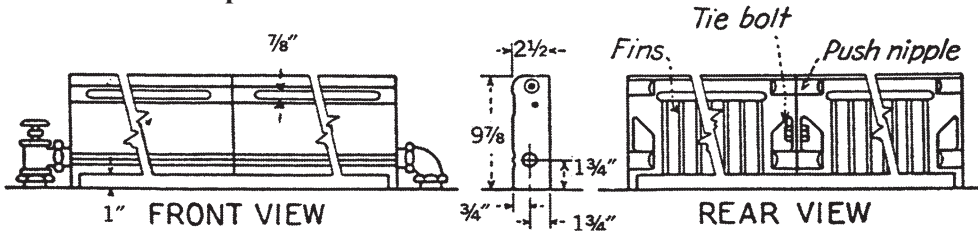
\*\*The Hot Water Ratings at 2000 lb. Flow Rate are limited to installations where the water flow rate through the Base-Ray is greater than 2000 lbs. per hour (four gallons per minute). Where the water flow rate through the Base-Ray is not known, the rating at the standard flow rate of 500 lbs. per hour must be used.

\*Add 1/2" to length for each bushing. Add 5" to length for each valve enclosure.

\*\*\*Based on 3/4" pipe connections.

9A Base-Ray Water Content - 2.5 lbs. or .3 gal. per linear ft.

## Dimensions and Specifications



**BASE-RAY TAPPINGS-** Tapped 3/4" top and bottom of end sections. A 3/4" x 1/8" vent bushing is furnished with each Base-Ray Assembly. Only one air vent location need be used.

Use of PTFE (Teflon®) tape or paste containing PTFE is not recommended as overtightening is possible, causing cracking of the Base Ray tappings.

Copper tubing is not recommended for steam applications due to high heat loss through the tubing and thermal expansion noise.

Maximum recommended length for steam applications is 10 lineal feet.

## Base-Ray® Assembly Chart

BASE-RAY Assemblies up to and including 6 lineal ft. are shipped in one piece.

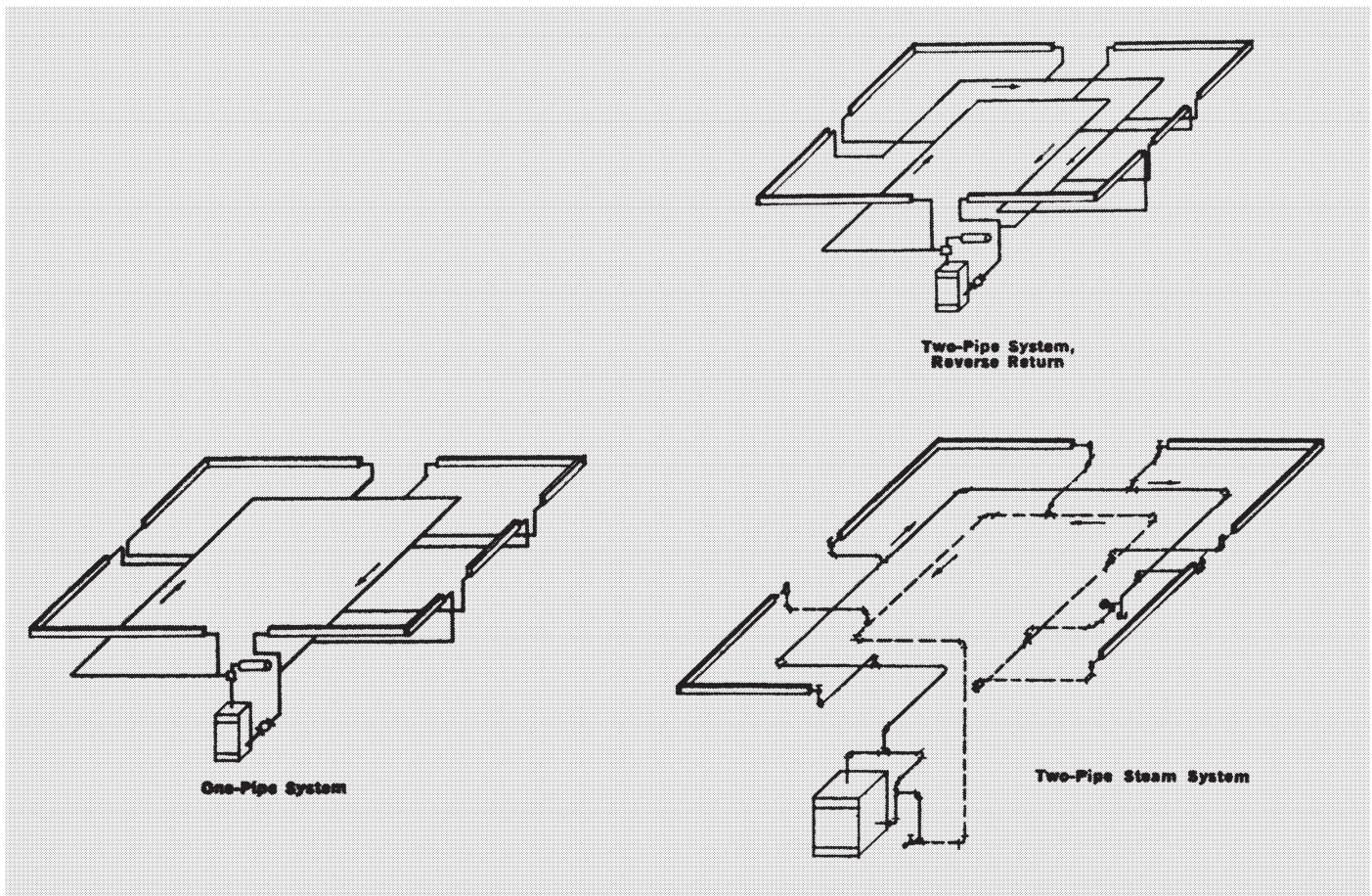
Longer Assemblies are shipped in two or more pieces or sub-assemblies, none of which exceeds 6 lineal ft.

### Sub-Assembly Chart

ASSEMBLY LENGTH	L.H.	CENTER	R.H.
6½ Ft.	5½ Ft.	---	1 Ft.
7 Ft.	6 Ft.	---	1 Ft.
7½ Ft.	5½ Ft.	---	2 Ft.
8 Ft.	6 Ft.	---	2 Ft.
8½ Ft.	5½ Ft.	---	3 Ft.
9 Ft.	6 Ft.	---	3 Ft.
9½ Ft.	5½ Ft.	---	4 Ft.
10 Ft.	6 Ft.	---	4 Ft.
10½ Ft.	5½ Ft.	---	5 Ft.
11 Ft.	6 Ft.	---	5 Ft.
11½ Ft.	5½ Ft.	---	6 Ft.
12 Ft.	6 Ft.	---	6 Ft.
12½ Ft.	5½ Ft.	6 Ft.	1 Ft.
13 Ft.	6 Ft.	6 Ft.	1 Ft.
13½ Ft.	5½ Ft.	6 Ft.	2 Ft.
14 Ft.	6 Ft.	6 Ft.	2 Ft.
14½ Ft.	5½ Ft.	6 Ft.	3 Ft.
15 Ft.	6 Ft.	6 Ft.	3 Ft.
15½ Ft.	5½ Ft.	6 Ft.	4 Ft.
16 Ft.	6 Ft.	6 Ft.	4 Ft.
16½ Ft.	5½ Ft.	6 Ft.	5 Ft.
17 Ft.	6 Ft.	6 Ft.	5 Ft.
17½ Ft.	5½ Ft.	6 Ft.	6 Ft.
18 Ft.	6 Ft.	6 Ft.	6 Ft.
18½ Ft.	5½ Ft.	2-6 Ft.	1 Ft.
19 Ft.	6 Ft.	2-6 Ft.	1 Ft.
19½ Ft.	5½ Ft.	2-6 Ft.	2 Ft.
20 Ft.	6 Ft.	2-6 Ft.	2 Ft.
20½ Ft.	5½ Ft.	2-6 Ft.	3 Ft.
21 Ft.	6 Ft.	2-6 Ft.	3 Ft.
21½ Ft.	5½ Ft.	2-6 Ft.	4 Ft.
22 Ft.	6 Ft.	2-6 Ft.	4 Ft.
22½ Ft.	5½ Ft.	2-6 Ft.	5 Ft.
23 Ft.	6 Ft.	2-6 Ft.	5 Ft.
23½ Ft.	5½ Ft.	2-6 Ft.	6 Ft.
24 Ft.	6 Ft.	2-6 Ft.	6 Ft.

### ASSEMBLIES AND SUB-ASSEMBLIES ARE MADE UP OF FOLLOWING SECTIONS

ASSEMBLIES	18" Left End	24" Left End	24" Int.	24" Right End	12" Right End	18" Panel	24" Panel
1½ Ft. Assembly	---	---	---	---	---	1	---
2 Ft. Assembly	---	---	---	---	---	---	1
2½ Ft. Assembly	1	---	---	---	1	---	---
3 Ft. Assembly	---	1	---	---	1	---	---
3½ Ft. Assembly	1	---	---	1	---	---	---
4 Ft. Assembly	---	1	---	1	---	---	---
4½ Ft. Assembly	1	---	1	---	1	---	---
5 Ft. Assembly	---	1	1	---	1	---	---
5½ Ft. Assembly	1	---	1	1	---	---	---
6 Ft. Assembly	---	1	1	1	---	---	---
<b>SUB-ASSEMBLIES</b>							
5½ Ft. L.H. Sub-Assy.	1	---	2	---	---	---	---
6 Ft. L.H. Sub-Assy.	---	1	2	---	---	---	---
6 Ft. Center Sub-Assy.	---	---	3	---	---	---	---
All R.H. Sub-Assy.	---	---	Required Number	1 or 1	---	---	---



## BASE-RAY® HYDRONICS

### Types of Systems

Hydronic Heating Systems are classified according to the piping arrangement and heating medium employed. BASE-RAY is very versatile in that it may be used in almost all types of systems as noted below:

1. Series Loop Forced Circulation Hot Water
2. One-Pipe Forced Circulation Hot Water
3. Two-Pipe Reverse Return Gravity or Forced Circulation Hot Water
4. Two-Pipe Steam or Vapor.

It is not recommended that BASE-RAY be used in a One-Pipe Steam System.

### System Description

1. **Series Loop** is a forced circulation hot water heating system with the BASE-RAY Assemblies connected so that all the water flowing through a circuit passes through each series-connected Assembly in the circuit. Thus, the Assemblies serve as portions of the main.
2. **One-Pipe** is a forced circulation hot water heating system utilizing one continuous main from boiler supply to boiler return. BASE-RAY Assemblies are connected to this pipe or main by two smaller pipes known as branches. When connecting these branches to the main, one of the standard

tees is replaced by a special tee frequently called a one-pipe fitting. These one-pipe fittings cause a portion of the water flowing through the main to pass through the BASE-RAY Assemblies and back to the main again.

3. **Two-Pipe Reverse Return** is a gravity or forced circulation hot water heating system utilizing one main to carry heated water from the boiler to the BASE-RAY Assemblies and a second main to carry the cooled water from the Assemblies back to the boiler. The Assemblies are connected to the return main in the reverse order from that in which they are connected to the supply main. Very few designers use this type of system for residential applications, since there is no difference between the heating qualities of this system and the other two hot water systems.
4. **Two-Pipe Steam or Vapor Systems** are steam systems in which each BASE-RAY Assembly is provided with two piping connections, and where steam and condensate flow in separate mains and branches. The Vapor system differs from the low pressure system only in the type of air valve used.

## SERIES LOOP SYSTEMS

### Installation Data

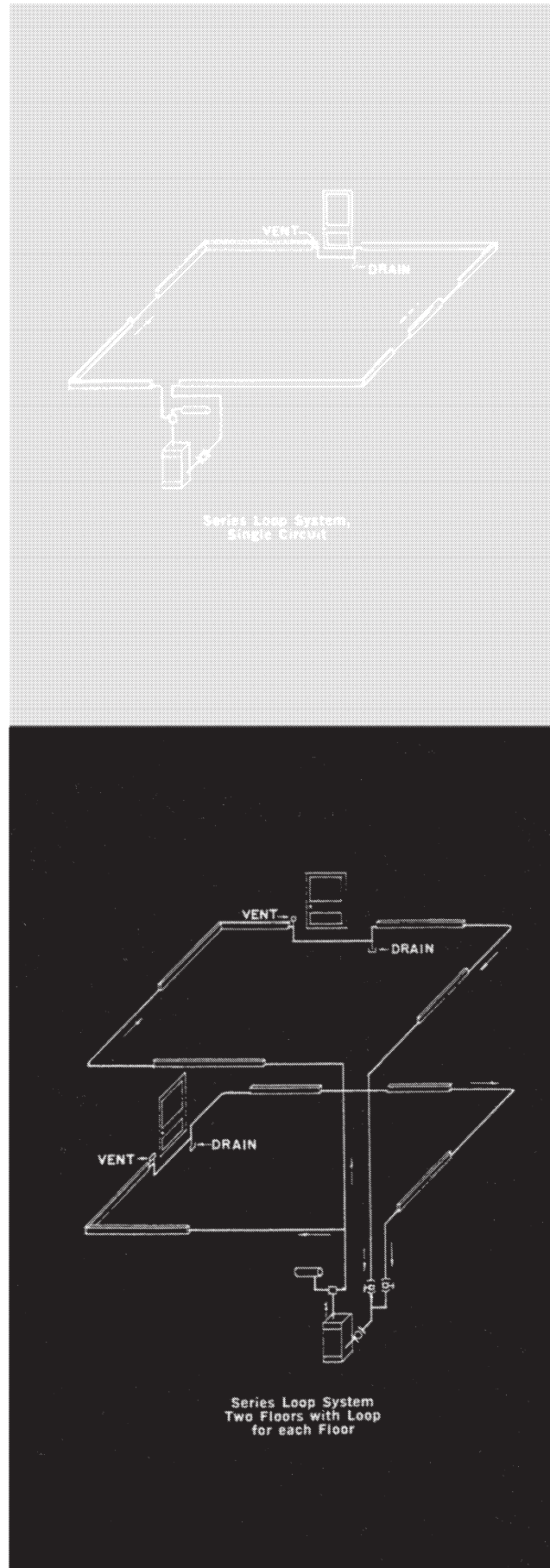
This type of installation, in which the BASE-RAY® Assemblies serve as part of the main, is the most economical way BASE-RAY can be installed. Substantial savings in labor and material are realized in that one-pipe fittings, shut-off valves, balancing cocks and additional piping are eliminated. Quality is not sacrificed as tests have proven the ability of a Series Loop System to produce comfort conditions equal to those produced by other hydronic heating systems. Series Loop Systems are ideal for homes without basements, especially those built on concrete slabs, as it eliminates the necessity for running the mains in the attic or in the concrete slab. With proper design, the Series Loop System can be used to advantage in apartment construction.

As indicated in the adjacent piping diagrams, the supply runs from the boiler to the first BASE-RAY Assembly in the circuit and then from Assembly to Assembly, dropping below the floor only when necessary to avoid obstructions such as doors, fireplaces, etc. BASE-RAY Baseboard Extensions are used to conceal the piping run above the floor.

It is sound practice to run a loop around an ordinary 5 or 6 room house. In the case of very small two-story homes, the loop may take in both first floor and second floor rooms. Larger ranch style, two-story and split level homes may use two separate loops running from the same supply line and coming back into the common return line. An example of this is shown (lower right) where the rooms on each floor are on a separate loop. In some two-story homes it might be desirable to put part of each floor on one loop and the other portions of each floor on a second loop. Do not include three stories on one loop. In multiple loop systems, a valve should be placed at the return end of each loop for balancing.

**EXPANSION** – BASE-RAY Assemblies and connecting piping will vary in length with water temperature changes in the system. To prevent distortion or noise as this expansion takes place, adequate measures must be provided in the system design and by the installer. Proper location of breaks in a run when the piping must drop through the floor to clear obstructions such as doors and fireplaces, expansion fittings, use of flexible tubing at the end of a run, offsetting the vertical risers in adequate size holes (1¼" holes for ¾" copper tubing, 1¼" x 1½" elongated holes for ¾" steel pipe) – all provide for expansion and make for a quality installation. In systems where high boiler water temperature must be maintained for domestic hot water, length of BASE-RAY Assemblies between two inside adjacent corners (when BASE-RAY is on three walls) should not exceed 25-feet, unless there is an expansion break between or swing joint provided at end. See SPECIAL APPLICATIONS, page 14. It is also desirable on these types of systems to provide a by-pass and mixing valve between boiler supply and return so that in mild weather, temperature changes in the system will be gradual instead of rapid.

**BALANCING SYSTEM** – System should be balanced on days when average winter temperatures prevail outdoors.



**To Design Series-Loop Base-Ray® Installation –**

1. Calculate the Heat Loss of each room using the procedure outlined in the I=B=R Heat Loss Calculation Guide No. H-21 or the ASHRAE Guide.
2. Using 210°F as design water temperature and 500 lbs/hr. as flow rate, select length of BASE-RAY Assembly for each room to produce desired output. (Design water temperature other than 210°F may be used but should not exceed 230°F.) If system designed on 20°F drop, this 210°F average water temperature means roughly, that under maximum load conditions, the water leaves the boiler at 220°F and returns at 200°F and returns at 200°F. Since maximum load conditions occur only at rare intervals, the system usually operates at considerably lower water temperatures.
3. Locate BASE-RAY Assemblies on Floor Plan drawn to scale.
4. Layout Piping on Floor Plan as illustrated. Since the temperature of the water decreases progressively from the first Heating Unit to the Last Heating Unit on a circuit, the system should be laid out, if possible, so that the Heating Units with the hotter water are in areas such as the living room, bath and dining room. Heating Units in bedrooms, kitchen and similar areas should be located on the end of the loop.
5. Measure length of Circuit (horizontal and vertical) from boiler supply to boiler return (include BASE-RAY lengths). In Series Loop Systems, on rare instances a BASE-RAY Assembly, Radiant Radiator or Slenderized Radiator is connected to the main with branches. Since a one-pipe fitting is used, add 12 additional feet to the measured length to obtain total length of Circuit.
6. Knowing the load-length of the loop from Steps 2 and 5 above, Table A will indicate whether or not a standard ¾" or 1" circulator is adequate.

If, for a given output, the total length of the loop exceeds the values shown in Table A, the loop may be split into two circuits – see Illustration. Check load-length of each circuit.

Determine from Table B if 1" trunk is adequate.

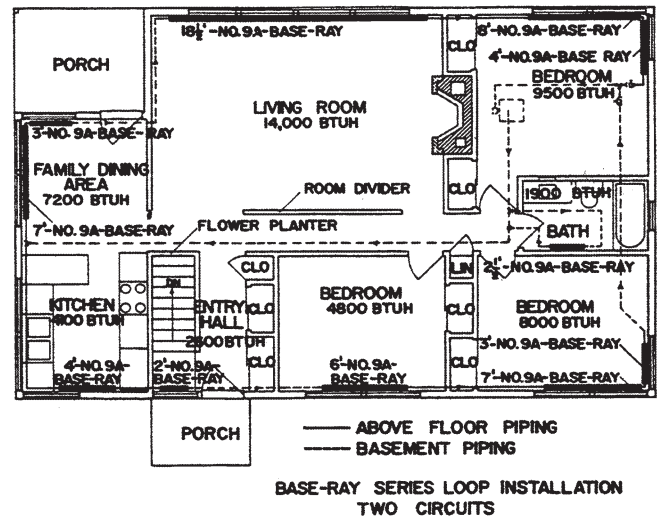
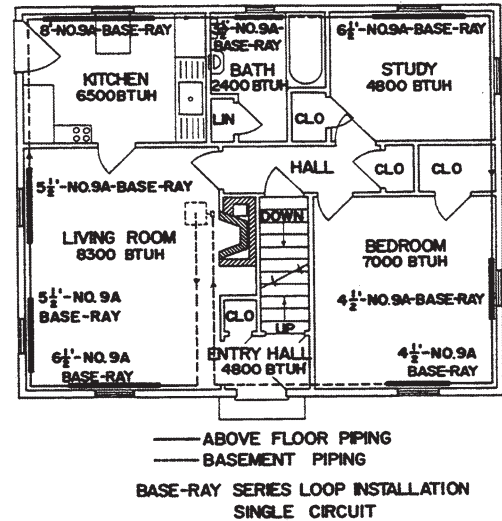


TABLE A		TABLE B	
Btu/Hr. Output of BASE-RAY Assemblies Each Loop	Total Length of Loop Ft.	Btu/Hr. Output of BASE-RAY Assemblies All Loops	Length of Longest Loop - Ft.
40,000	100	50,000	240
35,000	135	55,000	210
30,000	175	60,000	165
25,000	260	65,000	140
		70,000	120

NOTE: Table based on 20°F Drop through Circuit - ¾" piping

NOTE: Table based on head developed by Standard ¾" or 1" circulator - 20°F Drop through system.

For Piping Arrangements and Design conditions other than those given above, follow procedure outlined in I=B=R Installation Guide No. 200.

## Installation Details

A BASE-RAY® heating system is extremely easy to install – no other heating system requires less labor. The same installation practices that are used in an ordinary radiator system are followed. Use conventional methods in selecting boiler and pipe sizes, including mains, risers and branches. Supply and return connections to BASE-RAY are made in the same way as with conventional radiators.

I=B=R Installation Guide No. 200 for Hydronic Heating Systems shows installation details for both the conventional piping system and the Series Loop System.

## LOCATION OF BASE-RAY

BASE-RAY should be placed along exposed walls in place of the regular wood baseboard. If the outside walls do not provide sufficient space, place additional assemblies on inside wall.

## RECESSED

BASE-RAY may be recessed the depth of the lath and plaster, and will extend into the room approximately one and a quarter inches.

## EXPANSION

BASE-RAY will expand about 1/8" in 10 lineal feet with a temperature rise of 180°F. To provide for this, holes cut through the floors should be larger than the pipe, and swing connections should be located in branches between the Main and Risers.

## VENTING

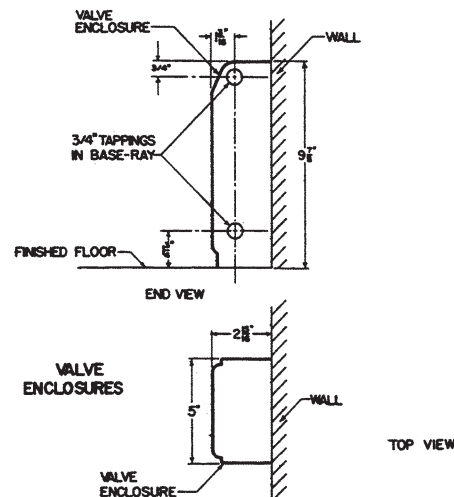
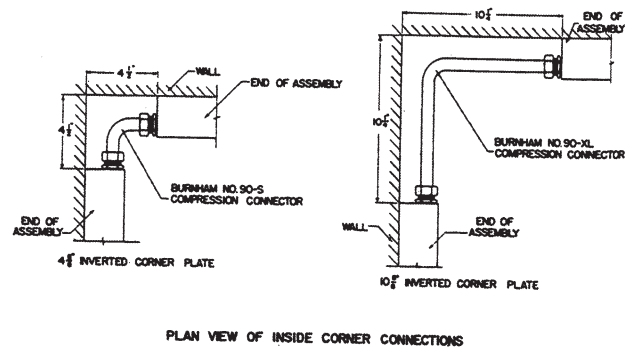
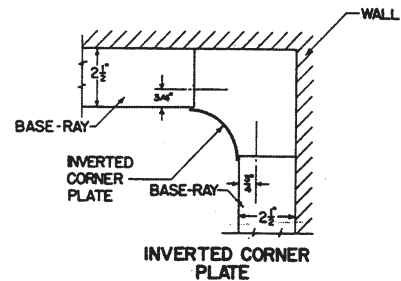
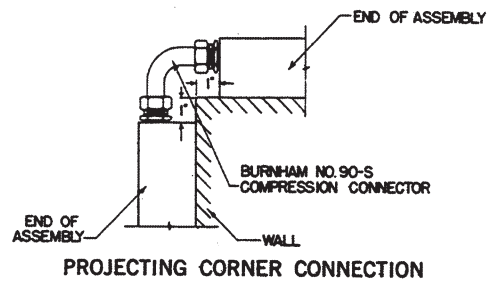
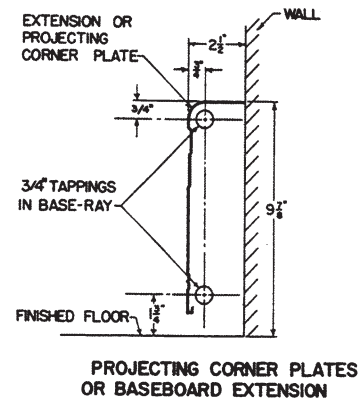
When two or more BASE-RAY assemblies are connected in series on a hot water job it is necessary to vent each assembly, unless the assemblies are connected at the top tapping. When connected in series on a two-pipe steam job, the assemblies should be connected at the bottom, and only one steam air vent need be used.

## MAXIMUM DIMENSIONS OF FITTINGS

Inasmuch as the BASEBOARD EXTENSION PANELS and PROJECTING CORNER PLATES are installed flush with the face of BASE-RAY, there are a few types of fittings that cannot be used in back of these parts because of the space limitations. As shown in the adjacent diagram, the diameter of the fittings cannot exceed 1½" – radiator union elbows and regular pipe unions usually measure more, ¾" copper sweat or screw fittings usually measure less. When iron pipe and fittings are used, straight connections may be made with ¾" right and left coupling and corner connections with ¾" street elbow. Because of these space limitations, Burnham has available a No. 90-S Compression Connector for use with the Projecting Corner Plate (see illustration).

Because of the radius on the face of INVERTED CORNER PLATE, fittings having a diameter greater than 1½" may be used (see illustration). For easy and quick connections at inside corners, however, we recommend the Burnham No. 90-S Compression Connector for use with the 4-5/8" Inverted Corner Plate. Both are illustrated.

VALVE ENCLOSURES have been designed to accommodate almost all makes of shut-off valves and steam traps. See Illustration for Enclosure dimensions.





## INSTALLATION INSTRUCTIONS

### 1. Wall Preparation:

To prevent excessive heat loss through the walls in back of BASE-RAY®, it is recommended that the stud space behind the Assemblies be insulated to a height of at least 12" above the floor with 4" mineral wool batts (blanket or loose insulation may also be used) or other approved insulating materials. This is particularly essential if the BASE-RAY is recessed. Mark Stud locations.

### 2. Allowance for Finished Flooring to Wall-to-Wall Carpeting:

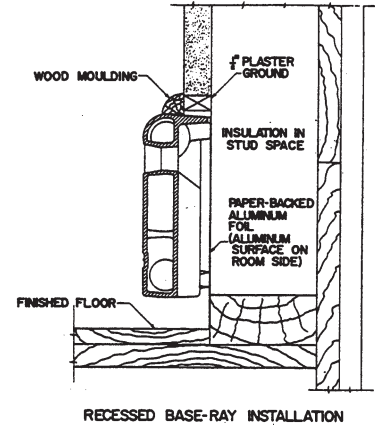
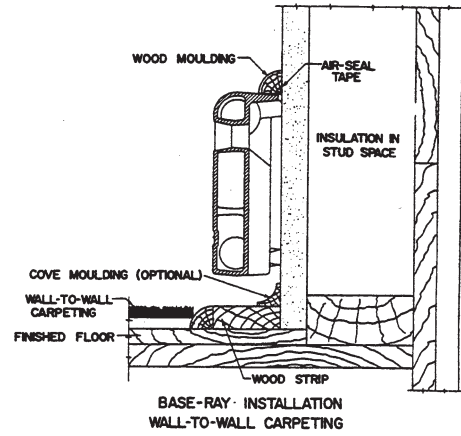
If BASE-RAY is to be installed prior to the finished floor, a wooden strip 2½" in width and equal in height to the finished floor should be installed along the base of all walls where baseboard assemblies and trim are to be placed. If allowance is not made for wall-to-wall carpeting, or for carpeting that is to be laid with edges flush to the room side surface of BASE-RAY, the air inlet of the BASE-RAY will be restricted, resulting in a reduction in output. To compensate for the wall-to-wall carpeting, baseboard assemblies and trim should be raised by laying under them a strip of wood 2½" wide and the same thickness as the carpet and pad.

### 3. Recessing of BASE-RAY Assemblies and Trim.

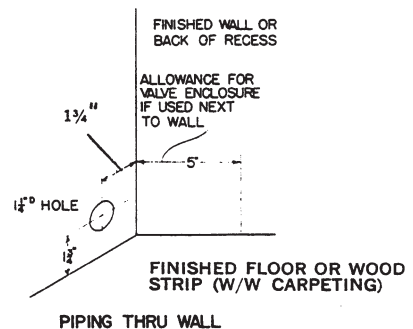
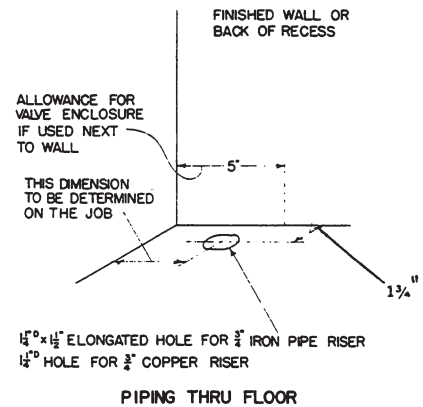
(If BASE-RAY to be installed free-standing, proceed to Step 4.)

BASE-RAY and Trim may be partially recessed or installed free standing against the finished wall surface. Although procedure for preparing recess may vary slightly with type of finished wall, in general, steps outlined below for lath and plaster construction may be followed:

- a. Nail ½" plaster ground to studs with the bottom of the plaster ground located 10" above finished floor.
- \* Additional height must be allowed if recess prepared before finished floor is laid or if wall-to-wall carpeting is to be installed – see Step 2 of Installation Instructions.
- b. Line back of recess with paper-backed aluminum foil. This can be accomplished quickly and neatly by stapling foil to studs with staple gun. Foil surface should be on room side.



### 4. Locate Holes for Piping (see Illustrations):



## 5. Assembling BASE-RAY®

BASE-RAY is shipped assembled in lengths up to six (6) lineal feet – longer assemblies are shipped in two or more sub-assemblies for assembly on the job (see BASE-RAY Assembly chart, page 4). One man can join two sub-assemblies together in a matter of minutes providing he has a BASE-RAY Assembly Clamp (available at a nominal charge) and follows the recommended procedure.

In assembling BASE-RAY sub-assemblies on the job, the sections should be lined up, face down, on the floor or other flat surface near the wall on which they are to be installed. Ends of section, nipple ports and nipples should be thoroughly cleaned with kerosene or gasoline and wiped dry with a clean cloth.

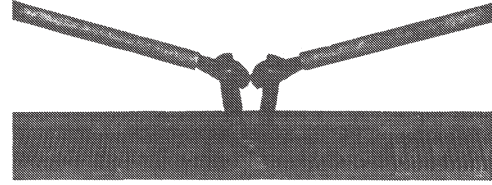
Place a thin coating of nipple lubricant on nipples and insert into the nipple ports of one assembly without cocking. Engage nipples in nipple ports of second assembly and push sections together by hand as far as possible keeping ends of sections parallel.

In order to secure necessary leverage with BASE-RAY Clamp, cut two pieces of 1/4" steel pipe 15" long and place them on the two cam handles.

Insert BASE-RAY Clamp nose in the recesses in the BASE-RAY castings, **being certain that the nose of the clamp is resting on the bottom of the recess – THIS IS IMPORTANT.** If the clamp nose will not reach the bottom of the recess, exert **light pressure** downward on the cam handles until the two castings are **PARTIALLY** drawn together. Release the pressure on the handles and the clamp nose will then drop to the bottom of the recess.

Press down on both cam handles simultaneously until castings are drawn together. **Be sure clamp is not tilted, since this may break casting.** If nipples do not draw up evenly during final tightening, strike end of assembly with wood block and hammer or mallet to bring the sections back in line. Do not strike BASE-RAY sections with metal hammer.

Remove the clamp, place the tie bolts in the bolt slots and tighten securely.



Sections being drawn together - ready for tie-bolt

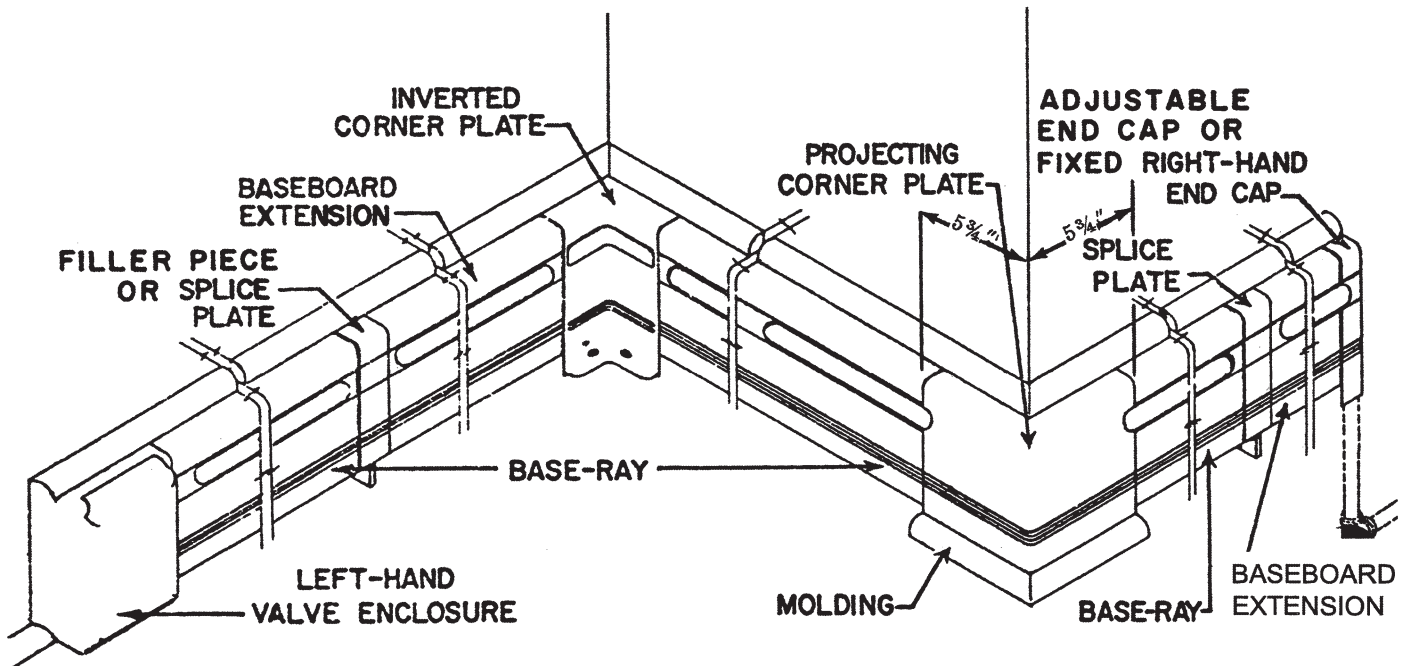
## 6. Installation of BASE-RAY® Assemblies

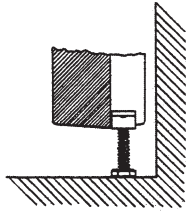
Install all fittings in end of sections and all necessary vents while assemblies are still laying flat on floor.

Install bottom center supports prior to raising assemblies to upright position. Refer to table for number of supports required. They should be spaced evenly.

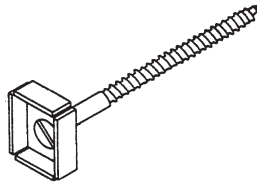
Length Assembly	Number of Top and Bottom Center Supports Required
1½ to 14½ Lineal Feet	1
15 to 21½ Lineal Feet	2
22 to 28½ Lineal Feet	3

Install the spring clip Bottom Center support by pushing it all the way up against the bottom of two fins and next to the waterway of the section as illustrated below. Run the 1/4" cap screw into the clip until head is not more than 3/4" from the clip.

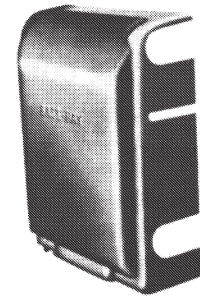




Spring Clip Bottom Center Support



TOP CENTER SUPPORT



Stand Assemblies upright, place in position and fasten to the walls with Top Center Supports using the number shown in the table above. Insert Top Center Supports in Air Outlet opening of Sections opposite studs (stud locations determined in step 1). Use wood screw furnished with Top Center Support and screw into stud until tight, the longer dimension of the top center support is in a vertical position when installed. Back off fraction of a turn to permit movement caused by expansion and contractions of sections. Adjust Bottom Center Supports by turning Cap Screws down until they begin to contact floor. Do not extend the Cap Screws any further.

Connect assemblies to piping. Complete remainder of piping to boiler, fill system with water and check for leaks.

CARE MUST BE EXERCISED TO SEE THAT 30 PSIG GAUGE PRESSURE IS NOT EXCEEDED.

DO NOT PRESSURE TEST WITH AIR.

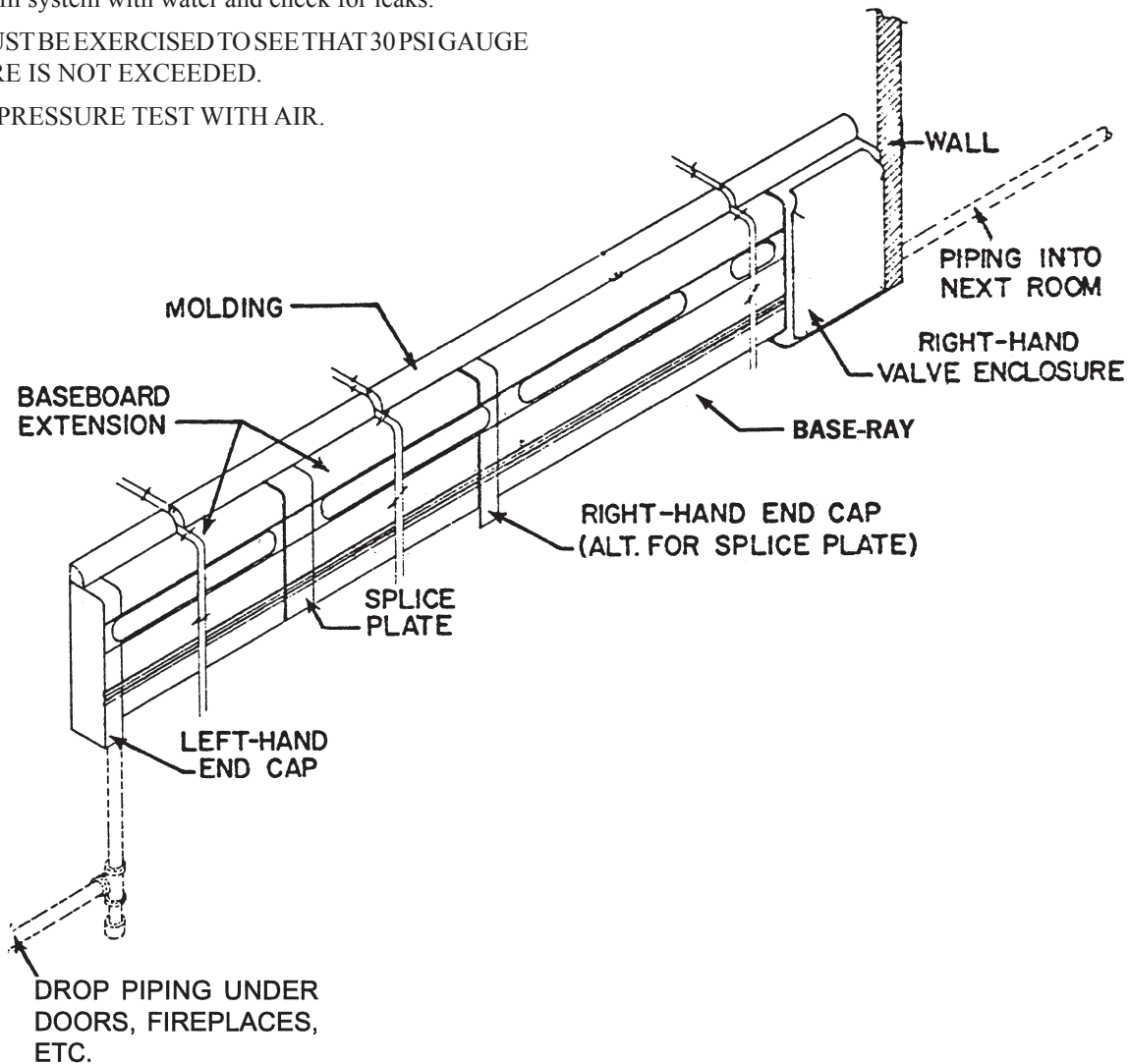
**7. Installation of Valve enclosures** (furnished in right-hand and left-hand patterns).

Remove knockout in end of Valve Enclosure if piping to run through Valve Enclosure.

Bend tab on Valve Enclosure so that hole is on inside of Valve Enclosure facing wall.

Place Valve Enclosure next to BASE-RAY® and fasten to BASE-RAY with 1/4" thumb screw furnished.

Insert screw furnished through tab on Valve Enclosure and fasten to wall. Set Valve Enclosure Cover in place.



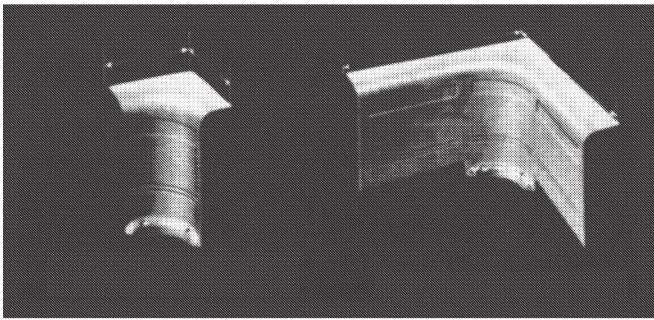
## 8. Installation of Corner Plates

**INVERTED CORNER PLATES**—for inside corners—furnished in two types, 4-5/8" standard plate is used when Assemblies on adjoining walls extend to within 4-3/8" of the corner. If this distance is greater than 4-3/8" but less than 10-3/8", the 10-5/8" plate is used. Extended Plate may be cut to desired length with hacksaw.

Set Inverted Corner Plate in place overlapping the end of the adjoining BASE-RAY® Assemblies. Secure to floor with wood screws furnished.

If installation is on tile with wood sub-flooring, drill 1/2" holes in tile in line with holes in Corner Plate. Holes should not penetrate sub-flooring. Substitute screws of same size as furnished but longer and secure Corner Plate to sub-flooring.

If installation is on masonry floor, drill 1/2" holes approximately 1" deep in floor in line with holes in Corner Plate. Drive slightly oversized wood plugs into holes and secure Corner Plate to plugs with wood screws furnished.



**PROJECTING CORNER PLATE** – for concealing pipe and fittings at outside corners. See section on **MAXIMUM DIMENSION OF FITTINGS**, page 8. Assemblies on adjoining walls must extend to within 3" of corner.

Set Projecting Corner Plate in place overlapping the ends of the adjoining BASE-RAY Assemblies. Secure with moulding (not furnished) at top and bottom.

## 9. Installation of Baseboard Extension, Splice Plates, End Caps and Filler Pieces.

**BASEBOARD EXTENSION** – Extension panels are furnished in six foot lengths but may be cut to desired lengths with hacksaw. Extensions are supported by hangers which are attached to studs (stud locations determined in Step 1) with two No. 10 x 1-1/2" wood screws.

Screw hangers to studs so that there is a hanger located at the extreme ends of the Baseboard Extension and at two foot intervals along its length. If construction members are not suitably located, use Moly Screw anchors to secure Hangers to wall. Bottom of Hangers should rest on finished floor unless BASE-RAY has been raised for wall-to-wall carpeting (see page 9). If such is the case, Hangers must be raised an equal amount.

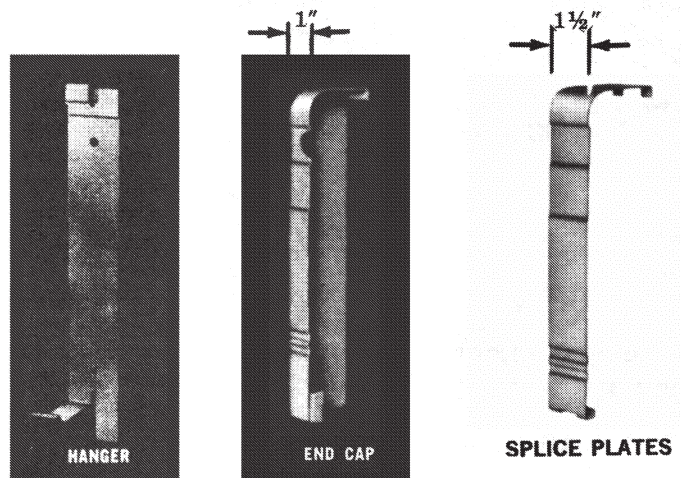
Install **END CAPS** on Extension (see succeeding paragraph), insert lip on top rear of Extension into slot at top of Hangers and snap channel on bottom of Extension under spacer arm on lower part of Hanger.

**SPLICE PLATES** – used to make neat covering for joint where two Extension Panels butt together or where Extension Panel terminates at BASE-RAY.

Plate hooks on bottom of Splice Plate over lip on bottom of Extension Panel and push top of Splice Plate toward wall until hooks on top of the Splice Plate snap into position behind the Extension or the BASE-RAY. When the Splice Plate is used to join an Extension Panel to BASE-RAY, bottom hook which overlaps BASE-RAY must be cut off.

**END CAPS** – available in both left-hand and right-hand patterns for finishing off ends of Baseboard Extensions that terminate at doorways or at Valve Enclosures. They can be used where Extensions butt against BASE-RAY in preference to Splice Plate.

Remove Knockout in end of End Cap if piping is to run in this direction. Slide over end of Extension Panel.

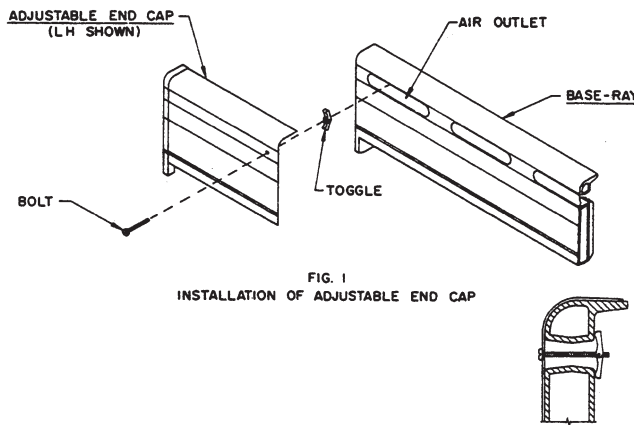


## ADJUSTABLE END CAPS & FILLER PIECES

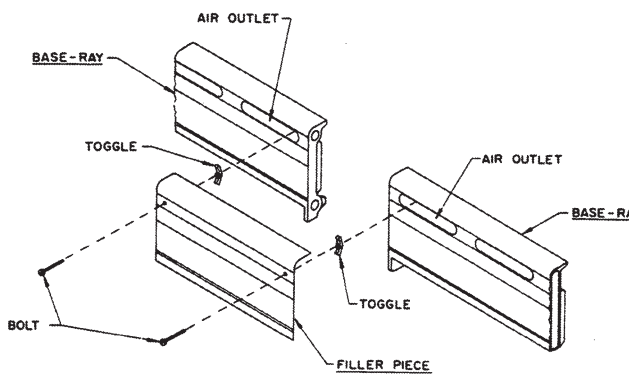
– **Adjustable End Caps** are available in both left-hand and right-hand patterns and are used in the same locations as the standard end caps except the 9” length of the adjustable end caps makes it possible to fill in spaces up to 7-1/2”. A knockout is also available in the ends for piping.

Filler pieces are used where a 9” space or less exists between two sections of baseboard or between a section of baseboard and baseboard extension.

To install adjustable end cap or filler piece accessory, insert bolt thru hole in accessory and engage toggle as shown below. Place accessory against BASE-RAY® at same time pushing toggle thru air outlet of BASE-RAY. With accessory in final location, tighten bolt until accessory is secure. Use finger to keep toggle in vertical position, as shown below.



## PROPER LOCATION OF TOGGLE WHEN SECURING ACCESSORY TO BASE-RAY



## INSTALLATION OF BASE-RAY ADJUSTABLE END CAP & FILLER PIECE

## 10. Completing Installation – Important

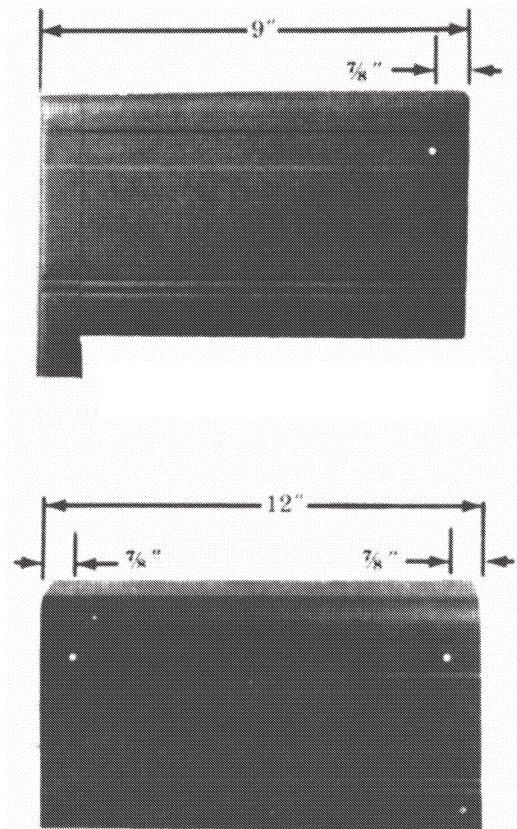
**AIR-SEAL** – It is necessary to prevent leakage of air between the walls and BASE-RAY®, since this will cause dirt streaks on the wall above the heating unit. This can be avoided by installing an “Air-Seal”.

We recommended using 1” wide tape for this purpose, preferably with a thermal setting adhesive, available from Burnham at nominal charge.

With the adhesive side down, press one-half of tape against the top of BASE-RAY and the other half against the wall as illustrated on page 9.

**WOOD MOULDING** – For finished installation, 3/4” quarter round or other wood moulding should be nailed to wall on top of BASE-RAY (over “Air-Seal”) and Trim and down side of Valve Enclosures. When Projecting Corner Plates are used, install wood moulding at base of Corner Plate to hold in place. An illustration showing the application of the moulding can be found on page 9.

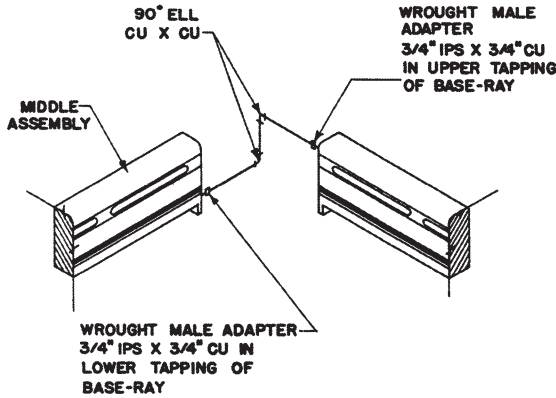
**PAINTING** – BASE-RAY and Trim are primed with a latex (water based) paint and must be top coated with a high grade oil or solvent based enamel to prevent rusting of the metals **immediately after installation. Primer coated products should not be allowed to sweat as a result of high room humidity or cold water in system.** The use of flat wall paint is not recommended since it may chip or crack when applied to surfaces that are heated. Consult reputable paint dealer.



**SPECIAL APPLICATIONS**

**BASE-RAY® INSTALLED ON THREE WALLS OF ROOM**

– When BASE-RAY is installed on three walls, expansion noises are sometimes created by the middle assembly when rigid piping is used to connect all three assemblies together. Flexibility can be gained by connecting two of the adjoining assemblies with a flexible connector or swing joint such as illustrated.

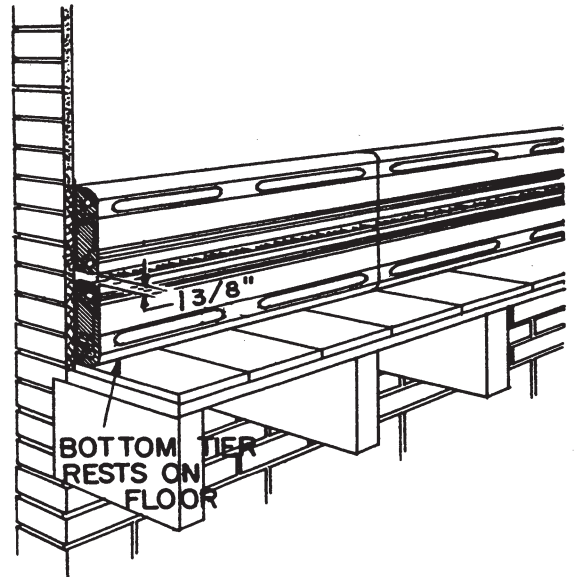


**INSTALLATION WITH BURNHAM RADIANT OR SLENDERIZED RADIATORS**

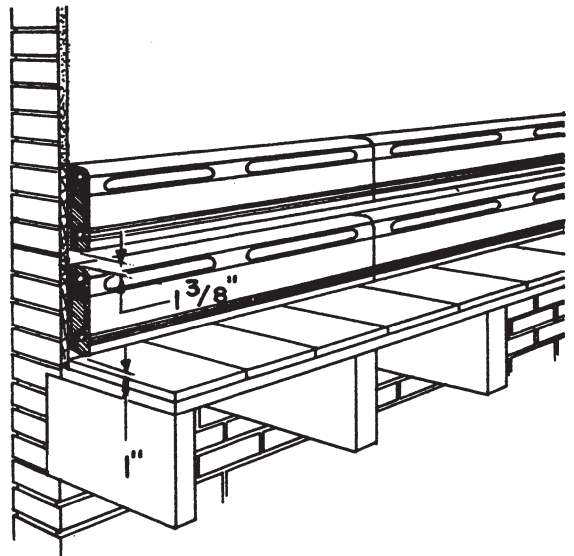
– Since a BASE-RAY installation is made in much the same manner as any other radiator system, BURNHAM RADIANT OR SLENDERIZED RADIATORS may be used in a BASE-RAY Radiant Baseboard System.

**TWO-TIER INSTALLATION** – Where wall space is limited, BASE-RAY may be installed in tiers. Both sections may be upright or lower section inverted as illustrated. Legs on end sections are cut off to enhance appearance.

**RATING CORRECTION FACTOR** – If BASE-RAY is installed in tiers in accordance with the illustrations, each tier will have a rating of .91 times the rating shown in the Tables on pages 2 and 3.

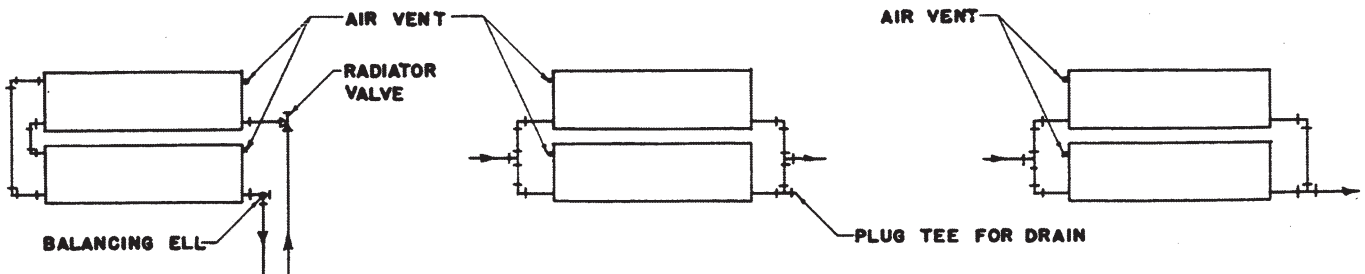


**Top Sections Upright,  
Bottom Sections Inverted.**



**Both Sections Upright**

**POSSIBLE PIPING ARRANGEMENTS  
TWO-TIER BASE-RAY FORCED CIRCULATION HOT WATER SYSTEMS**



**SUPPLY & RETURN AT  
SAME END OF ASSEMBLY**

**SUPPLY & RETURN AT OPPOSITE ENDS OF ASSEMBLY**

All Base-Ray® repair parts may be obtained through your local Burnham Wholesale Distributor. Should you require assistance in locating a Burnham Distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.

# Limited Warranty

## DUO-RAD<sup>®</sup>, DUO-RAD<sup>®</sup> II AND CAST IRON RADIATION

**Limited Warranty** – Except as provided below with respect to products or parts not manufactured by U.S. Boiler Co., Inc. U.S. Boiler Co., Inc. warrants to the original owner at the original installation site that products manufactured by U.S. Boiler Co., Inc. comply, at the time of manufacture, with recognized Hydronics industry regulatory agency standards and requirements then in effect and will be free from defects in materials and workmanship for a period of one year after the date of installation.

The remedy for breach of this warranty is expressly limited to the repair or replacement of any part found to be defective under conditions of normal use and does not extend to liability for incidental, special or consequential damages or losses such as loss of the use of the products, inconvenience, loss of time or labor expense involved in repairing or replacing alleged defective product. U.S. Boiler Co., Inc. shall have no responsibility for the performance of any product sold by it under conditions varying materially from those under which such product is usually tested under existing industry standards, nor for any damage to the product from abrasion, erosion, corrosion, deterioration or the like due to abnormal temperatures or the influence of foreign matter or energy, nor for the design or operation of any system of which any such product may be made a part or for the suitability of any such product for any particular application.

For products or parts not manufactured by U.S. Boiler Co., Inc., the warranty obligation of U.S. Boiler Co., Inc. shall, in all respects, conform and be limited to the warranty actually extended to U.S. Boiler Co., Inc. by its vendors.

Warranty service can be obtained by contacting the original installer of the product and providing him with a detailed description of any apparent defect. If this procedure fails to result in satisfactory warranty service, the owner should notify U.S. Boiler Co., Inc., P.O. Box 3079, Lancaster, PA 17604. Transportation to a factory or other designated facility for repairs of any products or items alleged defective shall, in all events, be the responsibility and at the cost of the owner.

Notwithstanding any of the above provision, (1) failures resulting from misuse, improper installation or lack of maintenance are not covered by this warranty, and (2) U.S. Boiler Co., Inc.'s liability under this warranty shall not exceed the selling price of the product found to be defective.

Equipment furnished by the Buyer, either mounted or unmounted, and when contracted for by the Buyer to be installed or handled is not covered by this warranty. U.S. Boiler Co., Inc. does not assume any responsibility in connection with such equipment, operation, warranty, performance, or any other liability connected thereto.

Then foregoing provisions of this WARRANTY shall be effective to the maximum extent permitted by applicable law, and, to the extent that any such provision would otherwise have an unconscionable result or would otherwise be inconsistent with applicable law, such provision shall be limited in effect to the minimum extent necessary to avoid such unconscionable result or inconsistency with applicable law.

Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose shall, to the extent permitted by applicable law, be limited in duration to a period of one year after the date of installation. To the extent permitted by applicable law, the remedies for breach of any such implied warranty shall be limited to the remedies set forth above with respect to a breach of the express limited warranty provided. With respect to the limitations on implied warranties set forth above, U.S. Boiler Co., Inc. hereby notifies each person to whom such warranty is made as follows: Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations, or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

