INSTALLATION MANUAL FOR

BASE-RAY®
CAST IRON BASEBOARD RADIATION

AHRI CERTIFIED® www.ahridirectory.org

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Heating Contractor	Installation Date
Address	Phone Number

U.S. Boiler Company

103829-01 - 9/13

Price - $2.00

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	90° - .22
140° - .82	120° - .54	100° - .32	

No. 9A Base-Ray® AHRI Ratings – Steam and Hot Water (**500** LBS/HR Flow Rate **)

Length in Lineal Feet*	Steam Rating	HOT WATER RATINGS AT 500 LBS./HR. (ONE GPM) FLOW RATE** AT AVERAGE WATER TEMPERATURE OF									Pressure Drop in Inches of Water ***
	Square Feet/hr	BTU/hr at 150°F	BTU/hr at 160°F	BTU/hr at 170°F	BTU/hr at 180°F	BTU/hr at 190°F	BTU/hr at 200°F	BTU/hr at 210°F	BTU/hr at 220°F	BTU/hr at 230°F	
Per Linear Ft.	**860**	**320**	**370**	**430**	**480**	**530**	**580**	**630**	**680**	**730**	
1.5	1290	480	555	645	720	795	870	945	1020	1095	0.10
2.0	1720	640	740	860	960	1060	1160	1260	1360	1460	0.10
2.5	2150	800	925	1075	1200	1325	1450	1575	1700	1825	0.11
3.0	2580	960	1110	1290	1440	1590	1740	1890	2040	2190	0.12
3.5	3010	1120	1295	1505	1680	1855	2030	2205	2380	2555	0.13
4.0	3440	1280	1480	1720	1920	2120	2320	2520	2720	2920	0.14
4.5	3870	1440	1665	1935	2160	2385	2610	2835	3060	3285	0.14
5.0	4300	1600	1850	2150	2400	2650	2900	3150	3400	3650	0.15
5.5	4730	1760	2035	2365	2640	2915	3190	3465	3740	4015	0.16
6.0	5160	1920	2220	2580	2880	3180	3480	3780	4080	4380	0.17
6.5	5590	2080	2405	2795	3120	3445	3770	4095	4420	4745	0.18
7.0	6020	2240	2590	3010	3360	3710	4060	4410	4760	5110	0.18
7.5	6450	2400	2775	3225	3600	3975	4350	4725	5100	5475	0.19
8.0	6880	2560	2960	3440	3840	4240	4640	5040	5440	5840	0.20
8.5	7310	2720	3145	3655	4080	4505	4930	5355	5780	6205	0.21
9.0	7740	2880	3330	3870	4320	4770	5220	5670	6120	6570	0.22
9.5	8170	3040	3515	4085	4560	5035	5510	5985	6460	6935	0.22
10.0	8600	3200	3700	4300	4800	5300	5800	6300	6800	7300	0.23
10.5	9030	3360	3885	4515	5040	5565	6090	6615	7140	7665	0.24
11.0	9460	3520	4070	4730	5280	5830	6380	6930	7480	8030	0.25
11.5	9890	3680	4255	4945	5520	6095	6670	7245	7820	8395	0.26
12.0	10320	3840	4440	5160	5760	6360	6960	7560	8160	8760	0.26
12.5	10750	4000	4625	5375	6000	6625	7250	7875	8500	9125	0.27
13.0	11180	4160	4810	5590	6240	6890	7540	8190	8840	9490	0.28
13.5	11610	4320	4995	5805	6480	7155	7830	8505	9180	9855	0.29
14.0	12040	4480	5180	6020	6720	7420	8120	8820	9520	10220	0.30
14.5	12470	4640	5365	6235	6960	7685	8410	9135	9860	10585	0.30
15.0	12900	4800	5550	6450	7200	7950	8700	9450	10200	10950	0.31
15.5	13330	4960	5735	6665	7440	8215	8990	9765	10540	11315	0.32
16.0	13760	5120	5920	6880	7680	8480	9280	10080	10880	11680	0.33
16.5	14190	5280	6105	7095	7920	8745	9570	10395	11220	12045	0.34
17.0	14620	5440	6290	7310	8160	9010	9860	10710	11560	12410	0.34
17.5	15050	5600	6475	7525	8400	9275	10150	11025	11900	12775	0.35
18.0	15480	5760	6660	7740	8640	9540	10440	11340	12240	13140	0.36
18.5	15910	5920	6845	7955	8880	9805	10730	11655	12580	13505	0.37
19.0	16340	6080	7030	8170	9120	10070	11020	11970	12920	13870	0.38
19.5	16770	6240	7215	8385	9360	10335	11310	12285	13260	14235	0.38
20.0	17200	6400	7400	8600	9600	10600	11600	12600	13600	14600	0.39
20.5	17630	6560	7585	8815	9840	10865	11890	12915	13940	14965	0.40
21.0	18060	6720	7770	9030	10080	11130	12180	13230	14280	15330	0.41
21.5	18490	6880	7955	9245	10320	11395	12470	13545	14620	15695	0.42
22.0	18920	7040	8140	9460	10560	11660	12760	13860	14960	16060	0.42

AHRI Ratings are determined from tests made in accordance with the AHRI Testing Standard for Baseboard Radiation.

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 ½" to length for each bushing. Add 5" to length for each valve enclosure.**

*****Based on ¾" pipe connections.**

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	90° - .22
140° - .82	120° - .54	100° - .32	

No. 9A Base-Ray® AHRI Ratings – Steam and Hot Water (**2000** LBS/HR Flow Rate **)

Length in Lineal Feet*	Steam Rating	HOT WATER RATINGS AT 500 LBS./HR. (ONE GPM) FLOW RATE** AT AVERAGE WATER TEMPERATURE OF									Pressure Drop in Inches of Water ***
	Square Feet/hr	BTU/hr at 150°F	BTU/hr at 160°F	BTU/hr at 170°F	BTU/hr at 180°F	BTU/hr at 190°F	BTU/hr at 200°F	BTU/hr at 210°F	BTU/hr at 220°F	BTU/hr at 230°F	
Per Lineal Ft.	**860**	**340**	**390**	**450**	**510**	**560**	**610**	**670**	**720**	**770**	
1.5	1290	510	585	675	765	840	915	1005	1080	1155	1.29
2.0	1720	680	780	900	1020	1120	1220	1340	1440	1540	1.39
2.5	2150	850	975	1125	1275	1400	1525	1675	1800	1925	1.50
3.0	2580	1020	1170	1350	1530	1680	1830	2010	2160	2310	1.61
3.5	3010	1190	1365	1575	1785	1960	2135	2345	2520	2695	1.71
4.0	3440	1360	1560	1800	2040	2240	2440	2680	2880	3080	1.82
4.5	3870	1530	1755	2025	2295	2520	2745	3015	3240	3465	1.93
5.0	4300	1700	1950	2250	2550	2800	3050	3350	3600	3850	2.03
5.5	4730	1870	2145	2475	2805	3080	3355	3685	3960	4235	2.14
6.0	5160	2040	2340	2700	3060	3360	3660	4020	4320	4620	2.25
6.5	5590	2210	2535	2925	3315	3640	3965	4355	4680	5005	2.35
7.0	6020	2380	2730	3150	3570	3920	4270	4690	5040	5390	2.46
7.5	6450	2550	2925	3375	3825	4200	4575	5025	5400	5775	2.57
8.0	6880	2720	3120	3600	4080	4480	4880	5360	5760	6160	2.68
8.5	7310	2890	3315	3825	4335	4760	5185	5695	6120	6545	2.78
9.0	7740	3060	3510	4050	4590	5040	5490	6030	6480	6930	2.89
9.5	8170	3230	3705	4275	4845	5320	5795	6365	6840	7315	3.00
10.0	8600	3400	3900	4500	5100	5600	6100	6700	7200	7700	3.10
10.5	9030	3570	4095	4725	5355	5880	6405	7035	7560	8085	3.21
11.0	9460	3740	4290	4950	5610	6160	6710	7370	7920	8470	3.32
11.5	9890	3910	4485	5175	5865	6440	7015	7705	8280	8855	3.42
12.0	10320	4080	4680	5400	6120	6720	7320	8040	8640	9240	3.53
12.5	10750	4250	4875	5625	6375	7000	7625	8375	9000	9625	3.64
13.0	11180	4420	5070	5850	6630	7280	7930	8710	9360	10010	3.74
13.5	11610	4590	5265	6075	6885	7560	8235	9045	9720	10395	3.85
14.0	12040	4760	5460	6300	7140	7840	8540	9380	10080	10780	3.96
14.5	12470	4930	5655	6525	7395	8120	8845	9715	10440	11165	4.06
15.0	12900	5100	5850	6750	7650	8400	9150	10050	10800	11550	4.17
15.5	13330	5270	6045	6975	7905	8680	9455	10385	11160	11935	4.28
16.0	13760	5440	6240	7200	8160	8960	9760	10720	11520	12320	4.38
16.5	14190	5610	6435	7425	8415	9240	10065	11055	11880	12705	4.49
17.0	14620	5780	6630	7650	8670	9520	10370	11390	12240	13090	4.60
17.5	15050	5950	6825	7875	8925	9800	10675	11725	12600	13475	4.70
18.0	15480	6120	7020	8100	9180	10080	10980	12060	12960	13860	4.81
18.5	15910	6290	7215	8325	9435	10360	11285	12395	13320	14245	4.92
19.0	16340	6460	7410	8550	9690	10640	11590	12730	13680	14630	5.03
19.5	16770	6630	7605	8775	9945	10920	11895	13065	14040	15015	5.13
20.0	17200	6800	7800	9000	10200	11200	12200	13400	14400	15400	5.24
20.5	17630	6970	7995	9225	10455	11480	12505	13735	14760	15785	5.35
21.0	18060	7140	8190	9450	10710	11760	12810	14070	15120	16170	5.45
21.5	18490	7310	8385	9675	10965	12040	13115	14405	15480	16555	5.56
22.0	18920	7480	8580	9900	11220	12320	13420	14740	15840	16940	5.67

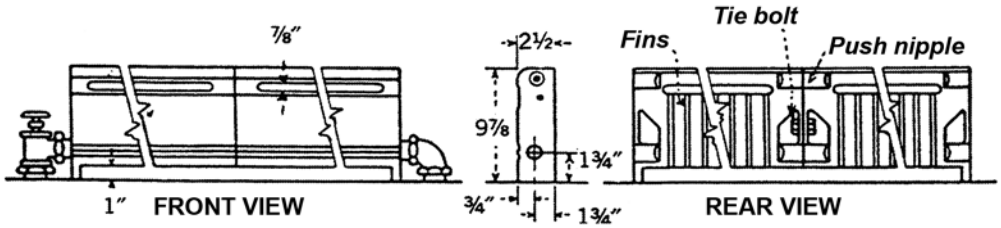
AHRI Ratings are determined from tests made in accordance with the AHRI Testing Standard for Baseboard Radiation.

Ratings based on active length. Active length same as total length.9A Base-Ray Water Content - 2.5 lbs. or .3 gal. per linear ft.

****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 know, the rating at the standard flow rate of 500 lbs. per hour must be used.**

***Add ½" to length for each bushing. Add 5" to length for each valve enclosure.**

*****Based on ¾" pipe connections.**



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

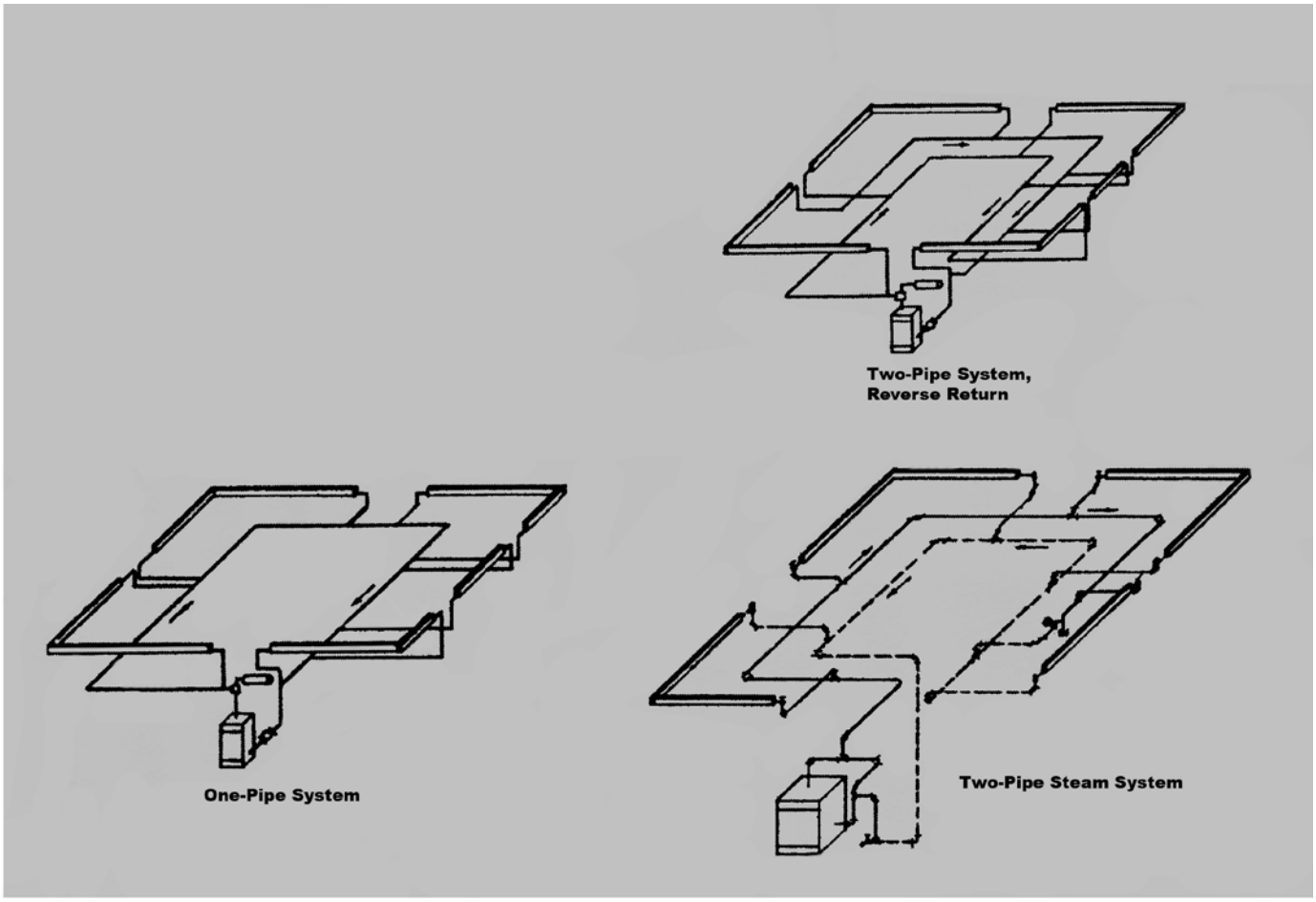
BASE-RAY Assemblies up to and including 6 lineal ft. are shipped in one piece.

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

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.	---	---	---	---	---	1	---
2 Ft.	---	---	---	---	---	---	1
2½ Ft.	1	---	---	---	1	---	---
3 Ft.	---	1	---	---	1	---	---
3½ Ft.	1	---	---	1	---	---	---
4 Ft.	---	1	---	1	---	---	---
4½ Ft.	1	---	1	---	1	---	---
5 Ft.	---	1	1	---	1	---	---
5½ Ft.	1	---	1	1	---	---	---
6 Ft.	---	1	1	1	---	---	---
Sub-Assemblies							
5½ Ft. L.H.	1	---	2	---	---	---	---
6 Ft. L.H.	---	1	2	---	---	---	---
6 Ft. Center	---	---	3	---	---	---	---
All R.H.	---	---	Req'd No.	1 or 1		---	---

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



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

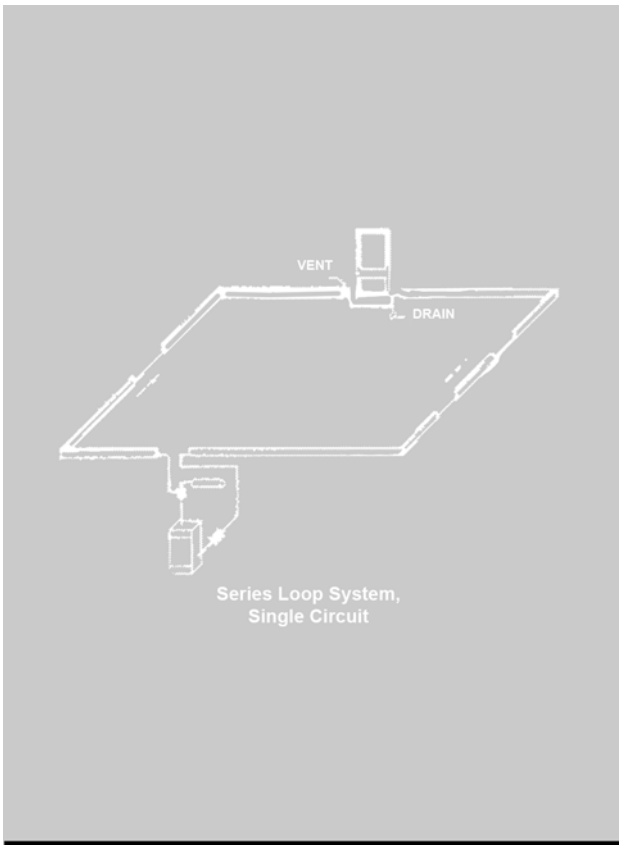
This type of installation, in which the BASE-RAY® Assemblies serve as part of the main, is the most economical way BASE-RAY can be installed. Substantial savings in labor and material are realized in that one-pipe fittings, shut-off valves, balancing cocks and additional piping are eliminated. Quality 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.

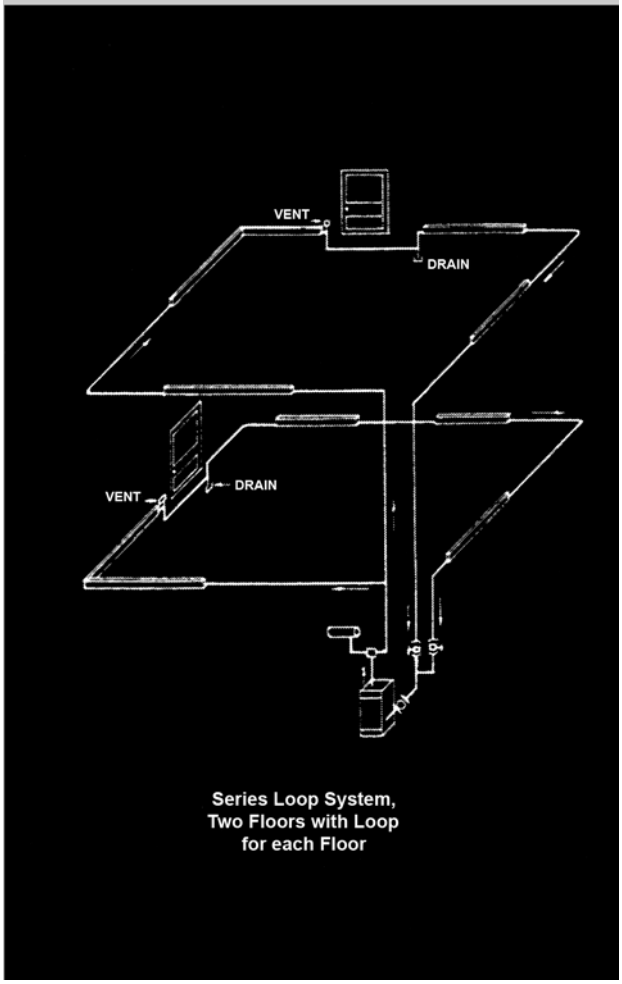
It is sound practice to run a loop around an ordinary 5 or 6 room house. In the case of very small two-story homes, the loop may take in both first floor and second floor rooms. Larger ranch style, two-story and split level homes may use two separate loops running from the same supply line and coming 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.



Series Loop System,
Single Circuit



Series Loop System,
Two Floors with Loop
for each Floor

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.

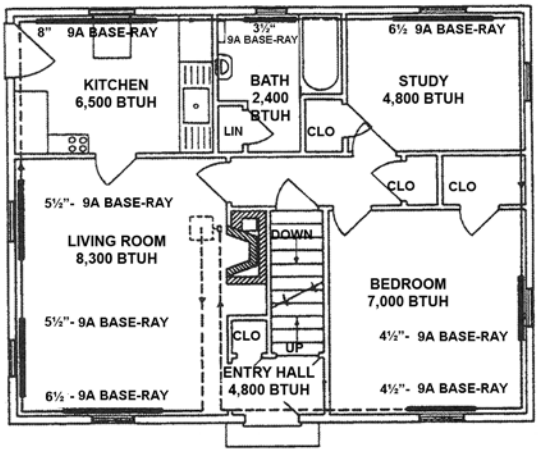
TABLE A		TABLE B	
Btu/Hr. Output of BASE-RAY Assemblies Each Loop	Total Length of Loop Ft.	Btu/Hr. Output of BASE-RAY Assemblies All Loops	Length of Longest Loop -Ft.
40,000	100	50,000	240
35,000	135	55,000	210
30,000	175	60,000	165
25,000	260	65,000	140
		70,000	120

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

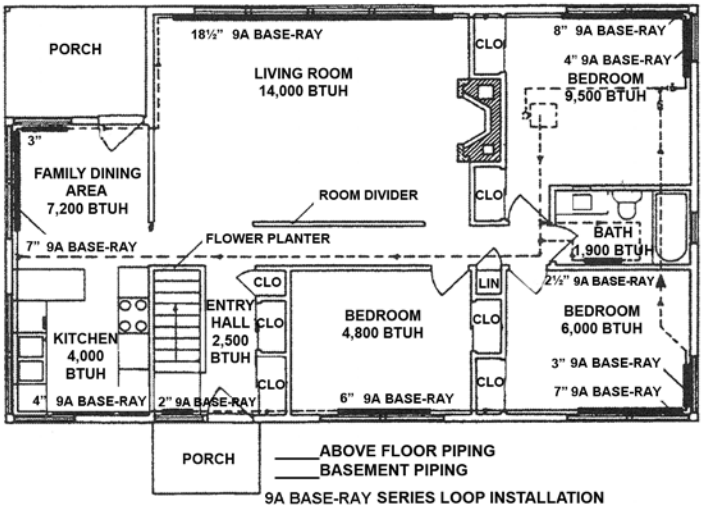
NOTE: Table based on head developed by Standard ¾" or 1" circulator - 20°F Drop through system.

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.



BASE-RAY SERIES LOOP INSTALLATION
SINGLE CIRCUITS



9A BASE-RAY SERIES LOOP INSTALLATION
TWO CIRCUITS

For Piping Arrangements and Design conditions other than those given above, follow procedure outlined in Residential Hydronic Heating Installation and Design I=B=R Guide.

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.

Residential Hydronic Heating Installation and Design I=B=R Guide 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

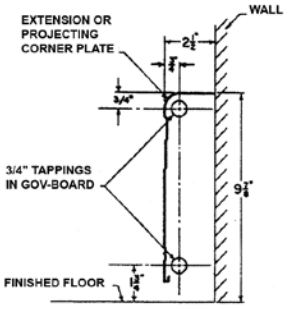
When two or more BASE-RAY assemblies are connected in series on a hot water job it is necessary to vent each assembly, unless the assemblies are connected at the top tapping. When connected in series on a two-pipe steam job, the assemblies should be connected at the bottom, and only one steam air vent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

MAXIMUM DIMENSIONS OF FITTINGS

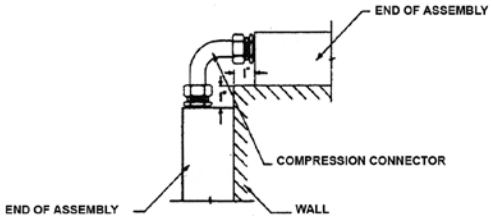
Inasmuch as the BASEBOARD EXTENSION PANELS and PROJECTING CORNER PLATES are installed flush with the face of BASE-RAY, there are a few types of fittings that cannot be used in back of these parts because of the space limitations. As shown in the adjacent diagram, the diameter of the fittings cannot exceed 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, U.S. Boiler Company 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 U.S. Boiler Company No. 90-S Compression Connector for use with the 4-5/8" Inverted Corner Plate. Both are illustrated.

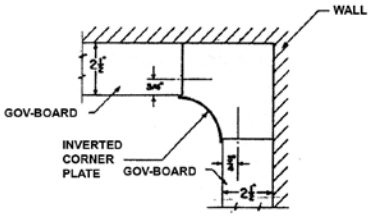
VALVE ENCLOSURES have been designed to accommodate almost all makes of shut-off valves and steam traps. See Illustration for Enclosure dimensions.



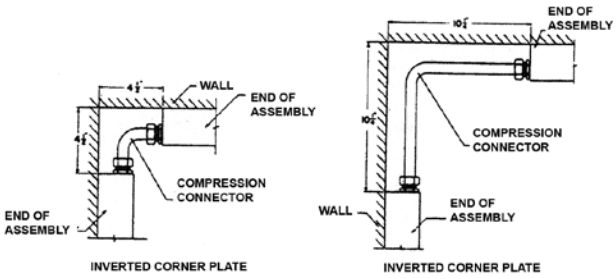
PROJECTING CORNER PLATES OR
GOV-BOARD EXTENSION



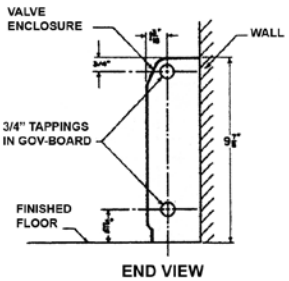
PROJECTING CORNER CONNECTION



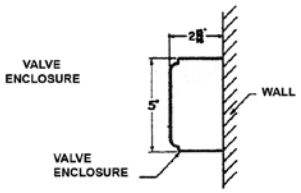
INVERTED CORNER PLATE



PLAN VIEW OF INSIDE CORNER CONNECTIONS



END VIEW



TOP VIEW

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.

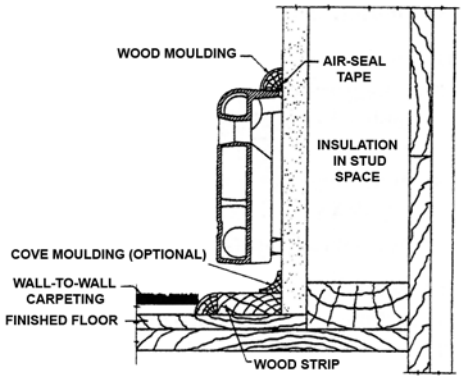
(If BASE-RAY to be installed free-standing, proceed to Step 4.)

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:

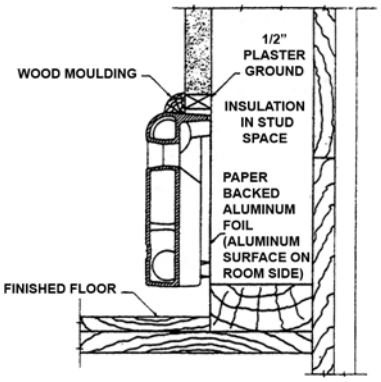
a. Nail ½" plaster ground to studs with the bottom of the plaster ground located 10" above finished floor.

* 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.

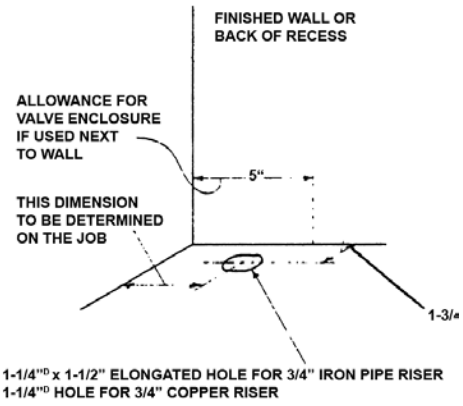


INSTALLATION
BASE-RAY WALL-TO-WALL CARPETING

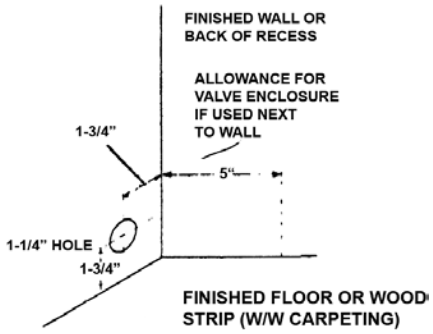


RECESSED BASE-RAY INSTALLATION

4. Locate Holes for Piping (see Illustrations):



PIPING THRU FLOOR



PIPING THRU WALL

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 tow 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.

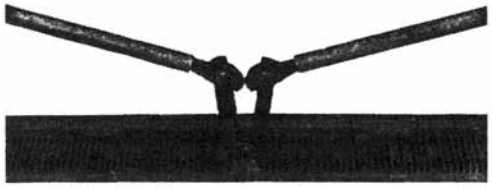
Place a thin coating of nipple lubricant on nipples and insert into the nipple ports of one assembly without cocking. Engage nipples in nipple ports of second assembly and push sections together by hand as far as possible keeping ends of sections parallel.

In order to secure necessary leverage with BASE-RAY Clamp, cut two pieces of 1¼" 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.



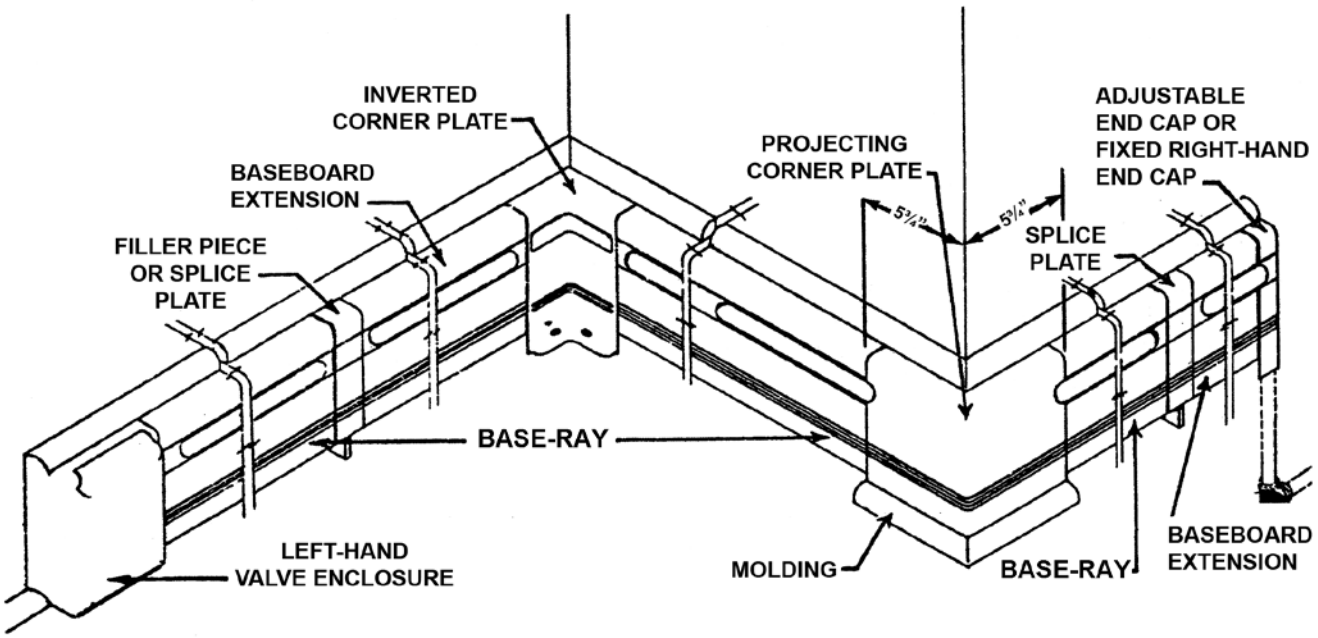
Sections being drawn together - ready for tie-bolt

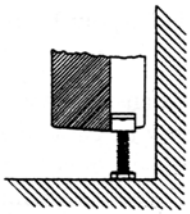
6. Installation of BASE-RAY® Assemblies

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.

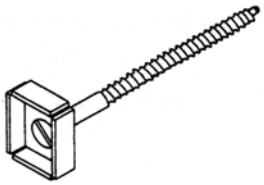
Length Assembly	Number of Top and Bottom Center Supports Required
1½ to 14½ Lineal Feet	1
15 to 21½ Lineal Feet	2
22 to 28½ Lineal Feet	3

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 ¼" cap screw into the clip until head is not more than ¾" 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 PSI GAUGE PRESSURE IS NOT EXCEEDED.

DO NOT PRESSURE TEST WITH AIR.

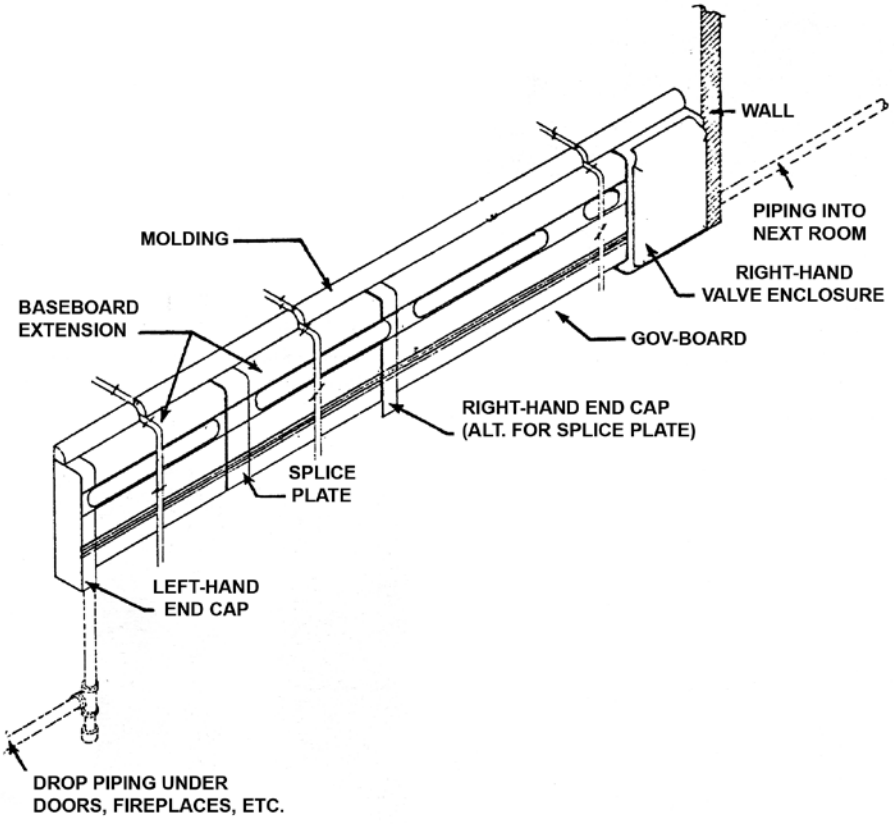
7. **Installation of Valve enclosures** (furnished in right-hand and left-hand patterns).

   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 ¼" thumb screw furnished.

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



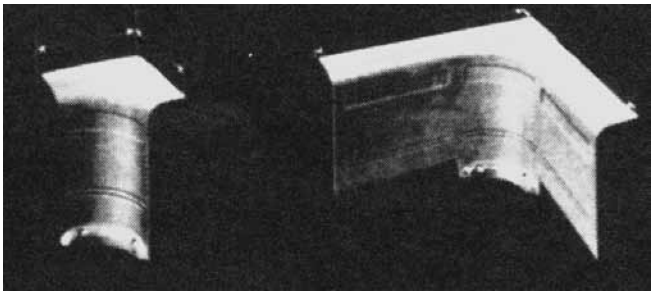
8. Installation of Corner Plates

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.

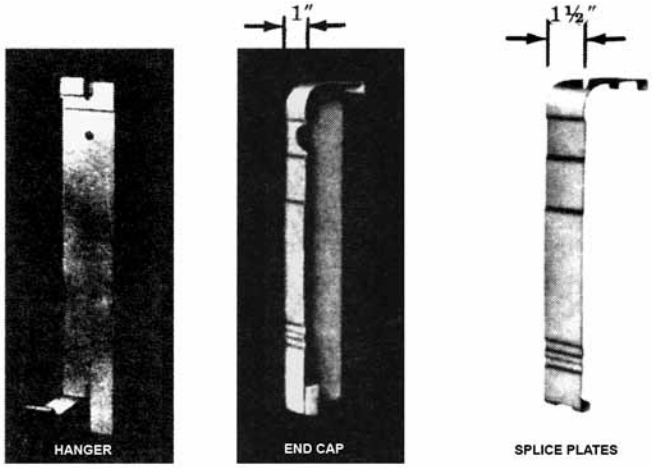
Install END CAPS on Extension (see succeeding paragraph), insert lip on top rear of Extension into slot at top of Hangers and snap channel on bottom of Extension under spacer arm on lower part of Hanger.

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 of 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.

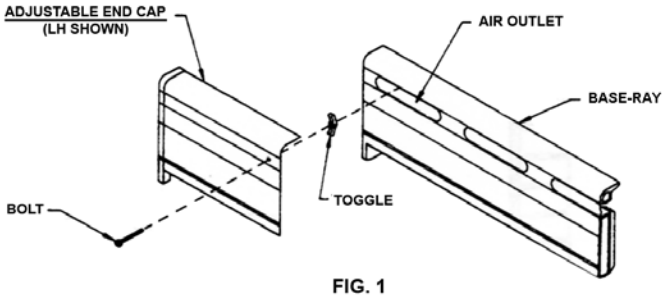


FIG. 1
INSTALLATION OF ADJUSTABLE END CAP

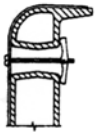


FIG. 2
PROPER LOCATION OF TOGGLE
WHEN SECURING ACCESSORY TO BASE-RAY

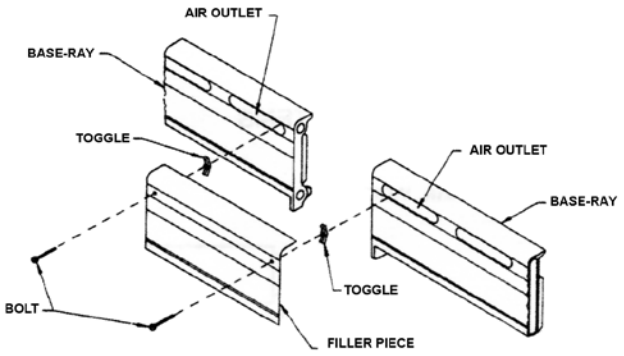


FIG. 3
INSTALLATION OF BASE-RAY
ADJUSTABLE END CAP & FILLER PEICE

10. Completing Installation – Important

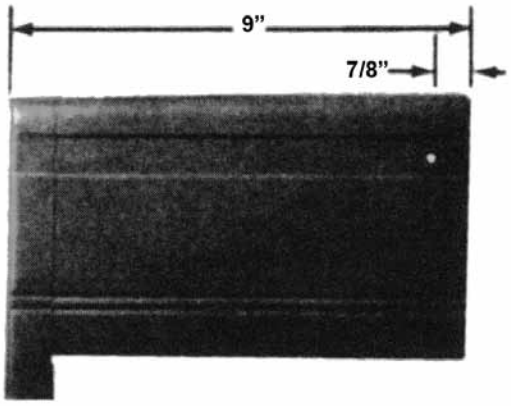
AIR-SEAL – It is necessary to prevent leakage of air between the walls and BASE-RAY®, since this will cause dirt streaks on the wall above the heating unit. This can be avoided by installing an "Air-Seal".

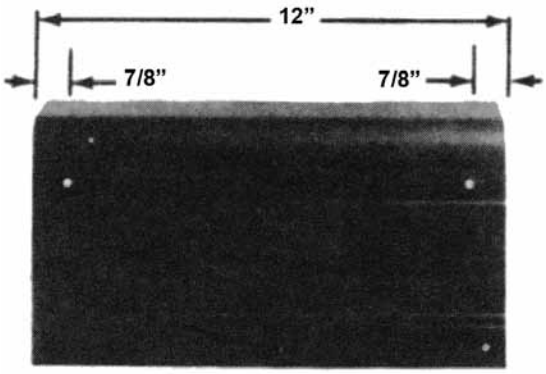
We recommended using 1" wide tape for this purpose, preferably with a thermal setting adhesive, available from U.S. Boiler Company at nominal charge.

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.

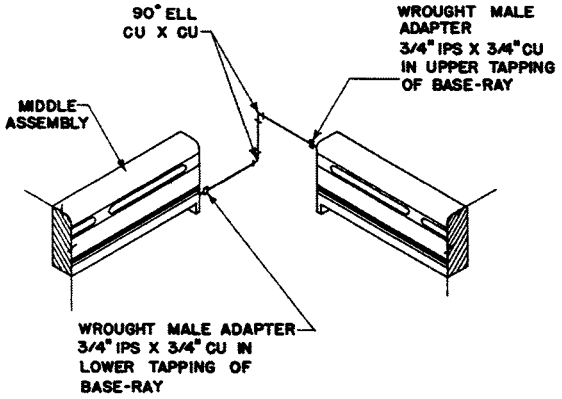
PAINTING – BASE-RAY and Trim are primed with a latex (water based) paint and must be top coated with a high grade oil or solvent based enamel to prevent rusting of the metals **immediately after installation. Primer coated products should not be allowed to sweat as a result of high room humidity or cold 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

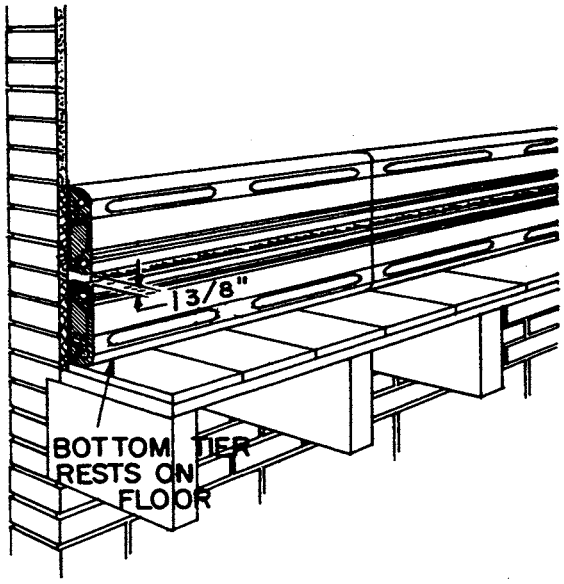
BASE-RAY® INSTALLED ON THREE WALLS OF ROOM – When BASE-RAY is installed on three walls, expansion noises are sometimes created by the middle assembly when rigid piping is used to connect all three assemblies together. Flexibility can be gained by connecting two of the adjoining assemblies with a flexible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



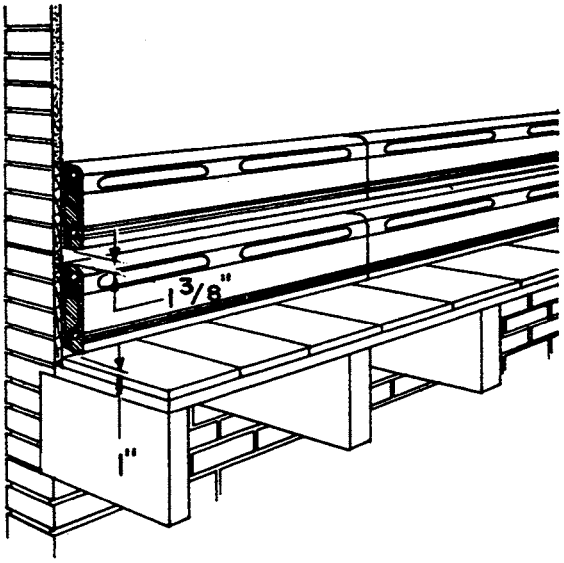
INSTALLATION WITH U.S. BOILER COMPANY RADIANT OR SLENDERIZED RADIATORS – Since a BASE-RAY installation is made in much the same manner as any other radiator system, U.S. BOILER COMPANY RADIANT OR SLENDERIZED RADIATORS may be used in a BASE-RAY Radiant Baseboard System.

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.

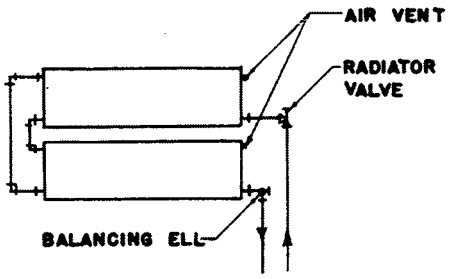


Top Sections Upright, Bottom Sections Inverted.

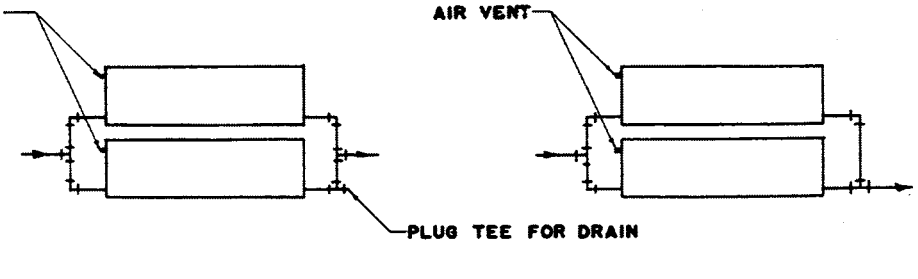


Both Sections Upright

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 U.S. Boiler Company Wholesale distributor. Should you require assistance in locating a U.S. Boiler Company Distributor in your area, or have questions regarding the availability of U.S. Boiler Company products or repair parts, please contact U.S. Boiler Company Customer Service at (717) 481-8400 or Fax (717) 481-8408.

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