



# Model HDR - RF

## Manual Addendum

(To be used in conjunction with HDRS-RF Manual)

For Gas, Oil and Combination burners

With and without Low NOx Flue Gas  
Recirculation (FGR)



Manual Part No. 950071  
September, 2014  
[www.webster-engineering.com](http://www.webster-engineering.com)

© 2014 All Rights Reserved

# TABLE OF CONTENTS

A.	General Information .....	2
B.	Component Description .....	8
C.	Setup & Adjustment .....	12

Ratings sheets. These represent the minimum size that can be safely used with this burner. Contact the factory if the furnace is smaller than the dimensions given. In many cases, other sizes may work depending on the fuel being used.

**READ AND SAVE THESE INSTRUCTIONS FOR REFERENCE.**

## A. General Information

This addendum covers the Model HDR-RF Combustion Head from Webster Engineering & Manufacturing Co. This combustion head is different from the combustion head used on the HDRS-RF burner and offers the capability to fire into different furnace configurations. All other attributes of the burner package are as defined in the HDRS-RF burner manual (Part No. 950062) and related documentation, including the Wiring Diagram, Fuel Trains and other manuals like the Flame Safeguard Manual.

### WARNING

**Read and understand all manual information before doing any work. This includes this manual, the HDRS-RF manual and the Flame Safeguard manual. Failure to properly understand how to adjust and set up this equipment could result in property damage, injury or death.**

The Model HDR-RF is offered in a wider size range than the HDRS-RF, and these differences are covered in this addendum. Other variations are also addressed in this addendum.

### 1. Model Number Configuration

Figure A-1 shows the model configuration for the HDR-RF product, and the offering variation. This is the model number that will appear on documents related to the burner, including the nameplate, although it may be truncated to fit available space.

The input rating is given in millions of BTUs' instead of Boiler HP as the HDRS-RF uses. This is a more common rating system for Watertube boilers.

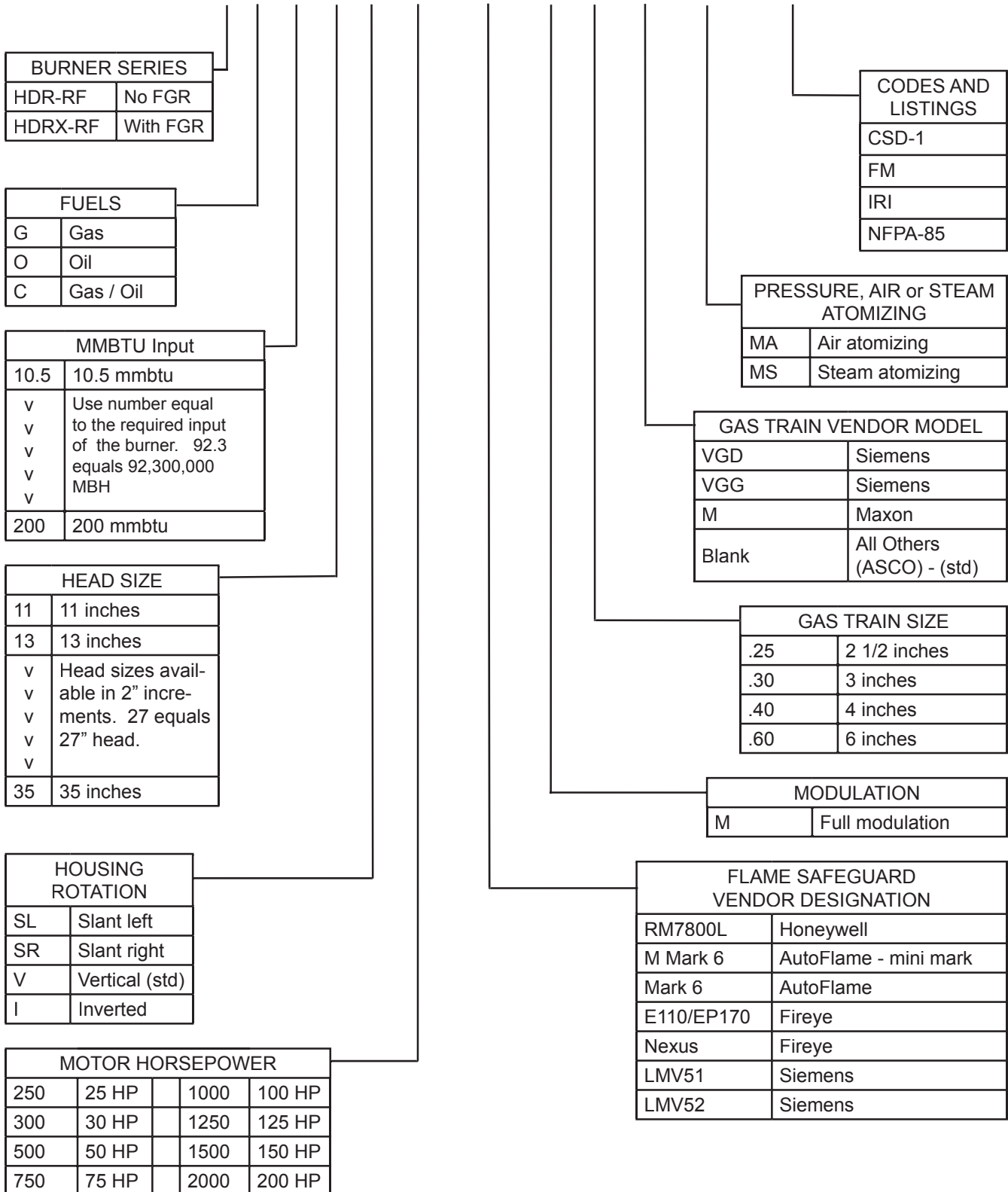
### 2. Dimensions and ratings

The Dimension and Ratings sheets for the Model HDR-RF are broken out by Watertube and Firetube application sheets attached. These provide the general sizing, dimensions and ratings for different applications. If there is a requirement for low NOx or altitude, the burner ratings will be reduced.

The minimum furnace size is given on the Dimensions and

# MODEL HDR(X) BURNER MODEL CONFIGURATION FIGURE A-1

**HDR-RFC-92.3-27 SL 1500 MARK6 -M .25 VGD -MA -UL/CSD-1**



The above represents the common model designations.  
Contact the factory for other options and special applications.

**Figure A-2 DIMENSIONS and RATINGS for Webster Model HDR-RF - For Watertube Applications**

Select the Head Size to obtain the required input. Select the fan size to overcome the furnace pressure.

- o Low NOx available to 50 ppm on natural gas.
- o Natural gas, propane, digester gas and No. 2 through No. 6 oil firing available
- o Plant air and steam atomization for oil firing available.
- o Linkage with fuel cams standard, parallel positioning controls available
- o Oil Firing available to 84 MMBTU/HR (#2 through #6 oil)

Head Size I.D.	11	13	13	13	15	17	17	17	19	19	21	21	23	25	25	27	27	29	29	31	31	33	33	35	35	35	
MMBTU / HR	10.46	12.56	14.65	16.74	20.93	25.11	29.30	31.39	33.48	37.67	41.85	46.04	50.22	54.41	58.60	62.78	66.97	71.15	75.33	79.51	83.70	87.88	92.07	96.25	100.43	104.61	
Net Gas manifold Press "w.c.	17.9	10.8	15.0	19.3	21.8	24.8	33.8	38.8	33.9	42.9	53.0	50.7	60.3	54.7	78.8	97.3	65.3	84.3	93.2	110.9	89.7	104.1	114.8	130.7	101.1	113.3	126.3
#2 oil GPH (2)	74.7	89.7	104.6	119.6	149.5	179.4	209.3	224.2	239.1	269.0	298.9	328.8	358.7	448.4	538.0	597.8	657.6	747.3	785.7	857.1	928.5	1000	1071	1142	1214	1285	1357
Natural Gas CFH x1000 (1)	10.46	12.56	14.65	16.74	20.93	25.11	29.30	31.39	33.48	37.67	41.85	46.04	50.22	54.41	58.60	62.78	66.97	71.15	75.33	79.51	83.70	87.88	92.07	96.25	100.43	104.61	
Oil pump motor HP	0.33	0.33	0.33	0.50	0.50	0.50	0.75	0.75	0.75	1.00	1.00	1.00	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Air compressor motor HP	2	2	5	5	5.5	5.5	5.5	5.5	5.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	
Minimum furnace height in inches	66	67	68	69	72	74	78	80	82	85	89	91	94	100	106	109	113	118	121	126	132	137	143	148	154	159	
Minimum furnace width in inches	66	67	68	69	72	74	78	80	82	85	89	91	94	100	106	109	113	118	121	126	132	137	143	148	154	159	
Minimum furnace length in inches	84	86	88	90	94	98	101	103	105	109	113	116	120	132	143	149	155	162	166	170	175	180	183	188	185	189	
Max heat release Kbtu/cf (3)	50	56	62	67	75	82	82	82	82	82	83	83	82	82	81	82	80	81	79	77	74	72	70	69	67	65	
Combustion air CFM	2093	2511	2930	3348	4185	5022	5859	6278	6696	7533	8370	9207	10044	12555	15066	16740	18414	20925	22000	24000	26000	28000	30000	32000	34000	36000	

Oil Firing Not Available in These sizes

Fan selections with maximum furnace pressure and motor HP	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.5" fan @ 3450 RPM																										
15" fan @ 3450 RPM																										
16.5" fan @ 3450 RPM																										
18.2" fan @ 3450 RPM																										
22.2" fan @ 1745 RPM																										
24.5" fan @ 1745 RPM																										
27" fan @ 1745 RPM																										
30" fan @ 1745 RPM																										
33" fan @ 1745 RPM																										
36.5" fan @ 1745 RPM																										
40.2" fan @ 1745 RPM																										
44.5" fan @ 1700 RPM																										
49" fan @ 1745 RPM																										

The 13.5" through 18.2" Fans operate at 3450 RPM

The 22.2" through 49" Fans operate at 1745 RPM

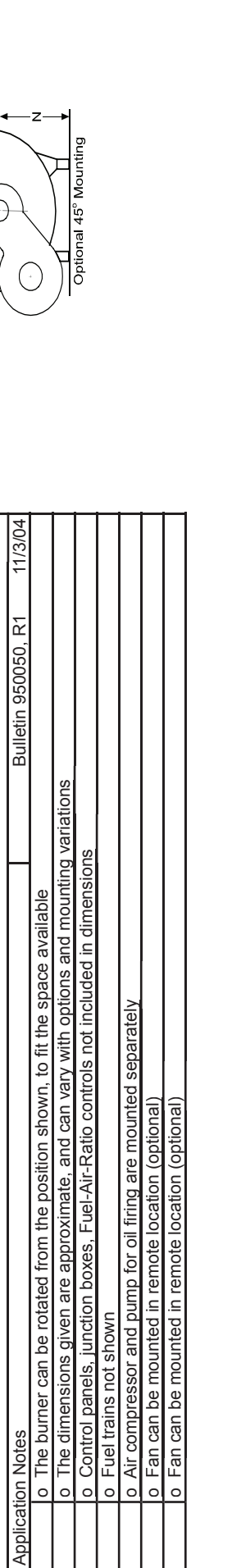
Notes:

- (1) Natural gas based on 1000 Btu/cf
- (2) #2 oil flow based on 140000 Btu/gal
- (3) Heat release based on furnace width, height and length

**Figure A-2 DIMENSIONS and RATINGS for Webster Model HDR-RF - for Watertube Applications**

Firing Head Size (ID) and Fan size (diameter)		13				15				17				19				21			
		HEAD	11	13	15	17	19	21	23	25	27	30	33	36.5	40.2	44.5	49	53.7			
RPM	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450	3450			
FAN	15	16.5	13.5	15	16.5	18.2	22.2	24.5	27	30	33	36.5	40.2	44.5	49	53.7	58.4	63.1			
A	55.1	57.9	52.1	55.1	57.9	61	65.8	69.3	73	77	81.2	85.1	89.2	93.2	97.2	101.4	105.7	110.1			
B	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2			
C	28.5	30.2	26.6	28.5	30.2	32	33.8	35.6	37.4	39.2	41.1	43.0	44.8	46.5	48.2	50.0	51.8	53.6			
D	11.4	12.5	10.3	11.4	12.5	13.8	16.8	18.5	20.4	22.6	24.9	27.5	30.4	33.6	37.0	40.4	43.8	47.2			
E	22.9	25.1	20.6	22.9	25.1	27.6	33.3	36.9	38.6	45.2	49.8	54.8	60.1	65.6	71.2	76.8	82.4	88.0			
F	10.2	11.2	9.2	10.2	11.2	12.3	14.8	16.3	18.2	20.1	22.2	24.4	26.9	29.4	31.9	34.4	36.9	39.4			
G	12.7	13.9	11.4	12.7	13.9	15.3	18.5	20.6	23.1	25.1	27.6	30.5	33.6	36.7	39.8	42.9	46.0	49.1			
H	59.6	59.6	59.6	59.6	59.6	63.1	66.7	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5			
I	22.0	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22			
J	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5			
K	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1			
L	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0			
M	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0			
N	38.1	38.4	37.8	38.1	38.4	38.8	39.6	40.1	40.6	40.9	41.5	42.1	42.6	43.1	43.6	44.1	44.6	45.1			

Firing Head Size (ID) and Fan size (diameter)		23				25				27				29				31				33				35			
		HEAD	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55										
RPM	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745											
FAN	33	36.5	40.2	44.5	36.5	40.2	44.5	36.5	40.2	44.5	49	53.7	58.4	63.1	67.8	72.5	77.2	81.9											
A	98.3	103.7	109.3	115.4	104.2	109.5	130.2	117.9	123.7	130.2	136.7	143.2	149.7	156.2	162.7	169.2	175.7	182.2											
B	24.1	24.1	24.1	24.1	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2											
C	49.3	52.1	55	57.8	52.5	55.1	72.5	66.2	69.3	72.5	75.6	78.7	81.8	84.9	88.0	91.1	94.2	97.3											
D	24.9	27.5	30.2	33.5	27.5	30.2	33.5	27.5	30.2	33.5	36.9	40.3	43.7	47.1	50.5	53.9	57.3	60.7											
E	49.8	55	60.5	67	54.9	60.5	67	54.9	60.5	67	73.7	80.5	87.3	94.1	100.9	107.7	114.5	121.3											
F	22.2	24.5	26.9	29.8	24.4	26.9	29.8	24.4	26.9	29.8	32.8	35.8	38.8	41.8	44.8	47.8	50.8	53.8											
G	27.6	30.5	33.6	37.2	30.5	33.6	37.2	30.5	33.6	37.2	40.9	44.6	48.3	52.0	55.7	59.4	63.1	66.8											
H	73.8	75.4	79.3	79.4	75.4	77.2	80.3	85.1	87.9	88.8	89.5	88.8	88.8	88.8	88.8	88.8	88.8	88.8											
I	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22											
J	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5											
K	18.7	20.3	24.2	24.3	20.3	22.1	25.2	21.5	24.3	25.2	25.9	26.6	27.3	28.0	28.7	29.4	30.1	30.8											
L	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6											
M	23	23	23	23	25	25	25	27	27	27	27	27	27	27	27	27	27	27											
N	54.3	55.0	55.9	56.9	59.3	60.0	61.0	59.3	60.0	61.0	62.0	63.0	64.0	65.0	66.0	67.0	68.0	69.0											



Application Notes		Bulletin 950050, R1	11/3/04
o The burner can be rotated from the position shown, to fit the space available			
o The dimensions given are approximate, and can vary with options and mounting variations			
o Control panels, junction boxes, Fuel-Air-Ratio controls not included in dimensions			
o Fuel trains not shown			
o Air compressor and pump for oil firing are mounted separately			
o Fan can be mounted in remote location (optional)			
o Fan can be mounted in remote location (optional)			

**Figure A-3 DIMENSIONS and RATINGS for Webster Model HDR-RF - for Firetube Applications**

For Firetube Applications (see Specification Sheet 950050 for Watertube applications)

Select the Head Size to obtain the required input. Select the fan size to overcome the furnace pressure.

- o Low NOx available to 50 ppm on natural gas.
- o Plant air and steam atomization for oil firing available.
- o Oil Firing available to 1000 BHP (#2 through #6 oil)
- o Natural gas, propane, digester gas and No. 2 - 6 oil firing available
- o Linkage with fuel cams standard, parallel positioning controls available

Head Size I.D.	11	13	13	13	13	15	17	17	17	17	19	19	19	21	21	23	25	25	27	27
Boiler HP	250	300	350	400	500	600	700	750	800	900	1000	1000	1100	1200	1500	1800	2000	2200	2500	2500
Maximum MBH	10463	12555	14648	16740	20925	25110	29295	31387.5	33480	37665	41850	41850	46035	50220	62775	75330	83700	92070	104625	104625
Natural gas CFH	10463	12555	14648	16740	20925	25110	29295	31387.5	33480	37665	41850	41850	46035	50220	62775	75330	83700	92070	104625	104625
Net Gas manifold Press "w.c."	17.9	10.8	15.0	19.3	21.8	24.8	33.8	38.8	33.9	42.9	53.0	50.7	60.3	54.7	78.8	97.3	65.3	84.3	84.3	84.3
#2 oil GPH	74.7	89.7	104.6	119.6	149.5	179.4	209.3	224.2	239.1	269.0	298.9	328.8	358.7	448.4	538.0	597.8	657.6	747.3	747.3	747.3
Oil pump motor HP	0.33	0.33	0.33	0.50	0.50	0.50	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Air compressor motor HP	2	2	5	5	5.5	5.5	5.5	5.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Minimum furnace dia	36	37	38	39	41	42	44	45	45	47	49	49	50	52	57	61	65	68	73	73
Minimum furnace length	122	127	133	138	149	160	170	176	181	192	203	213	224	248	248	258	265	270	275	275
Max heat release Kbtu/cf (3)	142	156	167	176	188	195	198	198	198	199	199	199	189	184	174	170	166	163	158	158
Combustion air CFM	2093	2511	2930	3348	4185	5022	5859	6278	6696	7533	8370	9207	10044	12555	15066	16740	18414	20925	20925	20925

Oil firing not available in these sizes

Fan selections with maximum furnace pressure and motor HP

13.5" fan @	15" fan @	16.5" fan @	18.2" fan @	3450 RPM
Max furn "wc	2	0	0	The 13.5" through 18.2" fans operate at 3450 RPM
Motor HP	5	5	5	
Max furn "wc	0	3	2	
Motor HP	5	7.5	7.5	
Max furn "wc	5	4	4	
Motor HP	10	7.5	7.5	
Max furn "wc	5	5	5	
Motor HP	15	15	15	

22.2" fan @	1745 RPM	24.5" fan @	1745 RPM	27" fan @	1745 RPM	30" fan @	1745 RPM	33" fan @	1745 RPM	36.5" fan @	1745 RPM	40.2" fan @	1745 RPM	44.5" fan @	1700 RPM	49" fan @	1745 RPM
Max furn "wc	0	3	2.5	0	5	4	3	0	0	0	0	0	0	0	0	0	0
Motor HP	3	2.5	0	5	4	3	0	0	0	0	0	0	0	0	0	0	0
Max furn "wc	2.5	0	0	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Motor HP	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Max furn "wc	4	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Motor HP	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Max furn "wc	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Motor HP	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Max furn "wc	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Motor HP	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Max furn "wc	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Motor HP	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Max furn "wc	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Motor HP	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Max furn "wc	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Motor HP	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Max furn "wc	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Motor HP	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Max furn "wc	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Motor HP	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150

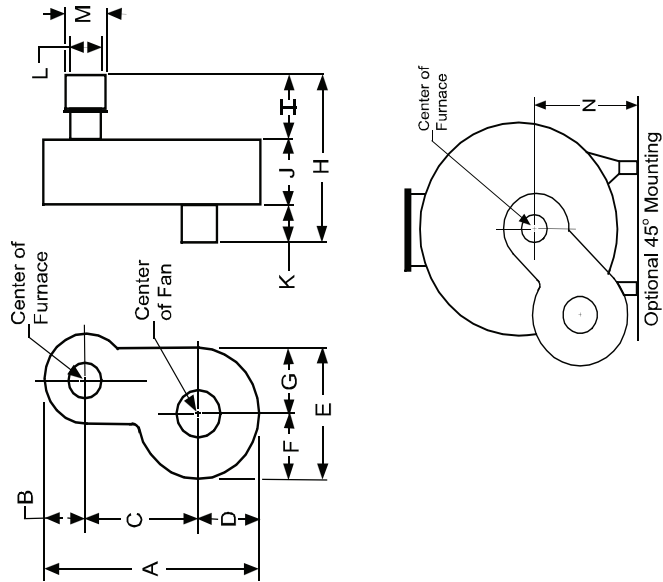
The 22.2" through 49" fans operate at 1745 RPM

Notes:  
 (1) Natural gas based on 1000 Btu/cf  
 (2) #2 oil flow based on 140000 Btu/gal  
 (3) Heat release based on furnace diameter and length with turnaround

**Figure A-3 DIMENSIONS and RATINGS for Webster Model HDR-RF - For Firetube Applications Page 2 of 2**

HEAD	Firing Head Size (ID) and Fan size (diameter)																	
	11			13			15			17			19					
RPM	3450	1745	1745	3450	1745	1745	3450	1745	1745	3450	1745	1745	3450	1745	1745	3450	1745	1745
FAN	15	16.5	13.5	15	16.5	18.2	22.2	24.5	27	30	33	16.5	18.2	27	30	33	36.5	27
A	55.1	57.9	52.1	55.1	57.9	61	65.8	69.3	73	77	81.2	82.8	87.3	92.9	97.2	82.2	86.7	92.9
B	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
C	28.5	30.2	26.6	28.5	30.2	32	33.8	35.6	37.4	39.2	41.1	34.4	36.6	44.2	46.5	48.6	45.9	48.6
D	11.4	12.5	10.3	11.4	12.5	13.8	16.8	18.5	20.4	22.6	24.9	12.5	13.8	20.4	22.6	26.1	20.4	22.6
E	22.9	25.1	20.6	22.9	25.1	27.6	33.3	36.9	38.6	45.2	49.8	25.1	27.6	40.8	45.3	49.8	40.8	45.2
F	10.2	11.2	9.2	10.2	11.2	12.3	14.8	16.3	18.2	20.1	22.2	11.2	12.3	18.2	20.2	22.2	24.4	20.1
G	12.7	13.9	11.4	12.7	13.9	15.3	18.5	20.6	20.4	25.1	27.6	13.9	15.3	22.6	25.1	27.6	30.5	22.6
H	59.6	59.6	59.6	59.6	59.6	63.1	66.7	68.5	69.6	75.4	80.3	63.1	66.7	82.2	85.7	88.3	69.1	70.4
I	22.0	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
J	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	21.1	21.1	21.1	21.1	21.1	21.1	21.1
K	13.1	13.1	13.1	13.1	13.1	16.6	10.2	12	13.1	16.6	16.6	16.6	13.1	16.6	17.4	18.7	13.1	16.6
L	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.1	6.1	6.1	6.1
M	11.0	11.0	13	13	13	13	13	13	13	13	13	15	15	15	15	17	17	19
N	38.1	38.4	37.8	38.1	38.4	38.8	39.6	40.1	40.6	40.9	41.5	46.1	46.5	49.6	50.2	50.9	44.4	47.5

HEAD	Firing Head Size (ID) and Fan size (diameter)														
	21			23			25			27					
RPM	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745	1745
FAN	30	33	36.5	40.2	44.5	40.2	44.5	44.5	44.5	44.5	44.5	44.5	40.2	44.5	49
A	87.3	92.9	96.7	102.5	98.3	103.7	109.3	115.4	104.2	109.5	130.2	117.9	123.7	130.2	136.7
B	18.2	18.2	18.2	18.2	24.1	24.1	24.1	24.1	24.1	24.2	24.2	24.2	24.2	24.2	24.2
C	46.5	48.6	51	53.9	49.3	52.1	55	57.8	52.5	55.1	72.5	66.2	69.3	72.5	75.6
D	22.6	26.1	27.5	30.4	24.9	27.5	30.2	33.5	27.5	30.2	33.5	27.5	30.2	33.5	36.9
E	45.3	52.1	55	60.5	49.8	55	60.5	67	54.9	60.5	67	54.9	60.5	67	73.7
F	20.2	23.2	24.5	26.9	22.2	24.5	26.9	29.8	24.4	26.9	29.8	24.4	26.9	29.8	32.8
G	25.1	28.9	30.5	33.6	27.6	30.5	33.6	37.2	30.5	33.6	37.2	30.5	33.6	37.2	40.9
H	68.3	70.4	70.4	75.9	73.8	75.4	79.3	79.4	75.4	77.2	80.3	85.1	87.9	88.8	89.5
I	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
J	21.1	21.1	21.1	21.1	24.5	24.5	24.5	24.5	24.5	24.5	24.5	32.8	32.8	32.8	32.8
K	16.6	18.7	18.7	24.2	18.7	20.3	24.2	24.3	20.3	22.1	25.2	21.5	24.3	25.2	25.9
L	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.8	8.8	8.8	8.8
M	21	21	21	21	23	23	23	23	25	25	25	27	27	27	27
N	50.4	51.0	53.0	53.7	54.3	55.0	55.9	56.9	59.3	60.0	61.0	59.3	60.0	61.0	62.0



**Application Notes**

- o The burner can be rotated from the position shown, to fit the space available.
- o The dimensions given are approximate, and can vary with options and mounting variations
- o Control panels, junction boxes, Fuel-Air-Ratio controls not included in dimensions
- o Fuel trains not shown
- o Air compressor and pump for oil firing are mounted separately
- o Fan can be mounted remotely (optional)
- o BHP shown above is approximate, as burner can operate through a wide range of inputs

Bulletin 950049 R1 11/3/04



## B. Component Description

See the component layout shown in the HDRS-RF manual. The combustion head is different in that it has parallel gas spuds and less swirl applied to the air stream. Figure C-1 shows the detail of this firing head including the burner drawer, refractory and gas manifold. Figure B-1 shows a typical HDR-RF combustion head assembly.

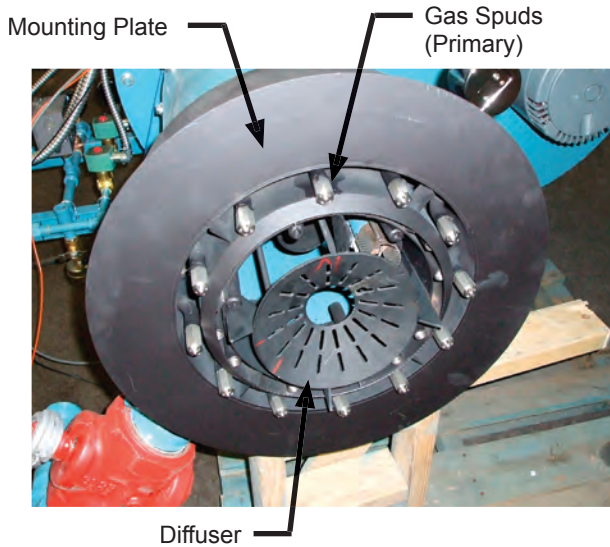


Figure B-1 Combustion Head Assembly

### 1. Refractory Shape

The refractory front plate for the HDR-RF burner has a unique shape as shown on Figure B-1. There is a notch in the surface close to the burner head that is combined with special gas spuds to form the flame front and retains the flame. This refractory must be in good mechanical condition for the burner to work properly.

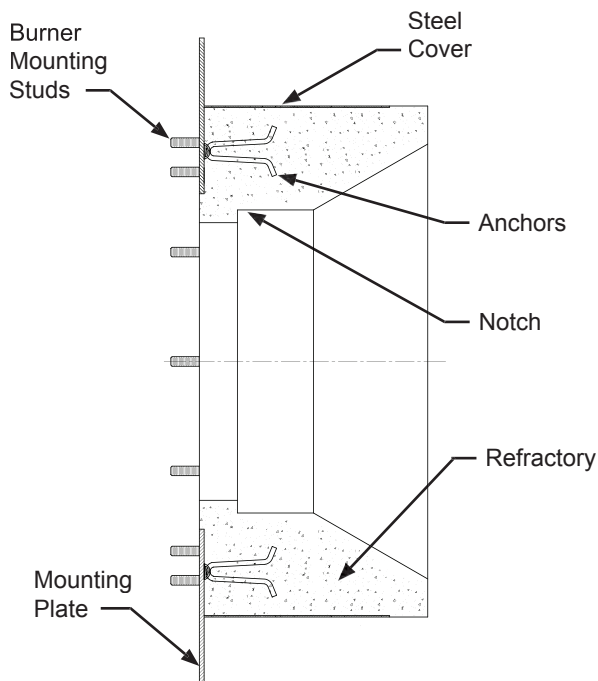


Figure B-2 Refractory Front Plate

The outer ring of orifices are used to provide flame retention on the refractory, and their position is critical in relation to the refractory.

### 2. Dual Gas Housing

Some applications require multiple gas fuels that are contained in separate housings with independent orifices. These burner heads will have double the number of gas orifices to accommodate both fuels, with all orifices terminating in the same position to support a common flame front.

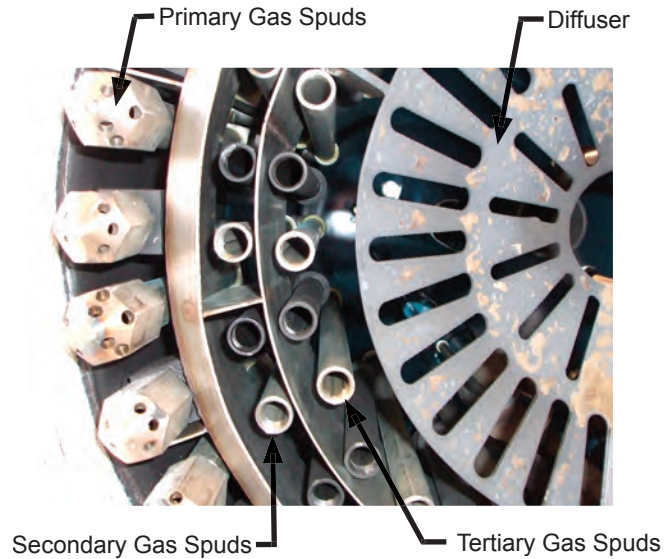


Figure B-3 Nozzle Arrangement

### 3. Oil Gun

The oil gun (with oil nozzle) can be easily removed from the burner by disconnecting the oil lines and pulling it apart. See Figure B-4. The position of the oil nozzle is adjusted by backing off the set screws that lock the pipes to the spacer, and sliding the pipes in and out. The spacer will provide the correct location when re-installed. If the burner will operate on gas for longer time intervals, the oil gun should be removed to prevent the oil from solidification in the nozzle.

### 4. Burner Drawer

The burner drawer holds the diffuser, pilot, scanner and oil gun tube. It can be removed from the burner by disconnecting the mounting bolts on the back flange and pulling it out.

#### CAUTION

Use care in handling burner drawer, especially the ignition cable insulators, which can easily break.

### 5. FGR System

Figure B-6 shows the FGR sizing criteria for the full range of products offered by the HDR-RF line. For complete



details on selection and sizing the FGR system, refer to the HDRS-RF manual.

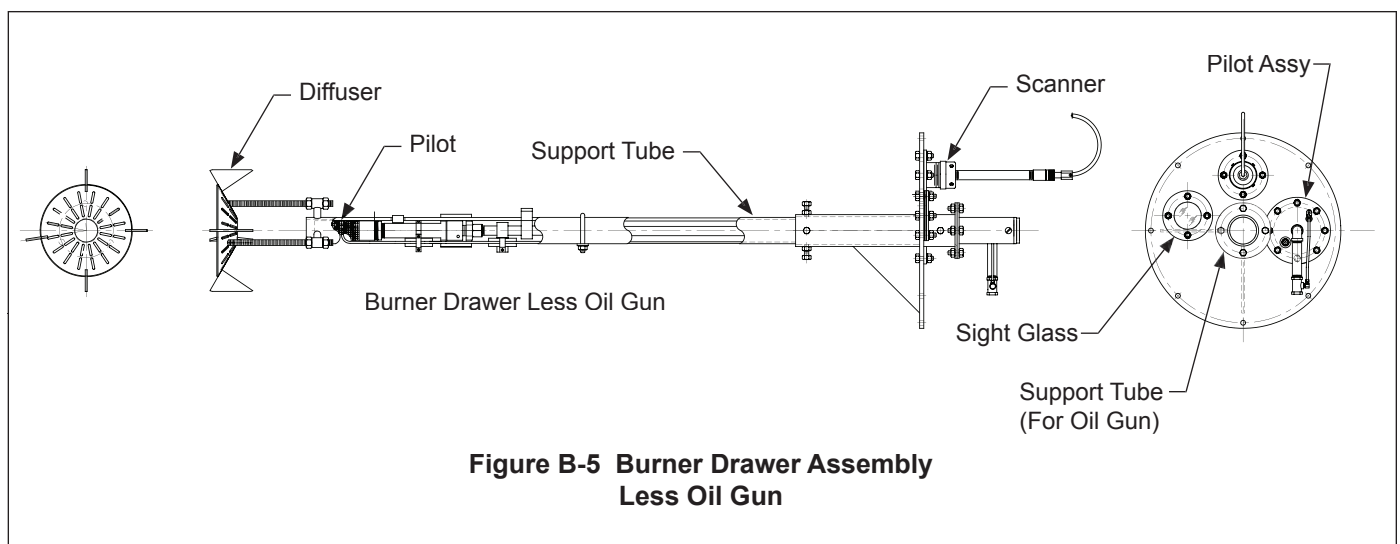
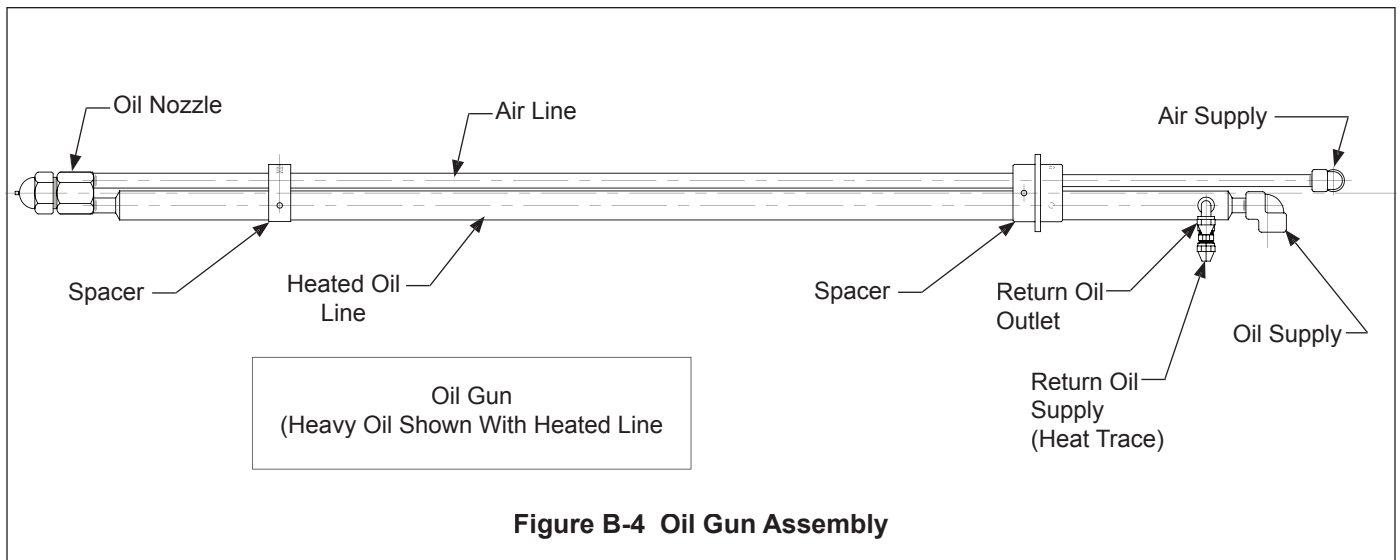


Figure B-6  
FGR Sizing Criteria

BHP	Max inlet press	Pressure Drop per 100' of Duct									
		4"	5"	6"	8"	10"	12"	14"	16"	18"	20"
<b>60 ppm NOx Level</b>											
200	1.00	1.4	0.4	0.1							
250	1.00	2.1	0.6	0.2							
300	1.25	3.1	0.9	0.3							
350	1.25	4.2	1.2	0.5							
400	1.25	5.5	1.6	0.6							
450	1.25	7.0	2.0	0.8	0.2						
500	1.50		2.5	0.9	0.2						
550	1.50		3.0	1.1	0.2						
600	1.50		3.6	1.3	0.3						
700	1.50		4.9	1.8	0.4						
750	1.50		5.6	2.1	0.5						
800	1.50		6.4	2.4	0.5	0.2					
900	2.00		8.1	3.0	0.7	0.2					
1000	2.00			3.7	0.8	0.2					
1100	2.00			4.5	1.0	0.3					
1200	2.00			5.4	1.2	0.4					
1300	2.00			6.3	1.4	0.4	0.2				
1400	2.00			7.3	1.6	0.5	0.2				
1500	2.00			8.4	1.8	0.5	0.3				
1600	2.00				2.1	0.6	0.3				
1700	2.00				2.4	0.7	0.3				
1800	2.50				2.6	0.8	0.3				
2000	2.50				3.3	1.0	0.4				
2200	2.50				3.9	1.2	0.5				
2300	2.50				4.3	1.3	0.6	0.3			
2400	2.50				4.9	1.4	0.6	0.3			
2500	2.50				5.1	1.5	0.7	0.3			
2600	2.50				5.5	1.6	0.7	0.3			
<b>30 ppm NOx Level</b>											
200	1.00			1.9	0.4	0.1					
250	1.00			2.9	0.6	0.2					
300	1.25			4.2	0.9	0.3					
350	1.25			5.8	1.3	0.4					
400	1.25			7.5	1.7	0.5	0.2				
450	1.25				2.1	0.6	0.3	0.1			
500	1.50				2.6	0.8	0.3	0.2			
550	1.50				3.1	0.9	0.4	0.2			
600	1.50				3.7	1.1	0.5	0.2			
700	1.50				5.1	1.5	0.7	0.3			
750	1.50				5.8	1.7	0.8	0.3			
800	1.50				6.6	2.0	0.9	0.4			
900	2.00				8.4	2.5	1.1	0.5			
1000	2.00					3.1	1.3	0.6			
1100	2.00					3.7	1.6	0.7			
1200	2.00					4.4	1.9	0.9			
1300	2.00					5.2	2.3	1.0	0.5	0.3	
1400	2.00					6.0	2.6	1.2	0.6	0.4	
1500	2.00					6.9	3.0	1.4	0.7	0.4	
1600	2.00					7.9	3.4	1.6	0.8	0.5	
1700	2.00					8.9	3.9	1.8	0.9	0.6	0.4
1800	2.50						4.4	2.0	1	0.6	0.4
2000	2.50						5.4	2.5	1.3	0.8	0.5
2200	2.50						6.5	3.0	1.5	1	0.6
2300	2.50						7.1	3.3	1.7	1	0.7
2400	2.50						7.7	3.6	1.8	1.1	0.7
2500	2.50						8.4	3.9	2	1.2	0.8
2600	2.50						9.1	4.2	2.1	1.3	0.9

BHP	Max inlet press	Pressure Drop per 100' of Duct									
		4"	5"	6"	8"	10"	12"	14"	16"	18"	20"
<b>20 ppm NOx Level</b>											
200	1.00			4.6	1.0	0.3					
250	1.00			7.2	1.6	0.5	0.2				
300	1.25				2.3	0.7	0.3				
350	1.25				3.1	0.9	0.4				
400	1.25				4.0	1.2	0.5	0.2			
450	1.25				5.1	1.5	0.7	0.3			
500	1.50				6.3	1.9	0.8	0.4	0.2		
550	1.50				7.6	2.3	1.0	0.5	0.2		
600	1.50					2.7	1.2	0.5	0.3		
700	1.50					3.7	1.6	0.7	0.4		
750	1.50					4.2	1.8	0.8	0.4		
800	1.50					4.8	2.1	1.0	0.5		
900	2.00					6.1	2.7	1.2	0.6		
1000	2.00					7.5	3.3	1.5	0.8		
1100	2.00						4.0	1.8	0.9		
1200	2.00						4.7	2.2	1.1		
1300	2.00						5.5	2.5	1.3	0.8	0.5
1400	2.00						6.4	2.9	1.5	0.9	0.6
1500	2.00						7.4	3.4	1.7	1.1	0.7
1600	2.00						8.4	3.8	2	1.2	0.8
1700	2.00							4.3	2.2	1.4	0.9
1800	2.50							4.9	2.5	1.6	1.0
2000	2.50							6.0	3.1	1.9	1.3
2200	2.50							7.3	3.7	2.3	1.5
2300	2.50							8.0	4.1	2.5	1.7
2400	2.50							8.7	4.4	2.8	1.8
2500	2.50							9.4	4.8	3.0	2.0
2600	2.50								5.2	3.2	2.1
		<b>4"</b>	<b>5"</b>	<b>6"</b>	<b>7"</b>	<b>10"</b>	<b>12"</b>	<b>14"</b>	<b>16"</b>	<b>18"</b>	<b>20"</b>

Figure B-6  
FGR Sizing Criteria

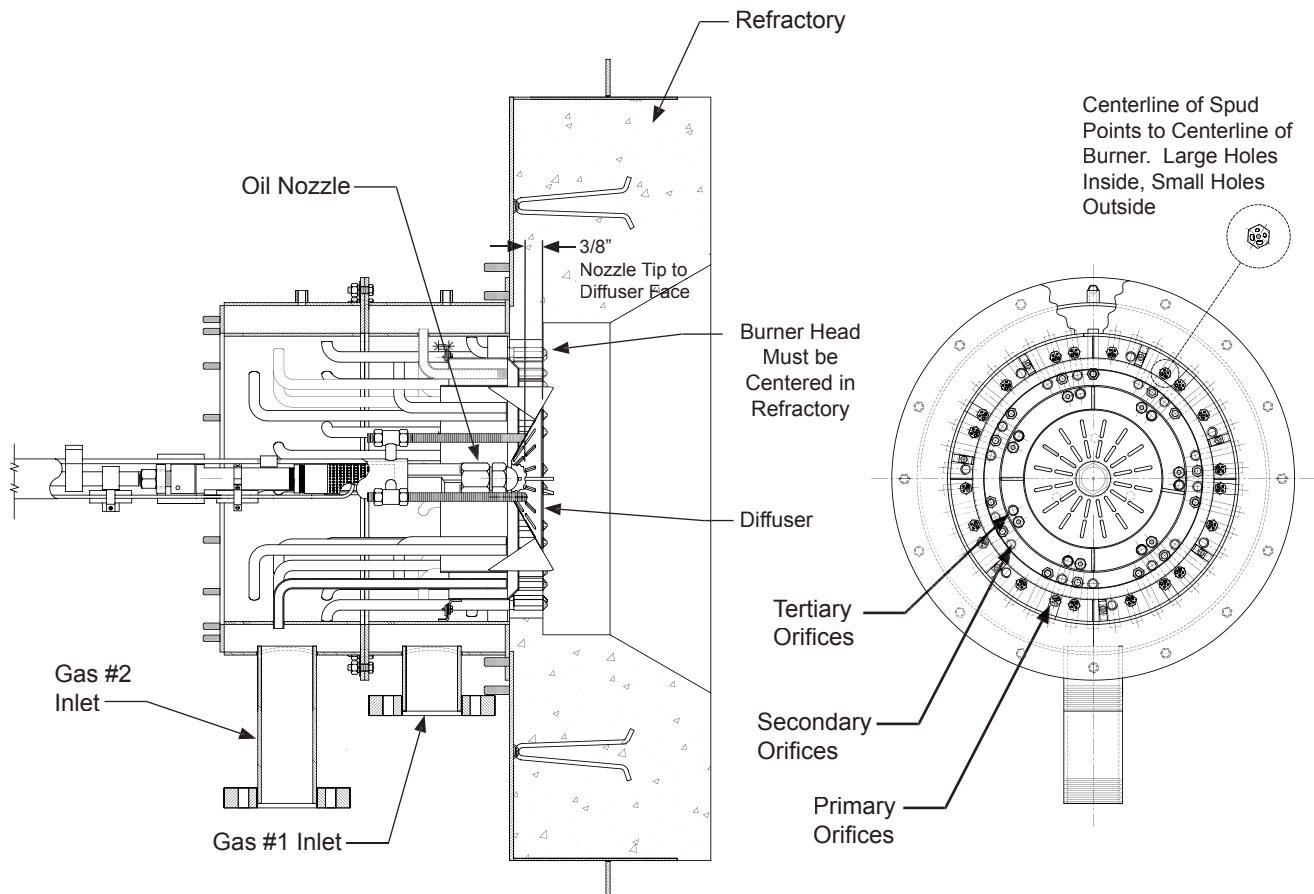
## C. Setup and adjustment

### 1. Burner Drawer Setup

Figure C-1 shows the general arrangement of the burner, refractory and other critical burner components. A dual housing is shown.

The O.D. plane of the diffuser should line up with the tapered end of the primary gas spuds (outer row). The position of the diffuser is adjustable by moving the guide tube. This can be done while firing from outside the burner.

The oil nozzle position should be 3/8" behind the O.D. plane of the diffuser. The position of the oil nozzle is also adjustable from outside the burner while the burner is firing. These settings are starting points and the final settings will be determined during start-up.



**Figure C-1 Burner Housing Assembly  
(Dual Housing Shown)**

### 2. Burner Adjustments

The Primary adjustment for oil firing is the position of the oil nozzle relative to the diffuser. This position should be maintained, especially if the diffuser positions adjusted for the gas fire. The register setting and excess air levels also impact the oil combustion.

For gas firing, the position of the diffuser relative to the gas spuds would be a primary adjustment. The register setting and excess air levels also impact the gas combustion. In some cases the gas spud arrangement may need to be adjusted to get proper mix for the furnace conditions. Refer to the HDRS-RF manual for complete adjustment and setup details.

**WEBSTER COMBUSTION TECHNOLOGY**  
619 Industrial Road - Winfield, KS 67156  
Phone: 620-221-7464 Fax: 620-221-9447  
sales@webster-engineering.com  
service@webster-engineering.com  
www.webster-engineering.com