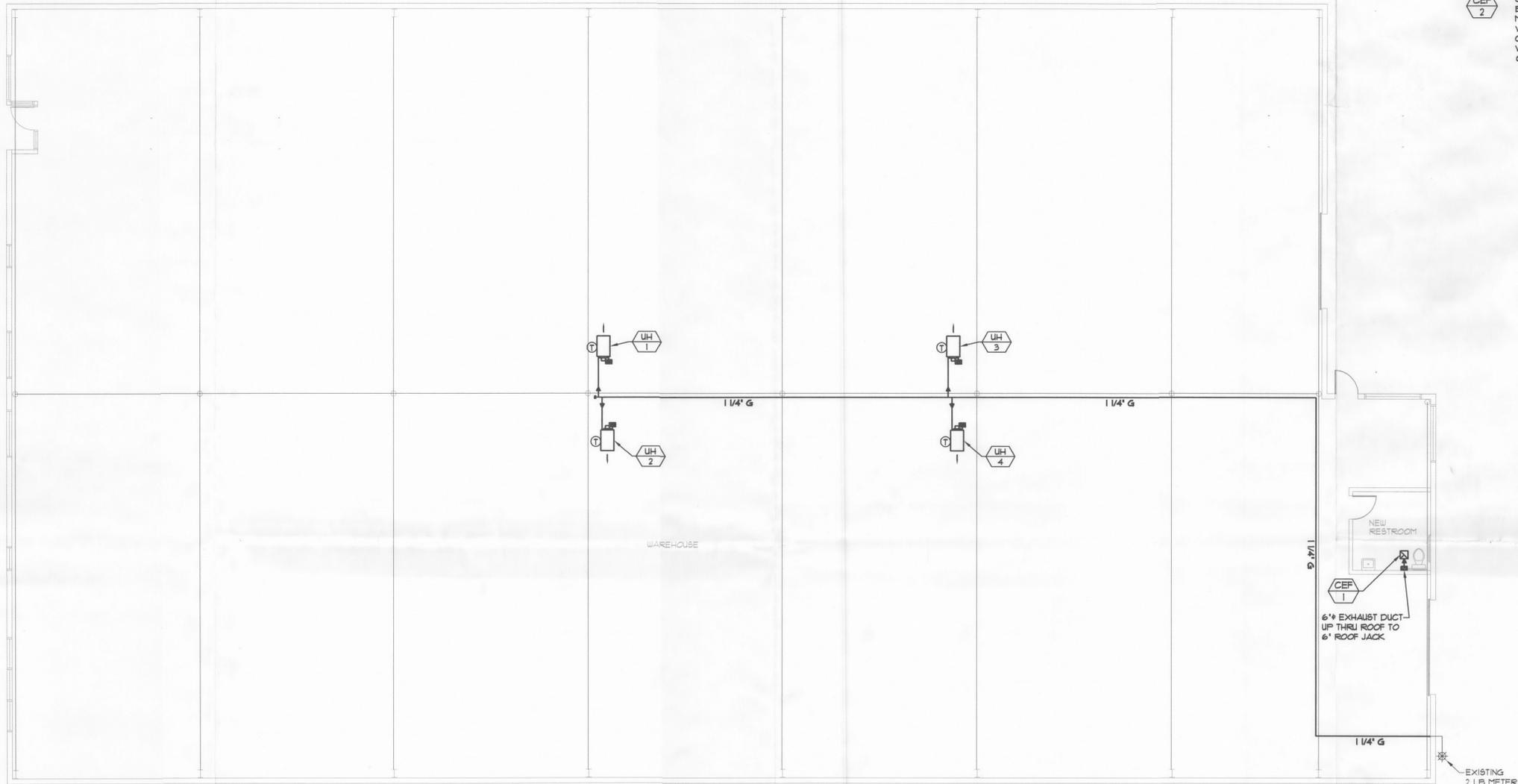


2013-11-20



### NEW EQUIPMENT


 BRAND : LENNOX  
 MODEL : LF24-100A  
 VOLTAGE : 115V/60/1 PHASE  
 INPUT BTU : 120,000  
 OUTPUT BTU : 80,500  
 FLUE SIZE : 4" ø  
 WEIGHT : 125 lbs.


 CEILING EXHAUST FAN  
 BRAND : BROAN  
 MODEL : 684  
 VOLTAGE : 115V/60/1 PHASE  
 CFM : 81  
 VENT SIZE : 4"  
 OPERATED BY LIGHT SWITCH

City of Portland  
 REVIEWED FOR CODE  
 COMPLIANCE  
 DEC 04 2013  
 Permit Number


**HVAC FLOOR PLAN**  
 1/8" = 1' - 0"

### GENERAL NOTES :

1. VERIFY LOCATIONS AND WEIGHTS OF MECHANICAL EQUIPMENT WITH ARROW MECHANICAL PRIOR TO STRUCTURAL CALCULATIONS. EQUIPMENT LOCATIONS AND WEIGHTS SOMETIMES CHANGE!
2. ELECTRICAL LOADS TO BE VERIFIED WITH ARROW MECHANICAL. EQUIPMENT ORDERED IS SOMETIMES DIFFERENT THAN WHAT IS SHOWN ON SCHEDULE.

13-234941--MT

THE WITHIN DESIGN IS THE EXCLUSIVE PROPERTY OF ARROW MECHANICAL. THE DRAWINGS OR BLUE PRINTS CONTAINING THIS DESIGN ARE AND SHALL REMAIN THE PROPERTY OF ARROW MECHANICAL. THE DELIVERY OF THE DRAWINGS OR BLUE PRINTS TO ANY OTHER PARTY DOES NOT CONSTITUTE AN ASSIGNMENT OF THE DESIGN OR ANY RIGHTS THEREIN. THE PURPOSE OF TRANSMITTING A SALE BY ARROW MECHANICAL OF THE AIR CONDITIONING SYSTEM INCORPORATING THE WITHIN DESIGN, INCLUDING THE WITHIN DESIGN, IS TO PROVIDE THE DESIGN OF ARROW MECHANICAL. CONSTITUTES A VIOLATION OF THE LAWS OF THIS STATE.	
DATE	
REVISION	
MARK	
<b>H.V.A.C. FLOOR PLAN</b> <b>POPE BUILDING</b> 2230 NW 22ND PLACE PORTLAND, OREGON	
DATE	11-20-2013
DRAWN	DJL
CHECKED	
<b>ARROW MECHANICAL CONTRACTORS INC.</b> 10330 S.W. TUALATIN ROAD, TUALATIN, OREGON 97062 PHONE (503) 692-1565	
SHEET NO.	M-1
	1 OF 1
JOB NO.	4228-P

01-1 TR 4



**ENGINEERING DATA**



**GAS UNIT HEATERS/DUCT FURNACES**

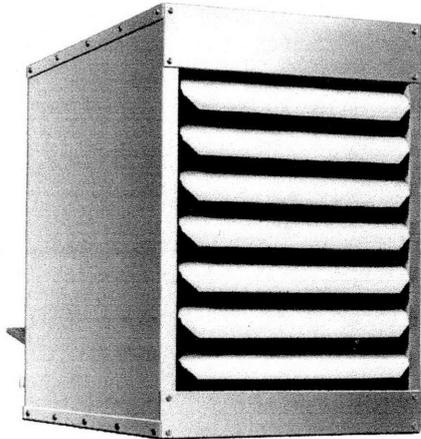
**LF24**

**GAS-FIRED UNIT HEATERS - HORIZONTAL**

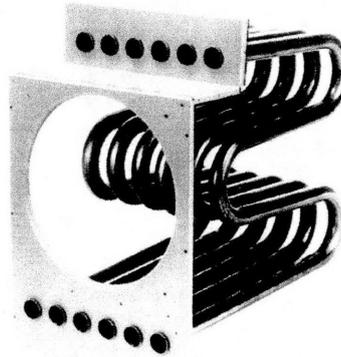
Steady-State Efficiency - 80.0% to 82.0%

Input - 100,000 to 390,000

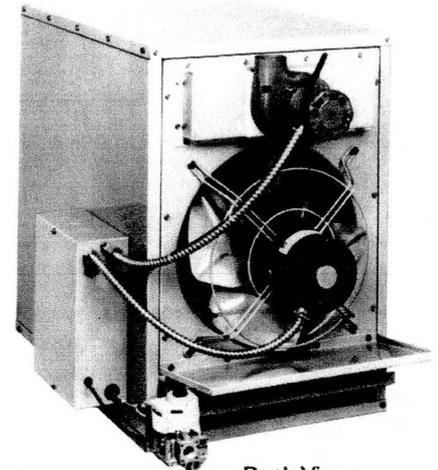
Bulletin No. 210000  
November 2003  
Supersedes March 2002



Front View



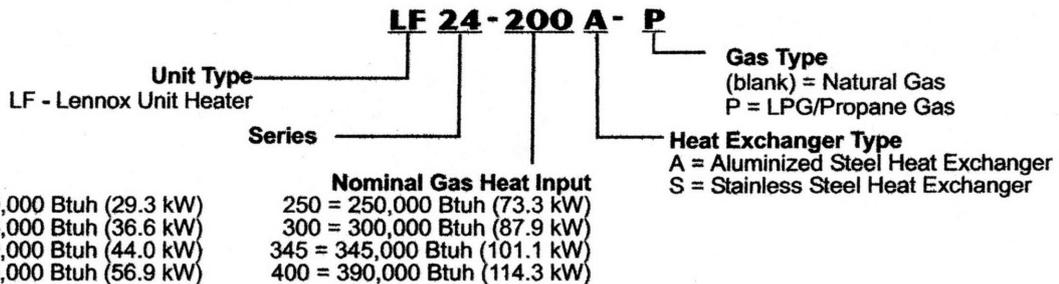
Tubular Heat Exchanger



Back View



**MODEL NUMBER IDENTIFICATION**



**FEATURES**

**CONTENTS**

Dimensions .....	Pages 4-5
Features .....	Pages 1-2
High Altitude Information .....	Page 3
Installation Clearances .....	Page 4
Model Number Identification .....	Page 1
Optional Accessories .....	Page 2
Specifications .....	Page 3
Throw Data .....	Page 4

**APPLICATIONS**

Lennox LF24 gas-fired, horizontal unit heaters are compact in design and easy to install. Units feature steady-state heating efficiencies of up to 82%. LF24 unit heaters are ideal for economical commercial heating systems. Units are shipped completely assembled with controls factory installed and wired. In addition, each unit is test operated at the factory to ensure proper operation and dependability. Installer has only to locate unit, make unit gas supply, flue, electrical connections and mount thermostat to complete the installation. Units may be vented horizontally or vertically.

Visit us at [www.lennox.com](http://www.lennox.com)  
For the latest technical information, [www.davenet.com](http://www.davenet.com)

NOTE - Due to Lennox' ongoing commitment to quality, Specifications, Ratings and Dimensions subject to change without notice and without incurring liability. Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury. Installation and service must be performed by a qualified installer and servicing agency.

## ↓

### SPECIFICATIONS

Gas Heating Performance	Model No. - Stainless Steel	LF24-100S	LF24-125S	LF24-150S	LF24-200S	LF24-250S	LF24-300S	LF24-345S	LF24-400S
	Model No. - Aluminized Steel	LF24-100A	LF24-125A	LF24-150A	LF24-200A	LF24-250A	LF24-300A	LF24-345A	LF24-400A
Heating Capacity Input - Btuh		100,000	125,000	150,000	195,000	250,000	300,000	345,000	390,000
	kW	29.3	36.6	44.0	56.9	73.3	87.9	101.1	114.3
Output - Natural - Btuh		80,500	100,625	120,750	156,000	201,250	241,500	276,000	312,000
	kW	23.6	29.4	35.4	45.6	59.0	70.8	80.9	91.4
Output - LPG/Propane - Btuh		82,000	105,500	123,000	156,000	205,000	246,000	281,200	312,000
	kW	24.0	30.9	36.0	45.6	60.1	72.1	82.4	91.4
Steady State Efficiency - Natural		80.5%	80.5%	80.5%	80.0%	80.5%	80.5%	80.0%	80.0%
	LPG/Propane	82.0%	82.0%	82.0%	80.0%	82.0%	82.0%	81.5%	80.0%
Connections in. (mm)	Flue size (round)	<sup>1</sup> 4 (102)	<sup>1</sup> 4 (102)	<sup>1</sup> 4 (102)	<sup>2</sup> 5 (127)	<sup>2</sup> 5 (127)	<sup>2</sup> 5 (127)	<sup>3</sup> 6 (152)	<sup>3</sup> 6 (152)
	Gas Piping Size	1/2 (13)	1/2 (13)	1/2 (13)	1/2 (13)	3/4 (19)	3/4 (19)	3/4 (19)	3/4 (19)
Fan Data	Number of Fans	1	1	1	1	2	2	2	2
	Diameter - in. (mm)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)	16 (406)
	Number of blades	4	4	5	5	5	5	5	5
	Number of Motors	1	1	1	1	2	2	2	2
	Motor Output - hp (W)	1/10 (75)	1/10 (75)	1/8 (93)	1/8 (93)	1/8 (93)	1/8 (93)	1/8 (93)	1/8 (93)
	Motor Full Load Amps - each (total)	4.1	4.1	2.1	2.1	2.1 (4.2)	2.1 (4.2)	2.1 (4.2)	2.1 (4.2)
Electrical Characteristics	115 volts - 60 hertz - 1 phase								
Shipping Weight 1 package - lbs. (kg)	140 (64)	150 (68)	165 (75)	175 (79)	285 (129)	305 (138)	310 (141)	315 (143)	
<b>OPTIONAL ACCESSORIES - MUST BE ORDERED EXTRA</b>									
Discharge Nozzle	Catalog No. - 30°	94K94	94K94	94K95	94K95	94K96	94K96	94K96	94K96
	Shipping weight lbs. (kg)	29 (13)	29 (13)	29 (13)	29 (13)	40 (18)	40 (18)	40 (18)	40 (18)
	Catalog No. - 45°	94K98	94K98	94K99	94K99	95K00	95K00	95K00	95K00
	Shipping weight lbs. (kg)	35 (16)	35 (16)	35 (16)	35 (16)	48 (22)	48 (22)	48 (22)	48 (22)
	Catalog No. - 60°	16L28	16L28	16L29	16L29	16L30	16L30	16L30	16L30
	Shipping weight lbs. (kg)	35 (16)	35 (16)	35 (16)	35 (16)	48 (22)	48 (22)	48 (22)	48 (22)
	Catalog No. - 90°	15L96	15L96	15L97	15L97	15L98	15L98	15L98	15L98
	Shipping weight lbs. (kg)	68 (31)	68 (31)	68 (31)	68 (31)	89 (40)	89 (40)	89 (40)	89 (40)
<sup>4</sup> High Altitude Pressure Switch Kit		43K58	43K58	43K58	---	---	---	---	---
LPG/Propane Kit		45L85	45L85	45L85	20L07	45L88	45L88	63J57	20L06

<sup>1</sup> 2-1/8 x 4 in. (54 x 102 mm) diameter adaptor is furnished with unit for flue connection.

<sup>2</sup> 2-1/4 x 2-3/4 in. (57 x 70 mm) rectangular to 5 in. (127 mm) round adaptor is furnished with unit for flue connection.

<sup>3</sup> 2-1/4 x 2-3/4 in. (57 x 70 mm) rectangular to 6 in. (152 mm) round adaptor is furnished with unit for flue connection.

<sup>4</sup> Required for proper unit operation at altitudes over 5501 feet (1675 m) above sea level.

### HIGH ALTITUDE DERATE

Unit may be fired at full input up to 2000 feet (610 m) above sea level. Above 2000 feet (610 m), manifold pressure must be adjusted on some units. Adjust pressure regulator to pressure shown in table. If unit is installed at an altitude greater than 7500 ft. (2286 m), unit must be derated by 4 percent for each additional 1000 ft. (305 m) above 7500 ft. (2286 m). In Canada, certification for installation at altitudes over 4500 feet (1372m) above sea level is the jurisdiction of the local authorities.

NOTE - This is the only permissible derate for the units.

Model No.	Feet Meters	Natural Gas Manifold Pressure - in. w.c. (Pa)					LPG/Propane Manifold Pressure - in. w.c. (kPa)				
		2500-3500	3501-4500	4501-5500	5501-6500	6501-7500	2500-3500	3501-4500	4501-5500	5501-6500	6501-7500
		760-1065	1065-1370	1370-1675	1675-1980	1980-2285	760-1065	1065-1370	1370-1675	1675-1980	1980-2285
LF24-100, LF24-125, LF24-150	No adjustment	No adjustment	3.4 (845)	<sup>1</sup> 3.3 (820)	<sup>1</sup> 3.2 (795)	No adjustment	No adjustment	8.7 (2.16)	<sup>1</sup> 8.4 (2.08)	<sup>1</sup> 8.1 (2.01)	
LF24-250	No adjustment	3.4 (845)	3.3 (820)	3.2 (795)	3.1 (770)	No adjustment	8.7 (2.16)	8.4 (2.08)	8.1 (2.01)	7.8 (1.94)	
LF24-300	No adjustment	No adjustment	3.4 (845)	3.3 (820)	3.2 (795)	No adjustment	No adjustment	8.7 (2.16)	8.4 (2.08)	8.1 (2.01)	
LF24-200, LF24-250, LF24-345, LF24-400	No adjustment	3.4 (845)	3.3 (820)	3.2 (795)	3.1 (770)	No adjustment	9.2 (2.28)	8.9 (2.21)	8.6 (2.13)	8.3 (2.06)	

<sup>1</sup> Combustion air inducer pressure switch must be changed out. Order 43K58 pressure switch.

## THROW DATA

Model No.	Air Volume		1 Effective Throw	
	cfm	L/s	feet	Meter
LF24-100, LF24-125	1900	895	60	20
LF24-150, LF24-200	2200	1035	65	20
LF24-250, LF24-300, LF24-345, LF24-400	4400	2075	80	24

NOTE - Adjustable horizontal louvers on unit allow a variation in throw and spread.

<sup>1</sup> Throw terminates where velocity reaches 50 ft. (15 m) per minute.

## INSTALLATION CLEARANCES

Top	6 inches (152 mm)
Sides	6 inches (152 mm)
Rear	18 inches (457 mm)
Bottom	0 inches (0 mm)
Flue	6 inches (152 mm)

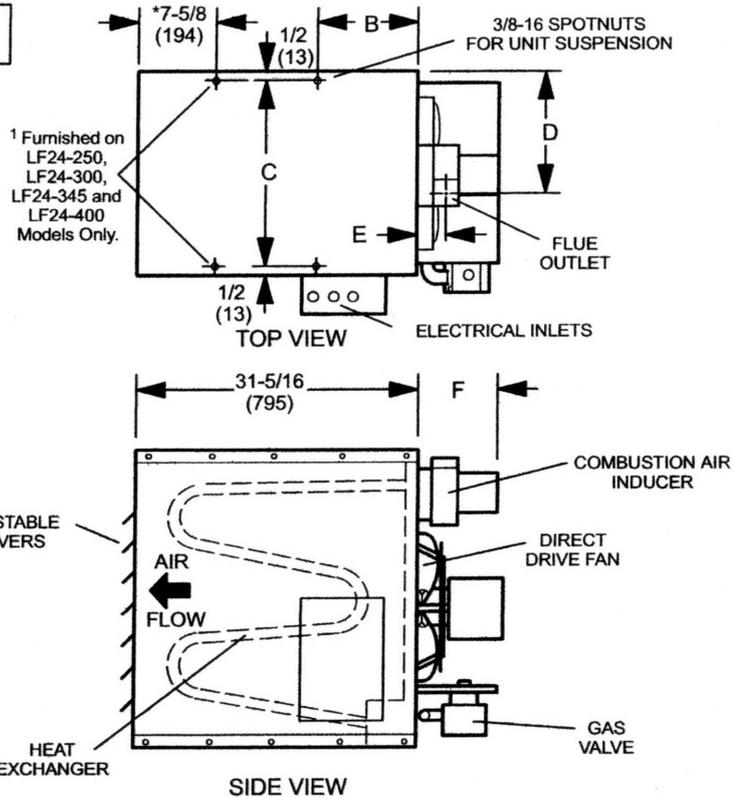
NOTE - Provide adequate clearance for servicing.

See Installation Instructions for further installation considerations.

## DIMENSIONS - INCHES (MM)

NOTE - Single fan model shown, LF24-100/-125/-150 and -200. LF24-250/-300/-345 and -400 have two fans.

<sup>1</sup> NOTE - Two Spotnuts are furnished on LF24-100, LF24-125, LF24-150 and LF24-200 models. - Four spotnuts are furnished on LF24-250, LF24-300, LF24-345 and LF24-400 models.



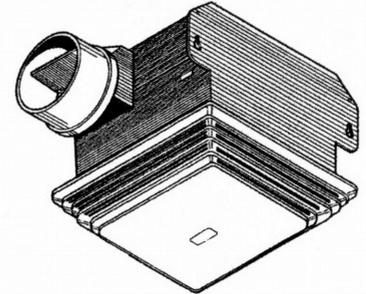
Model No.	A		B		C		D		E		F	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
LF24-100 LF24-125	20-3/16	512	11-1/2	292	19-1/16	484	11-3/4	298	3-1/4	83	7-7/8	200
LF24-150	23-1/8	588	11-1/2	292	22-1/16	560	13-3/4	349	3-1/4	83	7-7/8	200
LF24-200	23-1/8	588	11-1/2	292	22-1/16	560	8-1/2	337	3-1/4	83	8-11/16	220
LF24-250 LF24-300	41	1041	3-11/16	97	40	1016	17-3/4	451	3-1/2	89	8-11/16	220
LF24-345 LF24-400	41	1041	3-11/16	97	40	1016	17-1/2	445	3-1/2	89	9-13/16	248

C&F-1



**SPECIFICATION SHEET**

**MODEL 684  
CEILING/WALL FAN**



**Dependable, high performance bathroom ventilation.**

**FEATURES**

**GRILLE:**

- Attractive grille conceals interior
- Matte white polymeric – blends well with any decor
- Torsion spring grille mounting – no tools required
- White, metal grille kit available (purchase separately)

**BLOWER:**

- Plug-in, permanently lubricated motor
- Centrifugal blower wheel

**HOUSING:**

- Rugged, 26-gage galvanized steel construction
- Sturdy key-holed mounting brackets for quick, accurate installation
- Tapered, polymeric duct fitting with built-in backdraft damper for easy, positive duct connection and no metallic clatter

**Model 2687H & 3687H:** Rough-in housings for 2684F finish assemblies (packed 4 per carton). 3687H housings include slide channels and mounting brackets.

U.L. Listed for use over tubs and showers when connected to a GFCI protected branch circuit

**TYPICAL SPECIFICATION**

Ventilator shall be Broan Model 684.

Unit shall have galvanized steel housing with dual integral mounting brackets. It shall be ducted to a roof or wall cap.

Blower assembly shall be removable and have a centrifugal blower wheel and permanently lubricated motor.

Air delivery shall be no less and sound level no greater than values listed in the "Performance Ratings" charts on this sheet. Air and sound ratings shall be certified by HVI and AMCA licensed.

Unit shall be U.L. Listed for use over bathtubs and showers when connected to a GFCI protected branch circuit.



Broan-NuTone LLC certifies that the models shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.



Broan-NuTone LLC, 926 West State Street, Hartford, WI 53027 (1-800-637-1453)

REFERENCE	QTY.	REMARKS	Project
			Location
			Architect
			Engineer
			Contractor
			Submitted by
			Date

# PERFORMANCE RATINGS - MODEL 684

## AMCA LICENSED PERFORMANCE

Model No.		Static Pressure (in. wg Ps)					Volts	Total Watts	Nominal RPM	Duct Size
		0.0	0.1	.125	.250	.375				
684	CFM	89	89	87	77	59	120	48	1280	4" Round
	Sones	2.7	3.2	3.3	3.6	3.9				

The performance ratings include the effects of inlet grille and backdraft damper in the airstream. Speed (RPM) shown is nominal. Performance is based on actual speed of test. The sound ratings are loudness values in fan sones at 5' (1.5m) in a hemispherical free field calculated per AMCA Std. 301. Values shown are for Installation Type B: Free inlet fan sone levels. Air performance shown is for Installation Type B: Free inlet, Ducted outlet.

## SONES

Model Number	HVI Sones @ 0.1" Ps*	AMCA Sones @ 0.0" Ps*
684	2.5	2.7

\* There is difference between sone values certified by HVI for residential use and by AMCA for commercial/industrial use. Exact comparison of these values is not possible. This difference is mainly due to procedures used to convert measured sound to perceived sound. ANSI S3.4, used by both HVI and AMCA, specifies a procedure for calculating loudness as perceived by a typical listener under specific conditions. HVI establishes values at a distance of 5 feet from the fan in a "spherical free field"; AMCA establishes values at a distance of 5 feet in a "hemispherical free field". HVI and AMCA have different rules for rounding sone values.

## AMPS

MODEL NUMBER	AMPS
684	0.5



Broan-NuTone LLC certifies that the models shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

## HVI PERFORMANCE

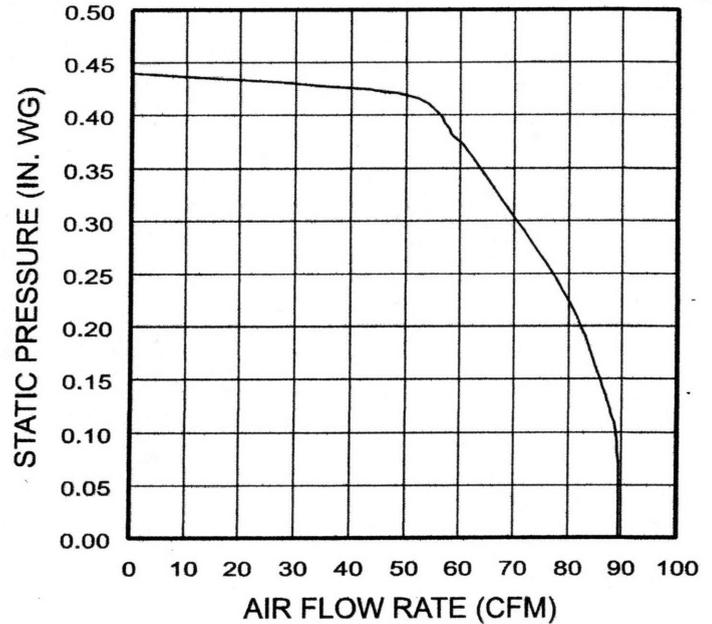
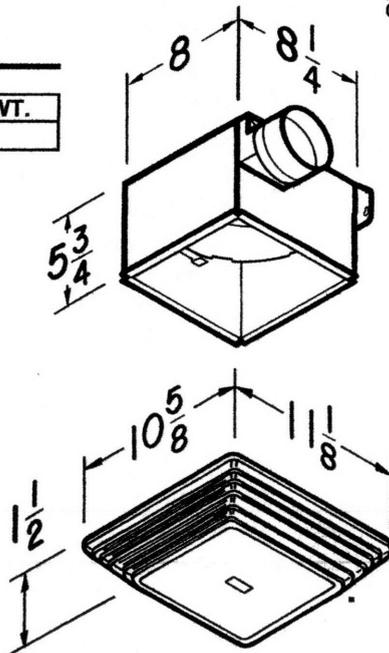
MODEL NUMBER	SONES	CFM @ 0.1" Ps
684	2.5	80



HVI-2100 CERTIFIED RATINGS comply with new testing technologies and procedures prescribed by the Home Ventilating Institute, for off-the-shelf products, as they are available to consumers. Product performance is rated at 0.1 in. static pressure, based on tests conducted in AMCA's state-of-the-art test laboratory. Sones are a measure of humanly-perceived loudness, based on laboratory measurements.

## WEIGHT

MODEL NO.	SHIPPING WT.
684	8.0 lbs.



Broan-NuTone LLC, 926 West State Street, Hartford, WI 53027 (1-800-637-1453)

# GAS PIPE CALCULATIONS

Based on 2010 OMSC Table C402.4(3)

Schedule 40 Metallic Pipe, 2 LB Inlet Pressure

GAS EQUIPMENT	INPUT BTU	DELIVERY PRESSURE
UH-1	100,000	2LB
UH-2	100,000	2LB
UH-3	100,000	2LB
UH-4	100,000	2LB
TOTAL LOAD	400,000	
LONGEST RUN 181'		
<b>GAS PIPE SIZING BASED ON STANDARD PSI DELIVERY AT 200'</b>		
SIZE 1 1/4"	MAX. CAPACITY 1,196,000	