

# Cambridge® S-Series Direct Gas-Fired Blow-Thru® Space Heaters

400 to 3,400 MBH Capacities  
Complete Heater Packages & Options



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# Genuine Cambridge® ... Nothing Else Like It!

Being the best at saving energy, reducing operating costs and improving indoor air quality has made Cambridge Engineering the preferred choice for heating warehouses, manufacturing plants, automobile service areas, aircraft hangars, indoor recreational facilities and other large commercial/industrial buildings. Other manufacturers now describe their heaters as being “Just Like Cambridge®.” Don’t believe it! Only Cambridge offers Blow-Thru® Space Heating Technology that outperforms every other direct gas-fired heater on the market.

## Application

- **Flexible Application** - Cambridge® S-Series Heaters can be used as a perimeter heating system or rotating air system; and as an air-neutralization or air-pressurization system. When properly applied, Cambridge Blow-Thru® Space Heaters will heat the least amount of fresh air required to address the facility’s air infiltration, make-up air and space heating needs.
- **High Induction Ratio** – The high velocity discharge air induces large volumes of room air into the discharge stream, at a ratio exceeding 10:1. This process mixes the high temperature discharge air with room air, providing large volumes of fresh, warm air flowing throughout the building, thus eliminating higher ceiling temperature and uncomfortable drafts.

## Certification

- **Tested and Certified by CSA International** - Cambridge was the first manufacturer certified to the more stringent requirements of ANSI Standard Z83.4/CSA3.7 for non-recirculating air heaters. S-Series Heaters are approved for use in both the U.S. and Canada.
- **ASHRAE 90.1 Compliant** - Properly configured energy efficient Cambridge® Heaters comply with the latest requirements of ASHRAE Standard 90.1. This is a requirement for LEED Certified Green Buildings and a growing number of local, state and federal (DOE) building codes.
- **Safe** – Non-recirculating Cambridge® Heaters have less than 5.0 ppm carbon monoxide and 0.5 ppm nitrogen dioxide at all firing rates. S-Series Heaters use 100% fresh outside air to improve indoor air quality.
- **Max Performance** - Despite misleading claims by our competitors, only Cambridge has a certified heater that will take 0°F inlet air and heat it through a 160°F temperature rise to achieve a max discharge temperature of 160°F. This higher temperature rating is crucial for space heating applications where the cost of energy matters.

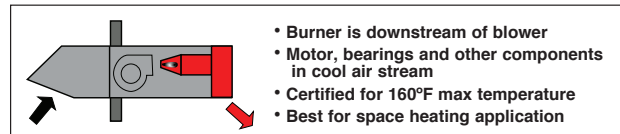
## Proprietary Cambridge Burner

Cambridge designs and manufactures its own proprietary high efficiency, stainless steel burners. You can’t get the high performance and extended life of a Cambridge burner unless you have a Cambridge® Heater.

## Blow-Thru® Space Heater Design

The S-Series Heater uses Blow-Thru® Space Heating Technology, where the proprietary Cambridge burner is located downstream of the blower. This translates into a smaller, more energy efficient design for space heating applications compared to a conventional draw-thru make-up air heater. Cambridge® S-Series Heaters use a lower horsepower motor and, most important of all, use less outside air to heat a building. This is because of its higher btu/cfm ratio and unique certified 160°F maximum rating for both discharge temperature and temperature rise from 0°F.

### Cambridge Blow-Thru® Heater



## Save Energy

High temperature rise, Blow-Thru® Space Heaters are 40% to 70% more energy efficient than all other types of indirect and direct gas-fired systems used to heat/ventilate large commercial and industrial buildings. This has been documented by computer energy modeling and a growing list of over 300 on-site building studies.

Other Industrial Heating Systems	Energy Savings with Cambridge® Space Heaters*
Boilers	40% to 70%
Unit Heaters	30% to 50%
Air Turnover Systems	25% to 70%
Infrared (Radiant)	15% to 40%
Make-Up Air (MUA)	20% to 50%
Recirculation (80/20 - pressurization)	20% to 50%

\* Some building studies show more energy savings than listed above

## Reduce Carbon Footprint

Saving energy means a corresponding reduction in CO<sub>2</sub> emissions to reduce your building’s carbon footprint. Cambridge heaters are recommended for LEED/Green projects.

## Lower Installation Costs

Smaller, lightweight, pre-piped and pre-wired S-Series Heaters are available with five mounting options including the popular thru-wall design for easier installation. Every heater is tested as a fully assembled unit to minimize initial start-up problems.

## Reliability

Genuine Cambridge® Heaters require little maintenance and are built to last. The Blow-Thru® design means the motor and other critical components are located in the cool air stream for extended life. Patented Low Fire Start technology increases reliability and saves energy. The industry’s best warranty package includes 2 years on the heater and 5 years on the stainless Cambridge burner.

## Genuine Cambridge® Specifications

### S-Series Blow-Thru® Space Heater

**General:** The high efficiency, S-Series Direct Gas-Fired Heater shall be manufactured, assembled and factory tested to assure proper alignment of assemblies and performance of controls and other components. Each heater must be design certified by CSA International to be in compliance with ANSI Standard Z83.4 • CSA 3.7 for Non-Recirculating Direct Gas-Fired Industrial Air Heaters and be labeled ASHRAE 90.1 compliant. **Each heater shall be capable of achieving a 160°F temperature rise with a discharge temperature of 160°F at 0°F outdoor temperature in accordance with the terms of the certification.** The standard heater mounting package, including all specified components, shall be  thru wall  roof top  under roof  outdoor vertical  indoor vertical.

**Construction:** Each **Blow-Thru®** space heater shall be constructed with the **burner section located at the blower discharge**, isolating the blower, motor, drive and control components from operationally detrimental high temperatures. The construction of each heater shall be built around a structurally reinforced, unitized housing and base made of G90 galvanized steel and shall be painted with a gray polyester powder paint finish. **Indoor mounted heaters** are to have a fully insulated cabinet with 1" thick, 1½ lb. density NFPA 90A thermal and acoustical insulation (mechanically fastened). The base of indoor heaters shall be fully, internally insulated with ½" thick, non-water absorbing, closed cell insulation. **Outdoor mounted heaters** shall have watertight access panels to the blower, motor and drive, and gas train. The control enclosure shall be directly accessible from the exterior of the heater and shall be watertight with a full length, continuous stainless steel hinge and full perimeter gasket seal.

**Blower:** The blower shall be constructed with a discharge transition duct which is approximately 2½ wheel diameters in length to provide maximum regain of static pressure and uniform discharge air temperature. The blower shall be a double width double inlet (DWDI), forward-curved centrifugal fan with a painted housing. The fan wheel shall be statically and dynamically balanced. [The fan bearings on Series S400, S800, S950, S1200 (with 3 HP motors) heaters shall have permanently lubricated self-aligning sealed ball bearings, resiliently mounted for sound and vibration attenuation.] [The fan bearings on Series S1200 (with 5 HP motors), S1600, S1850, S2200, and S3200 heaters shall have self-aligning, sealed ball bearings with grease fittings.] Fan bearings are to be located out of the heated air stream. Fan speed shall be at least 25% below the first critical speed for the shaft. The shaft shall be coated with a rust inhibitor. Bearing slingers shall be provided to minimize airborne moisture access to the fan bearings.

**Motor/Drive:** The motor shall be a \_\_\_\_ HP, ball bearing type, open drip-proof construction, designed for continuous duty at \_\_\_\_ volt \_\_\_\_ phase 60 Hz, and shall have a 1.15 service factor. The motor bearings shall be located out of the heated air stream. The motor mount is to be on an adjustable sliding base. The fan drive shall be a heavy duty V-belt drive designed for a 1.5 minimum service factor based on motor horsepower.

**Burner:** The direct gas-fired burner shall be suitable for  natural gas  propane air. Consult factory for  LP gas. The burner shall have stainless steel burner plates with non-clogging orifices. The burner shall produce less than 5 PPM (parts per million) carbon monoxide and 0.5 PPM nitrogen dioxide over its entire firing range. **The burner shall be warranted for five years.** The burner shall be furnished with a low voltage/hot surface ignition system and stainless steel flame rod.

**Gas Controls:** The temperature control system shall be EDL (Electronic Discharge Local) for all heaters. The EDL temperature control utilizes the Maxitrol Series 14 modulation controls. A gas valve leak test switch shall be provided to permit field verification of the gas tightness of the valve seats for heaters over 400,000 BTU/hr. A high gas pressure switch is required in applications where the gas supply pressure to the heater exceeds 14" WC.

**Controls:** The heater shall be furnished with factory mounted controls to include low temperature cutout, entering air thermostat, pre-purge timer, patented low fire start control, service switches for blower and burner operation at the heater, non-fused disconnect switch, IEC motor starter with single phase overload protection, redundant gas valves, pressure regulator, electronic temperature controls and a low voltage, class 2 transformer for remote control wiring.

**WARNING - DO NOT ATTEMPT TO SUBSTITUTE** any direct gas-fired heater incapable of achieving 160°F temperature rise with a discharge temperature of 160°F at 0°F outdoor. The technologies are different. Ability to heat the building will be jeopardized and energy costs will increase.

# Factory Design Assistance

Take advantage of our 45+ years experience calculating heat loads and let us help design the most effective and energy efficient heating system for your building. Our proprietary Cal-Q-Heat® Program has become an industry standard for heat load calculations associated with warehouses, distribution centers, manufacturing plants, aircraft hangars, indoor recreational facilities, automobile service areas and other large commercial/industrial buildings.

### Fill out the Cal-Q-Heat® form

- Contact your local Cambridge Sales Representative to obtain a Cal-Q-Heat® input data form. It will include a list of the required building parameters and operating conditions needed to provide a heat loss calculation. The minimum information required is shown at the right.
- The Cal-Q-Heat® form can also be downloaded from our website, filled out and faxed or emailed to Cambridge or your local representative.
- Remember, the heat load and heater design are only as good as the accuracy of the information provided.

### Cambridge provides the following:

- Fast turnaround for heat loads and heater design information to meet your specific requirements.
- System design to include the number, size and location of Cambridge Blow-Thru® Space Heaters that will result in the most effective and energy efficient heating system for the building.
- Heater cut sheets in CAD format can be provided on request.

### CAUTION:

All information provided by Cambridge is based on the use of energy efficient, Genuine Cambridge® direct gas-fired space heating equipment capable of achieving 160°F temperature rise with a discharge temperature of 160°F at 0°F outdoor.

DO NOT ATTEMPT TO SUBSTITUTE any other type of indirect or direct gas-fired heating equipment. The technologies are different. The ability to heat a building will be jeopardized and energy costs will increase.

## CAL-Q-HEAT® INFORMATION

**Job Name:** \_\_\_\_\_

**Job Location:** \_\_\_\_\_

### Design Temperatures

Indoor: \_\_\_\_\_°F Outdoor: \_\_\_\_\_°F

### Building Dimensions:

\_\_\_\_\_ ft. W x \_\_\_\_\_ ft. L x \_\_\_\_\_ ft. H

### Insulation

Roof R-value: \_\_\_\_\_ Walls R-value: \_\_\_\_\_

### Gas Supply

Natural Gas  Propane

### Exhaust

\_\_\_\_\_cfm

Intermittent

Continuous

### Doors

Qty: \_\_\_\_\_ Size: \_\_\_\_\_ft. W \_\_\_\_\_ft. H  Seals

Qty: \_\_\_\_\_ Size: \_\_\_\_\_ft. W \_\_\_\_\_ft. H  Seals

### LEED Project

Provide building sketch with location of doors.

# Selection Criteria

Series	Heater Discharge Height <sup>1</sup> (ft.)						
	1 HP	2 HP	3 HP	5 HP	7 1/2 HP	10 HP	15 HP
<b>S400</b>	10 - 15	15 - 25					
<b>S800</b>		15 - 25	15 - 25				
<b>S950</b>		15 - 25	15 - 25				
<b>S1200</b>		15 - 20	15 - 20	20 - 30			
<b>S1600</b>				20 - 30			
<b>S1850</b>				20 - 30	25 - 35		
<b>S2200</b>					20 - 30	25 - 35	30 - 40
<b>S3200</b>						25 - 35	30 - 40

**NOTE:** Consider accessibility and safety when selecting discharge height and mounting options.

<sup>1</sup>Typical Distance from bottom of discharge to finished floor. Consult factory for specific applications.

**Typical Capacity Selection**  
For Standard Mounting Packages<sup>3</sup> at sea level

Series	Motor HP	Units without Filter Sections						Units with Filter Sections <sup>2</sup>					
		160 °F Rise <sup>4</sup>			140 °F Rise <sup>4</sup>			160 °F Rise <sup>4</sup>			140 °F Rise <sup>4</sup>		
		Input MBH <sup>5</sup>	Inlet cfm	TESP <sup>1</sup> "WC	Input MBH <sup>5</sup>	Inlet cfm	TESP <sup>1</sup> "WC	Input MBH <sup>5</sup>	Inlet cfm	TESP <sup>1</sup> "WC	Input MBH <sup>5</sup>	Inlet cfm	TESP <sup>1</sup> "WC
<b>S400</b>	1	400	1,850	.13	400	2,210	.16	400	1,850	.25	400	2,210	.30
<b>S800</b>	3	757	3,500	.39	634	3,500	.39	735	3,400	.72	616	3,400	.72
<b>S950</b>	2	950	4,400	.22	950	5,250	.27	950	4,400	.31	900	4,970	.34
	3										950	5,250	.39
<b>S1200</b>	3	1200	5,555	.26	1064	5,875	.30	1200	5,555	.44	1023	5,650	.45
	5				1200	6,625	.42				1200	6,625	.75
<b>S1600</b>	5	1499	6,940	.50	1257	6,940	.50	1458	6,750	.75	1223	6,750	.75
<b>S1850</b>	5	1850	8,565	.19	1773	9,790	.23	1850	8,565	.25	1757	9,700	.30
	7½				1850	10,215	.24				1850	10,215	.31
<b>S2200</b>	7½	2200	10,185	.21	2065	11,400	.26	2200	10,185	.32	2028	11,200	.40
	10				2200	12,145	.31				2200	12,145	.48
<b>S3200</b>	10	2718	12,585	.36	2279	12,585	.36	2678	12,400	.48	2246	12,400	.48
	15	3107	14,380	.54	2604	14,380	.54	3046	14,100	.84	2554	14,100	.84

<sup>1</sup>Total External Static Pressure (TESP) is the total of all airflow resistances (in inches WC) from Mounting Package components. Any other system air flow resistances such as ductwork should be added to the above TESP figures.

<sup>2</sup>Pressure losses given for air filters in clean condition.

<sup>3</sup>For Indoor Vertical Mounting Package ratings, consult factory.

<sup>4</sup>The MBH and cfm ratings are based upon a discharge temperature of 160°F.

<sup>5</sup>Heater Input Capacity:  $Btu/hr = cfm \times \rho \times c_p \times 60 \times \Delta T \div 0.92$

Where: **cfm** is the inlet air volume of the blower  
**ρ** is the density<sup>6</sup> of the air handled by the blower (lb/ft<sup>3</sup>)  
**c<sub>p</sub>** is the specific heat of the air (0.240 Btu/lb °F)  
**60** is the conversion from minutes to hours  
**ΔT** is the temperature rise (160°F Max.)  
**0.92** is the conversion from sensible to total heat (output to input)

<sup>6</sup>Density is calculated from the following formula:  $\rho = 1.32605 \times (\text{barometric pressure} \div ^\circ R)$

Where: barometric pressure is in terms of inches of mercury ("Hg) and °R = (460 + T<sub>inlet</sub> °F)

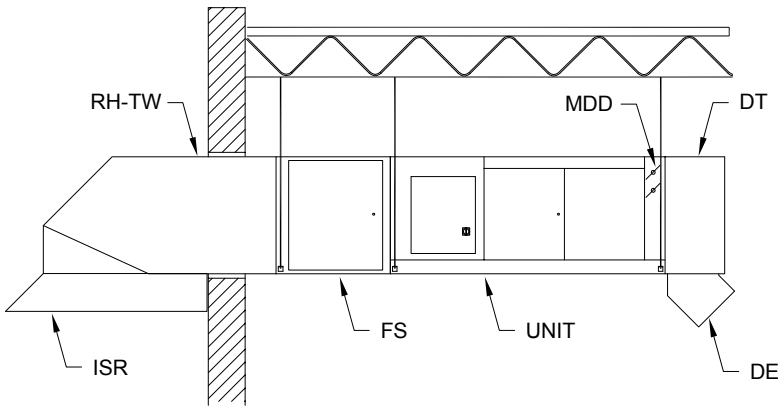
Series	Gas Inlet Size	Supply Pressure <sup>8</sup> Capacities - Natural Gas <sup>9</sup> (MBH)									
		6"WC	7"WC	8"WC	9"WC	10"WC	11"WC	12"WC	13"WC	14"WC	
<b>S400</b>	¾"	390	400								
<b>S800</b>	1"	485	535	585	630	665	705	745	780	800	
<b>S950</b>	1"	740	810	890	950						
<b>S1200</b>	1¼"	900	990	1060	1190	1200					
<b>S1600</b>	1½"	990	1100	1230	1310	1400	1480	1550	1600		
<b>S1850</b>	1½"	1380	1540	1720	1830	1850					
<b>S2200</b>	1½"	1500	1660	1830	2020	2200					
<b>S3200</b>	1½" <sup>7</sup>	1660	1960	2200	2420	2600	2800	3000	3140	3200	

<sup>7</sup>On S3200 heaters with Gas Supply Pressure below 1 psi or over 5 psi with a high pressure regulator, the inlet pipe size is increased to 2".

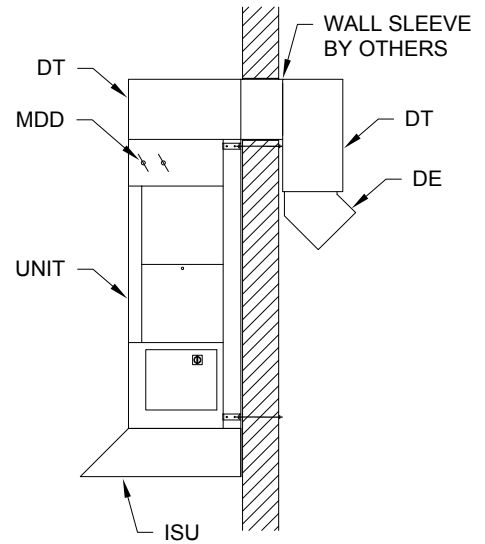
<sup>8</sup>Positive shut-off pressure regulators are required when gas supply pressure exceeds 14" WC for Series S400; 1 psi for Series S800, S950 and S1200; 2 psi for Series S1600; and 5 psi for Series S1850, S2200 and S3200.

<sup>9</sup>Consult factory for LP gas requirements.

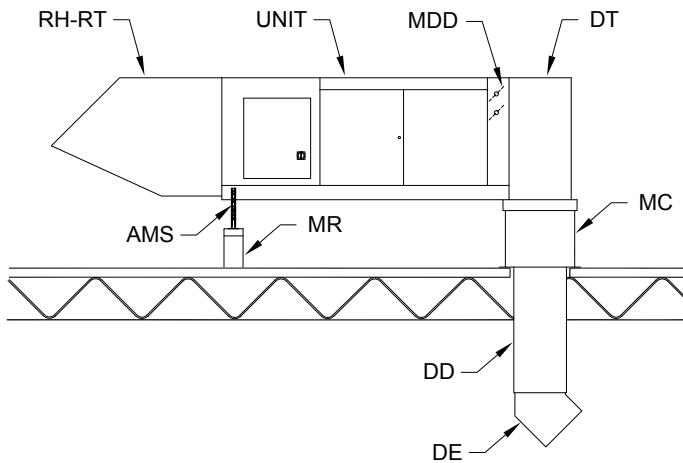
## Thru Wall (TW)



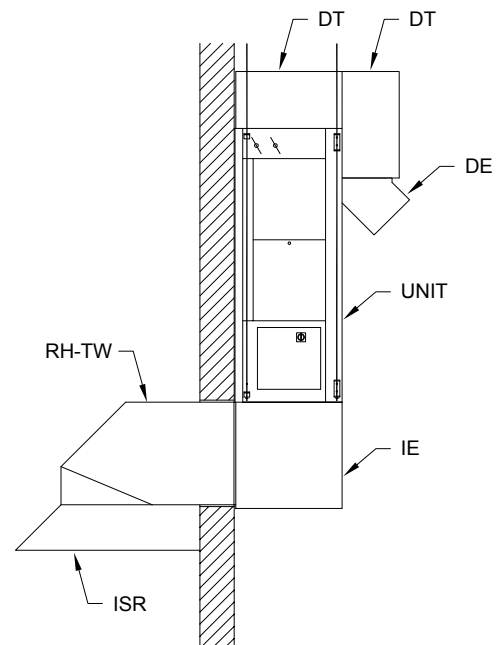
## Outdoor Vertical



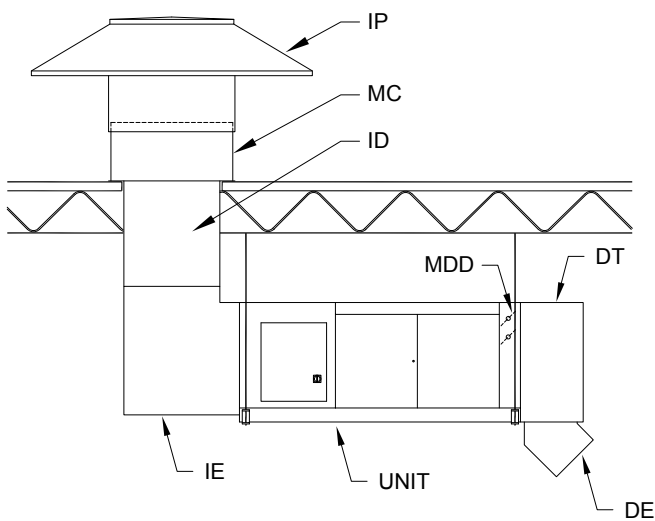
## Roof Top (RT)



## Indoor Vertical



## Under Roof

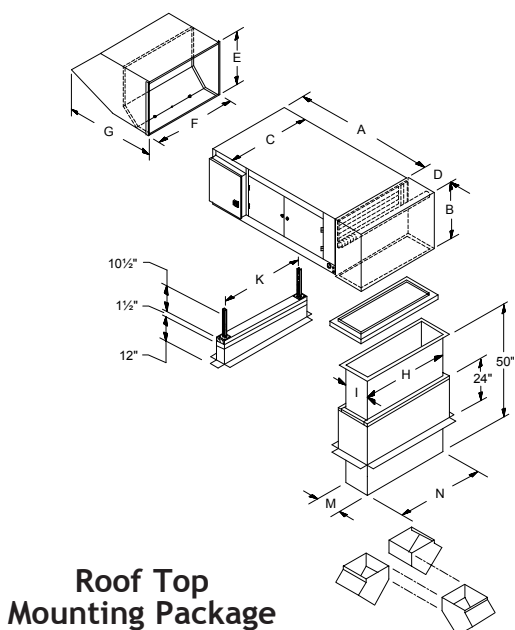
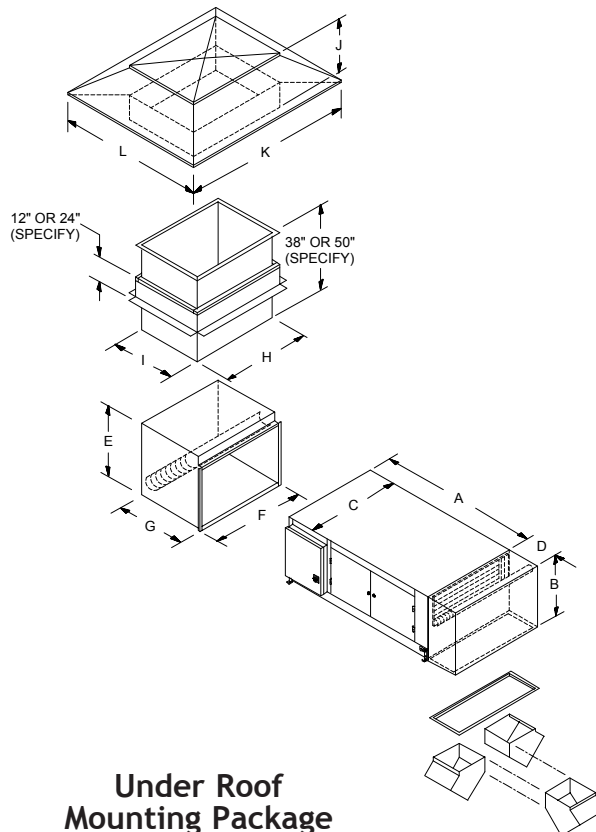
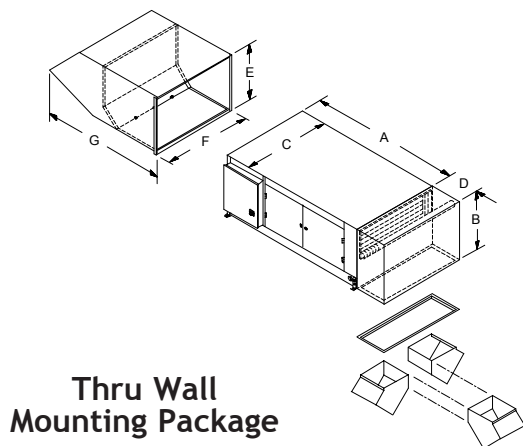


<b>DD</b>	<b>Discharge Duct:</b> The 50" discharge duct for roof top mounting package extends through the mounting curb.
<b>DE</b>	<b>Directional Elbows<sup>1</sup>:</b> Used to optimize heat distribution by directing air to meet the requirements of specific field applications. Field mounting is required.
<b>DISC</b>	<b>Non-Fused Disconnect<sup>1</sup>:</b> Service Switch for main power to the heater. Interlocked with the door of the electrical control enclosure.
<b>DT</b>	<b>Downturn<sup>1</sup>:</b> A 90° elbow with turning vanes. Thermal/acoustical insulation is factory installed.
<b>EAT</b>	<b>Entering Air Thermostat<sup>1</sup>:</b> The EAT automatically turns off the burner when the outdoor temperature approaches the EAT setpoint temperature (45°F to 70°F) while maintaining blower operation for ventilation.
<b>EDL</b>	<b>Electronic Discharge Local Gas Trains<sup>1</sup>:</b> An electronic discharge air temperature control which utilizes a discharge temperature sensor in conjunction with an electronic proportioning gas valve for maintaining the selected discharge air temperature. This control will permit manual adjustment of the discharge air temperature from 110°F to 160°F via the selector on the amplifier located in the heater's electrical control enclosure. (Field mounted external to vertical units except S400.)
<b>IE</b>	<b>Inlet Elbow:</b> Equipped with turning vanes, is used in conjunction with the under roof and the indoor vertical mounting option. Internally insulated bottom with non-water absorbing, closed cell insulation.
<b>IPP</b>	<b>Inlet Plenum Package<sup>2</sup>:</b> Used for the under roof mounting package, which consists of the inlet plenum, insulated 12" or 24" IPP mounting curb, and insulated inlet duct, 38" or 50" long. Filters are optional. Cant by others.
<b>ISR</b>	<b>Inlet Skirt - Rain Hood:</b> Used on the thru wall mounting package in conjunction with the thru wall rain hood. The accessory is recommended for applications subject to snow conditions. Field assembly is required.
<b>ISU</b>	<b>Inlet Skirt - Unit:</b> Required for outdoor vertical mounting package. Field assembly is required.
<b>LFS</b>	<b>Low Fire Start<sup>1</sup>:</b> The LFS function limits the initial heater firing for the first fifteen seconds of a heating cycle.
<b>LTC</b>	<b>Low Temperature Cutout with Alarm<sup>1</sup>:</b> The LTC alarm circuit functions to shut down the blower in approximately four (4) minutes if either of the following occurs: (1) The inlet temperature drops below the LTC setpoint (40, 45, 50 or 55°F) in the Ventilation mode; or (2) The gas valve fails to remain energized during a heating cycle.
<b>MB</b>	<b>Mounting Brackets<sup>1</sup>:</b> Provided on the vertical and horizontal heaters for installation from hanging rods.
<b>MC</b>	<b>Mounting Curb:</b> The insulated 24" mounting curb supports the discharge end of the unit and mates to the downturn. This mounting curb is designed for conventional, flat roof applications. Counter flashing is included. A cant, if required, is provided by others.
<b>MDD</b>	<b>Motorized Discharge Damper<sup>1</sup>:</b> An internally mounted two-position damper assembly that closes when the blower is not operating. Factory installed.
<b>MR/AMS</b>	<b>Mounting Rail/Mounting Stand:</b> An adjustable mounting stand (6 <sup>3</sup> / <sub>4</sub> " to 14 <sup>1</sup> / <sub>4</sub> ") is used in conjunction with the mounting rail as the rear heater support on the roof top mounting package. The rail provides a roof interface for both rubber and built-up roof decks. A counter flashing is provided. A cant, if required, is provided by others. An additional mounting stand and mounting rail is required when a filter section is specified. A 1 <sup>1</sup> / <sub>2</sub> " thick piece of pressure treated wood is required (not provided) for the base of the stand to rest on to meet the overall height of 24".
<b>PT</b>	<b>Pre-Purge Timer<sup>1</sup>:</b> The PT function provides a minimum of four air changes in the heater housing and any attached inlet accessories or field installed ductwork prior to an ignition attempt. The time is selectable at 2, 4, 8, 16, or 32 seconds.
<b>RCS-S</b>	<b>Remote Control Station-Security<sup>1</sup>:</b> The RCS-S is a lockable NEMA 1 enclosure (9"w x 14"h x 5"d) equipped with a three position keylock selector switch (Summer Ventilation - Off - Heating), an operating electronic thermostat (OET), and indicating lights for blower operation (green), burner operation (red), and reset (amber).
<b>RH-RT</b>	<b>Rain Hood - Roof Top<sup>2</sup>:</b> For the roof top mounting package; provided with an expanded metal inlet screen.
<b>RH-TW</b>	<b>Rain Hood - Thru Wall<sup>2</sup>:</b> For thru wall mounting package; provided with an expanded metal inlet screen. The thru wall rain hood length includes an integral insulated collar to accommodate up to 21" thick walls.
<b>SS</b>	<b>Service Switches<sup>1</sup>:</b> Located in the heater to allow local control by Service Technician when servicing the heater.

<sup>1</sup> Included with all Standard Mounting Packages shown on page 6.

<sup>2</sup> If one of the noted inlet accessories is not ordered, an inlet screen will be provided.

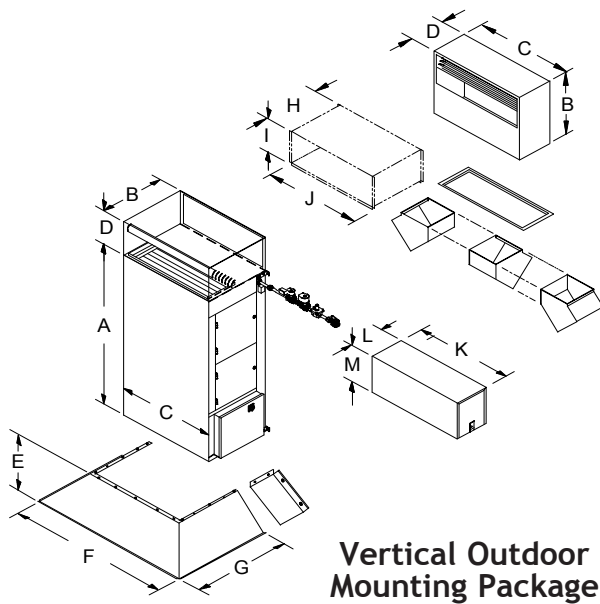
# Unit Weights and Dimensions



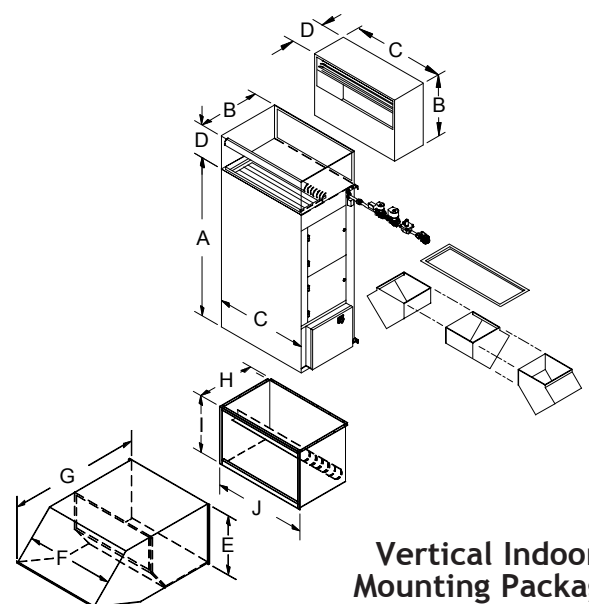
Mounting Package	Series	Dimensions														Weight (lbs.)
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	
Thru Wall	S400/800	60"	25½"	25½"	13"	24"	23½"	57¾"								550
	S950/1200/1600	72"	28"	42"	15"	27"	40¼"	60"								800
	S1850/2200/3200	80"	37½"	47"	24¾"	36¾"	45¼"	72"								1500
Roof Top	S400/800	60"	25½"	25½"	13"	24"	23½"	36¾"	22¼"	11"		25½"		11"	22¼"	600
	S950	72"	28"	42"	15"	27"	40¼"	39"	39½"	13"		42"		11"	33⅜"	900
	S1200/1600	72"	28"	42"	15"	27"	40¼"	39"	39½"	13"		42"		13"	39½"	900
	S1850	80"	37½"	47"	24¾"	36¾"	45¼"	51"	44¾"	22¼"		47"		22¼"	33⅜"	1650
	S2200/3200	80"	37½"	47"	24¾"	36¾"	45¼"	51"	44¾"	22¼"		47"		22¼"	44¾"	1650
Under Roof	S400/800	60"	25½"	25½"	13"	27½"	23¼"	26½"	23"	23"	24"	60"	60"			750
	S950/1200/1600	72"	28"	42"	15"	30¼"	39½"	31¼"	39½"	28"	24"	76¼"	65½"			1150
	S1850/2200/3200	80"	37½"	47"	24¾"	40"	45¼"	38½"	45"	35½"	32"	90"	80½"			1900



## Unit Weights and Dimensions



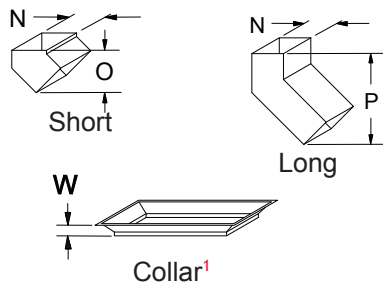
**Vertical Outdoor Mounting Package**



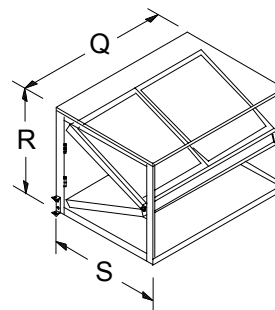
**Vertical Indoor Mounting Package**

Mounting Package	Series	Dimensions													Weight (lbs.)
		A	B	C	D	E	F	G	H	I	J	K	L	M	
Vertical Outdoor	S400/800	60"	25½"	25½"	13"	12"	49½"	37¾"	(A)	11"	22¼"	34"	14"	16"	500
	S950/1200/1600	72"	28"	42"	15"	12"	66"	40"	(A)	13"	39½"	34"	14"	16"	750
	S1850/2200	80"	37½"	47"	24¾"	12"	71"	49"	(A)	22¼"	44¾"	34"	14"	16"	1500
	S3200	80"	37½"	47"	24¾"	12"	71"	49"	(A)	22¼"	44¾"	42"	18"	26"	1500
Vertical Indoor	S400/800	60"	25½"	25½"	13"	24"	23½"	57¾"	25½"	25½"	25½"				650
	S950/1200/1600	72"	28"	42"	15"	27"	40¼"	60"	28"	28"	42"				950
	S1850/2200/3200	80"	37½"	47"	24¾"	36¾"	45¼"	72"	37½"	37½"	47"				1750

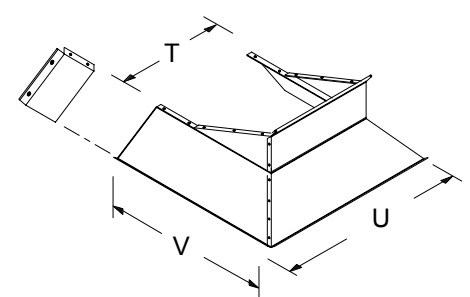
A = To be determined at installation



**Directional Elbows**



**Filter Section (optional)**

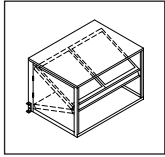


**Inlet Skirt for Rain Hood (optional)**

Series	Directional Elbows						Filter Section				Inlet Skirt for Rain Hood			
	Dimensions				Quantity		Dimensions			Weight (lbs.)	Dimensions			Weight (lbs.)
	N	O	P	W <sup>1</sup>	Short	Long	Q	R	S		T	U	V	
S400/800	11¼"	13¾"			2		25½"	25½"	33"	67	23½"	47½"	46½"	39
S950	11¼"	13¾"		3"	3		42"	28"	33"	90	40¼"	64¼"	49¾"	42
S1200/1600	13¼"	15"			3		42"	28"	33"	90	40¼"	64¼"	49¾"	42
S1850	11¼"	13¾"	21½"	5"	3	3	47"	37½"	35½"	130	45¼"	69¼"	60¾"	50
S2200/3200	11¼"	13¾"	21½"		4	4	47"	37½"	35½"	130	45¼"	69¼"	60¾"	50

<sup>1</sup>Does not apply to Roof Top applications

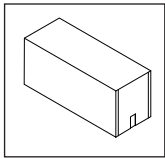
## S-Series Selection



### Filter Section (FS)

The FS is an in-line, V-bank filter section with 2" Permanent or Throw-away filters. The Filter Section is attached directly to the inlet end of the heater, with any additional inlet accessories attached directly to the inlet end of filter section. Each S-Series heater has the following number of filters in each filter section:

Series	Quantity	Dimensions
<b>S400/S800</b>	2	20" x 25" x 2"
<b>S950/S1200/S1600</b>	4	20" x 25" x 2"
<b>S1850/S2200/S3200</b>	12	16" x 25" x 2"

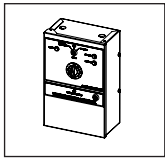


### Gas Train Enclosure (GTE)

The GTE is provided on all outdoor applications which require external mounting of gas train components. The following applications normally require this accessory:

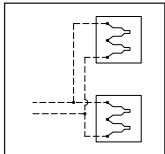
- All vertical units over 400 MBH
- FM applications with filter sections or without a discharge damper

## Electrical Control Options



### Temperature Setback System (TSS)

The TSS is a lockable NEMA 1 enclosure (9"w x 14"h x 5"d) equipped with a three position keylock selector switch (Summer Ventilation - Off - Heating), a combination operating electronic thermostat and seven day programmable time clock, an override timer and indicating lights for blower operation (green), burner operation (red) and reset (amber). The TSS accommodates separate programming for summer ventilation and heating modes. An auto-tuning, optimum start algorithm is available to maximize energy savings.



### Temperature Averaging System (TAS-2)

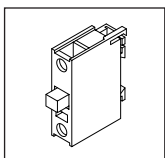
The TAS-2 option is used in conjunction with the OET or TSS to average the space temperature between two points within a facility. It consists of four thermistors which are wired in a series parallel combination in order to simulate a single thermistor response.

### Fused Disconnect Switch (FDS)

The FDS provides for line fusing of power supply voltage.

### Exhaust Fan Interlock (EFI)

Terminals are provided for wiring of EFI contacts provided by others. Typically used when the heater will be a slave to an exhaust fan.



### Exhaust Fan Contact (EFC)

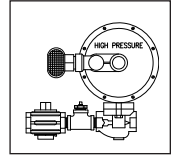
The EFC is an auxiliary dry contact mechanically interlocked to the operation of the motor starter of the heater. The dry contact is typically wired into an exhaust fan control circuit to activate an exhaust fan.

### Fire Protection Interlock (FPI)

Terminals are provided for wiring of FPI contacts provided by others. Typically used when the heater is required to be disabled by the fire protection system.

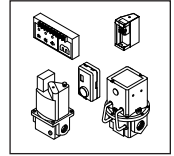
### High Pressure Regulator (HPR)

A positive shut-off high pressure regulator is required when the gas supply pressure exceeds the maximum gas pressure requirements or is specified by local codes or utilities. It is sized according to the gas supply pressure and the capacity requirements of the heater. It must be vented to the outdoors. (Specify gas supply pressure.)



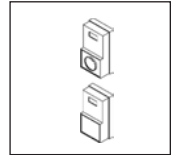
### Electronic Discharge Space Modulation (EDSM)

The EDSM temperature control utilizes the Maxitrol Series 44 modulation controls to maintain a constant space temperature (adjustable from 40° to 80°F). Discharge temperature modulates between the minimum (adjustable from 40° to 80°F) and maximum (adjustable from 80° to 160°F) setpoints on the amplifier. Includes an adjustable space temperature control and sensor.



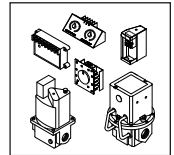
### Electronic Discharge Space Modulation / Tamper Proof (EDSM/TP)

The EDSM/TP temperature control is similar to the EDSM temperature control system above except the adjustable space temperature control is mounted in the Remote Control Station and the non-adjustable sensor is mounted in the space.



### Electronic Discharge Remote (EDR)

The EDR temperature control utilizes the Maxitrol Series 14 modulation controls to maintain the pre-selected discharge temperature that is set on the Remote Heat Adjust control which is mounted in either the Remote Control Station or the heater's Electrical Control Enclosure.



### Insurance Controls

Controls and gas train to comply with the requirements of Factory Mutual (FM) and/or Industrial Risk Insurers (IRI). Specify heater input and insurer for proper selection of insurance controls.

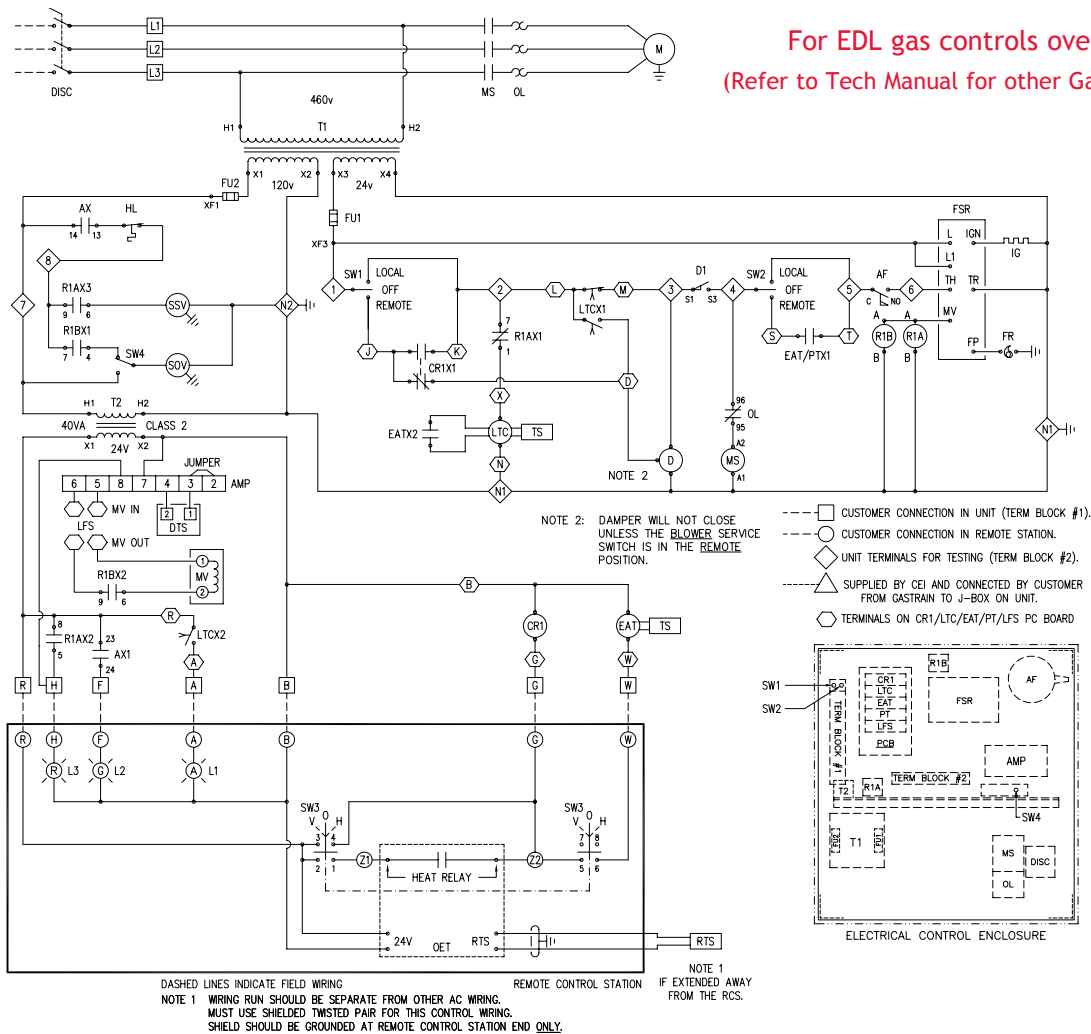
## Summary of Limited Warranty

Cambridge Engineering, Inc. warrants all S-Series products, including all components and sub-components thereof, to be free from defects in material and workmanship for a period of **twenty-four (24) months** from date of shipment, with the exception of the burner which is warranted for **five (5) years**, provided the product is properly installed and operated under normal conditions in accordance with the Cambridge Technical Manual and any other applicable instructions and in conformance with national and local codes.

*For complete warranty, see Standard Terms and Conditions  
in the product catalog or the Technical Manual.*

# Wiring Diagram

For EDL gas controls over 400 MBH only  
(Refer to Tech Manual for other Gas Control Wiring)



Symbol	Description
AF	Air Flow Switch
AMP	Amplifier Solid State
AX	Auxiliary Contact
AX1	Auxiliary Contact
CR1	Control Relay
D & D1	Damper Motor & End Switch
DISC	Service Disconnect Non - Fused
DTS	Discharge Temperature Sensor
EAT	Entering Air Thermostat
FR	Flame Rod
FSR	Flame Safeguard Relay (HSI)
FU1	Fuse 24 Volt Control

Symbol	Description
FU2	Fuse 120 Volt Control
HL	High Limit
IG	Igniter
L1	Light - Alarm
L2	Light - Fan
L3	Light - Heat
LFS	Low Fire Start
LTC	Low Temperature Cutout
M	Motor
MS	Motor Starter
MV	Modulating Valve
OET	Operating Electronic Thermostat

Symbol	Description
OL	Overload Relay
RTS	Remote Temperature Sensor
R1A&B	Relay Gas Valve
SOV	Shut-Off Valve - Gas
SSV	Safety Shut-Off Valve - Gas
SW1	Service Switch - Fan
SW2	Service Switch - Heat
SW3	Switch - Fan/Off/Heat
SW4	Switch - SOV Leak Test
T1	Transformer (24 & 120 Volt)
T2	Class 2 Transformer (24 Volt)
TS	Temperature Sensor (LTC/EAT)

Motor Size	Heater Amperage Requirements						
	120V/1Ph	208V/1Ph	230V/1Ph	208V/3Ph	230V/3Ph	460V/3Ph	575V/3Ph
1HP	18.6	9.8	9.3	6.0	5.5	2.8	2.2
2HP	26.6	14.6	13.3	8.9	8.1	4.1	3.2
3HP	36.6	20.1	18.3	12.0	10.9	5.5	4.4
5HP		32.2	29.3	18.1	16.5	8.3	6.6
7½HP				25.6	23.3	11.7	9.5
10HP				32.2	29.3	14.7	11.5
15HP				47.6	43.3	21.7	17.5