



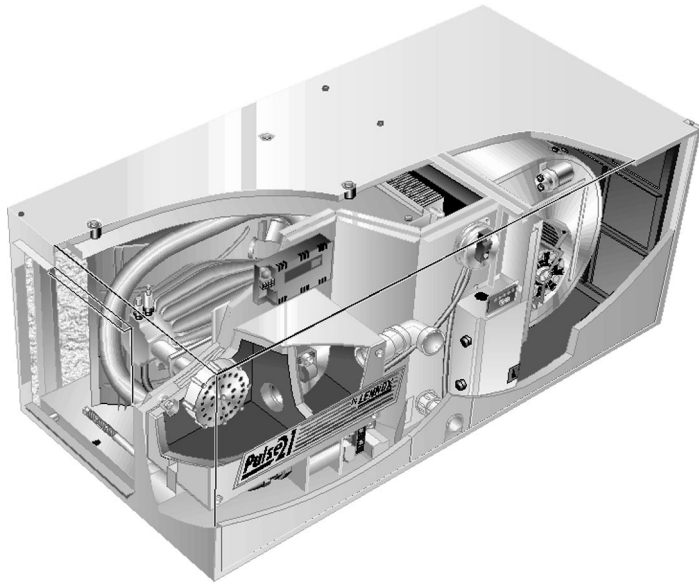
GSR21Q "PULSE21"® SERIES HORIZONTAL/DOWN-FLO GAS FURNACES HORIZONTAL UNIT HEATERS

GSR21Q

Bulletin #490054

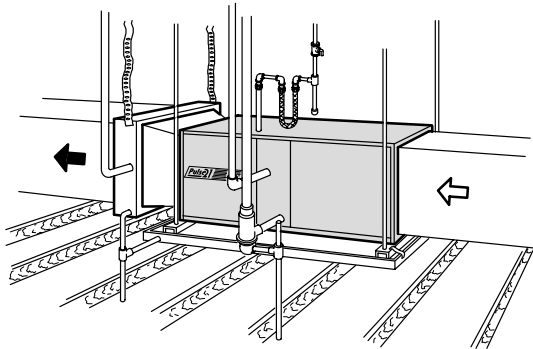
March 1993

14.1 to 27.0 kW (48 000 to 92 000 Btuh) Output
Add-On Cooling 5 to 18 kW (1-1/2 thru 5 Nominal Tons)

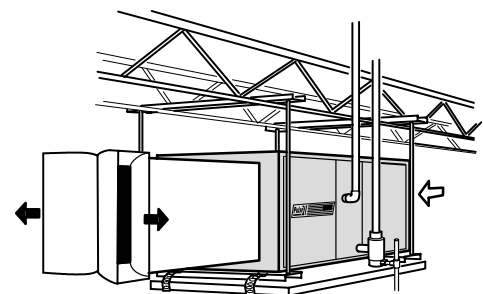


DOWN-FLO
POSITION

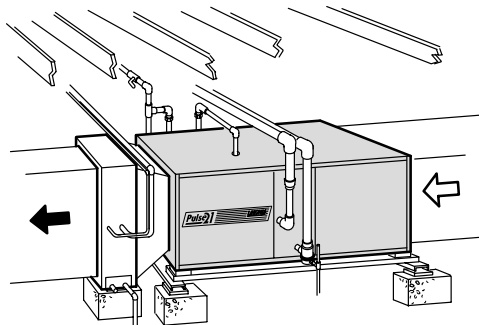
Typical Applications



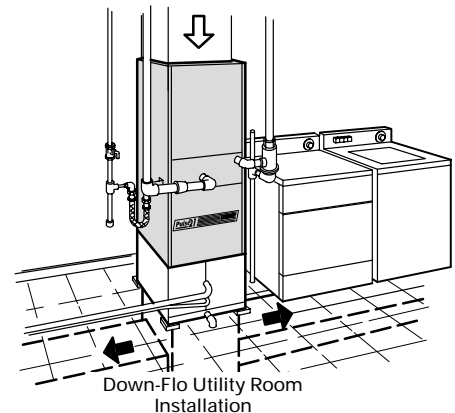
Horizontal Attic Installation



Suspended Horizontal Unit Heater Installation



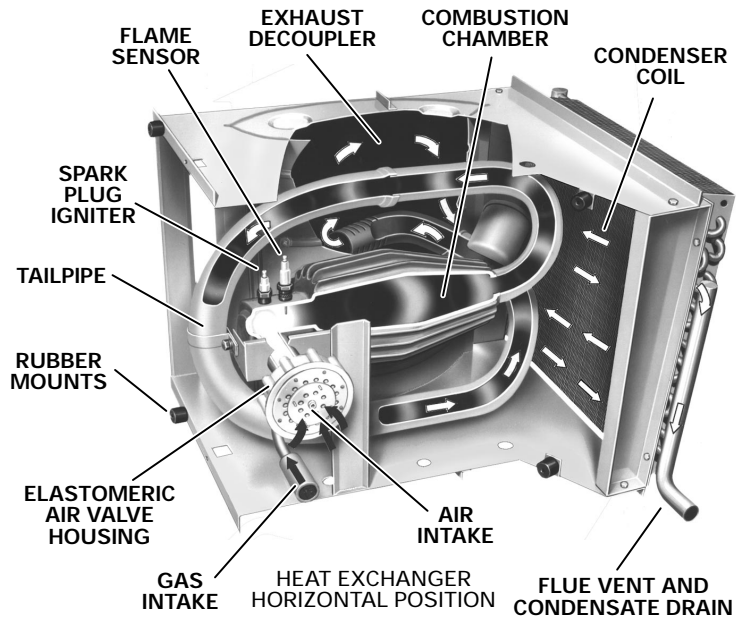
Horizontal Crawlspace Installation



Down-Flo Utility Room
Installation

PROCESS OF COMBUSTION

The process of combustion begins as gas and air are introduced into the sealed combustion chamber with the spark plug igniter. Spark from the plug ignites the gas/air mixture, which in turn causes a positive pressure buildup that closes the gas and air inlets. This pressure relieves itself by forcing the products of combustion out of the combustion chamber through the tailpipe into the heat exchanger exhaust decoupler and on into the heat exchanger coil. As the combustion chamber empties, its pressure becomes negative, drawing in air and gas for the next pulse of combustion. At the same instant, part of the pressure pulse is reflected back from the tailpipe at the top of the combustion chamber. The flame remnants of the previous pulse of combustion ignites the new gas/air mixture in the chamber, continuing the cycle. Once combustion is started, it feeds upon itself allowing the purge blower and spark plug igniter to be turned off. Each pulse of gas/air mixture is ignited at a rate of 60 to 70 times per second. Almost complete combustion occurs with each pulse. The force of these series of ignitions creates great turbulence which forces the products of combustion through the entire heat exchanger assembly resulting in maximum heat transfer.



FEATURES

Application — GSR21 series pulse furnaces are designed to be installed in either horizontal or down-flu positions. Horizontal air flow is left hand air flow only. Units provide heating efficiencies of up to 95%. Four models (natural gas or propane) are available with input capacities at 14.7, 23.4 and 29.3 kW (50 000, 80 000 and 100 000 Btuh). Units operate on the pulse combustion principle and do not require a pilot burner, main burners, conventional flue or chimney. Units can be installed in a utility room, alcove, closet, crawlspace or attic. Also, units are applicable as horizontal unit heaters in non-ducted systems. GSR21Q3-80, GSR21Q4/5-80 and GSR21Q4/5-100 models are applicable to the GSR21 Commercial Heat-Vent-Cool-Modular Indoor System. See bulletin in this tab section for specifications. Lennox add-on evaporator coils, electronic air cleaners and power humidifiers can easily be added for a total comfort all-season system.

High efficiency of the GSR21 series is achieved with a unique heat exchanger design which features: finned cast iron combustion chamber, temperature resistant steel tailpipe, aluminized steel exhaust decoupler section and a finned stainless steel tube condenser coil. Moisture, during the process of combustion, is condensed in the coil, extracting almost all usable heat out of the gas. Most of the combustion heat is utilized in the heat transfer from the coil, producing flue vent temperatures as low as 38°C to 54°C (100°F to 130°F) which allows the use of polyvinyl chloride (PVC) pipe for venting. Furnace can be vented through a side wall, roof or to the top of an existing chimney with up to 11m (35 ft.) of polyvinyl chloride (PVC) pipe and up to four 90 degree elbows. Condensate created in the coil (PH ranges from 4.0 to 6.0) is not harmful to standard household plumbing and can be drained into city sewers and septic tanks without damage.

The GSR21 furnace has no pilot light or burners. An automotive type spark plug is used for ignition on the initial cycle only, saving gas and electrical energy. In the pulse combustion process, the use of atmospheric burners is eliminated, with combustion confined to heat exchanger combustion chamber. Sealed combustion system virtually eliminates the loss of conditioned air due to combustion and stack dilution. Combustion air is piped to the furnace with same type polyvinyl chloride (PVC) pipe as used for exhaust gases.

Furnace is equipped with a standard type redundant gas valve in series with a gas expansion tank and gas intake flapper valve. Also factory installed are an air intake flapper valve, purge blower, spark plug igniter, flame sensor with solid-state control, fan control, dual limit controls, high and low voltage terminal strip, 30VA transformer and cleanable air filter. Furnished for field installation are a flexible gas line connector, (4) isolation mounting pads, base insulation pad and condensate drip leg.

Optional equipment available are: flue vent/air intake line roof or wall termination installation kits, propane conversion kits, down-flu additive base, horizontal support frame kit, mufflers, heat cable kit and thermostat.

GSR21 units are shipped completely factory assembled with all controls installed and wired. Units are test fired at the factory to insure proper operation.

Sequence of Operation — Room thermostat, on a demand for heat, will initiate purge blower operation for a pre-purge cycle (34 seconds) followed by energizing of ignition and opening of the gas valve. As ignition occurs, the flame sensor senses proof of ignition and de-energizes the spark igniter and purge blower. Furnace blower operation is initiated 30 to 45 seconds after combustion ignition. When thermostat is satisfied, gas valve closes and purge blower is re-energized for a post-purge cycle (34 seconds). Furnace blower will remain in operation until preset fan control temperature setting of 32°C (90°F) of fan control is reached. Should loss of flame occur before thermostat is satisfied, flame sensor controls will initiate 3 to 5 attempts at re-ignition before locking out unit operation. Loss of either combustion intake air or flue exhaust will automatically shut the system down.

Heat Exchanger Assembly — Lennox developed heat exchanger assembly consists of combustion chamber, tailpipe, exhaust decoupler section and condenser coil. Combustion chamber contains the spark plug igniter, flame sensor and combustion air and gas intake manifolds. Cast iron construction provides excellent radiation of heat over entire surface area. Finned "teardrop" shape design permits total air coverage of all surfaces with low resistance. Tailpipe connects the combustion chamber to the exhaust decoupler section. Precisely sized and shaped tailpipe is constructed of combination stainless and aluminized steel for superior resistance to high temperatures. Aluminized steel resonator on tailpipe minimizes combustion sound. Heavy gauge aluminized steel exhaust decoupler section has large surface area for maximum heat transfer. Air foil shape design results in complete air coverage with minimum air resistance. Condenser coil intake header connects to bottom of exhaust decoupler section. Large face area and circuiting of coil provides high heat transfer, minimum air resistance and proper moisture drainage. Coil is constructed of exactly spaced ripple-edged aluminum fins fitted to stainless steel tubes. Flared collars on fins grip tubes for maximum contact area. Flared tubing connections and high temperature brazing provide tight, leakproof joints. Combined flue vent and condensate drain outlet is located on the coil. Coil is factory tested for leaks. All components are mounted in a heavy gauge steel frame and installed in the furnace cabinet on resilient rubber mounts assuring quiet, vibration free operation. Heat exchanger has been laboratory life cycle tested.

FEATURES

Rugged Cabinet — Constructed of heavy gauge cold rolled steel. Cabinet is subject to a five station metal wash process resulting in a perfect bonding surface for a paint finish of baked-on enamel. The paint solution and metal are given opposite electrical charges resulting in positive adhesion and even coverage of the paint to the metal surfaces. Heat exchanger section is completely lined with 24 kg/m³ (1-1/2 lb./ft.³) density foil faced fiberglass insulation. Blower compartment is completely lined with 24 kg/m³ (1-1/2 lb./ft.³) density black mat faced fiberglass insulation. This results in quiet and efficient operation due to the excellent acoustical and insulating properties of fiberglass. Complete service access is accomplished by removing heating section and blower access panels. Removable panel is provided in vestibule panel for access to the spark plug and flame sensor. Safety interlock switch automatically shuts power off to unit when blower access panel is removed. Electrical inlets, gas line inlets, air intake and exhaust air outlets are provided in the cabinet.

Powerful Blowers — Units are equipped with quiet multi-speed direct drive blowers. Each blower assembly is statically and dynamically balanced. Multiple-speed motor is resiliently mounted. A choice of blower speeds is available on each blower. See blower performance charts. Change in blower speed is easily accomplished by simple wiring change.

Cleanable Air Filters — Washable or vacuum cleanable frame type filter is furnished as standard. Polyurethane media is coated with oil for maximum efficiency. Filter is readily accessible in unit for quick and easy removal for servicing.

Combustion Air Intake Box — Contains the purge blower and air intake flapper valve. Box is located on vestibule panel. Purge blower is equipped with a permanently lubricated motor. Blower operates only during pre-purge and post-purge cycles. Air is drawn through the blower during the combustion cycle by negative pressure in the combustion chamber. Pressure switches terminate unit operation in case of air intake or flue exhaust blockage. Flapper valve air housing is constructed of an elastomeric non-metallic polymer which reduces operating sound levels. Flapper valve section of the box is completely lined with 25mm (1 inch) thick 96 kg/m³ (6 lb./ft.³) density duct liner board, black neoprene coated fiberglass. Valve opening and closing is actuated by back pressure and negative pressure in combustion chamber during the heating cycle. Differential pressure switch, mounted on the vestibule panel, terminates unit operation in case of air intake or flue exhaust blockage.

Ignition Control — Solid-state control provides power for spark plug igniter. Also controls pre-purge and post-purge cycles and re-ignition sequence if loss of flame occurs. Ignition control is factory installed on the vestibule panel.

Automatic Gas Valve, Expansion Tank and Gas Intake Flapper Valve — 24 volt redundant dual gas control valve combines gas pressure regulation and manual main shutoff valve into one compact combination control. Dual valve design provides double assurance of 100% close off of gas on each heating cycle. Expansion tank is located downstream from the gas valve and absorbs any pressure pulsations. Gas intake flapper valve is installed in the combustion chamber intake manifold between the orifice and expansion tank. Valve is opened by entering gas pressure and closed by back pressure from combustion pulse during the heating cycle.

Wiring Junction Box — Power supply and thermostat connections are made at the wiring junction box located on the vestibule panel. Box contains 30 VA transformer, high and low voltage terminal strips and blower cooling relay. Terminal strip permits easy connections for optional power humidifiers and electronic air cleaners. Blower cooling relay activates blower operation for add-on air conditioning cooling.

Fan and Dual Limit Controls — Factory installed and accurately located upstream and downstream of the heat exchanger. Primary and secondary limit controls provide protection from abnormal operating conditions. Primary fan control brings blower on 30 to 45 seconds after combustion ignition and shuts blower off at factory temperature setting of 32°C (90°F). Upstream auxiliary fan control prevents nuisance cutout of secondary limit control (manual reset).

Installation Recommendations — Lennox recommends the following installation procedures to minimize any vibration transmitted from furnace during operation. Place (4) neoprene rubber isolation mounting pads (furnished) and/or base insulation pad (furnished), 25mm (1 inch) thick 24kg/m³ (1-1/2 lb./ft.³) density fiberglass, under the unit. Install flexible duct connectors in the supply air plenum and return air plenum or duct connection. Insulate 25mm (1 inch) thick, 24 to 48 kg/m³ (1-1/2 to 3 lb./ft.³) density, mat faced fiberglass supply and return air plenums through take-off or duct elbow. Use flexible gas connector (furnished) in gas supply piping where allowed by local codes. Insulate (refrigerant piping insulation or equivalent) all straps and hangers used in suspending ducts, electrical conduit, gas piping, combustion air intake piping and flue exhaust piping. In addition, use plastic pipe or tubing for drain line from the condensate coil drip leg (furnished) to the drain, do not use copper tubing.

OPTIONAL ACCESSORIES (Must Be Ordered Extra)

In-Line Mufflers (Optional for GSR21Q3-50 Model) — Two mufflers LB-52057CA (67F81) are optional and must be ordered extra. Mufflers field install, vertical or horizontal, one in the intake line and one in the exhaust line. See dimension drawings. Two mufflers are furnished on -80 & -100 units.

Propane Conversion Kits (Optional) — 29.3 kW (100 000 Btuh) input model requires a propane conversion kit LB-83176CM (73H60) for field changeover from natural gas. Kit is not furnished and must be ordered extra. 14.7 and 23.4 kW (50 000 and 80 000 Btuh) input models are shipped with the propane orifice furnished as standard for field conversion. See specifications table.

Thermostat (Optional) — Heating thermostat is not furnished and must be ordered extra. For all-season applications, heating-cooling thermostat is available with the condensing unit.

GSR21-50 Low Ambient Thermostat Kit (Optional) — Kit LB-58659CA (70G49) prevents GSR21-50 unit from short cycling (run times of less than 4 or 5 minutes) when system thermostat is set at 13°C (55°F) or less. Kit contains low temperature thermostat and relay with mounting bracket, mounting screws and necessary wires. Thermostat field installs in return air stream on blower housing. Must be ordered extra.

Down-Flo Additive Base (Optional) — Additive base is required for heating only models installed on combustible floors. Base is not furnished and must be ordered extra for field installation. See specifications table. Not required in add-on cooling coil applications.

Horizontal Support Frame Kit (Optional) — Kit provides support of the unit in horizontal applications. Kit consists of (2) 25mm x 38mm x 905mm (1 in. x 1-1/2 in. x 32-5/8 in.) and (2) 25mm x 76mm x 1368mm (1 in. x 3 in. x 53-7/8 in.) painted, heavy gauge cold rolled steel support channels with assembly and suspending holes. Bolts and nuts are furnished for field assembly of channels. Suspending rods must be furnished by installer. Kit is not furnished and must be ordered extra. See specifications table.

Condensate Drain Heat Cable Kits (Optional) — Self-limiting wattage heat cable prevents condensate drain from freezing when unit is installed in unconditioned space. Kit LB-56539DA (38G80) has 30.5 m (100 ft.) of heat cable. Kit LB-56496DA (39G01) contains 7.6 m (25 ft.) of heat cable. Splicing Kit LB-56530DA (39G02), available for connecting cable, makes two splices. Installation Kit LB-56497CA (38G81) contains necessary installing hardware.

OPTIONAL ACCESSORIES (Must Be Ordered Extra)

Concentric Vent/Intake Air Roof/Wall Termination Kit (Optional) — Facilitates installation of combustion air intake pipe and flue exhaust pipe. Kit LB-49107CE (**60G77**) contains concentric termination assembly, mounting clamp, roof flashing, reducer bushing and 45 degree elbow. Kit requires single hole penetration of roof or wall for installation. See dimension drawings.

Vent/Intake Air Roof Termination Kit (Optional) — Facilitates installation of combustion air intake pipe and flue exhaust pipe. Kit contains two neoprene rubber roof flashings and 457mm (18 in.) insulation sleeve for sealing and isolating intake and exhaust piping penetration in roof. Kit LB-49107CC (**15F75**) must be ordered extra for field installation. See dimension drawings.

Vent/Intake Air Wall Termination Kit (Optional) — Facilitates installation of combustion air intake pipe and flue exhaust pipe. Kit must be ordered extra. Select one of the following:

- 1 — Kit LB-49107CB (**15F74**) contains 2 stainless steel outside seal caps, 2 galvanized steel inside seal caps, 4 seal rings for the caps and 457mm (18 in.) insulation sleeve for sealing and isolating intake and exhaust piping penetration of wall. Maintain a maximum of 152mm (6 in.) between the inlet and outlet opening in the installation of the pipes. See dimension drawings.
- 2 — Kit LB-49107CD (**22G44**) consists of close-couple side-by-side Polyvinyl chloride (PVC) piping with galvanized steel wall cover plate for sealing and isolating piping penetration of the wall. Piping spacing and length is sized for proper wall installations. See dimension drawing.

SPECIFICATIONS

Model Number		GSR21Q3-50	GSR21Q3-80	GSR21Q4/5-80	GSR21Q4/5-100
*Input — kW (Btuh)		14.7 (50 000)	23.4 (80 000)	23.4 (80 000)	29.3 (100 000)
*Output — kW (Btuh)		14.1 (48 000)	21.7 (74 000)	22.3 (76 000)	27.0 (92 000)
Temperature rise range — °C (°F)		17—33 (30—60)	22—39 (40—70)	17—33 (30—60)	25 — 42 (45—75)
Maximum external static pressure — Pa (in wg.)		125 (.50)	125 (.50)	125 (.50)	125 (.50)
Gas connection iron pipe size — mm (in.)	Natural	13 (1/2)	13 (1/2)	13 (1/2)	13 (1/2)
	Propane	13 (1/2)	13 (1/2)	13 (1/2)	13 (1/2)
Vent/Intake air pipe size connection — mm (in.)		51 (2)	51 (2)	51 (2)	51 (2)
Condensate drain connection — mm (in.) SDR11		13 (1/2)	13 (1/2)	13 (1/2)	13 (1/2)
Blower wheel nominal diameter x width — mm (in.)		254 x 203 (10 x 8)	254 x 254 (10 x 10)	305 x 305 (12 x 12)	305 x 305 (12 x 12)
Blower motor — W (hp)		373 (1/2)	373 (1/2)	746 (1)	746 (1)
Number and size of filters — mm (in.)		(1) 508 x 635 x 25 (20 x 25 x 1)			
Nominal cooling that can be added — kW (Tons)		5.3 — 10.6 (1-1/2 — 3)	7.0 — 10.6 (2 — 3)	12.3 — 17.6 (3-1/2 — 5)	12.3 — 17.6 (3-1/2 — 5)
Shipping weight — Kg (lbs.)		141 (311)	144 (317)	149 (329)	152 (335)
Number of packages in shipment		1	†2	†2	†2
Electrical characteristics		220 / 240V — 50 Hz — 1 Phase			
Propane Kit (optional)		**Furnished			•LB-83176CM (73H60)
Optional Horizontal Support Frame — Shipping Weight		LB-56495CA (39G05) (All Models) — 8 kg (18 lbs.)			
Optional Down-Flo Additive Base — Shipping Weight		LB-80639BB (68387) (All Models) — 3 kg (6 lbs.)			

•Propane kit must be ordered extra for field changeover.

*High Altitude Derate — For elevations higher than 600m (2000 ft.) above sea level, unit must be derated 4% per 300m (1000 ft.) above sea level.

**Propane orifice furnished standard with unit for field changeover. Convertible gas valve requires simple adjustment without adding any parts. See installation instructions.

†Packages consists of assembled unit and (2) in-line mufflers.

INSTALLATION CLEARANCES

DOWN-FLO

Sides	25 mm (1 inch)
Rear	25 mm (1 inch)
Top	25 mm (1 inch)
Front	152 mm (6 inches)
*Floor	*Combustible
Flue Pipe	0 mm (0 inches)

* Clearance for installation on combustible floor if optional additive base is installed between furnace and combustible floor. Not required in add-on cooling coil applications if installed in accordance with local codes.

HORIZONTAL

Ends	76 mm (3 inches)
Rear	76 mm (3 inches)
*Top	76 mm (3 inches)
Front	152 mm (6 inches)
Floor	Combustible
Flue Pipe	0 mm (0 inches)

* Line contact installation permissible between jacket top or sides and building joists.

GSR21Q3-50 BLOWER PERFORMANCE

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
Pa	in. w.g.	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm
0	0	745	1575	595	1260	480	1020	375	795
25	0.10	725	1540	580	1230	470	995	360	765
50	0.20	710	1505	565	1200	455	965	345	730
75	0.30	695	1470	550	1170	445	940	330	700
100	0.40	675	1435	540	1140	425	905	315	670
125	0.50	660	1395	525	1110	410	870	295	630
150	0.60	640	1355	510	1075	395	835	280	590
175	0.70	620	1315	490	1040	380	800	260	550

NOTE — All air volume data is measured external to unit with air filter in place and 914mm (36 inch) duct on discharge end.

GSR21Q3-80 BLOWER PERFORMANCE

External Static Pressure		Air Volume at Various Blower Speeds							
		High		Medium-High		Medium-Low		Low	
Pa	in. w.g.	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm
0	0	800	1700	640	1355	510	1085	400	850
25	0.10	780	1655	615	1305	485	1030	370	785
50	0.20	750	1590	590	1245	460	980	340	725
75	0.30	715	1520	565	1200	440	935	320	675
100	0.40	690	1460	545	1155	420	890	295	630
125	0.50	670	1415	525	1110	400	850	275	585
150	0.60	640	1360	505	1065	380	800	250	525
175	0.70	615	1300	480	1020	355	755	215	460

NOTE — All air volume data is measured external to unit with air filter in place and 914mm (36 inch) duct on discharge end.

GSR21Q4/5-80 BLOWER PERFORMANCE

External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
Pa	in. w.g.	L/s	cfm	L/s	cfm	L/s	cfm
0	0	1075	2275	985	2090	865	1835
25	0.10	1050	2220	960	2035	840	1785
50	0.20	1020	2165	935	1980	820	1735
75	0.30	1000	2115	910	1925	795	1680
100	0.40	975	2065	885	1875	765	1625
125	0.50	950	2010	855	1815	740	1570
150	0.60	925	1955	830	1760	715	1510
175	0.70	890	1890	800	1695	680	1445

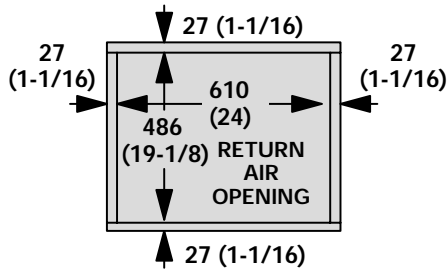
NOTE — All air volume data is measured external to unit with air filter in place and 914mm (36 inch) duct on discharge end.

GSR21Q4/5-100 BLOWER PERFORMANCE

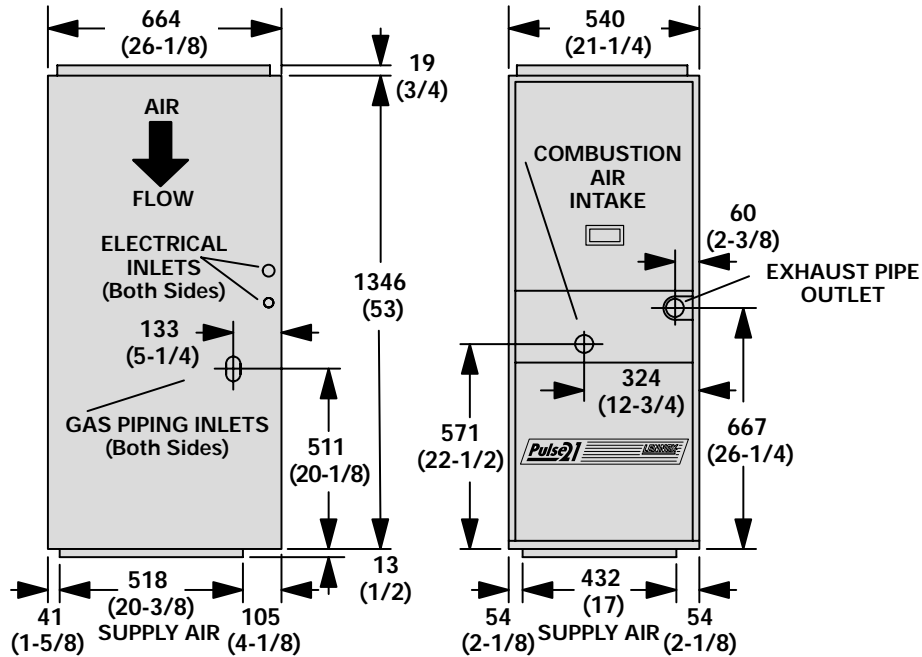
External Static Pressure		Air Volume at Various Blower Speeds					
		High		Medium		Low	
Pa	in. w.g.	L/s	cfm	L/s	cfm	L/s	cfm
0	0	1055	2240	965	2040	855	1810
25	0.10	1035	2195	945	2000	830	1760
50	0.20	1010	2140	920	1950	805	1705
75	0.30	985	2085	895	1895	780	1650
100	0.40	960	2030	870	1840	755	1595
125	0.50	930	1975	845	1790	725	1535
150	0.60	905	1920	820	1735	695	1475
175	0.70	880	1860	790	1675	670	1420

NOTE — All air volume data is measured external to unit with air filter in place and 914mm (36 inch) duct on discharge end.

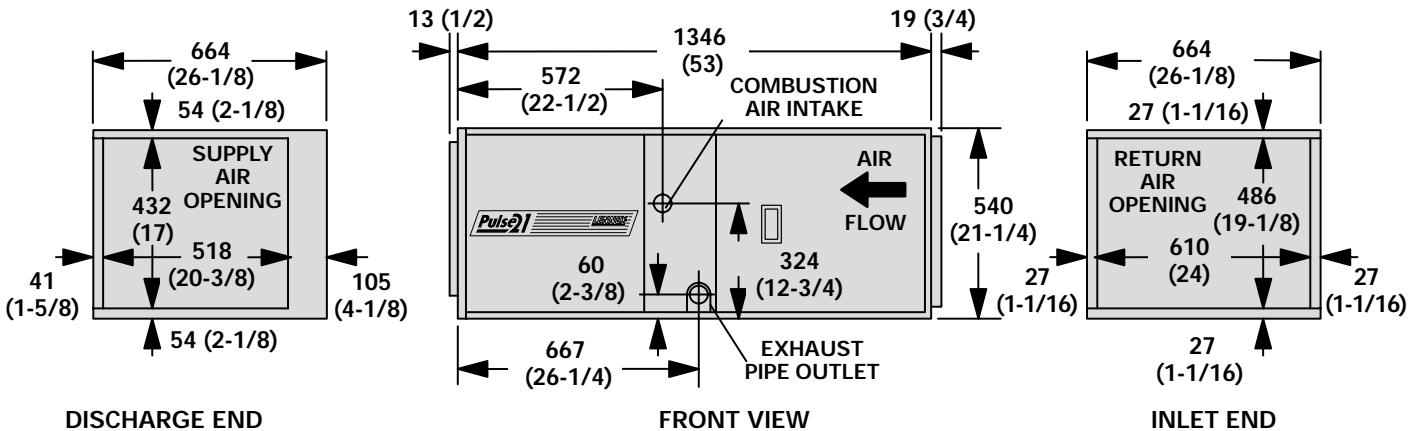
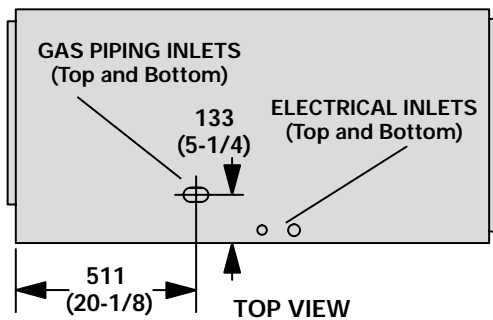
DOWN-FLO POSITION



NOTE — When heating only unit is installed on a combustible floor, an additive base is required. This is optional equipment and must be ordered extra. When using additive base, make opening in floor 67 mm (2-5/8 inches) larger (front to rear and side to side) than furnace supply air opening.

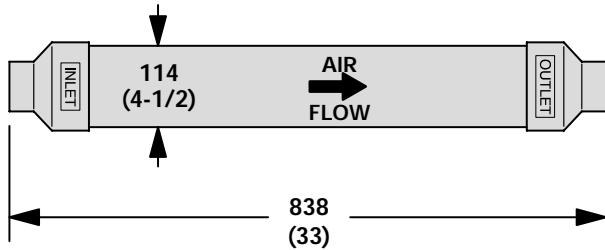


HORIZONTAL POSITION



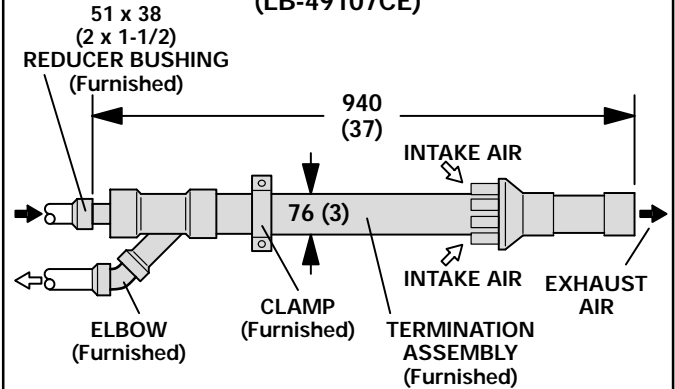
IN-LINE MUFFLERS
(Optional for GSR21Q3-50)
(LB-52057CA)

NOTE — Two mufflers are furnished per order number

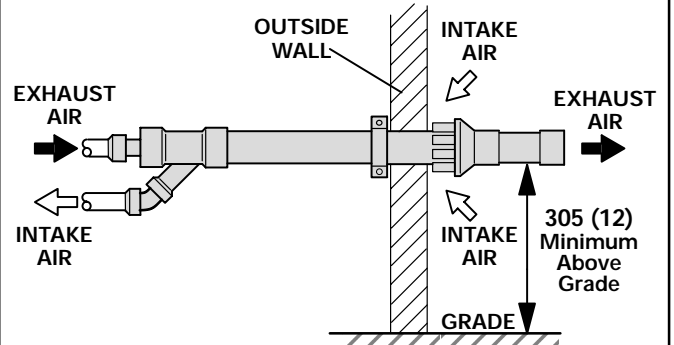


Note- (2) mufflers are furnished with GSR21Q3-80, GSR21Q4/5-80 and GSR21Q4/5-100

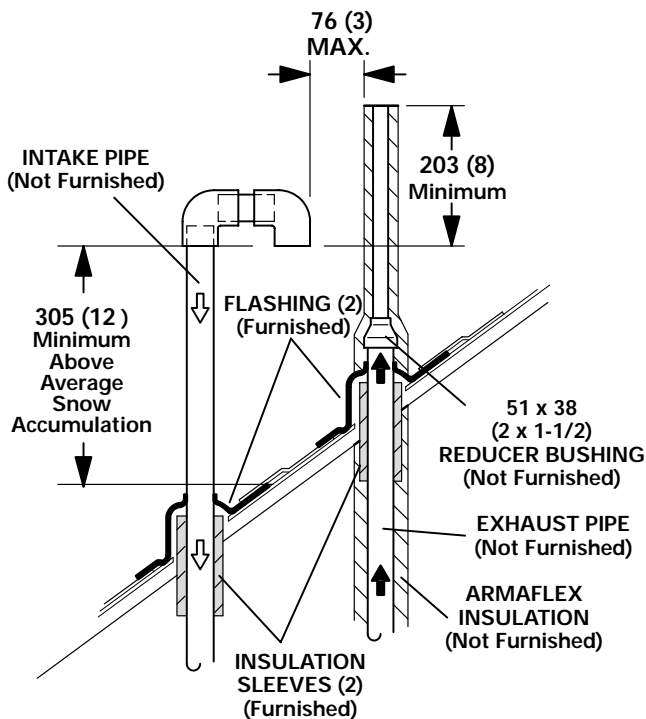
CONCENTRIC ROOF/WALL TERMINATION KIT
(LB-49107CE)



CONCENTRIC WALL TERMINATION APPLICATIONS



ROOF TERMINATION KIT
(LB-49107CC)



CONCENTRIC ROOF TERMINATION APPLICATIONS

