

TrueLeaf® Lennox® Unit Heater Systems



*Exclusive
TrueLeaf
Design Feature!*

Greenhouse Unit Heaters Redefined!

Dave Lennox started building heaters 100 years ago in Iowa. The same heritage and quality values that he began with are evident in these LF24 unit heaters for greenhouses.

A Technology Revolution— The Ultimate Heat Exchanger

Lennox LF24 Series Features

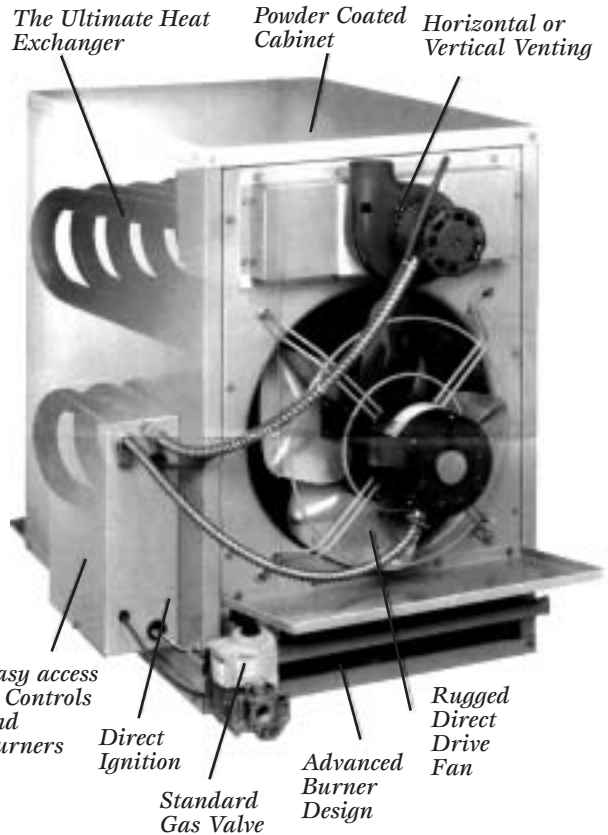
- Direct-to-flame Ignition
- Tubular Heat Exchanger
- Induced Draft Fan
- “Inshot” Burners
- Sidewall Venting
- Directional Louvers
- Insulated Powder Coated Cabinet
- LED Diagnostic Lights
- Legendary Technical Support



The LF24 series addresses most of the long standing problems that occur with greenhouse unit heaters. Using creative ingenuity, advanced design and innovative manufacturing techniques, the LF24 unit heaters are truly a giant step forward in the technology of forced air unit heaters.

Necessary Evil or Asset to your operation?

We asked growers for their opinions on the quality of unit heaters available today. Resoundingly, they agreed



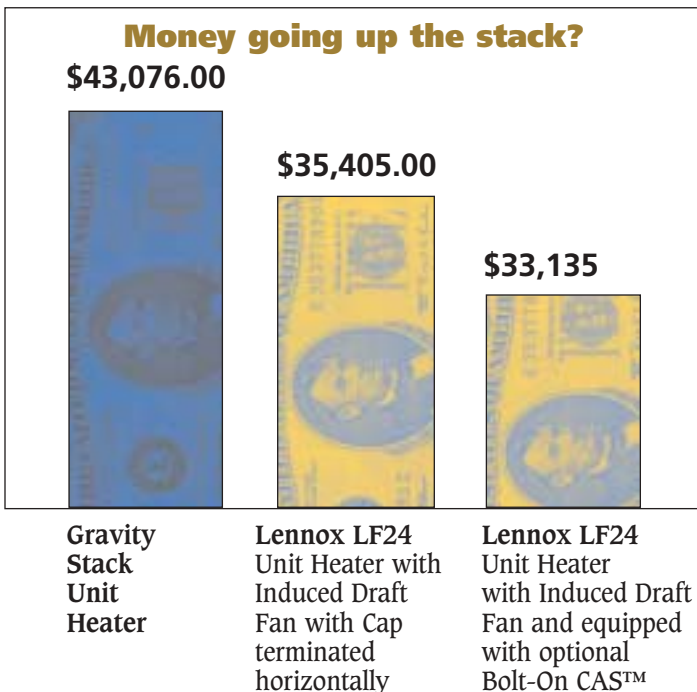
their level of satisfaction was very low. So low, that many growers see unit heaters as a “necessary evil”; equipment they begrudgingly replace year after year after year.

Behind these long standing problems are the fact that for many years the design of unit heaters did not advance. This simply does not make any sense in view of the fact that essentially all of the other tools for plant production like glazings, benches, irrigation, etc. have continued to evolve.

Building on TrueLeaf’s expertise in heating greenhouses and Lennox’s expertise in building heating equipment, a new option is now available that will change the way you look at unit heaters. Lennox Industries has so much confidence in this product that they back it with a warranty on its heat exchanger of 15 years on stainless steel units and 10 years on aluminized steel units*.

Cost Comparisons

Other unit heaters available today are designed with the old “clamshell” style heat exchanger, positioned above “ribbon” type burners. These are the most



Based on one acre greenhouse in Pennsylvania — 65°^F, Natural Gas @ \$.80 per Therm

* See warranty for complete details

common points of failure, especially in the greenhouse environment. Heat exchangers invariably fail at the points where manufacturing processes have weakened the metal by stamping, crimping and welding. The LF24's heat exchanger has no stress points, no points where the metal has been compromised.

Lennox engineers took a huge step forward by developing the seamless tubular heat exchanger. Smooth, continuous tubes are formed in a serpentine shape and then placed in parallel rows. Both ends are carefully expanded (without metal damage or fatigue) into flat metal plates that support the heat exchanger tubes and provide mounting locations for the gas train and burners (at the bottom end) and flue collector box and power venter (at the top end).

The design of the LF24 heat exchanger is simplicity defined. But, make no mistake, a tremendous amount of development work and rigorous testing is in the soul of every unit. Whether you select the aluminized steel or stainless steel option, you are assured long term, quiet operation.

Advanced Burner Design

The LF24's burner design is more akin to that of a fire-tube boiler than a unit heater. With these "in-shot" burners, the flame is retained inside the heat exchanger and fires down the inside of the heat exchanger tube. This design accomplishes three things: First, it eliminates the need for separate conventional "ribbon-style" burners; Second, it enhances flame quality and heat transfer; and Third, it eliminates most burner corrosion problems. Conventional burners fail when moisture from condensation drips on them. This problem is eliminated with the LF24.

Direct Ignition

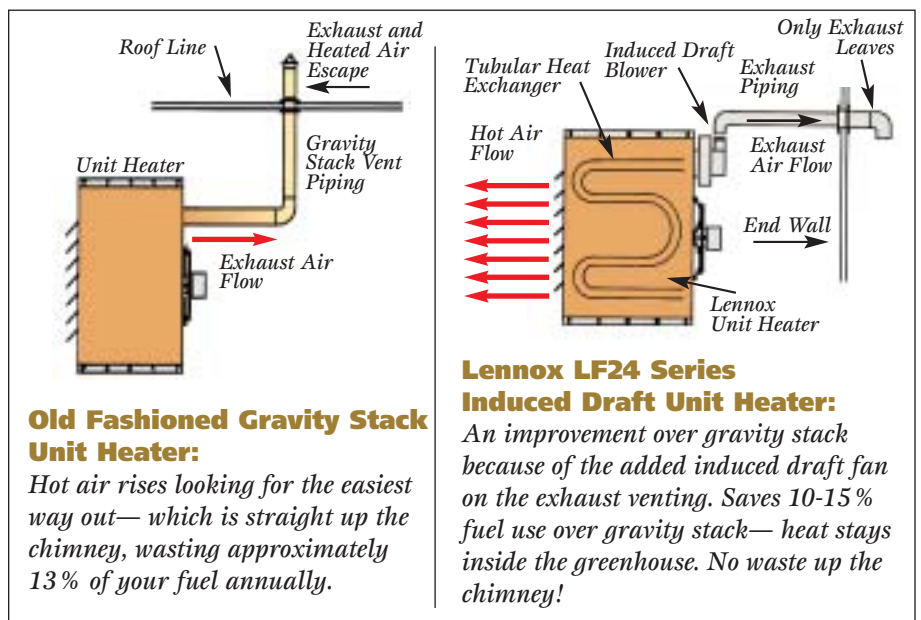
The other problem area we discovered with traditional unit heaters is that most spark ignition systems have proven to be problematic. Many growers have decided to trade the potential energy savings they offer for the simplicity and reliability of standing pilot systems.

Lennox believes that standing pilots are a thing of the past... but also that conventional spark ignition systems have not lived up to their promises. This is because conventional spark ignition systems were developed "on top" of the conventional standing pilot concept. The innovators at Lennox integrated a "direct-spark" ignition system into the LF24 that lights the burners directly, without using any separate pilot light at all.

Direct ignition is the most durable intermittent system available. And since there is no pilot light to collect dust and cobwebs, reliability is ensured. Upon a call for heat from your thermostat, a simple electronic arc is made next to one of the burners. This burner lights and ignites the rest of the burners across the unit. A small flame sensor is placed at the far burner to verify that all burners are safely lit.

Induced Draft with Horizontal Sidewall Venting

To ensure that your precious fuel dollars remain inside your greenhouse and don't end up going out the stack between heating cycles, the LF24 is equipped with a high quality blower to eject the products of combustion cleanly and completely. The blower features a stainless steel shaft and bearings.



Horizontal venting increases the seasonal efficiency of the LF24 by reducing gravitational stack losses of heated greenhouse air. The small cost difference between the LF24 and conventional gravity stack units will typically be recovered in 12 months or less.

When your LF24 units are called upon to bring heat into your greenhouse, the induced draft fan will cycle on for approximately 30 seconds to “prepurge” any unburned gasses and to create the proper pressure for operating the in-shot burners. This fan operates at all times when the unit is running and will turn off after the desired greenhouse temperature is reached and the gas valve is closed.

Direct Drive Fan(s)

All LF24 heaters are equipped with an efficient, quiet, direct-drive fan. On sizes 250 to 400, two fans are used for even air distribution over the heat exchanger. Adjustable louvers allow for precise control of air flow.

The free flowing design of the heat exchanger and efficient fan provide very high CFM rates and much higher effective throw distance than the nearest competitor. This means you will have better air flow and temperature evenness with LF24 unit heaters inside your operation. Some growers have called this “Soft Heat”.

Rugged Lightweight Cabinet

Baked on “powder-coated” paint and heavy gauge steel are the reasons that your LF24 units will maintain their external appearance for many years. Inside, insulation has been installed to keep the surface cool.

Two point cabinet suspension on the 50 to 150 models and four point suspension on the 200 to 400 models make overhead installation in your greenhouse easy and secure. Each suspension point features 3/8” “spotnut” attachments. Special hanging kits can be purchased separately.

LED Diagnostic Lights

Diagnostic lights provide a visual indication of potential operating issues. A flashing pattern reports five different early warnings for growers to diagnose heater problems comprehensively.

TrueLeaf Multi-Duct Heating System

Designed primarily for “row crop” production of vegetables, and cut flowers, where hot air and dehumidification are well suited.

A traditional Lennox LF24 series unit heater is mated with a blower style fan engineered to provide optimum CFM and static pressure.



Multi-Duct System being installed for a vegetable production greenhouse in Mexico.

A duct system transports the airflow across the end of the greenhouse and poly tubes are “teed” off that duct to distribute heat down each row. A locking damper control ensures a balanced distribution of air. This system is especially suited for production of greenhouse tomatoes, peppers or cucumbers.

Hot Shot Models

Available in 30,000, 45,000, 60,000 and 75,000 BTUH models. Great for use in cold frames, hobby house, garden sheds or head houses. Anywhere that you need a little “Hot Shot” of heat.



Compact “Hot Shot” unit, only 12 inches tall.

Available Options for your TrueLeaf/Lennox Installation:

Gas Pressure Regulator

TrueLeaf can provide the correct gas pressure regulator for each model Lennox, natural gas or LP. The regulator is an essential element if the gas service at the location of the unit is delivered at higher than 14" WC (1/2 PSI).



Stainless Steel upgrade

Heaters come standard with an aluminized heat exchanger, with a 10-year warranty. The upgrade to stainless steel is a good choice for the greenhouse industry; the Stainless Steel upgrade offers a 15-year warranty.

LP Conversion Kit

All Lennox units come equipped for natural gas. LP fuel conversion kits are available and must be added to your order. This option will be shipped separately and must be installed on site.

Polytube Adapter

We build these adapters to connect perforated polytube to the outlet of LF24 units. You can inflate up to 150 foot length with twin fan units (LF24250 and up).



Venting

TrueLeaf has packaged the correct venting materials for each model Lennox. Exhaust venting is essential to making the unit heater function properly. Venting is pre-packaged and ready to ship as a convenient option for you. Includes single wall vent pipe, type-B vent pipe, elbows, fire stop and the all important bird screen cap. Inlet venting is only required if you choose to add a Combustion Air Separator Kit (CAS).



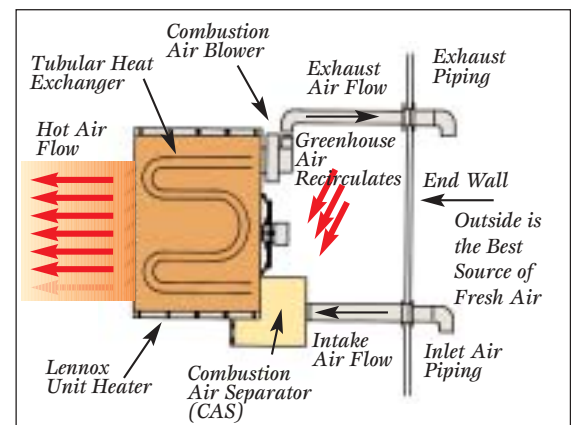
Combustion Air Separator—CAS

- Available exclusively with TrueLeaf/Lennox unit heaters.
- Easily installed with 6 bolts
- Very cost-effective pricing (Compare to Modine® "PSH" series)

Why a Combustion Air Separator (CAS)? A TrueLeaf Exclusive!

A typical 30' x 96' greenhouse has about 36,000 cubic feet of air. A typical 250,000 BTUH unit heater exhausts @ 3,600 cubic feet of air and exhaust per hour. For every hour the heater runs, there is a 10% forced air exchange which means 10% of the heated air is exhausted. This is expensive and wasteful!

CAS stops this inherent air exchange by bringing the air needed for combustion in from the outside through a sealed duct. This means you are heating only the re-circulated greenhouse air. Thereby increasing efficiency by 5% to 7% by allowing cooler, drier, cleaner air to be used in the combustion process, and extending the life of the Lennox unit heater.



Lennox LF24 Series with the TrueLeaf Exclusive Combustion Air Separator (CAS) System for the Best Installation Possible!



| LF24 Hot Shots | LF24-30A | LF24-45A | LF24-60A | LF24-75A |
|--|---------------------------------------|---------------------|---------------------|---------------------|
| Heating Capacity Input Btuh (kw) | 30,000 (8.8) | 45,000 (13.2) | 60,000 (17.6) | 75,000 (22.0) |
| Heating Capacity Output Btuh (kw) | 24,300 (7.1) | 36,500 (10.7) | 48,000 (14.1) | 60,000 (17.6) |
| Steady State Efficiency | 81.0% | 81.0% | 80.0% | 80.0% |
| Air Volume-cfm (L/s) | 535 (250) | 750 (355) | 830 (390) | 950 (450) |
| Temp. Rise-°F (°C) | 42 (23) | 45 (25) | 55 (31) | 60 (33) |
| Air Throw at 8ft. (2.4m) Mounting Height-ft. (m) | 25 (7.6) | 25 (7.6) | 40 (12.2) | 40 (12.2) |
| Flue Size Round in. (mm) | Vertical Venting 3 (76)* | 3 (76)* | 4 (102)** | 4 (102)** |
| | Horiz. Venting-Residential 4 (102)*** | 4 (102)*** | 5 (127)**** | 5 (127)**** |
| Gas Piping Size-in. (mm) Natural or LPG Propane | 1/2 (13) | 1/2 (13) | 1/2 (13) | 1/2 (13) |
| Amps | 1.7 | 1.7 | 4.1 | 4.1 |
| Fan Motor RPM | 1650 | 1650 | 1050 | 1050 |
| Electrical Characteristics | 115 V-60 Hz-1 phase | 115 V-60 Hz-1 phase | 115 V-60 Hz-1 phase | 115 V-60 Hz-1 phase |
| Shipping Weight- lbs.(kg) 1 pkg. | 60 (27) | 63 (29) | 87 (40) | 91 (41) |
| Width (Inches) | 25.0 | 25.0 | 25.0 | 25.0 |
| Height (Inches) | 12.0 | 12.0 | 17.0 | 17.0 |
| Depth (Inches) | 18.5 | 18.5 | 18.5 | 18.5 |

* 2 1/8" x 3" (54mm x 76mm) diameter adapter is furnished with unit for flue connection. ** 2" x 4" (51mm x 102mm) diameter adapter is furnished with unit for flue connection. *** 3" x 4" (76mm x 102mm) vent diameter adapter is required (not furnished) for horizontal venting in residential applications. **** 4" x 5" (102mm x 127mm) vent diameter adapter is required (not furnished) for horizontal venting in residential applications.

LF24

| Aluminized Steel Stainless Steel | LF24-100A LF24-100S | LF24-125A LF24-125S | LF24-150A LF24-150S | LF24-200A LF24-200S | LF24-250A LF24-250S | LF24-300A LF24-300S | LF24-345A LF24-345S | LF24-400A LF24-400S |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| Heating Capacity Input Btuh (kw) | 100,000(29.3) | 125,000(36.6) | 150,000(44.0) | 195,000(56.9) | 250,000(73.3) | 300,000(87.9) | 345,000(101.1) | 390,000(114.3) |
| Heating Cap. Output Btuh(kw) | Natural 80,500(23.6) | 100,625(29.4) | 120,750(35.4) | 156,000(45.6) | 201,250(59.0) | 241,500(70.8) | 276,000(80.9) | 312,000(91.4) |
| | LPG/Propane 82,000 (24.0) | 105,500 (30.9) | 123,000 (36.0) | 156,000 (45.6) | 205,000 (60.1) | 246,000 (72.1) | 281,200 (82.4) | 312,000 (91.4) |
| Steady State Efficiency | Nat./LPG 80.5% | 80.5% | 80.5% | 80.0% | 80.5% | 80.5% | 80.0% | 80.0% |
| | Propane 82.0% | 82.0% | 82.0% | 80.0% | 82.0% | 82.0% | 81.5% | 80.0% |
| Flue Size Round-in. (mm) | 4(102)* | 4(102)* | 4(102)* | 5(127)** | 5(127)** | 5(127)** | 6(152)*** | 6(152)*** |
| Gas Piping Size-in. (mm) | 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 Motor Full Load Amps (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 | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase | 115 volts 60 hertz- 1 phase |
| Shipping Weight-lbs. (kg) 1 Package | 140 (64) | 150 (68) | 165 (75) | 175 (79) | 285 (129) | 305 (138) | 310 (141) | 315 (143) |
| Width (Inches) | 20.2 | 20.2 | 23.1 | 23.1 | 41.1 | 41.1 | 41.1 | 41.1 |
| Height (Inches) | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| Depth (Inches) | 31.3 | 31.3 | 31.3 | 31.3 | 31.3 | 31.3 | 31.3 | 31.3 |

*2 1/8" x 4" (54mm x 102mm) diameter adapter is furnished with unit for flue connection. **2 1/4" x 2 3/4" (57mm x 70mm) rectangular to 5" (127mm) round adapter is furnished with unit for flue connection. ***2 1/4" x 2 3/4" (57mm x 70mm) rectangular to 6" (152mm) round adapter is furnished with unit for flue connection.



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