



FIELD CONTROLS
The Venting Solutions Company®

Venting for Oil Applications



O I L V E N T I N G G U I D E

www.fieldcontrols.com

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May 2008

Field Controls Product Evolution

Field Controls has made products for the oil and gas heating markets since 1927. Starting with draft controls for large, commercial furnaces, Field quickly began to develop products for the residential market. Today Field

Controls focuses on draft control, combustion air, and power venting ... products that improve and support oil and gas burning equipment.

1982

The PVO Power Venter

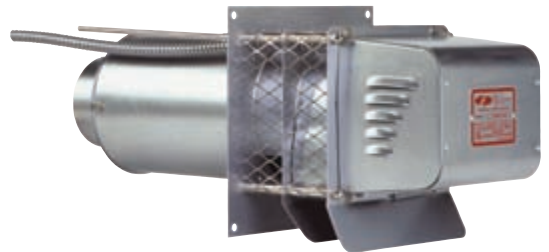
The indoor mounted PVO Power Venter provides an economical power venting system for oil appliances. All controls are built into these units. A Vent Hood is required to terminate the vent system.



1988

The SWG Aluminized Power Venter

Combined motor, blower and vent hood into one, compact, easy to install unit. Primarily used with gas applications.



1993

The SWG Stainless Power Venter

Developed for oil applications. Designed to withstand New England and Canadian winters.



2007

The ComboVent™

All stainless unit includes combustion air connection and extendable body for walls up to 14" thick.



Note: A separate Gas Venting Guide is available for gas applications. For more information on Field Controls products, wiring diagrams and installation manuals, visit www.fieldcontrols.com or call 252.522.3031.

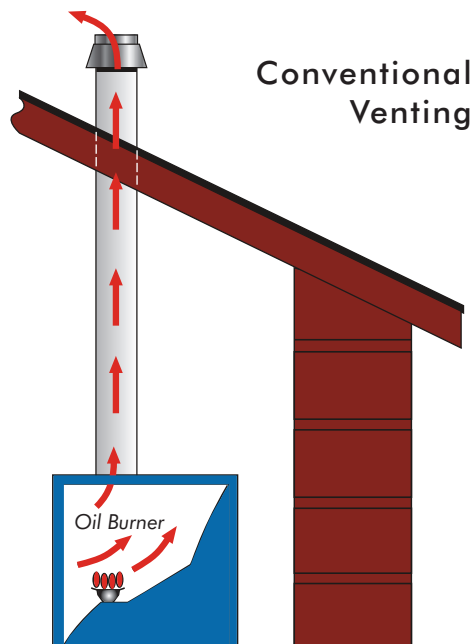
The Evolution of Venting

As long as people have used fire to heat, it has been necessary to vent the smoke and combustion gases from the dwelling. Since heat rises, the natural solution was to allow the gases to vent through the roof via a hole or chimney. For centuries, this "natural draft" style of venting has been the accepted standard for venting stoves, furnaces and boilers. Whether fired by wood, coal, oil or gas, this system worked well and, when possible, is still used today.



Energy Efficiency and Tighter Homes

In the late 1970's and early 80's, energy efficiency became a top priority in America resulting in tighter homes and more efficient heating equipment. Tight

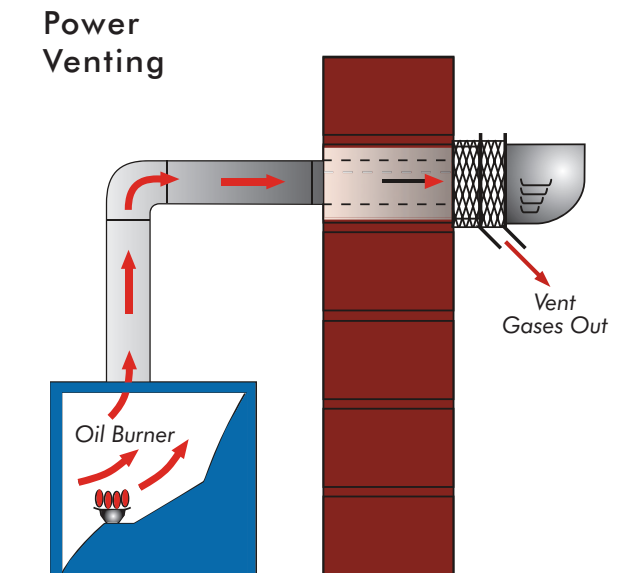


Hot air rises. As long as a chimney exists, it is in good condition and the combustion gases are warm enough to rise naturally, this method can be effective and safe.

homes restrict the infiltration of outside air which also restricts natural draft. Higher efficiency furnaces generate "cooler" exhaust gases which are more difficult to exhaust naturally as well. These factors led to the development of a mechanical method of venting to properly remove combustion gases from the dwelling.

Homes without Chimneys

Electric heat grew in popularity through the 1960's and 70's, resulting in the construction of homes without chimneys. Today, many homeowners are converting their heat from electric to gas or oil. In these cases, the contractor is faced with a challenge of venting the equipment. Choices include constructing a chimney or mechanically venting through the sidewall. Sidewall venting is much less expensive, easier and faster.



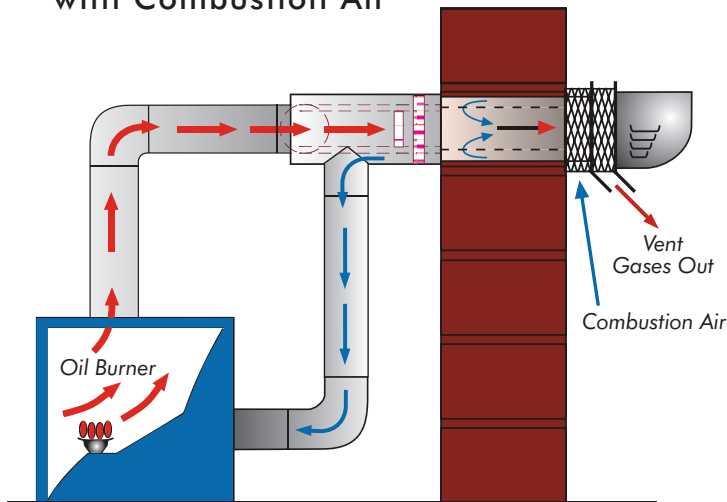
Mechanically pulls gases through the sidewall, saving the cost and space required for a chimney.

Deteriorating Chimneys

Another factor contributing to the use and growth of power venting has been the deteriorating chimney. Oil and gas combustion generate acid rich gas that can eventually destroy a clay or masonry chimney. A deteriorating chimney can be relined with metal duct, but even metal duct is subject to rust and corrosion due to the destructive nature of the acid and condensation. Sidewall venting is safer and less expensive than relining a chimney.

The Evolution of Venting

Power Venting with Combustion Air



Provides fresh air for combustion while exhausting combustion gases through one hole in sidewall.

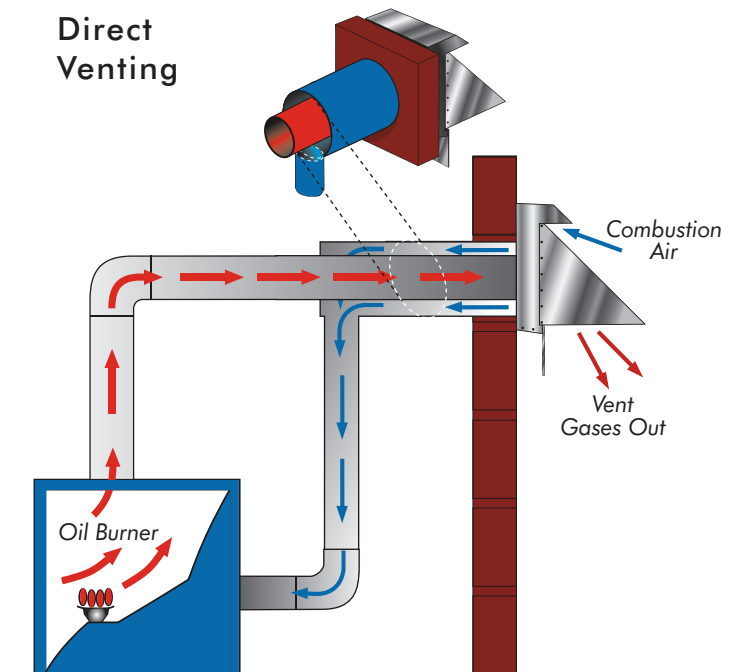
Power Venting

In the early 1980's, Field Controls introduced the PVO power venter. It was an indoor mounted power venter connected to the outside wall via a vent hood. The PVE, PVO and PVG series venters are still popular and in use today. In 1988, Field introduced and patented the outdoor mounted SWG power venter. It combined the motor, blower, and vent hood in one convenient package. The double wall pipe allows for near-zero clearance to combustibles. The SWG is available aluminized for gas applications and stainless steel for oil use. In 2007, Field introduced the ComboVent™ Power Venter. The ComboVent is all stainless and includes a combustion air connection and an extendable body for walls up to 14 inches thick.

Direct Venting

In response to the growing use of direct vent burners, Field Controls developed the Field Direct™ Venting System in 2005. The FDVS is included as part of the original equipment on many popular brands of furnaces and boilers and is not yet available through wholesale distributors. The FDVS includes a double wall system that simultaneously vents combustion gases while bringing combustion air to the burner.

Direct Venting



The fan is a part of the furnace and forces combustion gases out the sidewall via double-walled sealed pipe. Combustion air is pulled into the structure simultaneously.

ComboVent™ Combustion Air. Power Venting. Combined.

Introducing the most versatile, easiest to install, easiest to service, all inclusive combustion air/vent system ever made.



A total system for combustion air and venting.

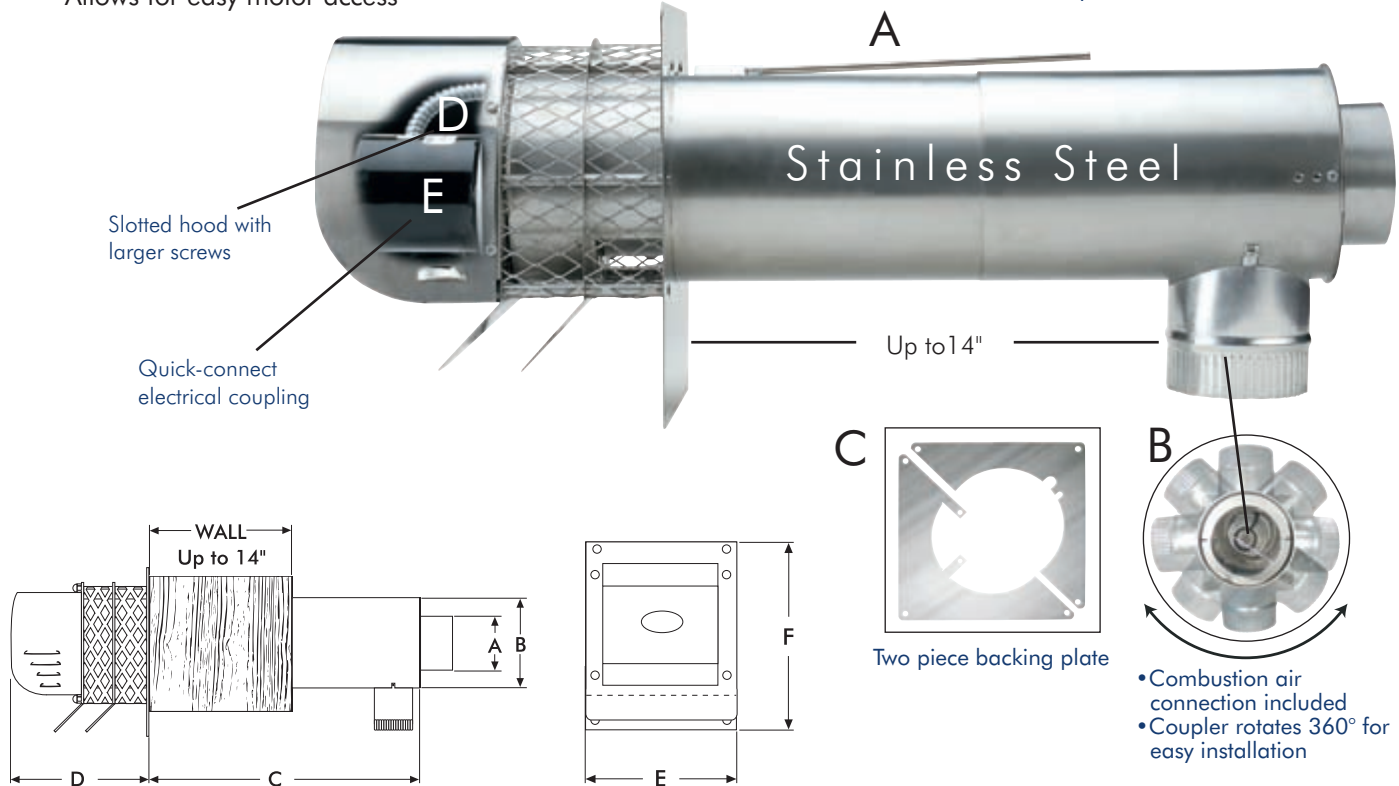
- A - Telescoping stainless steel body
Accommodates walls up to 14" thick
- B - Combustion air connection included
Provides fresh air directly to burner
Coupler rotates 360° for easy installation
- C - Two piece backing plate
Can be mounted at any point during installation



Easier to Service

- D - Slotted hood with larger screws
Saves time during annual service
- E - Quick-connect electrical coupling
Allows for easy motor access

Telescoping stainless steel body
Accommodates walls up to 14" thick



Specifications and Dimensions

Model	Volts	Hz	Amps	Watts	RPM	Thermal Protection	A	B	C	D	E	F
CV-4	115	60	1.7	138	3000	YES	4"	6"	11 3/4"-17 3/4"	9 1/2"	9"	9"
CV-5	115	60	1.3	144	3100	YES	5"	7"	11 3/4"-17 3/4"	10 3/4"	12"	12 1/4"

SWG Stainless Power Venter

Benefits of the SWG Power Venter include:

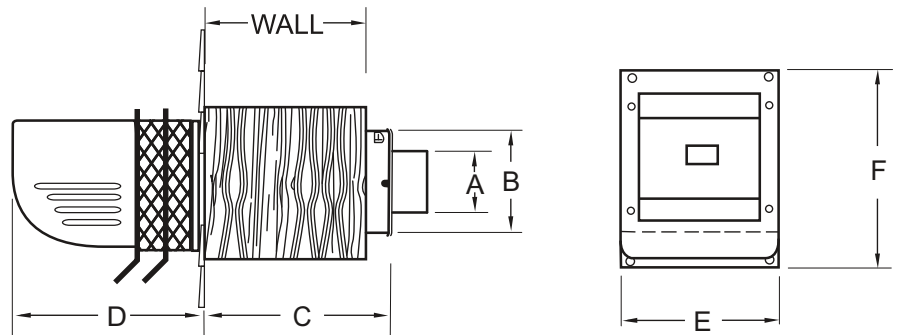
- 100% negative pressure in the vent pipe for maximum safety.
- Standard galvanized pipe can be used instead of expensive stainless steel.
- No need to seal vent pipe joints, saving time and money.
- Significantly longer vent lengths than positive pressure, direct vent systems.
- The SWG is recommended by major heating appliance manufacturers.

The SWG must be sized to match the appliance or appliances' input firing rate. Most firing rates are published in the manufacturer's installation manual. SWGs must be installed with a CK Control Kit to ensure proper listing and safe, efficient venting.



Replacement Motor Kit and Stainless Steel Model shown.

Note: SWG-4HD, 5 & 6 Motor Kits include a stainless steel blower wheel for better performance and extended life.



Specifications and Dimensions

Model	A	B	C	D	E	F
SWG-3	3"	5"	9 1/8"	8 1/2"	7 5/8"	9 3/16"
SWG-4HD	4"	6"	11 3/4"	9 1/2"	9"	9"
SWG-4HDs	4"	6"	11 3/4"	9 1/2"	11"	11 1/2"
SWG-5	5"	7"	11 3/4"	10 3/4"	12"	12 1/4"
SWG-5s	5"	7"	11 3/4"	10 1/2"	12"	12 1/2"
SWG-6	6"	8"	11 3/4"	10 3/4"	12"	12 1/4"
SWG-6s	6"	8"	11 3/4"	10 1/2"	12"	12 1/2"
SWG-8	8"	10"	11 3/4"	11 7/8"	13"	14 1/4"
SWG-10	10"	14"	19 1/2"	24"	20"	21"
SWG-12	12"	16"	19 1/2"	25"	22"	23"
SWG-14	14"	18"	19 1/2"	26"	24"	25"

NOTE: Control Kits are required for operation of the SWG. "s" Designates stainless steel model (recommended for oil applications).

Sizing The Power Venter

Size the Power Venter based on the input firing rate of the appliance. If the power venter is being used to vent multiple appliances, add the input firing rates for each appliance and use that total to size the venter. Knowing the total input GPH for oil, the venter can be sized from **Table 1**. Select the venter rated closest to the total input GPH for installation. If the input of the appliance is higher than the max allowable for that size Power Venter, move to the next larger size.

Do not select a venter with a maximum GPH lower than the appliance. The equivalent feet of vent pipe for the installation must be calculated. Based on the vent pipe diameter to be used, compare the calculated equivalent feet of vent pipe with the maximum equivalent feet allowable for the venter (**see Table 1**). If the calculated equivalent feet is greater than that allowed for the venter, increase the diameter of the vent pipe to be used and refer to the table or use the next larger size Power Venter.

SWG and ComboVent (CV)

Table 1 -Sizing The Venter (Use Maximum GPH Input)

MODEL	MAX* OIL GPH INPUT 100psi	MAX* OIL GPH INPUT 140psi	Maximum Equivalent Feet of Vent Pipe		VENT PIPE SIZE
			AT MAX GPH INPUT	AT 60% OF MAX GPH INPUT	
SWG-3	N/A	N/A	21	80	3"
			50	100	4"
SWG-4HD, 4HDs, CV-4	1.10	.90	35	100	4"
			65	100	5"
			100	100	6"
			100	100	7"
SWG-5, 5s, CV-5	1.85	1.55	16	44	4"
			51	100	5"
			95	100	6"
			100	100	7"
SWG-6, 6s	2.65	2.25	28	78	5"
			68	100	6"
			100	100	7"
SWG-8	4.75	4.0	26	72	7"
			51	100	8"
			70	100	9"
SWG-10	9	7.5	10	100	8"
			30	100	10"
			75	100	12"
SWG-12	13.5	11.5	16	100	10"
			40	100	12"
			86	100	14"
SWG-14	21	17.75	8	85	12"
			18	100	14"
			35	100	16"

* Select venter according to the actual rated maximum GPH input. ComboVent GPH ratings at 100 psi. Do not exceed maximum oil GPH input. For multiple venting system applications add the input for each. Unit sizing may vary depending on specific application. Consult your dealer or factory representative for the proper sizing for your particular application.

Note: In Table 1, the maximum equivalent footage allowable for the vent pipe is given for two points, the maximum GPH venting capacity and at 60% of the maximum. This allows for estimating values between the two given points.

Locating The Power Venter

Calculating Equivalent Feet of a Vent System

Procedure

1. Determine the total equivalent feet for each type of fitting used in the venting system from Table 2.
2. Calculate the total feet for the straight lengths of pipe.
3. Add the equivalent feet of the fittings to the total amount of feet of straight length pipe. This will approximate the total equivalent feet of the vent system.

Example: System Pipe Size = 4"

Step 1 2-90° Elbows (4") = 14 Ft.

Step 2 10-2 Ft. Lengths of 4" Pipe = 20 Ft.

Step 3 Total Equivalent Feet = 14 Ft. + 20 Ft. = 34 Ft.

Table 2

Vent Pipe Fittings	Vent Pipe Diameter									
	3"	4"	5"	6"	7"	8"	9"	10"	12"	14"
Tee	19	25	31	38	44	50	56	63	75	89
Y-Connection	10	13	16	20	23	26	29	32	39	45
90° Elbow	5	7	9	11	12	14	16	18	21	25
45° Elbow	3	4	4	5	6	7	8	9	10	13

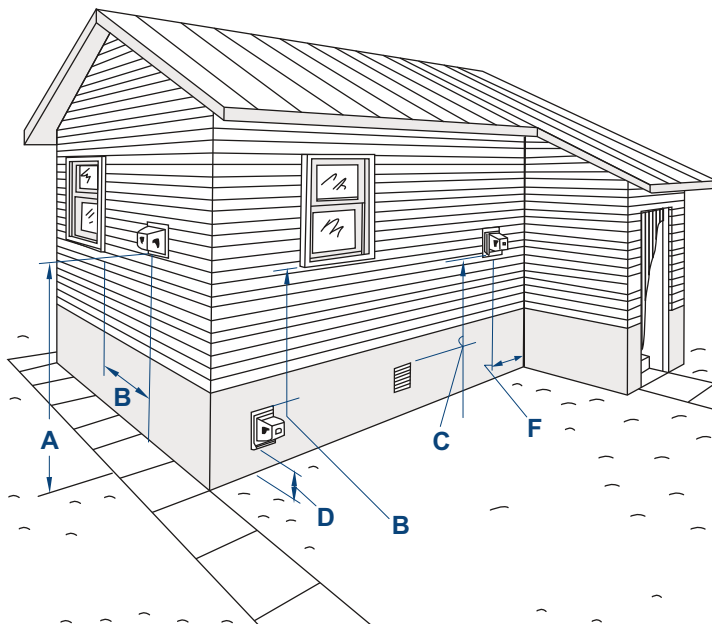
Using a Reducer/Increaser

		Small Pipe Size									
		3"	4"	5"	6"	7"	8"	9"	10"	12"	14"
Large Pipe Size	3"	0									
	4"	2	0								
	5"	4	2	0							
	6"	5	4	2	0						
	7"	6	5	4	1	0					
	8"	7	7	6	3	2	0				
	9"	7	8	7	5	4	2	0			
	10"	8	8	8	6	6	4	2	0		
	12"	8	10	10	8	9	8	6	4	0	
	14"	9	10	12	10	12	11	9	8	3	0
	16"	9	11	12	11	14	13	13	11	8	3
	18"	9	11	13	12	15	15	15	14	11	7
20"	9	12	14	13	16	17	17	17	15	11	

To estimate the equivalent foot length of the Reducer/Increaser chart, find the figure at the intersection of the small pipe size and the large pipe size.

Terminal Locations of a Vent System

Location of the termination of the venting system should comply with the National Fuel Gas Code, ANSI Z223.1, manufacturer's recommendations and/or applicable local codes. See diagram for typical terminal locations.



- The exit termination of a mechanical draft system must not be less than 7' above grade when located adjacent to a public walkway.*
- The venting systems, with the exception of direct vent appliances, must terminate at least 4' below, 4' horizontally, or 1' above any door, window or gravity air inlet into the building.
- A venting system must terminate at least 3' above any forced air inlet located within 10'.
- The bottom of the vent terminal must be located at least 1' above finished grade.**
- The vent termination should not be mounted directly above or within 3' horizontally from an oil tank vent or gas meter (not shown in diagram).
- The vent termination point must not be installed closer than 3' from an inside corner of an L-shaped structure.
- For basement installations where a window well must be used or in installations where the vent terminal cannot be mounted to maintain the minimum 12" clearance above grade, use a Field Vent Riser™. The Vent Riser ensures the vent termination is above grade or the snow line and is in compliance with local codes (not shown in diagram).

* 10" or larger should be 10' minimum above public walkway.

** 10" or larger should be 4' above finished grade.

Clearance to Combustibles

If mounting the venting system near combustible materials, refer to Diagram A for allowable installation clearances. Clearances are based on an installation using single wall galvanized steel vent pipe. If manufactured double wall vent pipe is required or used for the installation, clearance should be based on the vent pipe's rated clearance. Always check local code requirements for code restrictions.

Routing of the vent system and clearances for the vent pipe may be planned once the termination location is determined. Route the vent pipe from the appliance to the venter using as few elbows as possible. The horizontal section of the vent pipe should have a slight upward slope from the appliance to the venter. The vent pipe size (diameter) can be smaller than a typical chimney vented system and still overcome the higher pressure losses because the power venter mechanically creates the required draft or air flow to vent the system.

For estimating the minimum vent pipe diameter for an oil system, multiply GPH by 140,000 BTU/GAL, then divide by 12,600 BTU/sq. in. This will give the minimum cross sectional area required. (See Table 3 for area to diameter conversion.) For multiple equipment venting systems, divide the total BTU/hr. input for all appliances by 9,300 BTU/sq. in. This will give you the minimum vent pipe diameter needed for the common breaching of the vent system.

As a rule of thumb, size the vent pipe to the outlet diameter of the heating equipment for a single appliance venting system. For multiple appliance venting systems, use the outlet diameter of the largest unit and add 50%.

Diagram A

Single Pipe System

Allowable Inlet Temperature	Clearance (B)
400°F or Less	3" min.
550°F or Less	4" min.
550°F or Less	3" min.*

Double Pipe System

Allowable Inlet Temperature	Clearance (A)
400°F or Less	.5" min.
550°F or Less	1" min.
550°F or Less	.5" min.*

* With galvanized sheet metal liner or equivalent

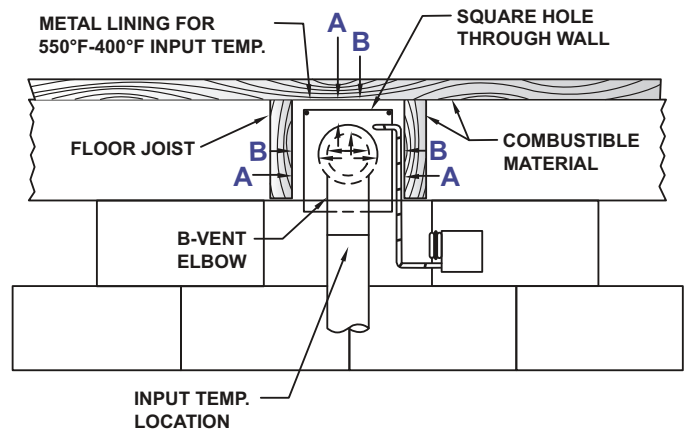
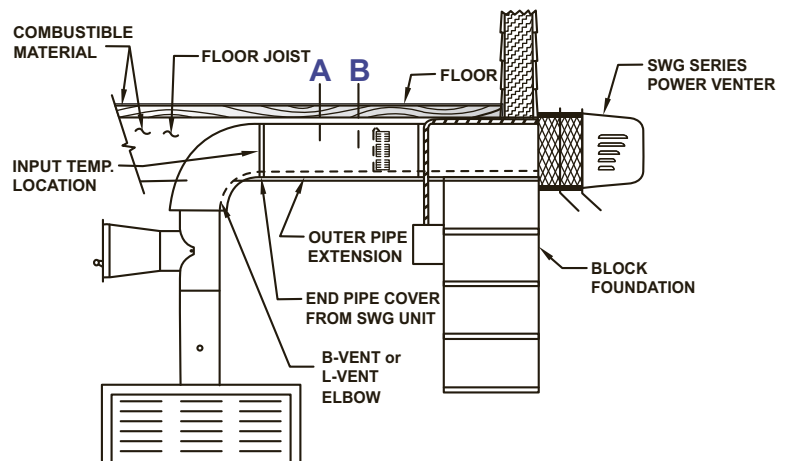


Table 3

Pipe Size	Nominal Cross-Sectional Area Sq. Inches
3"	7
4"	13
5"	20
6"	28
7"	38
8"	50
9"	64
10"	79
12"	113
14"	154



Control Kits



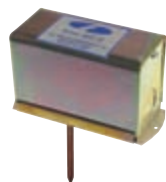
Control Kit*

Control Kits

Control Kits (CK) control the operation of Power Venters. See the chart below to select the proper kit for your application.

Model	Applications	Draft Proving Switch	Secondary Safety Switch	Thermal Post Purge	Adjustable Electronic Post Purge	RJR-6 120V Relay
CK-61	All oil-fired systems. Has adjustable electronic post purge.	✓	✓		✓	✓
CK-62	All oil-fired systems. Has thermally activated post purge.	✓	✓	✓		✓
CK-63	All oil-fired systems. (May require optional delay oil valve for simultaneous burner operation.)	✓	✓		✓	✓

* Control Kits are ETL approved accessories when used in conjunction with the SWG and ComboVent Power Venters.



PPC-4 Post Purge

Control Kit Installation:

CK-63 remote mounted. For use with 120 VAC oil-fired systems. Electronic post purge is included (shown with cover off). CK kits can be mounted up to 100 feet from venter.



Thermal Safety Switch

Our thermal safety switches efficiently detect flue gas spillage due to a blocked flue, continuous down drafting or inadequate draft condition. With the safety switch wired in series with the burner circuit, the switch will de-energize the system's burner or burner control once it senses the spillage of hot flue gases. It will not allow the burner to restart until the switch has been manually reset.



Model	Part No.	Contact Material	Load-Rating (Amps)	Load-Rating (Volts)	Normally Closed Switch	Switch Type	Application	
WMO-1	46086900	Silver	10 Amps	120 AC	200°F	M	SPDT	Manual reset. Designed for use with power venting and chimney vented systems for oil-fired applications.

System Setup

SYSTEM SETUP:

Figure 1 shows a typical oil-fired appliance and the expected ranges of several readings taken at various locations in the system. Note: If a vent pipe reducer is required, use a smooth walled gradual reducer. Place it at the venter inlet as shown in Figure 1.

1. Set the choke plate in the power venter, or extension kit, to its full open position. Set the draft control adjustment weight to its midpoint position.
2. Adjust the thermostat so that the unit will run continuously. Allow the unit to operate for 5 to 10 minutes to ensure stack temperature stabilization.
3. Find out the manufacturer's recommended over-fire or breeching draft. Close the choke plate on the SWG until the draft above the draft control reads approximately 0.04" w.c. greater than the recommended breeching draft. Example: If the appliance manufacturer recommends a 0.02" breech draft, adjust the choke plate to get an approximate 0.06" draft above the draft control.
4. Adjust the barometric draft control to obtain the manufacturer's recommended draft over-fire or at the breech. The draft control gate should be open approximately half its full swing during normal operation. This allows the gate to swing open or closed depending on changes in atmospheric pressure or operating conditions.
5. If the proper draft cannot be obtained at the breech or if the gate does not open as described, then adjust the choke plate in the SWG to reduce or increase the airflow. Re-adjust the draft control to obtain the required draft, since moving the choke plate will change the system draft.

Procedure for adjusting the pressure switch

- Turn pressure switch adjustment clockwise until the burner quits.
- Turn counter-clockwise slowly until the burner starts.
- Turn an additional 1/4 to 1/2 turn counter-clockwise.

Note: Every installation will require unique pressure switch adjustment.

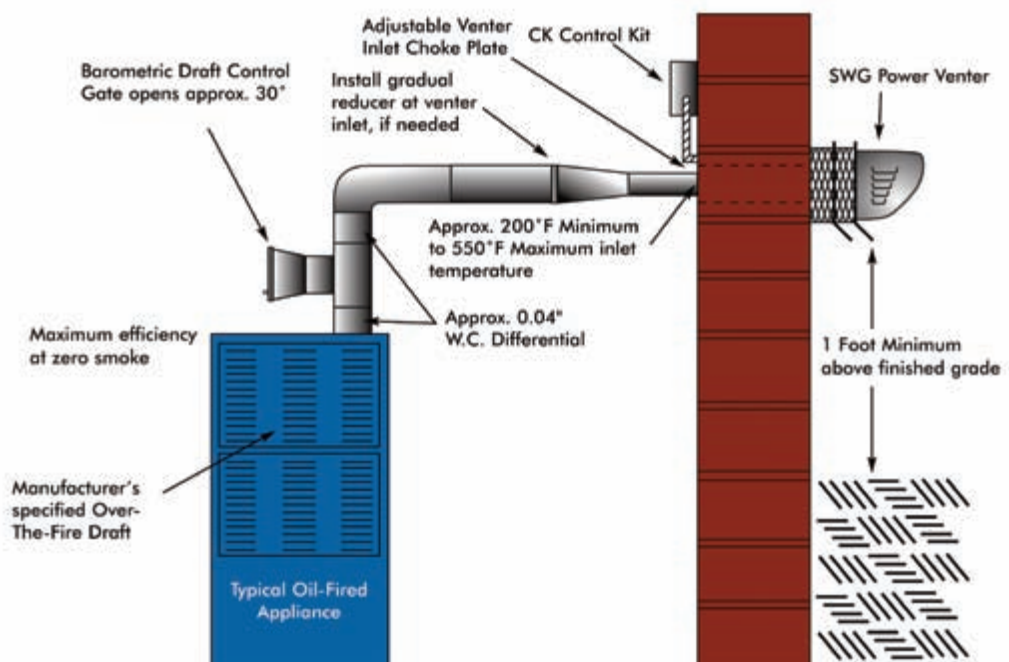


Figure 1

System Setup and Maintenance

6. Once proper draft is achieved, measure CO₂ and smoke level. If necessary, adjust the intake airflow at the burner to obtain the highest possible CO₂ reading with a zero smoke reading. As the intake airflow is increased or decreased, the draft may change. Repeat steps 3 through 6 to re-adjust the draft control and choke plate before attempting any other adjustments.
7. Measure combustion efficiency and exhaust gas temperature at the venter inlet. Combustion efficiency should be adjusted to maximum attainable at zero smoke. Exhaust gas temperature at the venter inlet should range between 200°F and 550°F.
8. If maximum efficiency and zero smoke yields a temperature below 200°F at the inlet to the venter, the following suggestions must be considered.
 - A. Use a larger oil nozzle or higher oil pump pressure to raise the firing rate of the burner. Repeat steps 3 through 7 until all combustion parameters are within the specified ranges.
 - B. Reduce the length of the duct from the appliance to the venter which will increase the venter inlet temperature.
 - C. Insulate the vent pipe to minimize heat loss.
 - D. Seal the vent pipe joints to reduce uncontrolled dilution air.

TESTING:

1. The thermostat (wall thermostat, or aquastat) calls for heat, starting venter motor.
2. After the venter motor has come up to speed, the pressure switch closes. This closes the circuit to the burner and allows the burner to operate. This occurs in approximately 1 to 2 seconds.
3. After the heating requirement is satisfied, the thermostat circuit opens and deactivates the burner and power venter circuit.
4. Oil venting systems require a post purge device. During the post purge cycle, the venter operates for a period after the burner has shut off. This is to purge the remaining flue gases and to cool the combustion chamber. Typical post purge times are 3 to 5 minutes. Longer purge times may be required depending on system installation.

ANNUAL MAINTENANCE:

1. Motor: Inspect the motor once a year; it should rotate freely. To prolong the life of the motor, lubricate with six drops of SWG Super Lube, Part #46226200, annually. Use of any other type of lubricant may cause premature motor failure.
2. Wheel: Inspect the venter wheel annually to clear any soot, ash, or coating which inhibits either rotation or air flow. Remove all foreign materials before operating.
3. Vent System: Inspect all vent connections annually for looseness, for evidence of corrosion, and for flue gas leakage. Replace, seal or tighten pipe connections if necessary. Check the venter choke plate to ensure it is secured in place. Check the barometric draft control to ensure the gate swings freely.
4. System Safety Devices: With the heating system operating, disconnect the pressure sensing tube from the pressure switch on the CK Kit. This should stop the burner operation. Re-connecting the tube should relight the burner.



SWG Super Lube

- Oil motor and fan shaft with SWG Super Lube annually
- Works in conditions of -40° to 300° (F)
- Synthetic lubricant which maintains specified viscosity
- Use of any other lubricant may cause premature failure

FieldDirect™ Venting System

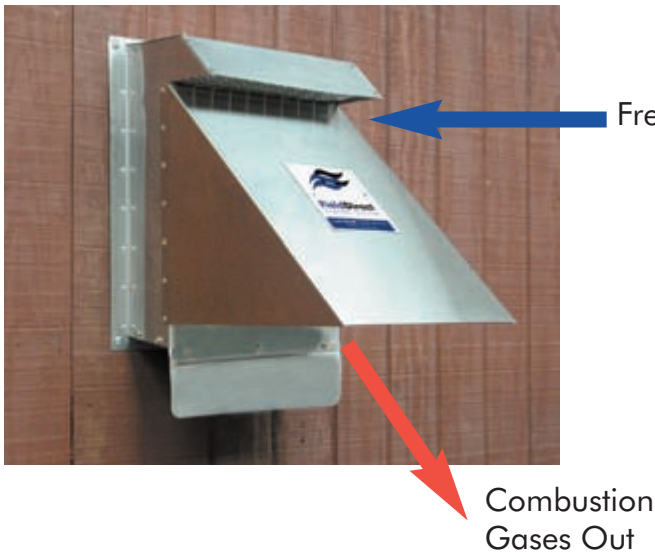


Patent Pending Design

Benefits of FieldDirect Venting System

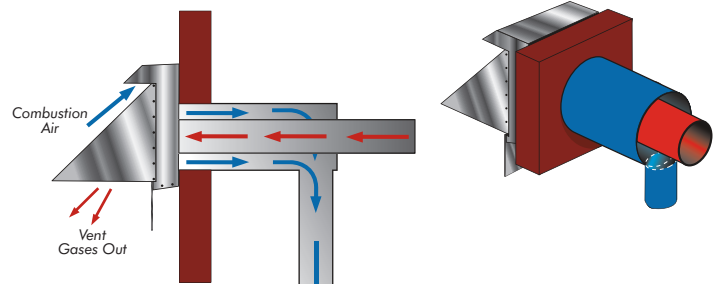
- No adverse reactions to direct wind loads up to 50mph.
- Burner efficiency actually improves under direct wind load.
- Decreased chance of exhaust gases recirculating into the structure.
- Virtually impossible for snow to block the air intake.
- Stainless 316 construction.
- Inner pipe is angled to drain condensation outside.
- Stainless, seam welded inner pipe reduces potential of corrosion and leakage.
- Exhaust angle reduces migration.
- Nozzle configuration accelerates combustion gases away from the structure.

How FieldDirect Venting Systems Work



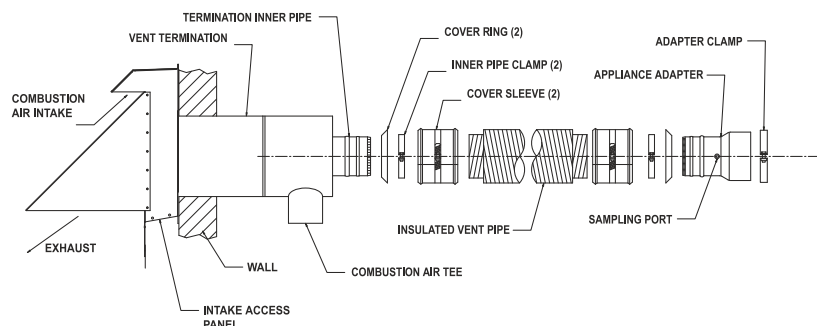
Allows combustion air to enter from the top of the unit.

Combustion gases are accelerated at the nozzle and exit the structure at an optimal angle.



Installation Advantages of FieldDirect Venting System

- Installs with one hole through the wall.
- Zero clearance to combustibles.
- Seamless inner pipe, heavy-duty clamps, and sealant prevent leakage of vent gases.
- Combustion Air Tee can be rotated within 180 degrees.





FIELD CONTROLS
The Venting Solutions Company®

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