342 N. Co. Rd. 400 East
Valparaiso, IN 46383
888-432-8924 • Fax 219-462-7985
www.heatwagon.com

Installation and Maintenance Manual

Please retain this manual for future reference.

VG600
VF600

Construction Heater

CAUTION: Do not use this heater in a space where gasoline or other liquids having flammable vapors are stored.

Revision 1-17

IMPORTANT INFORMATION! READ FIRST

The heater is designed for use as a construction heater under ANSI Z83.7a-2000. Heater is not intended for use in pest remediation. The primary purpose of construction heaters is to provide temporary heating of buildings under construction, alteration, or repair and to provide emergency heat. Properly used, the heater provides safe, economical heating. Products of combustion are vented outside the area being heated.

The heater **IS NOT** designed as an Unvented Gas Fired Room Heater under ANSI-Z21.11.2 and **SHOULD NOT** be used in the home.

ANSI A119.2(NFPA 501C)-1987 Recreational Vehicle Standard prohibits the installation or storage of LP-gas containers even temporarily inside any recreational vehicle. The standard also prohibits the use of Unvented Heaters in such vehicles.

NFPA-58 1989 STANDARD FOR THE STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

Use of the heater must be in accordance with this Standard and in compliance with all governing state and local codes. Storage and handling of propane gas and propane cylinders must be in accordance with NFPA 58 and all local governing codes.

We cannot anticipate every use which may be made for our heaters. **CHECK WITH YOUR LOCAL FIRE SAFETY AUTHORITY IF YOU HAVE QUESTIONS ABOUT LOCAL REGULATIONS.**

Other standards govern the use of fuel gases and heat producing products in specific applications. Your local authority can advise you about these.

CAUTION

DO NOT USE THIS HEATER IN A SPACE WHERE GASOLINE OR OTHER LIQUIDS HAVING FLAMMABLE VAPORS ARE STORED OR USED.

CONSTRUCTION HEATER GENERAL HAZARD WARNING:

Failure to comply with the precautions and instructions provided with this heater, can result in death, serious bodily injury and property loss or damage from hazards of fire, explosion, burn, asphyxiation, carbon monoxide poisoning, and/or electrical shock.

Only persons who can understand and follow the instructions should use or service this heater.

If you need assistance or heater information such as an instruction manual, labels, etc., contact your local Heat Wagon dealer or the manufacturer.

W A R N I N G

Fire, burn, inhalation, and explosion hazard. Keep solid combustibles, such as building materials, paper or cardboard, a safe distance away from the heater as recommended by the instructions. Never use the heater in spaces which do or may contain volatile or airborne combustibles, or products such as gasoline, solvents, paint thinner, dust particles or unknown chemicals.

Not for home or recreational vehicle use!

If you have read this entire manual and you still have questions, please call us at 219-464-8818

Installation and Maintenance Manual
Model VG600
Construction Heater

Table of Contents:

WARRANTY

This heater is guaranteed against defective materials and workmanship for one (1) year from Heat Wagon invoice date.

Warranty repairs may be made only by an authorized, trained and certified Heat Wagon dealer. Warranty repairs by other entities will not be considered. Warranty claims must include model number and serial number. Components are guaranteed to the extent of the component manufacturer's warranty.

LIMITATIONS

Warranty claims for service parts (wear parts) such as spark plugs, igniters, and flame rods will not be allowed. Diagnostic parts such as voltage meters and pressure gauges are not warrantable. Evidence of improper fuel usage, fuel pressures outside of manufacturer's specification, poor fuel quality, improper electric power, misapplication and/or evidence of abuse may be cause for rejection of warranty claims.

Labor, travel time, mileage and shipping charges will not be allowed. Minor adjustments to heaters are the responsibility of the dealer. Defective parts must be tagged and held for possible return to the factory for 60 days from date of repair. The factory will provide a return goods authorization, (RGA) for defective parts to be returned. No warranty will be allowed for parts not purchased from Heat Wagon.

heat wagon

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www.heatwagon.com

SAFETY & CAUTION

- Instructions given in this manual and the applicable regulations of the local authorities must be followed.
- The unit may be operated only by those persons who have been instructed in its proper use.
- The unit is to be installed and operated in such a way as to ensure the safety of employees and surroundings.
- Never cover the unit's air openings.
- Always ensure adequate fresh air supply to the unit.
- Never stand in front of the discharge end of the heater.
- Keep a minimum clearance of 10 feet from the fuel source. Storing and use of liquid fuel must comply with the regulations and instructions given by the local authorities.
- Do not introduce foreign objects into the unit.
- Do not expose the unit to direct water jets.
- All electric cables outside the unit are to be protected against damage.
- Always disconnect the unit from power supply and turn off the gas supply when maintenance or service is being performed.
- **IF NOT OPERATED WITHIN GUIDELINES OF THESE OPERATING INSTRUCTIONS, MANUFACTURER WILL NOT BE HELD RESPONSIBLE AND WARRANTY WILL BECOME VOID.**

SPECIFICATIONS

Model No. VG600

Fuels:	Vapor Propane or Natural Gas
Capacity:	600,000 BTU/HR
Blower:	5400 CFM 3/4″ SP
Electrical Rating:	120 Volts, 15 Amps
Fuel Consumption:	NG-572 CFH / Propane-6.6 GPH
Gas Connection:	1″ FNPT
Remote Thermostat:	On/Off
Max. Discharge Temp.:	175°F @ 0°F Ambient
Duct Size:	20″ Dia., 75 ft. max (straight), temp. rating 225°F min.
Actual Dimensions:	90″L x 36″W x 54″H
Weight (approximate):	770 lbs.
	Utilize Dedicated 20 Amp Service

Gas Supply:	Inlet Pressure		Manifold Pressure	Burner Orifice
	Max W.C.	Min W.C.	W.C.	
Vapor Propane	14″ W.C.	8″ W.C.	2.8″	2.0
Natural Gas	14″ W.C.	7″ W.C.	2.8″	3.7

VF600

Fuel Supply:	Manifold Pressure (Fuel Pump)	Burner Nozzle
	151 psi	3.5 GPH x 60A

Note: 1 pound per square inch (psi) = 28″ W.C. (water column)
Note: See page 14 for recommended duct, gas hose and pressure regulators.

OPERATING INSTRUCTIONS

INSTALLATION

- When transporting, use both lifting eyes located on sides of heater.
- Place the unit on a level and non-combustible surface.
- Minimum clearances from combustibles:
  - outlet, minimum 10 feet
  - sides, minimum 3 feet
  - top, minimum 3 feet
  - flue pipe exhaust minimum 2 feet
- If the unit is placed indoors, secure an adequate fresh air opening for the burner combustion air.
- The unit may not be installed and operated in premises where explosive or combustible fumes or dust are present. Always check the regulations of local authorities.
- Be certain that neither the air inlet nor the air outlet is obstructed.

FUEL SUPPLY

For supply pressures greater than 1/2psi

- **A regulator must be installed on the heater to ensure that the pressure to the heater does not exceed 1/2 psi inlet pressure. Excessive pressures over 1/2 psi (14″ W.C.) will damage controls and void warranty**.

- This heater is shipped as either natural gas or vapor propane. Check for proper burner orifice in burner.

  Vapor Propane 2.0
  Natural Gas 3.7

- Be certain to use adequate hose or pipe size to ensure proper volume and pressure. See Chart Below.

VAPOR PROPANE QUICK REFERENCE HOSE CHART

(Tank sizing chart on page 9)

Hose Length in Feet	BTU 600,000 1/2PSI	10PSI
10	3/4	3/8
25	1	3/8
35	1	3/8
50	1-1/4	3/8
75	1-1/4	1/2
100	1-1/4	1/2
125	1-1/4	1/2
150	1-1/4	1/2
175	1-1/2	3/4
200	1-1/2	3/4
225	1-1/2	3/4

NATURAL GAS QUICK REFERENCE HOSE CHART

Hose Length in Feet	BTU 600,000 1/2PSI	1PSI	2PSI	5PSI
10	1	3/4	3/4	3/4
25	1-1/4	3/4	3/4	3/4
35	1-1/4	3/4	3/4	3/4
50	1-1/4	3/4	3/4	3/4
75	1-1/2	3/4	3/4	3/4
100	1-1/2	3/4	3/4	3/4
125	1-1/2	1	3/4	3/4
150	2	1	3/4	3/4
175	2	1-1/4	3/4	3/4
200	2	1-1/4	3/4	3/4
225	2	1-1/4	3/4	3/4

FUEL SUPPLY (CONTINUED)

- For proper propane tank sizing see page 9.
- Visually inspect the hose assembly and ensure that it is protected from traffic, building materials, and contact with hot surfaces. If it is evident that there is excessive abrasion or wear, or the hose is cut, replace it immediately.
- Purge air from line and wait 10 minutes for gas to dissipate.
- After installation, check the hose assembly for gas leaks by applying a water and soap solution to each connection.
- Fuel hose must be UL approved.
- The installation of this heater to a natural gas supply must confirm with all applicable local codes or, in the absence of local codes, with the *National Fuel Gas Code ANSI Z223.1/NFPA 54*. For vapor propane, refer to standard for *Storage and Handling of Liquified Petroleum Gases ANSI/NFPA 58*.

ELECTRICAL

- Electric cable extensions must be connected based on the unit capacity and cable length.
- We highly recommend a dedicated line, 20 amp minimum.
- Confirm voltage at heater connection (105V min.) to ensure proper operation.

EXHAUST FLUE PIPE

- The unit is to be connected to a flue pipe with adequate draft, to ensure the proper start and operation of the unit. Refer to page 11.
- The flue pipe and its installation must comply with the regulations and instructions given by the local authorities.
- A flue pipe must be used at all times. You must increase flue pipe diameter if its is longer than 26″

DISCHARGE DUCTING (Warm Air)

- Minimum clearance from combustible materials is 4 inches.
- Use steel ducting or fabric ducting capable of withstanding maximum temperature of 225°F.
- Maximum length of duct: 75′ (straight).
- Duct diameter: 20″.
- Make sure that the duct is safely and properly fastened to the outlet.
- Avoid sharp bends and corners to ensure maximum air flow and avoid back pressure/heat accumulation in heater.
- Do not exceed 3/4″ w.c. of back pressure.
- FAILURE TO COMPLY WITH THESE RECOMMENDATIONS COULD RESULT IN SHUTDOWN OF THE HEATER.

Rec Duct PN WD2025 (20′Dia. x 25′ Long)

START UP

- Only people trained in the operation and supervision of this heater should operate and maintain the unit.
- Check the unit to make sure that there are no visible defects on the control and safety devices and that the unit has been installed correctly.
  1. Check that the control switch on the control box is in position "0" (STOP).
  2. Pre-select desired room temperature on the remote thermostat. The temperature must be set higher than the ambient temperature.
  3. Open all possible shut-off devices of the fuel supply lines.
  4. Turn the control switch on the control box to position "1" (HEATING).
  5. When the ambient temperature level is low, the burner switches on automatically. The fan does not switch on until the set temperature (104°F) of the heat-exchanger has been reached (will take approximately 1-5 minutes).

- After startup, the heater is operated automatically by the room thermostat and governed by all control devices, including the safety limit controls.
- The room thermostat and burner sensor control the running sequences of the burner and the fan sensor controls the fan function.
- Overheat limit reset controls and shuts off the heater (burner) in the case of overheating.
- The unit can also be used for ventilation purposes only, if needed.
  1. Turn the control switch on the control box to position "2" (VENTILATION).
  2. The unit is now in the continuous ventilating mode.
  3. Heating is not possible in this mode.

SHUT DOWN

- Turn control switch to position "0" (STOP).
- If moving the heater, close fuel supply followed by turning control switch to position "0" (Stop).

Important!
The air supply fan continues running to cool down the combustion chamber/heat exchanger and then stops later. The fan can restart for several times before finally switching off!

WARNING!

UNIT MAY BE UNPLUGGED IN EMERGENCY SITUATIONS ONLY. OTHERWISE, DO NOT STOP THE UNIT BY UNPLUGGING IT. UNIT NEEDS TO COOL DOWN USING ITS OWN FAN. FAILURE TO COMPLY WITH PROPER SHUT-DOWN PROCEDURES CAN CAUSE DAMAGE TO THE COMBUSTION CHAMBER, HEAT EXCHANGER, SAFETY FEATURES AND WILL VOID WARRANTY.

MAINTENANCE

Prior to starting any maintenance work be sure to disconnect unit from power supply after the unit cools down fully and fan shuts off! (Shut Down Procedures page 6)

To ensure the proper function of the unit, it must be serviced on regular basis. Maintenance can be performed, excluding the control devices and safety limit controls, by an authorized trained & certified Heat Wagon dealer. The control devices and safety limit controls do not need routine maintenance. If these items fail they must be replaced.

- Do not use any aggressive cleaning agents, which are harmful or environmentally unfriendly, when cleaning the unit.
- Do not use water jet when cleaning the unit.
- Pressurized air may be used for maintenance. Be careful not to damage the fan blower wheel with too much pressure (<30 psi).
- Check whether the unit is free from mechanical damage, replace faulty parts as necessary.
- ***Check fan blower wheel of the fan at regular intervals and clean it with a small brush when needed, especially in a dusty (drywall) environment.***
- Check functionality of control and safety devices regularly.
- Have the flue gas values of the burner checked regularly by authorized agents.
- Be sure to store the unit in a dust free and dry place when it is not used for a long period of time. Cover the exhaust flue to prevent entry of foreign objects.

SERVICE

- The complete unit, including heat exchanger, combustion chamber and burner should be cleaned from dust and dirt after every heating period, at a minimum of once per year.

-Removal of combustion chamber/heat exchanger:

For proper cleaning of the unit, manufacturer recommends removal of the access panel of the heat exchanger. Clean combustion chamber and exchanger tube with brush. Vacuum all loose ash and soot. Close all cleaning flanges carefully to avoid damage to gasket material.

-Disassembling of burner:

1. Disassemble two tightening nuts on the combustion chamber flange and remove burner from mounting flange. Take care not to damage the flange gasket.

2. Pull out the burner. Take care not to damage the burner head and power cable. Clean blower wheel, ignitor electrode and flame sensor. Inspect the inside of the combustion chamber.

REFERENCE CHARTS

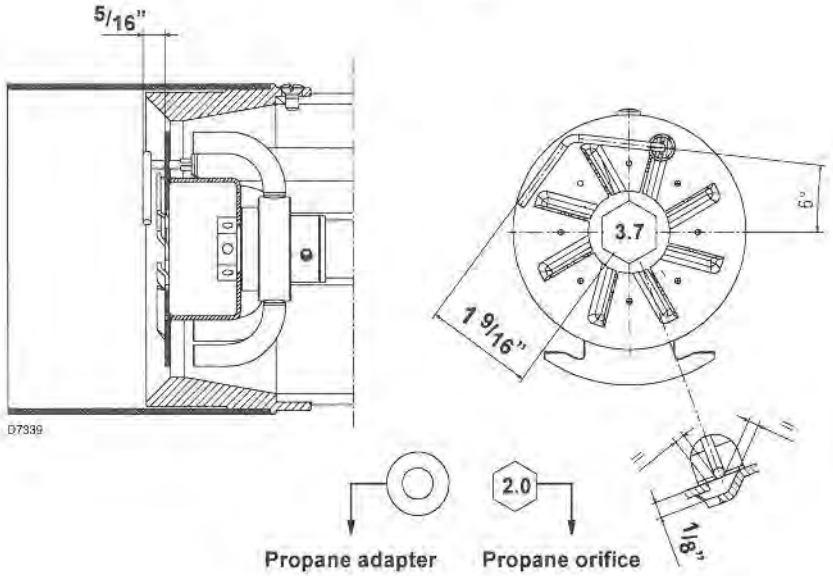
VAPORIZATION RATES IN BTUH @ 0 DEG. F

TANK SIZE	NUMBER OF TANKS MANIFOLDED	PERCENTAGE OF TANK FILLED					
		10%	20%	30%	40%	50%	60%
250							
	1	126,900	169,200	197,400	225,600	253,800	282,000
	2	279,180	372,240	434,280	496,320	558,360	620,400
	3	486,027	648,036	756,042	864,048	972,054	1,080,060
500							
	1	198,135	264,180	308,212	352,240	396,270	440,300
	2	435,897	581,196	687,066	774,928	871,794	968,660
	3	758,857	1,011,809	1,180,451	1,349,079	1,517,714	1,686,349
1000							
	1	354,240	472,320	551,040	629,760	708,480	787,200
	2	779,328	1,039,104	1,212,288	1,385,472	1,558,656	1,731,840
	3	1,356,739	1,808,985	2,110,483	2,411,980	2,713,478	3,014,976

NOTE: USE FOLLOWING MULTIPLIERS FOR OTHER AIR TEMPERATURES

For -10° F multiply x 0.50
For + 10°F multiply x 1.5
For +20°F multiply x 2.0
For +40°F multiply x 3.0
For +50°F multiply x 3.5
For +60°F multiply x 4.0

ELECTRODE AND FLAME PROBE ADJUSTMENTS



⚠ **WARNING:**
Do not turn the ignition electrode. Leave it as shown in the drawing.
If the ignition electrode is put near the ionization probe, the amplifier of the control box may be damaged.

LPG Kit

The LPG kit allows the above burners, suitable to run on natural gas, to burn LPG.

TECHNICAL FEATURES

The thermal output and working field of burners converted to use LPG are the same as those for the use of natural gas.
(See burner technical instructions).

GAS Family 3:

Net calorific value: 24 - 34 kWh/m^3

21,000 - 29,300 kcal/m^3

Min. pressure 25 - max. 50 mbar.

LIST OF KIT'S COMPONENTS

Quantity	Component
1	Washer
1	Diffuser 2
1	Adhesive label
1	Technical instructions

CONVERSION

On the combustion head of the burners, that natural gas diffuser should be replaced with the one used for LPG, and a washer should be added.

Proceed as follows: (Fig. A)

- Disassemble the ignition electrode and the ionisation probe.
- Take the distributor-diffuser disc off after removing the diffuser.
- Insert the washer, re-assemble the distributor-diffuser disc and fix the diffuser (stamping 2) sent as equipment.
- Reassemble the electrode and the ionisation probe in the position foreseen in the instructions for the natural gas.
- Affix the adhesive label as illustrated in Fig. B.

COMBUSTION HEAD ADJUSTMENT

This is the same as for the burners running on natural gas. (See burner technical instructions).

CORRELATION BETWEEN GAS PRESSURE AND BURNER OUTPUT (Fig. C)

Pressure measured at the pipe coupling of the burner working with LPG (Net calorific value 23,000 kcal/m^3), with combustion chamber at 0 mbar.

Fig. A

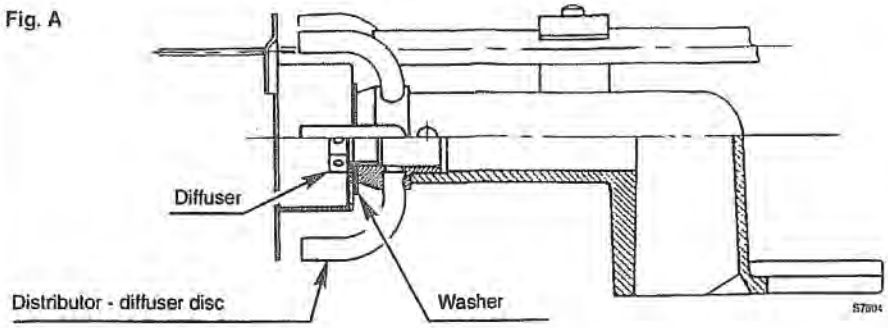


Fig. B

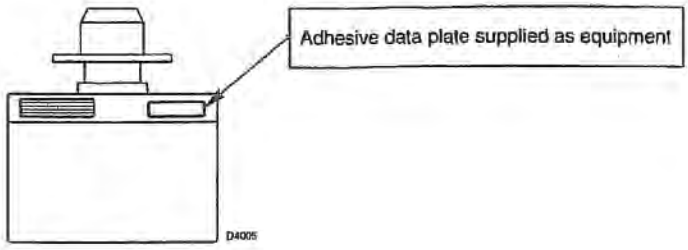
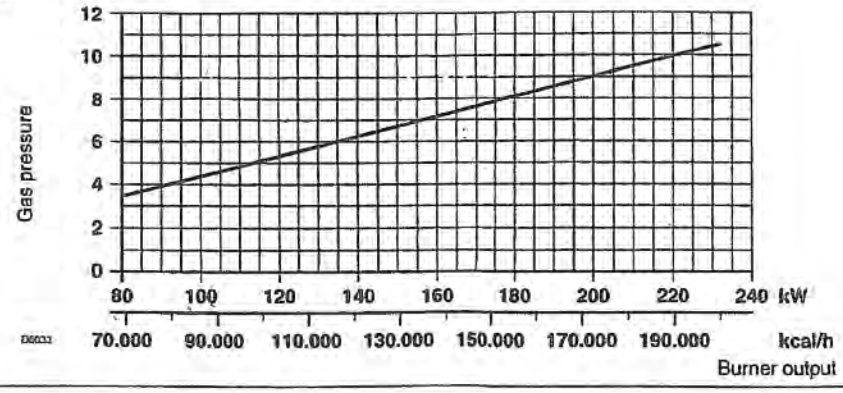


Fig. C



Propane Orifice Kit
PN BIE 3000886

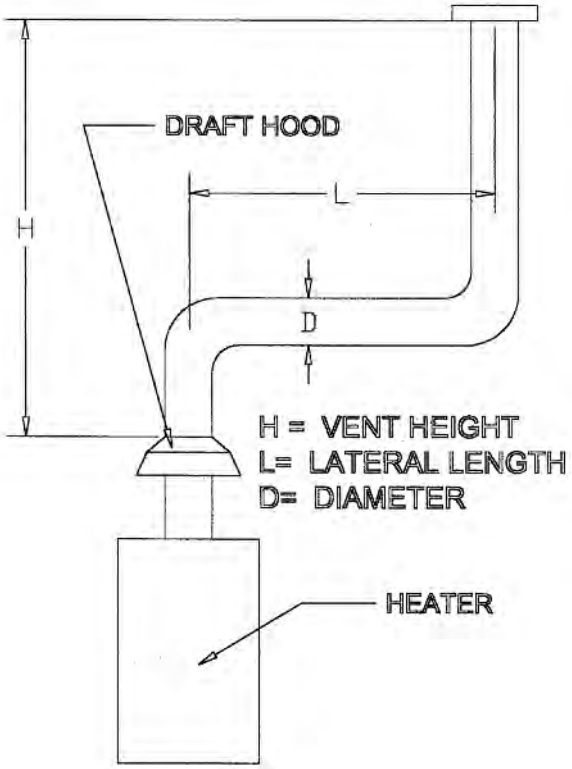
Natural Gas Orifice
PN BIE 3006703

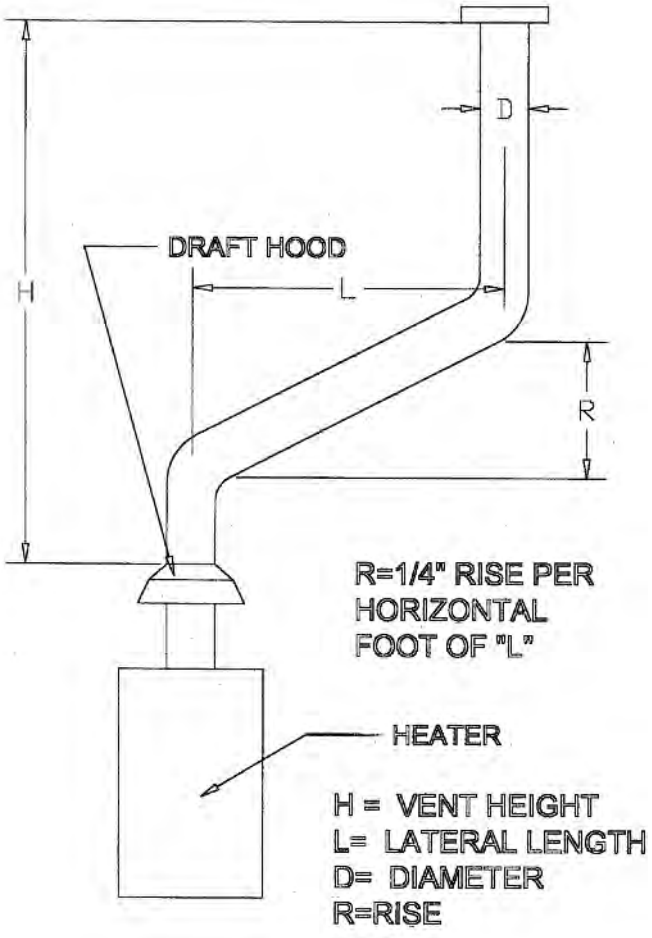
Note: Propane orifice needs to be installed with washer.

Remove washer for NG orifice installation.

heat wagon

EXHAUST FLUE PIPE GUIDELINES



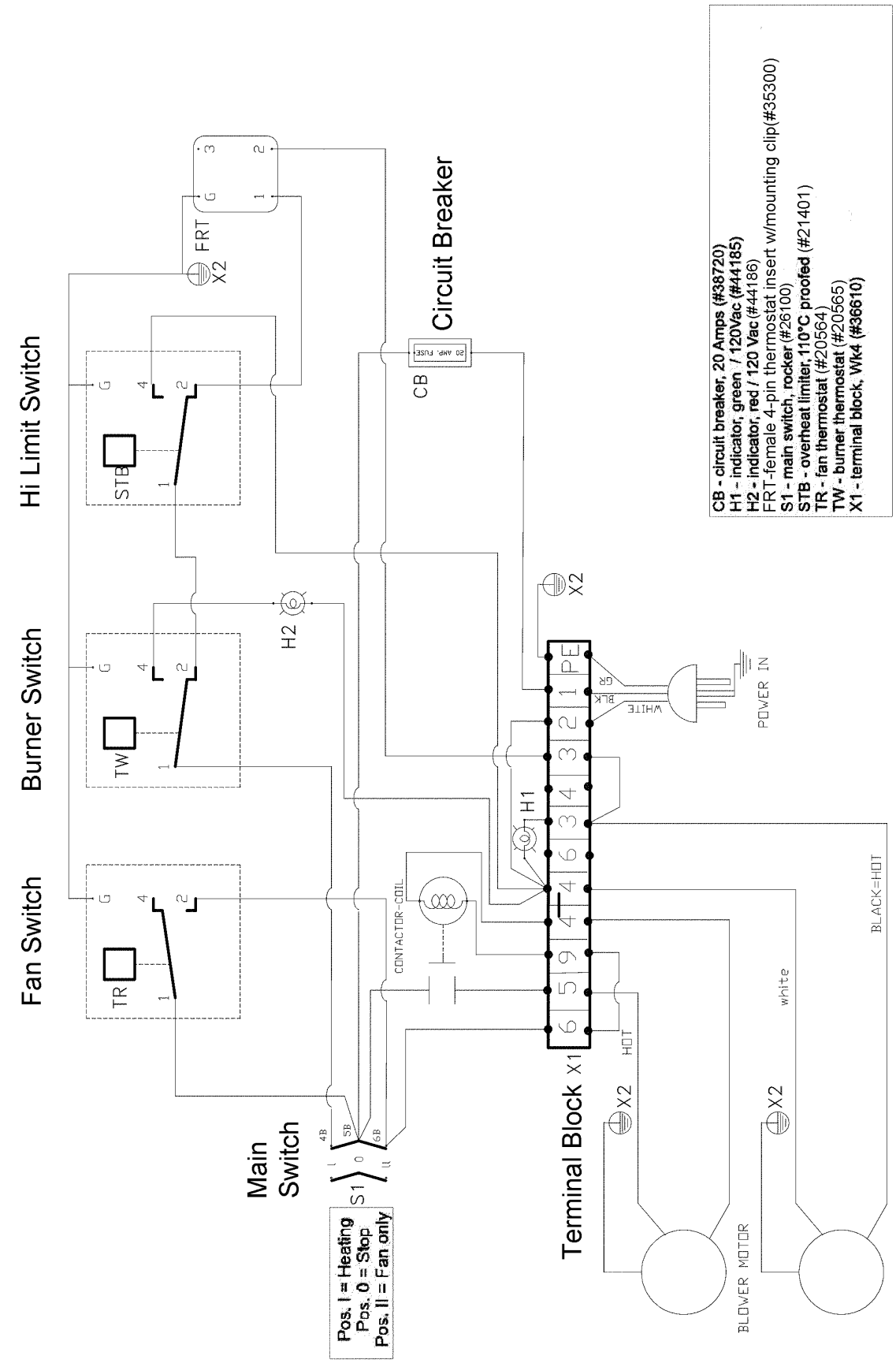


CAPACITY OF TYPE B DOUBLE-WALL VENTS SERVING A SINGLE DRAFT HOOD-HEATER x 1000 BTU'S

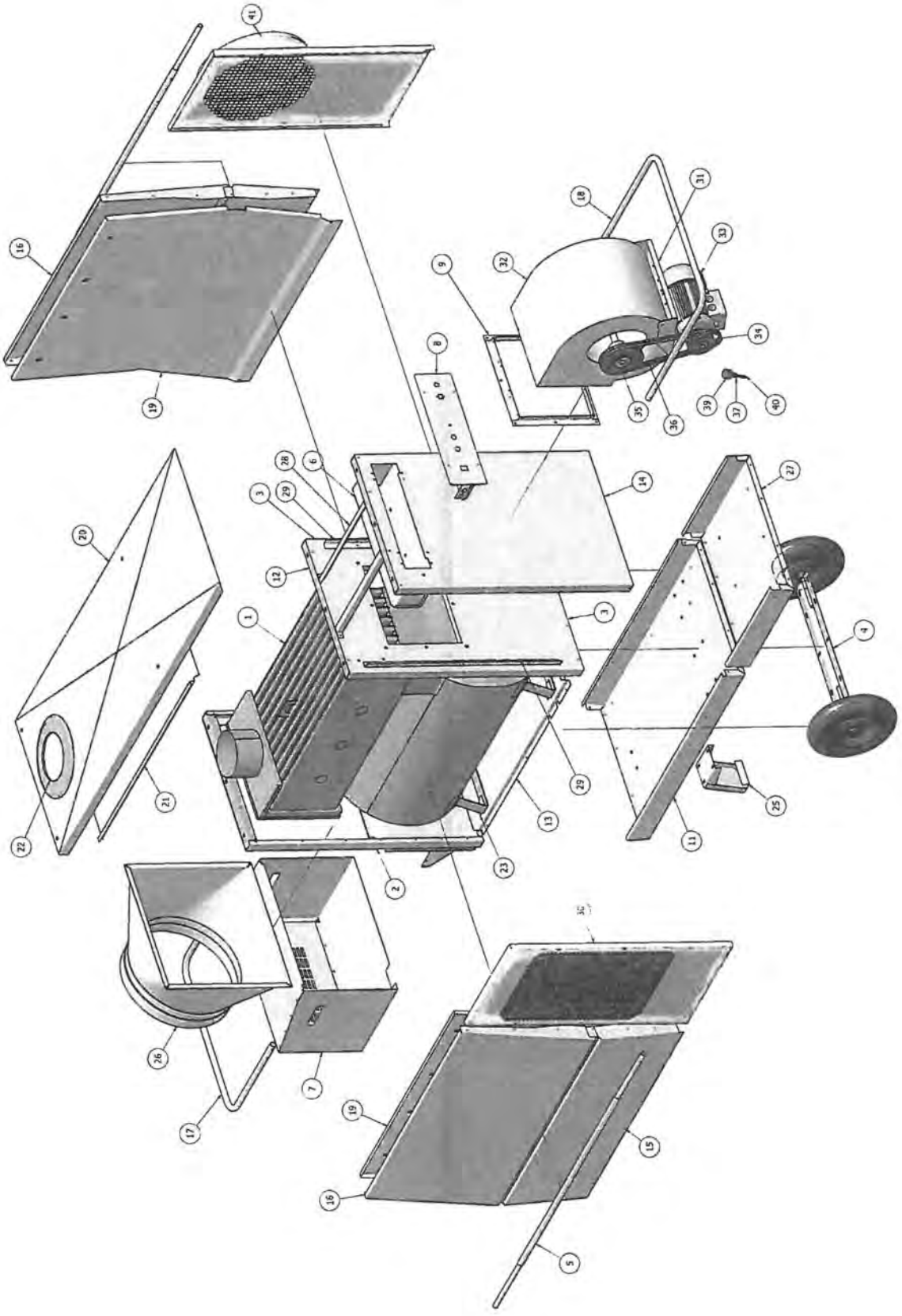
FOR INDOOR APPLICATIONS

VENT DIAMETER (D) INCHES					
		8	10	12	14
TOTAL VENT HEIGHT(H) FEET	LATERAL LENGTH (L) FEET				
6	0	370	570	850	1170
	2	285	455	650	890
	6	273	435	630	870
	12	255	406	610	840
8	0	415	660	970	1320
	2	322	515	745	1020
	8	303	490	720	1000
	16	281	458	685	950
10	0	450	720	1060	1450
	2	355	560	850	1130
	10	330	525	795	1080
	20	300	486	735	1030
15	0	525	840	1240	1720
	2	414	675	985	1350
	15	373	610	905	1250
	30	328	553	845	1180
20	0	575	930	1350	1900
	2	470	755	1100	1520
	10	443	710	1045	1460
	20	410	665	990	1390
	30	380	626	945	1270
30	0	650	1060	1550	2170
	2	535	865	1310	1800
	20	473	784	1185	1650
	40	415	705	1075	1520

WIRING CHART



PARTS BREAKDOWN



PARTS LIST

ITEM #	QTY	PART #	DESCRIPTION
1	1	2077-10	BURNER CHAMBER ASSEMBLY
2	1	2077-50	BURNER PANEL
3	1	2077-51	BLOWER WALL
4	1	2077-52	WHEEL SHAFT
5	2	2077-53	HANDLE, SIDE
6	1	2077-63	ELECTRICAL BOX
7	1	2077-64	BURNER HOUSING COVER
8	1	2077-65	CONTROL PANEL
9	1	2077-71	BLOWER FLANGE
10	1	2077-72	SURFACE PLATE INLET NOZZLE NOT SHOWN
11	1	2077-130	BOTTOM PLATE BURNER
12	3	2077-135	LIFTING BEAM
13	1	2077-137	INSULATING PANEL, BOTTOM
14	1	2077-139	BACK PANEL
15	2	2077-147	SIDE PANEL, BOTTOM
16	2	2077-148	SIDE PANEL, TOP
17	1	2077-150	HANDLE, BURNER
18	1	2077-151	HANDLE, BLOWER
19	2	2077-152	INSULATING PANEL, SIDE
20	1	2077-154	TOP COVER
21	1	2077-155	INSULATING PANEL, TOP
22	1	2077-156	COLLAR, SMOKE FLUE ADAPTER
23	4	2077-164	HOUSING ATTACHMENT SLOTS
24	2	2077-180	TIRE NOT SHOWN
25	1	2077-170	SUPPORT LEG
26	1	2077-203	DUCT ADAPTER
27	1	2077-221	BOTTOM PLATE, BLOWER
28	2	2077-222	BRACKET, TOP BLOWER
29	2	2077-223	MOUNTING STRIPS, SIDE
30	1	2077-226	AIR INLET, LEFT PANEL
31	1	2077-227	MOTOR MOUNT PLATE
32	1	38243420M	AIR FAN
33	1	HM1050	MOTOR
34	1	LD4P	MOTOR CLUTCH PULLEY
35	1	AK74	BLOWER FAN PULLEY
36	2	A42	V BELT
37	4	M10 x 1.25 -din zn	HEX NUT
38	2	M10-din 934 zn	HEX NUT
39	2	040 H25 -M10	VIBRATION DAMPER
40	2	M10-90 din 975 zn	THREADED ROD
41	1		AIR INLET, RIGHT

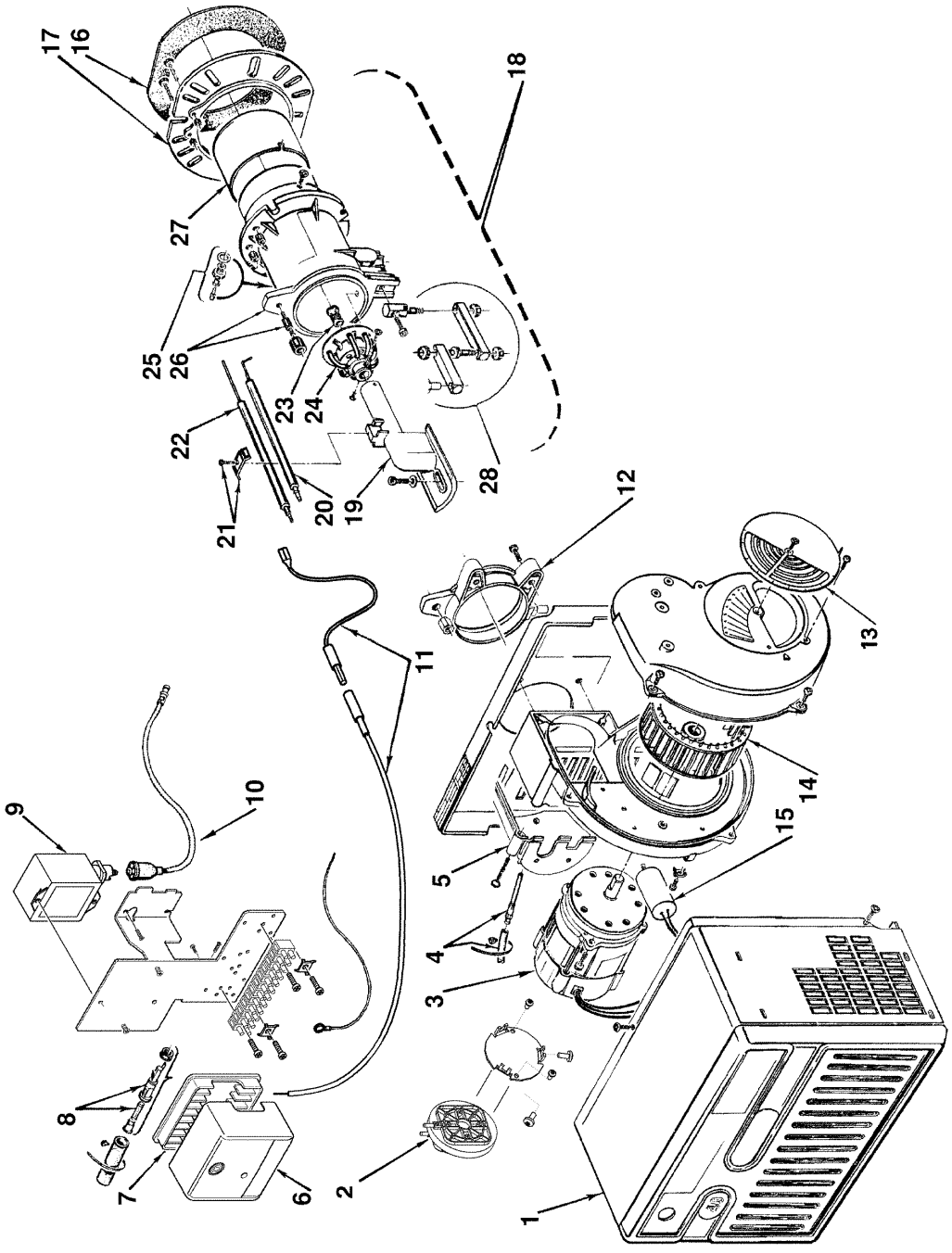
NOT SHOWN

214490	FLUE STACK
140008B	BURNER
THIDF	THERMOSTAT ASSEMBLY
38720	CIRCUIT BREAKER
44185	INDICATOR, GREEN LIGHT
44186	INDICATOR, RED LIGHT
26100	MAIN SWITCH, ROCKER
21401	OVERHEAT LIMIT SWITCH
20564	FAN SWITCH
20565	BURNER SWITCH
36610	TERMINAL BLOCK
35300	FRT ASSEMBLY-FEMALE THERMOSTAT CONNECTION
RT	4-PIN MALE THERMOSTAT PLUG W/COVER AND CORD RESTRAINT

OPTIONAL ACCESSORIES

WD2025	20” x 25’ DUCT
40SV06	REGULATOR, 3/4” INLET x 1” OUTLET, 60PSI MAX INLET
11SV08	REGULATOR, 1-1/4” INLET x 1-1/4” OUTLET, 20PSI MAX INLET

SPARE PARTS BREAKDOWN



SPARE PARTS LIST

No.	CODE	DESCRIPTION	No.	CODE	DESCRIPTION
1	**3007246**	Burner back cover	18	**3950471**	**Short combustion head (280T1)**
2	**3020314**	Air pressure switch	19	**3006697**	Drawer assembly elbow
3	**3005845**	Burner motor	20	**3006706**	Electrode assembly
4	**3007288**	Air switch tube and connector	21	**3003409**	Electrode & ionization clamp
5	**3007294**	Air plate cover	22	**3020209**	Ionization assembly
6	**3013072**	Primary control box	23	**3006703**	Natural gas diaphragm
7	**3003784**	Primary control sub-base	24	**3006700**	Distributor head and mixing plate
8	**3006804**	Fuse 6.25A	25	**3005447**	Gas test point
9	**3002462**	Transformer - Ignition	26	**3007525**	Manifold
10	**3002461**	High voltage lead	27	**3006694**	End cone
11	**3007310**	Ionization lead	28	**3000870**	Hinge assembly
12	**3006689**	Chassis mounting collar			
13	**3007206**	Air gate			
14	**3005799**	Fan			
15	**3007307**	Capacitor 20 μF			
16	**3005852**	Mounting gasket			
17	**3005851**	Universal mounting flange			

Gas Pipe Train - Not Shown

C5852400	Maxitrol Regulator (RV61)
C5850607	ASCO Solenoid
C5850017	Dungs Valve

RIELLO BURNER - WIRING

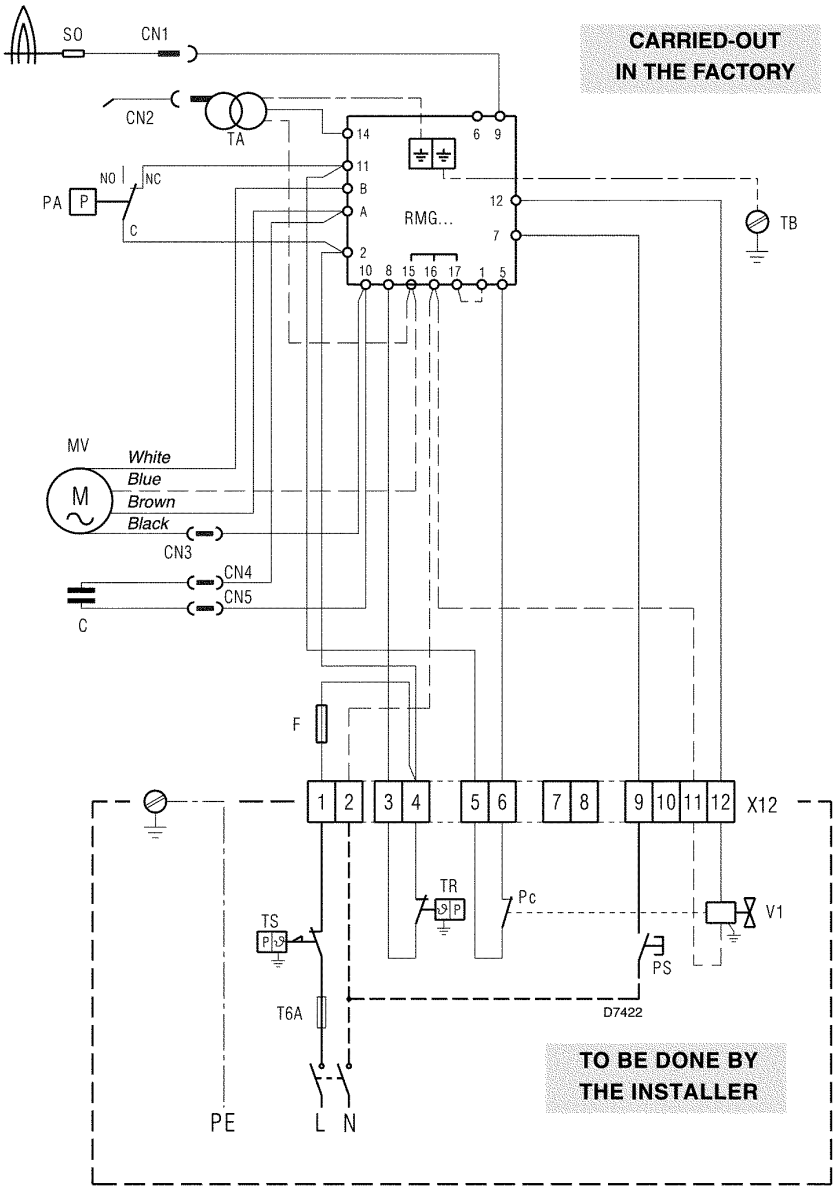
FACTORY WIRING DIAGRAM

CONTROL CIRCUITS

Burner operation may be controlled by 120V control systems.
The required controls must be connected to the burner as described on the following.

120V CONTROL SYSTEM

The burner provides it own power supply for the control circuits that is switched internal from terminal 1(L) & 2 (N), do not apply power on any other terminal or damaged to the control could occur.
The factory-installed jumper can be removed if a P.O.C device is desired.



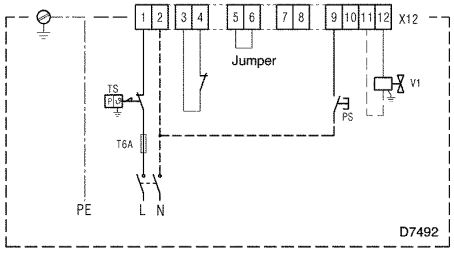
NOTE

If an external electrical source is utilized, the conversion burner, when installed, must be electrically grounded with a solid green wire to Earth Ground, in accordance with local codes or, in the absence of local codes, with the National Electrical Code ANSI/NFPA 70-1990 and the CSA Electrical Code.

Wiring legend

- **C** - Capacitor MV
- **F** - Fuse 6.25A
- **CN...** - Connectors
- **MV** - Motor
- **PA** - Air pressure switch
- **Pc** - Valve source interlock
- **PS** - Remote lock-out signal
- **SO** - Ionization probe
- **TA** - Ignition transformer
- **TB** - Burner earth
- **TR** - Limit thermostat
- **TS** - Safety thermostat
- **T6A** - Fuse
- **V1** - Gas valve
- **X12** - Terminal board 12 pole

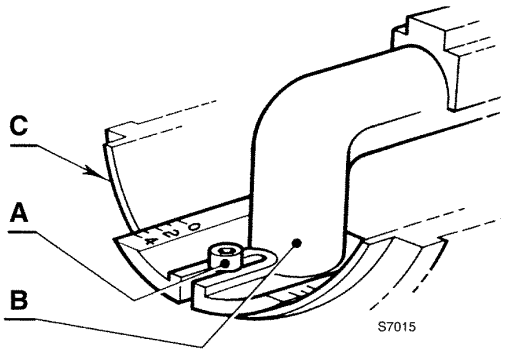
120V CONTROL SYSTEM



RIELLO BURNER - COMBUSTION HEAD

COMBUSTION HEAD SETTING

To set combustion head, loosen the Allen screw (**A**) and move the elbow (**B**) so that the rear edge of the air tube (**C**) coincides with the set point number.
See firing rate chart for set points.
Retighten the Allen screw (**A**).



⚠ **Make sure you are using the correct table for either Natural gas or Propane gas.**

BURNER SETUP CHART

	BTU Input	Air Gate	Stop Gate	Manifold Pressure	Line Pressure
NATUARAL GAS	250,000	1.1	0.0	1.00	1.37
	350,000	2.0	0.0	2.00	2.70
	450,000	2.5	1.0	1.87	3.10
	550,000	2.9	2.0	1.75	3.45
	650,000	4.0	3.0	2.05	4.35
	750,000	5.0	4.0	2.45	5.35
	900,000	9.0	5.0	3.35	7.75
PROPANE	250,000	1.20	0.0	1.23	1.40
	350,000	2.00	0.0	2.25	2.53
	450,000	2.40	1.0	2.15	2.60
	550,000	3.20	2.0	2.8	3.63
	650,000	4.25	3.0	3.2	4.30
	750,000	5.25	4.0	4.2	5.65
	900,000	8.00	5.0	5.2	6.90

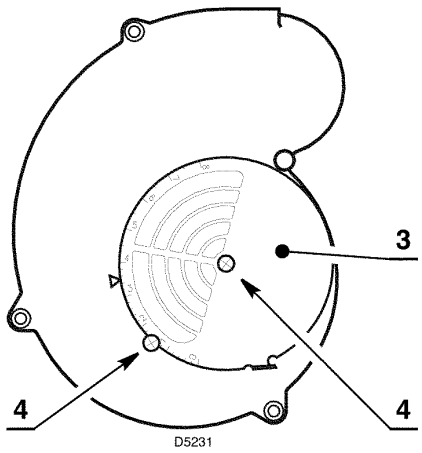
1) All tests were performed with 0" wc chamber pressure
2) Line pressure measured at test point before burner regulator.

NOTE:
The above settings are a starting point for adjustments ONLY; a qualified gas technician using proper test equipment must do the final adjustments.
Proper CO_2, O_2, and CO readings must be taken and be within regulating code requirements.
All the settings above are based on zero (0) over fire-draft.
If positive or negative chamber conditions exist some settings changes made be required.
For any referral to valve setting, please check the attached manufacturer valve specification.

RIELLO BURNER - AIR GATE

AIR GATE ADJUSTMENT

To regulate the combustion air, adjust the manual air gate (3), by loosening the locking screws (4).
Once the optimal adjustment is reached, tighten the locking screws (4).



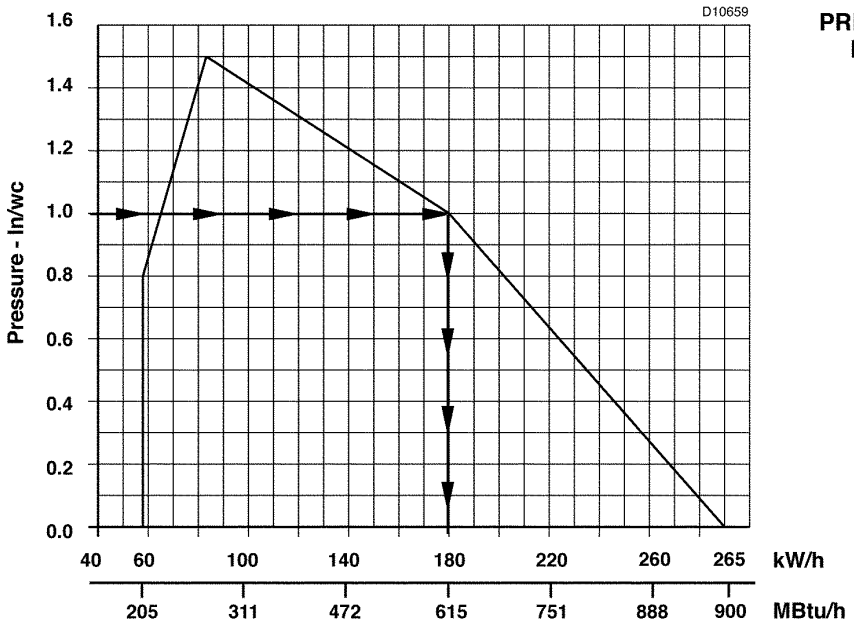
EXAMPLE SETTING - (for natural gas)
To set the air intake for a desired burner output of 450,000 Btu/hr, use **TABLE** to determine the correct air gate setting.
In this case, the setting would be 1.8 for natural gas.
Turn the manual air gate (3) until the arrow points to 1.8 on the scale.
Tighten locking screws (4).

All settings in **TABLE** are obtained with zero (0) pressure in the combustion zone and at normal operating temperatures. i.e., steady state hot conditions.

Note: Burner must be fired **ONLY** with fuel that is listed on the burner serial label.

PRESSURE WORKING CHART

The chart below shows effects of pressure in the combustion zone on the minimum/maximum burner outputs.
In this example, with a maximum operating pressure of 1.0 inches water column in the combustion zone, you will be able to obtain a maximum of 615 KBtu/h burner output.

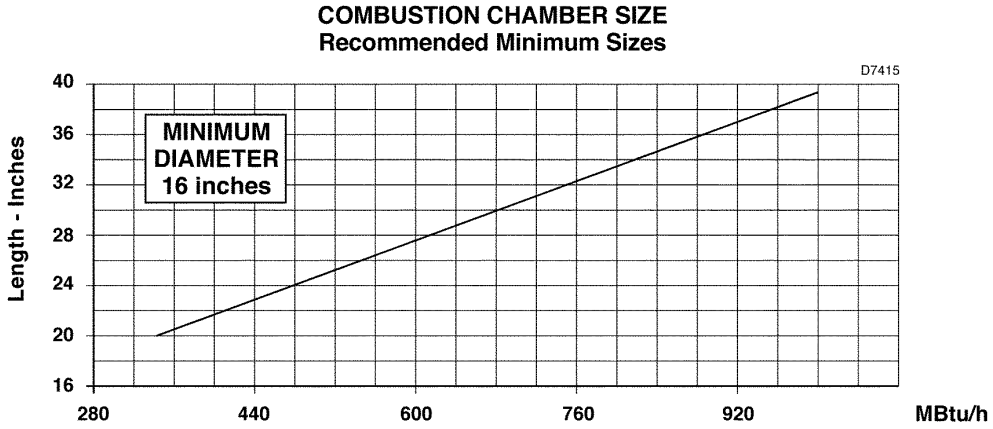


PRESSURE WORKING CHART
Natural and Propane Gas

Any change from zero (0) pressure in the combustion zone will affect the KBtu output of the burner. To supply the required input to the appliance, manifold pressure will have to be adjusted to compensate for this condition.

RIELLO BURNER - COMBUSTION CHAMBER

COMBUSTION CHAMBER SIZE



NOTES:

1) Sizes shown above are for cylindrical or wet base boilers, or air cooled heat exchangers.
2) To size the chamber in applications other than wet base boilers, you must calculate area in square inches of the combustion zone required to give you a grate area or floor area to match the BTU inputs according to local authority.
3) Recommended firebrick or cerafelt material has a continuous run limited to 2400 degrees Fahrenheit and a melting point of 3000 degrees Fahrenheit.

COMBUSTION CHECKS

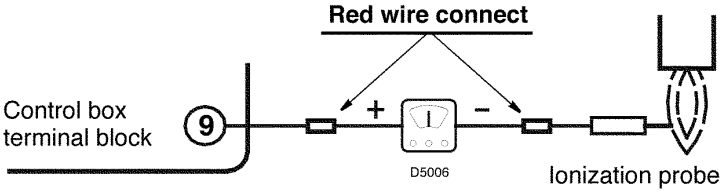
CO_2 It is advisable not to exceed a measured reading of 10% CO for Natural Gas or 12% CO for Propane Gas taken with the burner cover in place, to avoid the risk of the formation of CO due to minor changes in wind/draft conditions which may occur.

CO For safety reasons, the value of .02% (200ppm) free air sample must not be exceeded.

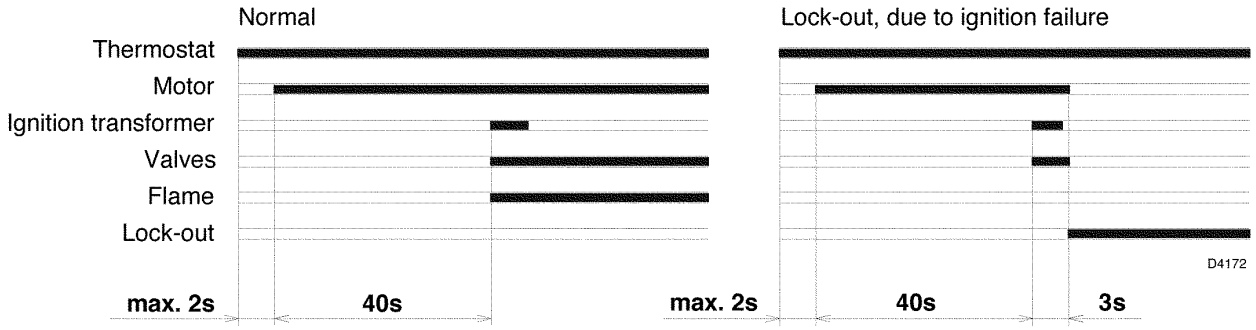
IONIZATION CURRENT

The minimum amount of current necessary for the control box to operate properly is 5 micro Amps DC.

To measure the ionization current, disconnect the red wire connector and insert a DC micrometer in series with control box terminal 9 and the ionization probe, which senses the flame.



BURNER START-UP CYCLE



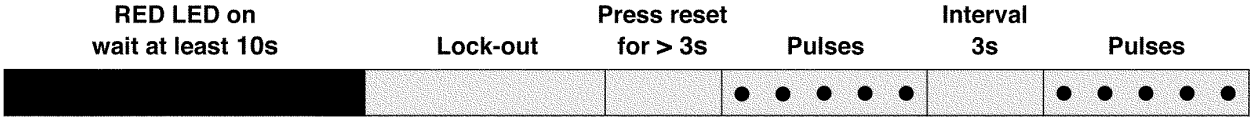
START-UP CYCLE DIAGNOSTICS

During start-up, indication is according to the followin table:

COLOUR CODE TABLE	
Sequences	**Colour code**
Pre-purging	●●●●●●●●●●
Ignition phase	●○●○●○●○●○●
Operation, flame ok	❑❑❑❑❑❑❑❑❑❑❑❑
Operating with weak flame signal.	❑○❑○❑○❑○❑○
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●▲●
Lock-out	▲▲▲▲▲▲▲▲▲▲
Extraneous light	▲❑▲❑▲❑▲❑▲❑▲
Index: ○ Off ● Yellow ❑ Green ▲ Red	

RESETTING THE CONTROL BOX AND USING DIAGNOSTICS

The control box features a diagnostics function through which any causes of malfunctioning are easily identified (indicator: **RED LED**).
To use this function, you must wait at least 10 seconds once it has entered the safety condition (**lock-out**), and then press the reset button. The control box generates a sequence of pulses (1 second apart), which is repeated at constant 3-second intervals.
Once you have seen how many times the light pulses and identified the possible cause, the system must be reset by holding the button down for between 1 and 3 seconds.



The methods that can be used to reset the control box and use diagnostics are given below.

RESETTING THE CONTROL BOX

To reset the control box, proceed as follows:
➢ Hold the button down for between 1 and 3 seconds.
The burner restarts after a 2-second pause once the button is released.
If the burner does not restart, you must make sure the limit thermostat is closed.

VISUAL DIAGNOSTICS

Indicates the type of burner malfunction causing lock-out.
To view diagnostics, proceed as follows:
➢ Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
A yellow light pulses to tell you the operation is done.
Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, indicated in the table below.

RIELLO BURNER - DIAGNOSTICS (TROUBLESHOOTING)

SOFTWARE DIAGNOSTICS

Reports the life of the burner by means of an optical link with the PC, indicating hours of operation, number and type of lock-outs, serial number of control box etc ...

To view diagnostics, proceed as follows:

➢ Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
A yellow light pulses to tell you the operation is done.
Release the button for 1 second and then press again for over 3 seconds until the yellow light pulses again.
Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

Once the operations are done, the control box's initial state must be restored using the resetting procedure described above.

BUTTON PRESSED FOR	CONTROL BOX STATUS
Between 1 and 3 seconds	Control box reset without viewing visual diagnostics.
More than 3 seconds	Visual diagnostics of lock-out condition: (LED pulses at 1-second intervals).
More than 3 seconds starting from the visual diagnostics condition	Software diagnostics by means of optical interface and PC (hours of operation, malfunctions etc. can be viewed)

The sequence of pulses issued by the control box identifies the possible types of malfunction, which are listed in the table below.

SIGNAL	PROBABLE CAUSE
2 pulses ● ●	The flame does not stabilise at the end of the safety time: – faulty ionisation probe; – faulty or soiled gas valves; – neutral/phase exchange; – faulty ignition transformer – poor burner regulation (insufficient gas).
3 pulses ● ● ●	Minimum air pressure switch does not close: – make sure VPS trips to produce lockout; – air pressure switch faulty; – air pressure switch incorrectly regulated; – fan motor does not run; – maximum air pressure switch operating.
4 pulses ● ● ● ●	Min. air pressure switch does not open or light in the chamber before firing: – air pressure switch faulty; – air pressure switch incorrectly regulated.
7 pulses ● ● ● ● ● ● ●	Loss of flame during operations: – poor burner regulation (insufficient gas); – faulty or soiled gas valves; – short circuit between ionisation probe and earth.
10 pulses ● ● ● ● ● ● ● ● ● ●	– Wiring error or internal fault.

RIELLO BURNER - TROUBLESHOOTING

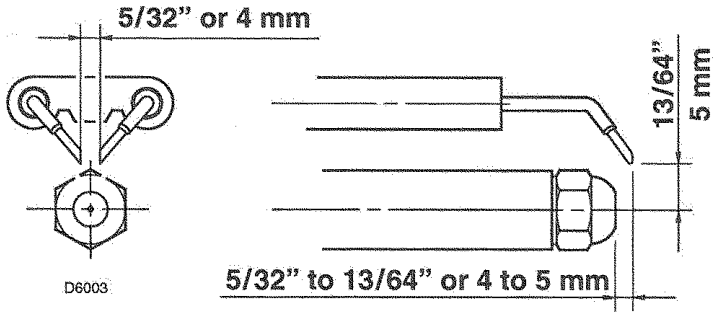
PROBLEM SOLVING GUIDE

Burner starting difficulties and their causes:

1) The burner goes to lockout after the prepurge period because the flame does not ignite.
   a) Air has not been fully evacuated from the gas lines.
   b) The gas valve is passing too little gas.
   c) The ignition spark is irregular or not present.
   d) The gas valve is defective.
2) The burner does not start when there is a call for heat.
   a) The air pressure switch has failed to return to n.c. contacts.
   b) There is no gas, or insufficient pressure in the supply lines to activate the optional gas pressure switch (if used).
   c) There is a blown buss fuse behind the terminal strip.
   d) The burner has gone off on safety.
   e) The low voltage contacts or the low voltage relay are defective.
3) The burner does not go through prepurge, ignition is established, the burner fires for 2 seconds, then goes to lockout.
   a) The air pressure switch does not change from normally closed to normally open contacts. This condition exists due to insufficient pressure in the air tube. Moving the firing head towards zero (0) on the stop gate will rectify this problem.
4) The burner goes through prepurge, ignition is established, the burner fires for 2 seconds, then goes to lockout.
   a) The flame rectification rod (flame rod) has shorted to ground or is defective.
   b) Polarity is reversed or the earth ground is not properly connected.
   c) The ionization current is weak (lower than 5 micro-amps).

VF600 OIL FIRED
BURNER ELECTRODE SETTING

IMPORTANT:
THESE DIMENSIONS MUST BE OBSERVED AND VERIFIED.

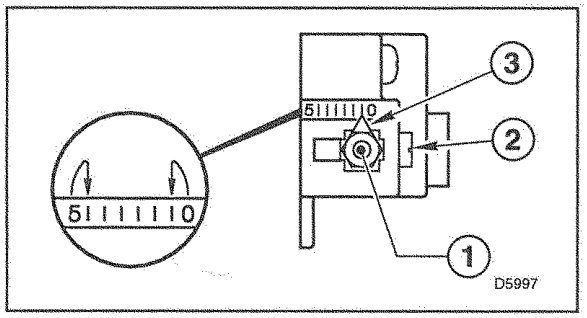


TURBULATOR SETTING

A) Loosen NUT (1), then turn SCREW (2) until the INDEX MARKER (3) is aligned with the correct index number as per the Burner Set-up chart, on page 12.

B) Retighten the RETAINING NUT (1).

NOTE: Zero and five are scale indicators only. From left to right, the first line is 5 and the last line 0.



OIL LINE CONNECTIONS

This burner is shipped with the oil pump set to operate on a **single** line system.
To operate on a **two** line system the by-pass plug **must** be installed.
Warning: Do not operate a **single** line system with the by-pass plug installed. Operating a **single** line system with the by-pass plug installed will result in damage to the pump shaft seal.

Note: Pump pressure must be set at time of burner start-up. A pressure gauge is attached to the **PRESSURE PORT** (8) for pressure readings. Two **PIPE CONNECTORS** (5) are supplied with the burner for connection to either a single or a two-pipe system. Also supplied are two **ADAPTORS** (3), two female 1/4" NPT, to adapt oil lines to burner pipe connectors. All pump port threads are **British Parallel Thread** design. Direct connection of NPT threads to the pump **will damage** the pump body.

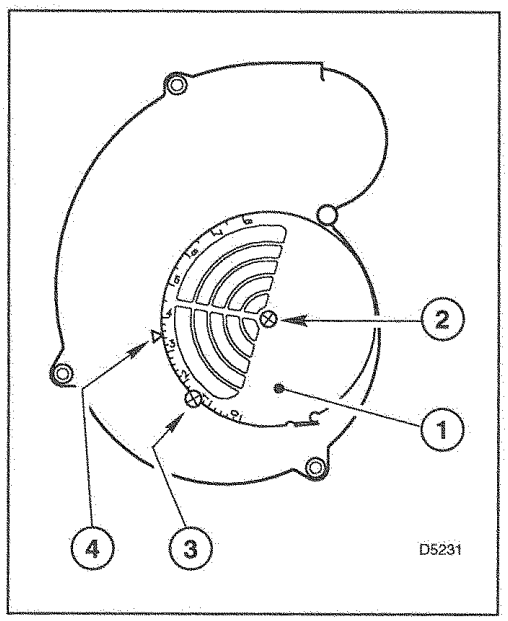
VF600 OIL FIRED
BURNER AIR ADJUSTMENT

A) Regulation of the combustion air flow is made by adjustment of the manual AIR ADJUSTMENT PLATE (1) after loosening the FIXING SCREWS (2 & 3). The initial setting of the air adjustment plate should be made according to Column 5 in the Burner Set-up Chart.

B) The proper number on the manual AIR ADJUSTMENT PLATE (1) should line up with the SETTING INDICATOR (4) on the fan housing cover. Once set, the air adjustment plate should be secured in place by tightening SCREWS 2 and 3.

C) The final position of the air adjustment plate will vary on each installation. Use instruments to establish the proper settings for maximum CO_2 and a smoke reading of zero.

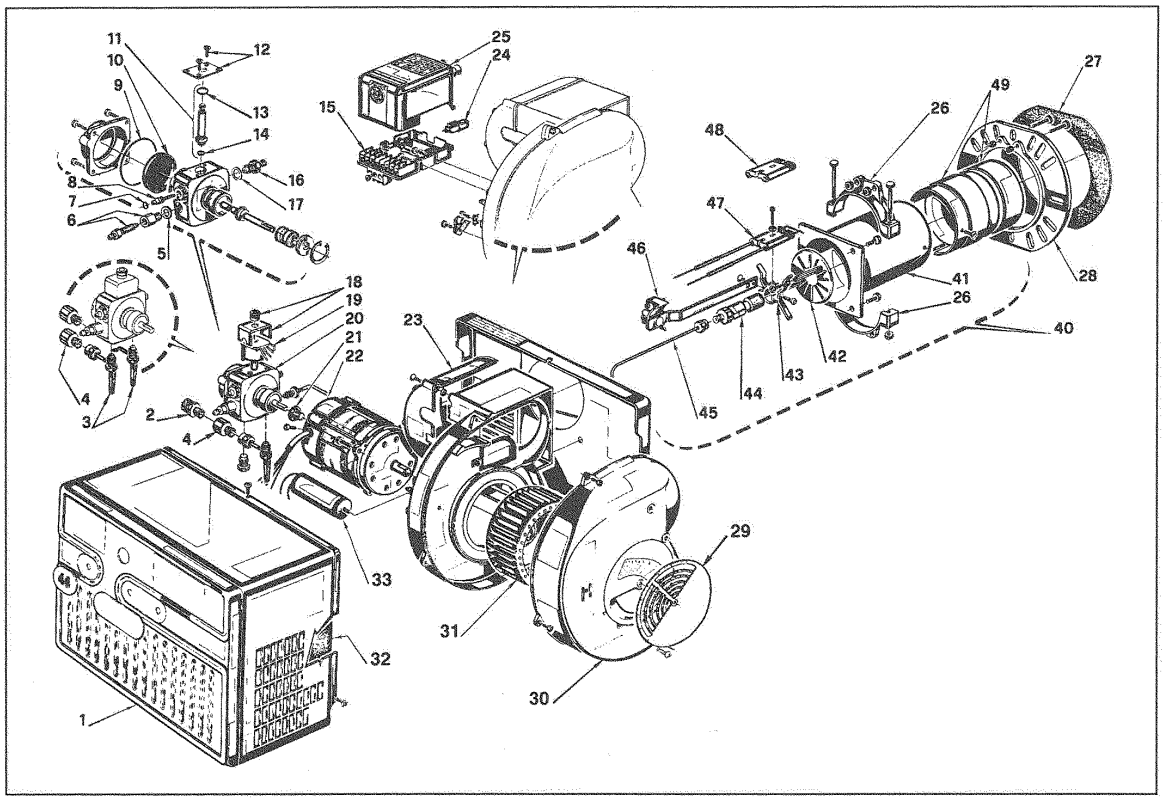
NOTE: Variations in flue gas, smoke, CO_2 and temperature readings may be experienced when the burner cover is put in place. Therefore, the burner cover **must** be in place when making the final combustion instrument readings, to ensure proper test results.



BURNER SET-UP CHART

1		2	3		4	5
ACTUAL FIRING RATE ± 5%		NOZZLE SIZE	PUMP PRESSURE		TURBULATOR SETTING	AIR DAMPER SETTING
GPH	kg/h	GPH	PSI	BAR		
2.55	8.2	2.00 x 45°/60°	170	11.6	0.0	1.8
2.85	9.2	2.25 x 45°/60°	160	11	0.5	2.0
3.00	9.7	2.50 x 45°/60°	150	10	1.0	2.2
3.65	11.8	3.00 x 45°/60°	150	10	1.5	2.6
4.00	13.7	3.50 x 45°/60°	151	10	2.0	3.1
4.85	15.7	4.00 x 45°	150	10	3.0	4.5
5.45	17.6	4.50 x 45°	150	10	4.5	5.2
5.75	18.6	5.00 x 45°	140	9.6	5.0	5.5

VF600 OIL FIRED
BURNER PARTS BREAKDOWN



NO.	CODE	DESCRIPTION
1	3007235	Burner Back Cover
2	3006571	3/8" NPT/Metric Adapter - Male
3	3006994	Pipe connector - Supply and Return
4	3005847	1/4" NPT/ Metric Adapter - Female
5	3007077	Crushable Metal Washer
6	3007568	Bleeder
7	3007028	O-Ring - Pump Pressure Regulator
8	3007202	Regulator Screw
9	3007162	O-Ring - Pump Cover
10	3005719	Pump Screen
11	3006925	Valve Stem
12	3007203	Valve Stem Plate
13	3007029	O-Ring - Valve Stem Upper
14	3007156	O-Ring - Valve Stem Lower
15	3002278	Primary Control Sub Base
16	3007268	Nozzle Outlet Fitting
17	3007087	Crushable Metal Washer
18	3006553	Coil U-Bracket and Knurled nut
19	3002279	Coil
20	3007802	Pump
21	3000443	Pump Drive Key
22	3005845	Motor
23	3007318	Air Tube Cover
24	3002280	Photo-cell
25	3001157	Primary Control 530SE/C
26	3005849	Semi Flange
27	3005852	Mounting Gasket
28	3005851	Universal Mounting Flange
29	3007206	Manual Air Shutter
30	3007211	Air Intake Housing
31	3005799	Fan

NO.	CODE	DESCRIPTION
32	3007358	Acoustic Liner
33	3005846	Capacitor 16 µF
40	3949171	**Short Combustion Head 5" (274T1)**
41	3005892	Short Air Tube
42	3005897	Turbulator Disc
43	3005896	Cross - casting
44	3006965	Nozzle Adapter
45	3006985	Nozzle Oil Tube - Short
46	3005900	Regulator assembly - Short
47	3005902	Electrode assembly - Short
48	3005869	Electrode Porcelain
49	3005895	End Cone

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