

INSTALLATION & OPERATION

C MANUAL

POWER FLAME INCORPORATED

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. Do not touch electrical switches.
3. Extinguish any open flame.
4. Call your gas supplier immediately.

Do not store or use gasoline or other flammable liquids and vapors in the vicinity of this or any other appliance.

WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

NOTICE

Effective 4/1/94 Underwriters Laboratories require that all gas burners firing at inputs of 2,500 MBH and under be supplied with two gas safety valves or one gas valve with proof of closure (Valve seal over travel). The photos in this manual may not depict these specific components. All U.L. listed products shipped after 4/1/94 will comply with U.L. requirements.

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1. GENERAL PRODUCT INFORMATION

Principal of Operation

Power Flame Type C Burners incorporate the principles of pressure atomization for oil and multiple orifice, venturi operation for gas. The total package utilizes the forced draft, flame retention concept. The Type C burner is listed and labeled by Underwriters Laboratories, Inc. Capacities, when fired at 0.2" w.c. positive combustion chamber pressure, range from 3 to 136.4 GPH of commercial grade #2 fuel oil and/or 98 to 19,100 CFH of natural gas. Air for combustion is furnished by an integrally mounted combustion air fan. The Power Flame packaged combustion system can be operated under positive or negative furnace pressures with clean, efficient combustion in a wide range of combustion chamber conditions. (Consult page 6 for appropriate ratings.)

Power Flame Type C Burners are designed to produce greater flame turbulence and reduce flame size. As a result, they require less combustion volume for complete combustion and can be easily fired under positive furnace pressure. Forced draft pressurized operation requires stacks of smaller diameter and height.

The Power Flame C Burner is a totally packaged and factory tested combustion system offering single unit responsibility. The package incorporates accurate control of the fuel-air ratio throughout the firing range with the resultant controlled flame patterns and clean combustion for maximum efficiency.

Combustion air flow is controlled by a multi-louvered damper assembly. The combustion air is supplied by an integral motor-driven blower, which discharges into the burner blast tube assembly. High turbulence flow is controlled by means of an adjustable fan diffuser system. Various system mode operations are obtained by applying appropriate control valves and fuel/air actuators. Units are capable of operating in modes consistent with specific demand requirements, from *fixed* or *on-off* through *full modulation*.

The air/fuel ratio is established at the time of start-up and proven with combustion test equipment to provide the lowest practical oxygen with a clean flame.

A Flame-Safeguard Programmer, available in various control sequences, programs the firing cycle. The operating cycle is sequenced to ensure normal and safe conditions before fuel can be introduced into the combustion area. The complete firing cycle is supervised to ensure that ignition of main flame is properly established and maintained. Both direct spark and gas pilot ignition systems are available. Flame monitoring is provided by optical scanner of the cesium oxide, lead sulfide, cadmium sulfide or ultraviolet types.

The limit circuit includes the operating limit control to maintain set operating pressure or temperature, as well as a high limit control to guard against excessive pressure or temperature. Low water and other similar safety controls can be interlocked into the burner control system to fit specific job and/or code requirements.

The control circuit is normally 120 volts. A control circuit transformer may be furnished to provide the 120 volt control circuit for polyphase motor applications. The control circuit is frequently interlocked with the polyphase motor circuit to shut down the burner in the event of an interruption of the motor current.

Power Flame Type C burners are capable of firing single or multi-fuel applications. (See model selection, page 6, Table 2.)

For multi-fuel burners, fuel changeover may be provided by automatic control, influenced by outside temperature or manual switching. Interlocking relays and timers ensure safe changeover of fuels by means of a timed interruption of firing, long enough to cause a complete recycle of the programmer.

The prewired Control Panel is mounted and wired as an integral part of the burner in accordance with recommendations of Underwriters Laboratories, Inc. and National Electrical Code. Components are wired to numbered terminal strips. Panels and burners are factory fire tested before shipment. Comprehensive wiring and gas and/or oil piping diagrams are furnished with each burner in accordance with individual job or application requirements. Wall mounted or free-standing control panels are also available.

Power Flame C burners are available with control systems to comply with the requirements of Factory Mutual, Industrial Risk Insurers and any special state, municipal, local and utility company codes, including New York City Department of Buildings (MEA), NYC Department of Environmental Protection, Commonwealth of Massachusetts, State of Connecticut Fire Marshall, Illinois School Code and others.

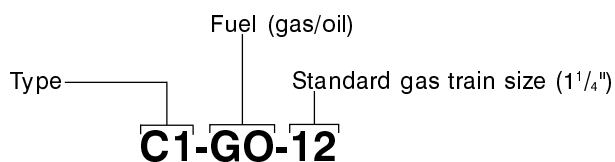
MODEL IDENTIFICATION

The numerical suffix after the letter C denotes the burner frame size. The letter R inserted immediately after the letter C denotes an inverted blower configuration.

The alphabetical designation immediately following the frame size indicates the fuels to be used: G is gas only; O, oil only; and GO, combination gas/oil.

The two numbers following the fuel designation, in all gas and gas/oil listings, denote the standard gas train size. (Selected components may be different pipe sizes than the nominal train size coded.)

10	1" gas train	20	2" gas train
12	1 ¹ / ₄ " gas train	25	2 ¹ / ₂ " gas train
15	1 ¹ / ₂ " gas train	30	3" gas train



Frame size (see capacity ratings)

Any alphabetical suffix (such as A, B, C, S or V, etc.) to the fuel designation denotes special product coding (consult factory).

See page 6 *Standard Burner Ratings and Component Data* for further information.

UNPACKING AND HANDLING

Type C Power Flame burners are usually shipped as a unit with an integrally mounted, prewired control panel. A remote fuel oil pumpset is shipped separately on the larger size oil and oil/gas units. Gas train components may be mounted on the burner or shipped loose for field mounting.

Uncrate burner carefully and check all parts received against the computer generated Burner Specification Sheets supplied by Power Flame. Components not mounted on the burner (shipped loose) are designated with an L on the sheets. Claims of shortage or damage must be immediately filled with the carrier.

WARRANTY AND SPARE PARTS INFORMATION

Power Flame offers a 15 month Limited Warranty on all components from the date of shipment. See page 51 for details.

The Owners Information envelope packed with the burner contains a Warranty Registration Card. The Warranty Registration Card is also a request form for a computer generated Spare Parts List. An on-hand supply of spare parts is highly recommended in case of emergency shutdown. The pre-addressed, postage paid

Warranty Registration Card should be completed and returned to Power Flame. In the event that the Warranty Registration Card is lost, please contact Power Flame's Customer Service Department in Parsons, Kansas. All communications with the factory will be handled more efficiently if the burner is identified by the burner model, serial and invoice numbers. This information is stamped into the burner nameplate that is attached to the integral control panel (or to the burner, when remote control panels are supplied).

COMPONENT INFORMATION-GENERAL

The contents of this manual are general in nature, due to the wide variety of equipment specifications, insurance requirements and state, local and other codes.

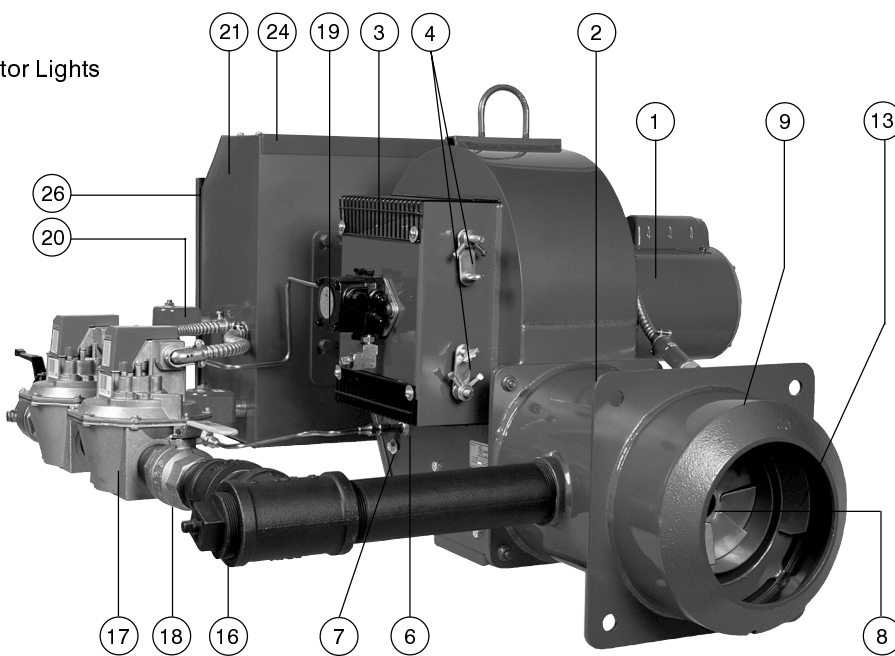
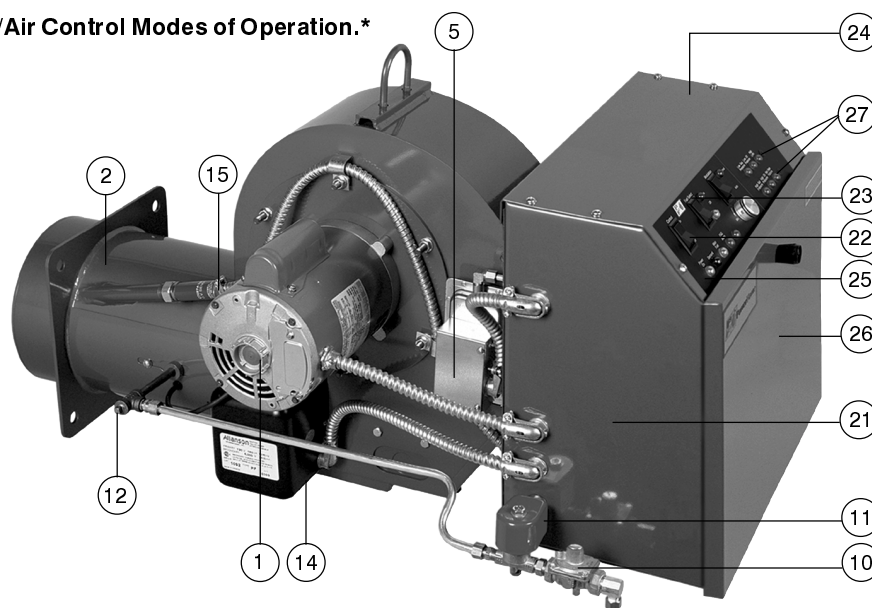
The computer generated Burner Specification Sheets shipped with the burner represent the as *built* version of your specific Power Flame combustion system. Part numbers and component descriptions will match those components supplied. A duplicate set of Burner Specification Sheets is available through Power Flame's Customer Service Department.

Figure 1

Burner Component Identification

Typical for Model CR-GO with On-Off Fuel/Air Control Modes of Operation.*

1. Blower Motor
2. Blast Tube
3. Air Inlet Housing
4. Air Inlet Damper Manual Adjustment Arms
5. Air Flow Switch
6. Drawer Assembly Cover Plate
7. Drawer Assembly Adjustment
8. Air Diffuser
9. Flame Retention Ring
10. Gas Pilot Regulator
11. Gas Pilot Solenoid Valve
12. Gas Pilot Test Tee
13. Gas Pilot Assembly
14. Gas Pilot Ignition Transformer
15. Flame Scanner (Detector)
16. Orifice Tee with Gauge Test Port
17. Automatic Gas Valve
18. Leakage Test Cock
19. Oil Pump
20. Oil Solenoid Valve
21. Control Panel
22. On-Off Switch
23. Fuel Selector Switch
24. Hinged (Total Access) Top Section
25. Light and Switch Circuit Board
26. Removable Total Access Door
27. Optional Board for Sequence Indicator Lights



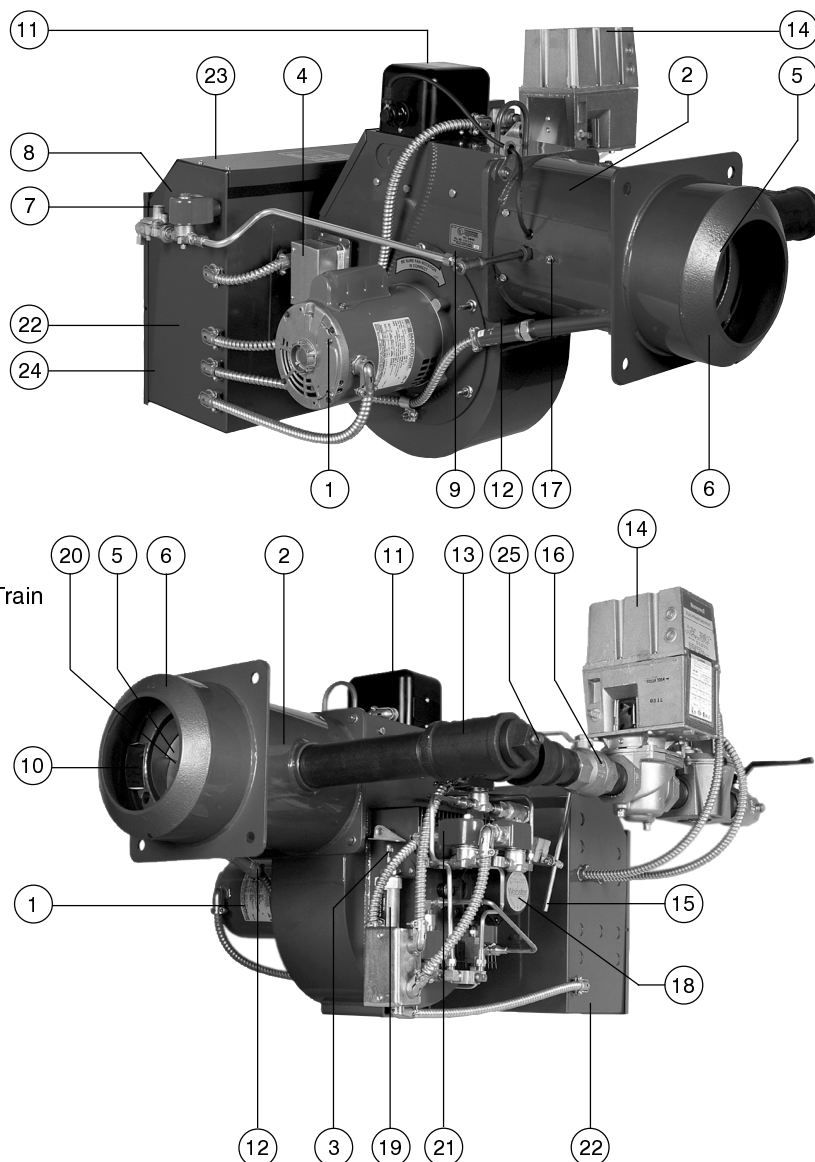
*The components and arrangements shown are typical for a Model CR-GO combination gas/oil burner. Gas only or oil only units will have similar components relating to their specific fuel. In some cases, the type of components and/or their arrangement may vary from this depiction. For specifics on your system, refer to the technical information supplied with the burner.

Figure 2

Burner Component Identification

Typical for Model C-GO with Low-High-Off or Low-High-Low Fuel/Air Control Modes of Operation.*

1. Blower Motor
2. Blast Tube
3. Air Inlet Housing
4. Air Flow Switch
5. Air Diffuser
6. Flame Retention Ring
7. Gas Pilot Regulator
8. Gas Pilot Solenoid Valve
9. Gas Pilot Test Tee
10. Gas Pilot Assembly
11. Gas Pilot Ignition Transformer
12. Flame Scanner (Detector)
13. Orifice Tee With Gauge Test Port
14. Motorized Gas Valve (Low-High-Off or Low-High-Low)
15. Air Damper Drive Linkage Assembly
16. Leakage Test Cock
17. Gas Premix Adjustment (Optional Feature)
18. Oil Pump
19. Hydraulic Damper Actuator
20. Oil Nozzle
21. Low-High-Off or Low-High-Low Oil Control Train
22. Control Panel
23. Hinged (Total Access) Top Section
24. Removable Total Access Door
25. Test Port



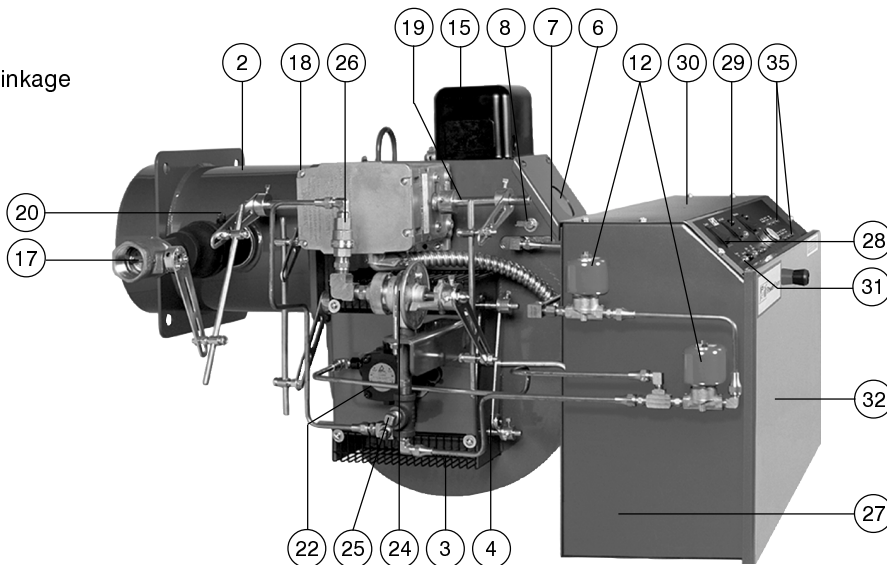
*The components and arrangements shown are typical for a Model C combination gas/oil burner. Gas only or oil only units will have similar components relating to their specific fuel. In some cases, the type of components and/or their arrangements may vary from this depiction. For specifics on your system, refer to the technical information supplied with the burner.

Figure 3

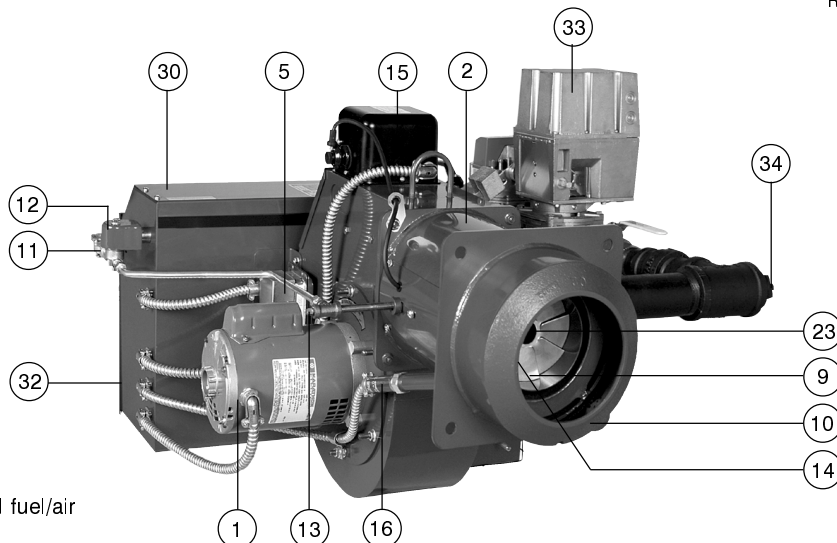
Burner Component Identification

Typical for Model C-GO with Modulating Fuel/Air Control Modes of Operation.*

1. Blower Motor
2. Blast Tube
3. Air Inlet Housing
4. Air Inlet Damper Cross Connecting Linkage
5. Air Flow Switch
6. Flame Retention Ring
7. Drawer Assembly Cover Plate
8. Drawer Assembly Adjustment
9. Air Diffuser
10. Flame Retention Ring
11. Gas Pilot Regulator
12. Gas Pilot Solenoid Valve
13. Gas Pilot Test Tee
14. Gas Pilot Assembly
15. Gas Pilot Ignition Transformer
16. Flame Scanner (Detector)
17. Modulating Butterfly Gas Valve
18. Modulating Drive Motor
19. Jack Shaft and Drive Linkage
20. Gas Pressure Gauge Test Port
21. Gas Premix Adjustment (Optional Feature)



- 22. Oil Pump
- 23. Oil Nozzle
- 24. Modulating Oil Valve
- 25. Oil Nozzle Bypass Pressure Test Tee
- 26. Nozzle Return Line Check Valve
- 27. Control Panel
- 28. On-Off Switch
- 29. Fuel Selector Switch
- 30. Hinged (Total Access) Top Section
- 31. Light and Switch Circuit Board
- 32. Removable Total Access Door
- 33. Motorized Gas Valve
- 34. Test Port
- 35. Optional Board for Sequence Indicator Lights



NOTE:
See page 22, Figure 28 for depiction of characterized fuel/air control system.

*The components and arrangements shown are typical for a Model C-GO combination gas/oil burner. Gas only (C-G) or oil only (C-O) units will have similar components relating to their specific fuel.

In some cases, the type of components and/or their arrangement may vary from this depiction. For specifics on your system, refer to the technical information supplied with the burner.

Standard Burner Dimensional Data

Figure 4

Model C Configuration

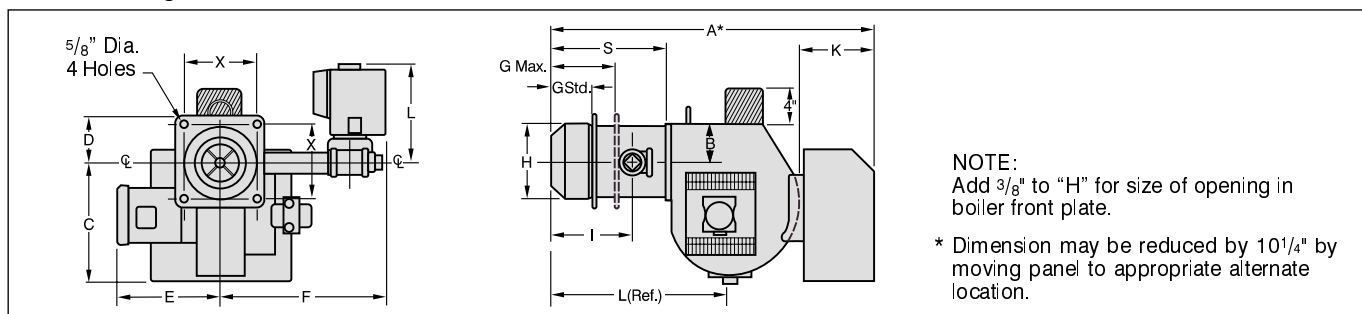


Figure 5

Model CR Configuration

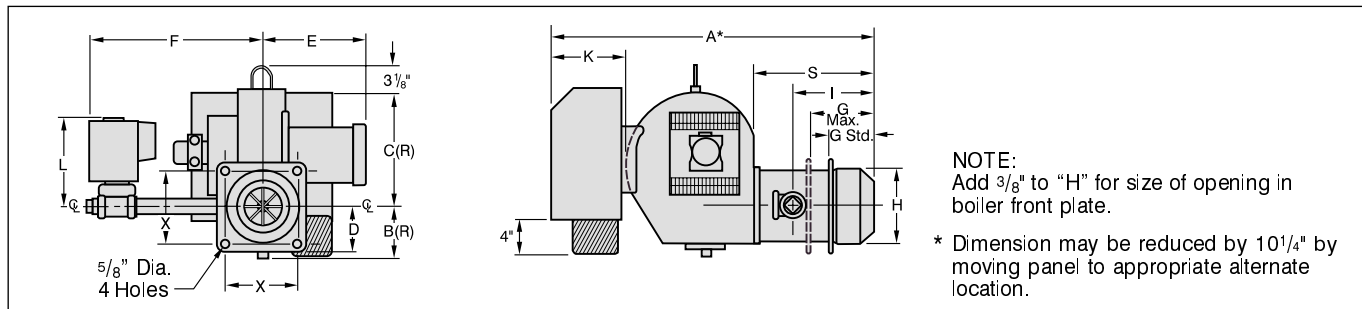


Table 1

Standard Dimensions (Inches)

Model	F**								G			H	I	K	L	S	X	
	A	B	B(R)	C	C(R)	D	E	Gas/Oil	ST. Oil	STD	MAX*							CAD ST. Oil
C1	34 1/8	3 13/16	5 9/16	14 1/2	14 1/2	4 5/8	12 1/4	20	12 3/4	3 1/4	4 3/4	11	7 1/4	7 3/8	10 1/4	17 1/8	12 5/8	7 1/4
C2	39 1/8	4 1/2	6 1/8	14 7/8	14	5 1/4	14	20	13	4	6 3/4	11 1/2	8 3/4	8 1/2	10 1/4	18 1/8	13 3/8	8 1/2
C3	44	5 1/4	7	16 5/8	15 1/4	6	16	22 3/8	14 1/4	4 1/2	8	-	10 1/8	11 1/2	10 1/4	22	15 1/2	10
C4	50	6 1/4	7 5/16	18 7/8	17 11/16	7	18 1/2	28	18	6	9	-	12 1/8	14 1/4	10 1/4	26 5/8	19 1/8	12
C5	50	6 1/4	7 5/16	18 7/8	17 11/16	7	18 1/2	26 1/2	18	6	9	-	12 1/8	14 1/4	10 1/4	26 5/8	19 1/8	12
C6	49 7/8	6 1/4	7 5/16	18 7/8	17 11/16	7 3/4	19 7/8	26 1/2	18	5	11 3/4	-	13 5/8	14 1/8	10 1/4	26 1/2	19	13 1/2
C7(B)	51 11/16	8 1/8	10 1/8	24 5/16	22 3/8	8 3/4	18	21 13/16	21 13/16	4 7/8	11 1/4	-	15 5/8	13 7/8	9 1/8	26 1/2	19	13 1/2
C8	56 9/16	8 1/8	10 1/8	27 1/8	27 5/8	8 3/4	20	24 3/8	24 3/8	3 1/4	9 5/8	-	15 5/8	12 1/4	9 1/8	24 7/8	17 5/16	13 1/2

* This dimension may be increased. Consult factory.
Note: Dimensions shown are standard, but may vary due to component changes, etc.

** This dimension depicts space required to accommodate a standard gas train, standard oil valves and standard burner mounted pump.

Table 2

Standard Burner Ratings and Component Data Power Flame Certified Capacity 0.2" W.C. Positive Pressure (D)

Burner Model (A)	Standard Flame Sensor (B)	3450RPM Blower Motor H.P.(C)	GPH Maximum	MBTU/HR. Natural Gas Maximum	Nominal Boiler H.P.	Gas Pressure Required Inches W.C. (E) Min.Max.	Standard Gas Train Size (F)	Burner Pump Mounted Oil Pressure Pump Suction Capacity In GPH(G)	Suction Capacity	
									Motor H.P.	Separate Driven Oil Pressure Pump If Supplied (H) Suction Capacity In GPH
Model CGO (Combination Gas/Oil)										
C1-GO-10	UV	1/3	7	980	23.5	5.6-14	1"	19(J)	1/3	19(J)
C1-GO-12	UV	1/3	9.7	1360	32.3	5.3-14	1 1/4"	19(J)	1/3	19(J)
C2-GO-15	UV	3/4	15.7	2200	52.3	5.2-14	1 1/2"	70(K)	1/3	70(K)
C2-GO-20A	UV	1	17.5	2500	60.0	4.8-14	2"	40	1/3	40
C2-GO-20B	UV	1 1/2	22	3080	73.5	4.8-14	2"	40	1/3	40
C3-GO-20	UV	2	30	4200	87.0	5.9-14	2"	105	1/2	105
C3-GO-25	UV	2	33.7	4718	112.0	7.0-14	2 1/2"	105	1/2	105
C3-GO-25B	UV	3	37.5	5250	125.0	7.2-14	2 1/2"	135	3/4	135
C4-GO-25	UV	5	45	6300	150.0	8.0-14	2 1/2"	135	3/4	135
C4-GO-30	UV	5	56	7840	190.0	12.1-14	3"	N/A	3/4	135
C5-GO-30	UV	7 1/2	75	10500	250.0	19.9-28	3"	N/A	1	250
C5-GO-30B	UV	7 1/2	75	10500	250.0	17.8-28	3"	N/A	1	250
C6-GO-30	UV	10	101.5	14215	340.0	26.5-28	3"	N/A	1	250
C7-GO-30	UV	15	121.4	17,000	404.0	40-280	3"	N/A	1	265
C7-GO-30B	UV	20	126.4	17,700	421.0	40-280	3"	N/A	1	265
C8-GO-30	UV	15	136.4	19,100	454.0	50-280	3"	N/A	1	265
Model CG (Gas)										
C1-G-10	UV	1/3	-	980	23.5	5.6-14	1"	-	-	-
C1-G-12	UV	1/3	-	1360	32.3	5.3-14	1 1/4"	-	-	-
C2-G-15	UV	1/2	-	2200	52.3	5.2-14	1 1/2"	-	-	-
C2-G-20A	UV	3/4	-	2500	60.0	4.8-14	2"	-	-	-
C2-G-20B	UV	1	-	3080	73.5	4.8-14	2"	-	-	-
C3-G-20	UV	1 1/2	-	4200	100.0	5.9-14	2"	-	-	-
C3-G-25	UV	1 1/2	-	4718	112.0	7.0-14	2 1/2"	-	-	-
C3-G-25B	UV	3	-	5250	125.0	7.2-14	2 1/2"	-	-	-
C4-G-25	UV	3	-	6300	150.0	8.0-14	2 1/2"	-	-	-
C4-G-30	UV	5	-	7840	190.0	12.1-14	3"	-	-	-
C5-G-30	UV	7 1/2	-	10500	250.0	19.9-28	3"	-	-	-
C5-G-30B	UV	7 1/2	-	10500	250.0	17.8-28	3"	-	-	-
C6-G-30	UV	10	-	14215	340.0	26.5-28	3"	-	-	-
C7-G-30	UV	15	-	17,000	404.0	40-280	3"	-	-	-
C7-G-30B	UV	20	-	17,700	421.0	40-280	3"	-	-	-
C8-G-30	UV	15	-	19,100	454.0	50-280	3"	-	-	-
Model CO (Oil)										
C1-O(S)	CC	1/3	9.7	-	32.3	-	-	19(J)	1/3	19(J)
C2-OA(S)	CC	3/4	15.7	-	52.3	-	-	70(K)	1/3	70(K)
C2-OB(S)	CC(I)	1 1/2	22	-	73.5	-	-	40	1/3	40
C3-O	UV	2	33.7	-	112.0	-	-	105	1/2	105
C3-OB	UV	3	37.5	-	125.0	-	-	135	3/4	135
C4-OA	UV	5	45	-	150.0	-	-	135	3/4	135
C4-OB	UV	5	56	-	190.0	-	-	N/A	3/4	135
C5-O	UV	7 1/2	75	-	250.0	-	-	N/A	1	250
C5-OB	UV	7 1/2	75	-	250.0	-	-	N/A	1	250
C6-O	UV	10	101.5	-	340.0	-	-	N/A	1	250
C7-O	UV	15	121.4	-	404.0	-	-	N/A	1	265
C7-OB	UV	20	126.4	-	421.0	-	-	N/A	1	265
C8-O	UV	15	136.4	-	454.0	-	-	N/A	1	265

- A. See page 2 for further model number information.
- B. The flame sensor shown - UV (Ultra Violet) or CC (Cad Cell). Other flame sensors such as Lead Sulfide and photo cell are available to comply with specifications or codes.
- C. If separate pump is supplied, HP may be reduced. For positive pressure applications on C1 burners with integral pump firing over 8 GPH or some OEM boilers, a 1/2 HP motor and oversized fan are required on oil and gas/oil burners.
- D. Capacities listed are based on 0.20" W.C. positive pressure. Derate capacities approximately 5% for each + .50" W.C. combustion chamber pressure, except for C5-OB and C5-G(O)-30B, which are rated for 250 BHP at + 1.2" W.C. All capacities based on 2000' elevation. Derate capacity by 4% for each additional 1000' elevation.
- E. At inlet to main shutoff cock with burner operating at maximum input rate. If auxiliary gas valves are used, C2-G(O)-20A through C4-G(O)-30 inlet pressure of 28" (1 #) are permitted when using optional 325-3 pilot regulator.
- F. Model numbers will always reflect the standard U.L. listed gas train sizes to correlate with U.L. input listings. The actual train size may vary, depending on local gas supply pressures available.
- G. and H. Suction line and oil filter must be sized to provide these suction capacities. **Do not** size suction lines or filter capacities based on burner firing rates. See page 11 for further information.
- I. C2-OB will be supplied with a UV sensor if firing rate is above 20 GPH (unless specified otherwise).

J. The standard pump normally supplied is 19 GPH for On-Off or Modulating and 40 GPH for Fixed Air Low Fire Start, Low-High-Off and Low-High-Low operation. Optional pumps are available which, depending on model specified, could be as high as 70 GPH. Refer to information shipped with the burner and/or consult the factory for specifics.

K. The standard pump normally supplied is 40 GPH for Low-High-Off and Low-High-Low, 70 GPH for On-Off and modulating operation. Optional pumps are available for Low-High-Off and Low-High-Low which could be as high as 70 GPH. Refer to information shipped with the burner and/or consult the factory for specifics.