

MAINTENANCE  
OPERATING SPECIFICATION  
&  
TECHNICAL DATA  
For  
CY 2020 FA

## **CYCLONATOR INCINERATORS**

### **GENERAL COMMENTS**

With regulations by the Federal and Local authorities placing strong emphasis on improving our environment and controlling the quality of our air, incineration seems to be the most promising, quick method of waste disposal presently available to us today. The importance of incineration lies in its ability to reduce waste to an absolute minimum ultimate residue as ash, thereby, reducing the cost of labor, handling equipment and hauling of such residue. In addition to lowering of cost, inert residue with a minimum of organic matter can be disposed over unlimited areas.

Generally, incinerators are required to perform satisfactorily over a wide range of operating conditions. They are expected to burn the refuse to ashes without the emission of smoke, bad odors, fumes, ash, charred materials, sparks and the release of toxic pollutants. Air pollution by incinerators has been a major concern to air pollution agencies. The two major causes being: (1) Poor and improperly designed incinerators. (2) Improper operation. The latter has been the primary source of most incinerator complaints.

### **INCINERATOR DESIGN**

Westland (forced air) units are designed to consume type O through type III waste and are built for heavy industrial use. These units meet limited Environmental Standards.

Westland C.A. (controlled air) units are designed to consume type O through type III waste and are developed with more complex control capability in order to meet the more demanding Environmental Standards of the nineteen nineties.

These units are constructed of material that has been tested and proven satisfactory before they are shipped from the factory. They are simple to operate and require very little maintenance. If a reasonable amount of care is taken in the operation of these units, repair costs should be minimal.

### **TYPES OF WASTE**

**Type O - Trash** - A mixture of highly combustible waste such as paper, cardboard, cartons, wood boxes and combustible floor sweepings from commercial and industrial activities. The mixtures contain up to 10% by weight of plastic bags, coated paper, laminated paper, treated corrugated cardboard, oily rags and plastic or rubber scraps.

This type of waste contains 10% moisture, 5% incombustible solids and has a heating value of 8500 btu/lb. of refuse as fired.

Type I Rubbish - A mixture of combustible wastes such as paper, cartons, rags wood scraps, floor sweepings from commercial and industrial sources. The mixture contains up to 20% by weight of garbage. This type of waste contains 25% moisture, 10% incombustible solids and has a heating value of 6500 btu/lb. of refuse as fired.

Type II - Refuse - A mixture of rubbish and garbage, mostly residential sources. This mixture has 35 - 80% in composition by weight of rubbish and 65 - 20% of garbage. This type of waste contains 50% moisture, 7% incombustible solids and a heating value of 4300 btu/lb. of refuse as fired.

Type III - Garbage - A mixture of animal and vegetable wastes, restaurants, hotels markets and wastes from institutional, commercial and club sources. This mixture has a composition by weight of 100% garbage and rubbish of up to 35%. This type of waste contains 70% moisture, 5% of incombustible solids and a heating value of 2500 btu/lb. of refuse as fired.

**CY 2000 FA  
MODEL 2020 "D" (Diesel Fired)**

PRIMARY BURNER        455,000 Btu/Hr.  
SECONDARY BURNER    600,000 Btu/Hr.

**1.     Fuel Consumption**

for type # 2 and # 3 Waste - 29.5 Litres per Hour

Capacity of Fuel Tank for Dual Burner is 682 Litres  
Total running Time - 20 Hours of Operation per tank maximum

**2.     Capacity of Incinerator**

#2 Waste - 68 kg.

#3 Waste - 45 kg.

**3.     Emission Standards:**

Each unit has to be individually approved for every type of waste to be incinerated and has to be tested to meet the environmental standards of each province. The model TMF 2020 "D" has been designed to meet the Air Pollution Guidelines of Alberta Environment.

**4.     Maintenance & Operational Cost:**

The interior lining of the incinerator is made to stand rugged use. Although it deteriorates over a period of time, we supply material to reline the inside compartment of the incinerator. As far as the exterior is concerned, the only regular maintenance required is the painting of the exterior steel casing.

**Operating Cost:** Fuel Consumption - Varies With Usage Per Day.

**CYCLONATOR FORCED AIR INCINERATOR  
OPERATING INSTRUCTIONS  
DIESEL FIRED – WIC - 201**

**Initial Start Up for CY Incinerators**

- \* Set-up smoke stack and bolt in place
- \* Load fuel in tank.
- \* Bleed burner
- \* Plug in 110 volt power supply to receptacle below the timer
- \* Set the Air Timer for 20 Minutes
- \* Set the Timer 10 minutes and allow burner to operate for full 10 minutes without any refuse in the combustion chamber. Check if air induction fan is operating, timers functioning and burner operating properly.

## **Operation**

- \* Set the timer in off position
- \* Open the charging door and load incinerator with refuse up to 60% of full capacity. **DO NOT OVERLOAD.**
- \* Close charging door.
- \* Set Air Timer for 120 minutes
- \* Set Timer for 30 minutes - 1 hour, depending on the amount of refuse left after each burn
- \* Clean out ash with a shovel or rake taking care not to damage the refractory. (Note: The ash must be removed after each burn to prevent clogging of the air jets.)
- \* Allow the incinerator to cool down for 10 minutes before reloading

**Note:** Under No Circumstances should the burner be wired direct to the power supply as the air induction system will not function, thus causing the incinerator to overheat.

Failure to comply with the above instructions could result in loss of warranty.

## **Maintenance**

The incinerator requires less maintenance as long as care is taken in its operation. But once in a while, one of its two major components can burn out or overheat. They are the forced air fan and the oil gun burner.

### **The Forced Air Fan**

The blower is manufactured as one complete unit and the only thing that can go wrong with it is the motor. If the motor overheats the whole fan has to be replaced. To replace a blower, first disconnect the power supply. Open the burner-blower casing, detach the electrical connections from the blower to the timer, unbolt the blower base, pull the whole fan out and install a new one.

### **The Burner**

The burner has a few components that a malfunction on either one can result to a non-operational burner. Introduction to these different components is essential. To avoid costly repairs, the following are instructions for removal and replacing burner parts:

#### **1. ELECTRODE ASSEMBLY**

Remove screw B, Fig. 3 and rotate transformer on its hinge. After opening the tubing connection at the side of the blower housing, remove clamp nut, E, and disengage the oil line. Remove the firing assembly by rotating it 1/4 turn in a clockwise direction and then pulling it outward and upward. Refer to Figure 11 for firing assembly adjustments. To reinstall

the firing assembly, insert it with the bend of the tubing in the vertical plane and rotate it 1/4 turn counter clockwise so the bend coincides with the outlet in the housing. Make sure the bus bars are positioned so that they will contact the transformer terminal nuts when the transformer is in its normal position.

2. **NOZZLE**

For removal and installation of the nozzle follow the steps for removal of the electrode assembly, change nozzle. Check to see that the electrode gap is 1/8" and that the tips of the electrode are 1/16" in front of the nozzle and 7/16" above the center of the nozzle (See Figure II). Reinstall the electrode assembly. Tighten the clamp nut and also the flare nut.

\* Look at blast tube from front end and check nozzle for being in center on end cone opening. If it is not, adjust knurled nut and inside nut on oil pipe.

3. **BLEEDING THE FUEL LINE**

To purge the air from the fuel line and oil pump, loosen the bleeder valve on side of the pump. Close the burner switch and allow the burner to run until there is no air bubbles in the oil issuing from the valve. Then tighten the bleeder valve.

4. **AIR BAND**

If the burner is firing with a lot of smoke, the air band might have moved in transit or altitude has changed. To ensure proper combustion air into the burner, the air band has to be adjusted by loosening the air band locking screw and turning the band to the direction desired for proper combustion. Then retighten the screw.

5. **MOTOR, FAN, FLEXIBLE COUPLING**

Loosen set screw F. Remove the two screws A1 and A2. The motor may now be removed from the housing with the fan and coupling attached to its shaft. To remove the coupling, loosen the set screw and pull rubber coupling away from shaft. To remove the fan from the motor shaft, loosen set screw C. For installation reverse the above procedure.

6. **PUMP**

Loosen screws D1 & D2. Open pipe and tubing connections, loosen set screw F and remove pump.

7. **TRANSFORMER**

Remove Screw B and rotate transformer on its hinge.

For Parts and Service call:

**WESTLAND Environmental Services Inc**

**[www.westlandenvironmental.com](http://www.westlandenvironmental.com)**

**Phone No. (780) 447-5052      Fax No. (780) 447-4912**

When Ordering Parts Always Give the Following:

1.     Model
2.     Part Name
3.     Part Number
4.     Size
5.     Quantity

1-BTU = 1.055 KJ

TABLE NO. 1  
CLASSIFICATION AND DESIGN DATA OF WASTES TO BE INCINERATED

Type of Waste	Description	Principal Components	Approximate Composition % by Weight	Moisture Content % (Design Maximum)	(Average) Incumbustible Solids %	KJ Value Per Kg. of Refuse as Fired (Design Minimum)	Required Minimum Input (kw per Kg Waste)
I*	Rubbish	Combustible waste, paper, cartons, rags, wood scraps, floor sweepings; domestic, commercial industrial sources.	Rubbish 100% (garbage up to 20%)	25%	10%	15000	0
II*	Refuse	Rubbish and garbage; residential sources.	Rubbish 35-80% Garbage 65-20%	50%	7%	10000	1.3
III*	Garbage	Animal & vegetable wastes, restaurants, hotels, markets; institutional, commercial & club sources.	Garbage 100% (rubbish up to 35%)	70%	5%	5815	1.9
IV**	Animal solids & organic wastes.	Carcasses, organs, solid organic wastes; hospital, laboratory abattoir, animal pound, and similar sources.	100% Animal & human tissue	62%	9%	2300	7.5
V	Gaseous liquid or semi-liquid wastes.	Industrial process wastes (tars, paints, solvents, fumes).	Variable	Dependent on predominant components.	Must be determined by wastes survey.		Must be determined by wastes survey.
VI	Semi-solid & solid.	Combustibles requiring hearth, retort, or grate burning equipment (rubbish, plastics, wood wastes).	Variable	Dependent on predominant components.	Must be determined by wastes survey.		Must be determined by wastes survey.

\*The above figures are recommended for use in computing heat release, burning rate, velocity and other details of incinerator design.  
\*\*Type IV wastes require a "heated hearth" type of incinerator.



## INCINERATOR SIZE GUIDE

### 1. Approximate Usage Guide:

- a) Each man produces approximately 1.4 kg (3 lbs) of Garbage per day when living in a camp.
- b) Each 20 Cu. Ft. Incinerator consumes approximately 45 kg of garbage per hour.
- c) Each 50 Cu. Ft. Incinerator consumes approximately 91 kg of garbage per hour.
- d) Average maximum burn time per incinerator is six (6) hours.
- e) Fuel consumption: (Approximate)

INCINERATOR MODEL	DIESEL LITRE/HOUR	PROPANE LITRE/HOUR	NATURAL GAS CU. METER/HOUR
CY1020FA	16	19	13
CY2020FA	30	35	24
CY1050FA	28	33	22
CY2050FA	41	49	33

### 2. Fuel Specifications:

- a) Diesel – 1,000 Litres per Cu. Meter (6.25 Gal. Per Cu. Ft.)
- b) Diesel Weights – 1.2 Kg. Per Litre (10 Lbs. per Gal.)
- c) Heating Value (BTU/GAL.) of Diesel Fuel
  - Winter 129,700
  - Summer 132,700
- d) Propane Weights – .6 kg. Per Litre (5 Lbs. per Gal.)
- e) Heating Value of Propane  
110,000 BTU/GAL.
- f) Heating Value of Natural Gas  
35,000 BTU/CU. Meter

NOTE: Imperial Measure in Brackets

**CYCLONATOR FORCED AIR INCINERATOR  
OPERATING INSTRUCTIONS  
DIESEL FIRED - HF AFC**

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(Note: The ash must be removed after each burn to prevent clogging of the air jets.)

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**The Forced Air Fan**

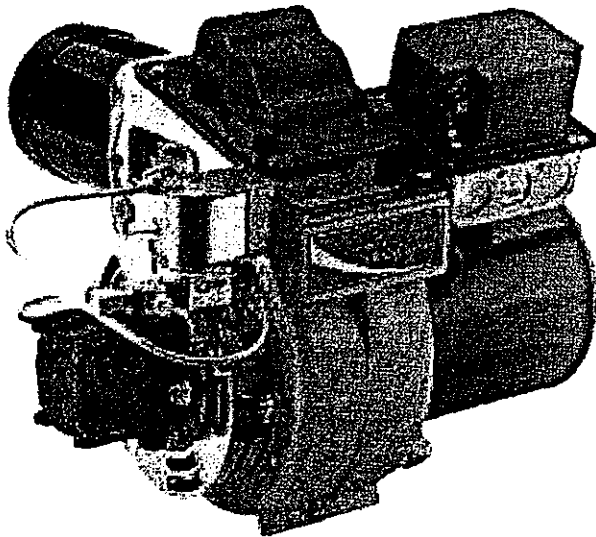
The blower is manufactured as one complete unit and the only thing that can go wrong with it is the motor. If the motor overheats the whole fan has to be replaced. To replace a blower, first disconnect the power supply.

# MODEL **CF500/** **CF800** Oil Burner

## Instruction Manual

### ON/OFF Operation

Firing rate: CF500: 1.75 - 5.50 GPH  
CF800: 3.00 - 8.00 GPH  
Motor voltage: 120 / 60 Hz std.



**Thank you** for purchasing a  
Beckett burner. With proper care and  
regular maintenance, it will provide  
years of trouble-free service. Please  
take a few minutes to read the section  
entitled "To the owner" inside this  
manual. Then, keep the manual in a  
safe place where it can be easily  
located if needed by your professional  
service technician.

**Beckett**

# Please . . . read this page first

## Hazard definitions

The following will be used throughout this manual to bring attention to hazards and their risk factors, or to special information.

**DANGER** Denotes presence of a hazard which, if ignored, will result in severe personal injury, death or substantial property damage.

**CAUTION** Denotes presence of a hazard which, if ignored, could result in minor personal injury or property damage.

**WARNING** Denotes presence of a hazard which, if ignored, could result in severe personal injury, death or substantial property damage.

**NOTICE** Intended to bring special attention to information, but not related to personal injury or property damage.

## To the owner —

**WARNING** Installation and adjustment of the burner requires technical knowledge and the use of combustion test instruments. Do not tamper with the unit or controls. Call your qualified service technician. Incorrect operation of the burner could result in severe personal injury, death or substantial property damage.

Have your equipment inspected and adjusted at least annually by your qualified service technician to assure continued proper operation.

Never attempt to use gasoline in your heating appliance or to store gasoline or combustible materials near the heating equipment. This could result in an explosion or fire, causing severe personal injury, death or substantial property damage.

## To the owner —

**WARNING** Never burn garbage or refuse in your heating appliance or try to light the burner by tossing burning material into the appliance. This could result in severe personal injury, death or substantial property damage.

Never attempt to use crankcase or waste oil in your heating appliance. This could damage the fuel unit or heating equipment, resulting in risk of severe personal injury, death or substantial property damage.

Never restrict air openings on the burner or to the room in which the appliance is located. This could result in fire hazard or flue gas leakage, causing severe personal injury, death or substantial property damage.

## To the installer —

**WARNING** Read all instructions before proceeding. Follow all instructions completely. Failure to follow these instructions could result in equipment malfunction, causing severe personal injury, death or substantial property damage.

This equipment must be installed, adjusted and started only by a qualified service technician—an individual or agency, licensed and experienced with all codes and ordinances, who is responsible for the installation and adjustment of the equipment. The installation must comply with all local codes and ordinances and with the National Fire Protection Standard for Oil-Burning Equipment, NFPA 31 (or CSA B139-M91).

## To the installer —

**NOTICE** Concealed damage - If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim.

Contacting Beckett for service information or parts - Please record the burner serial number (and have available when calling or writing). You will find the serial number on the Underwriters Laboratories label, located on the left rear of the burner.

**NOTICE** High altitude installations — Accepted industry practice requires no derate of burner capacity up to 2,000 feet above sea level. For altitudes higher than 2,000 feet, derate burner capacity 4% for each 1000 feet above sea level.

## Warranty

Beckett warrants its equipment to those who have purchased it for resale, including your dealer. If you have any problems with your equipment or its installation, you should contact your dealer for assistance.

Refer to warranty sheet in literature packet included with burner for details.

## Specifications

Fuels	#1 or #2 Fuel Oil
Firing range	CF500: 1.75 - 5.50 GPH CF800: 3.00 - 8.00 GPH
Motor	1/2 HP 3450 RPM 120/60 hz standard 4.8 amps @ 120 VAC
Ignition Trans.	120V/10,000V
Housing	Cast aluminum
Fuel unit	100 - 200 PSIG
Oil nozzle	45° - 70° solid
Shipping wt.	55 lbs.

## Agency approvals

- Underwriters Laboratories has certified this burner to comply with ANSI Standard 296 and has listed it for use with No. 1 or No. 2 fuel oil as specified in ASTM D396. State and local approvals appear on the burner rating label.
- Certified by ULC.
- Approved by Commonwealth of Massachusetts - State Fire Marshall.
- Accepted by N.Y.C. M.E.A.
- Other approvals may be available and must be specified at time of order.

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## Before you begin . . .

The following resources will give you additional information for your installation. We suggest that you consult these resources whenever possible. Pay particular attention to the appliance manufacturer's instructions.

**Appliance manufacturer's instructions** — Always follow the appliance manufacturer's instructions for burner installation, equipment and set-up.

**1-800-OIL-BURN** — Beckett's technical services hot-line.

**[www.beckettcorp.com](http://www.beckettcorp.com)** — Beckett's website.

# Pre-installation checklist

## ☐ Combustion air supply

- The burner requires combustion air and ventilation air for reliable operation. Assure that the building and/or combustion air openings comply with National Fire Protection Standard for Oil-Burning Equipment, NFPA 31. For appliance/burner units in confined spaces, the room must have an air opening near the top of the room plus one near the floor, each with a free area at least one square inch per 1,000 Btu/hr input of all fuel burning equipment in the room. For other conditions, refer to NFPA 31 (CSA B139-M91 in Canada).
- If there is a risk of the space being under negative pressure or of exhaust fans or other devices depleting available air for combustion and ventilation, the appliance/burner should be installed in an isolated room provided with outside combustion air.

## ☐ Clearances

- With the burner installed in the appliance, there must be adequate space in front of and on the sides of the burner to allow access and operation. Verify that the clearance dimensions comply with all local codes and with the appliance manufacturer's recommendations.

## ☐ Fuel supply

- The fuel supply piping and tank must provide #1 or #2 fuel oil at pressure or vacuum conditions suitable for the fuel unit (oil pump) on the burner. Refer to fuel unit literature in the literature envelope in the burner carton to verify allowable suction pressure.

### **WARNING**

The fuel unit is shipped without the by-pass plug installed for CF500/CF800 ON/OFF burners. You must install this plug on two-pipe systems. **DO NOT** install the by-pass plug in the fuel unit if connected to a one-pipe oil system. Failure to comply could cause fuel unit seal failure, oil leakage and potential fire and injury hazard.

If fuel supply is **level with or higher than** fuel unit —

- When the fuel unit is not required to lift the oil, the installation is usually suitable for either a one-pipe or two-pipe oil system. The oil pressure at the inlet of the fuel unit must not exceed 3 psig.
- See **Figure 7** for one-pipe fuel supply installations. See **Figure 8** for two-pipe fuel supply installations.

If fuel supply is **below** the fuel unit —

- Use a two-pipe oil system when the fuel unit must lift the oil more than 8 feet if burner is equipped with a **B** fuel unit. The return line provided by the two-pipe system is needed to purge the air from the fuel lines and minimize the likelihood of air-related problems during operation.

## ☐ Vent system

- The flue gas venting system must be in good condition and must comply with all applicable codes.

## ☐ Electrical supply

- Verify that the power connections available are correct for the burner. All power must be supplied through fused disconnect switches.

## ☐ Verify burner components —

- **Burner box**, Model CF500 and CF800
- **Air tube assembly** (selected per following)
- **Mounting flange kit**
- **Pedestal mounting assembly kit** (recommended)
- **Gil nozzle**, per **Table 1** — Use only 45° to 70° solid pattern nozzles unless otherwise shown by appliance manufacturer. Find the required firing rate in the 150 psig column (factory-set fuel unit pressure). Select the corresponding nozzle from column 1 (*Rated gph @ 100 psig*).

**Table 1 - Nozzle capacities**

Rated gph @ 100 psig	Pressure - pounds per square inch	
	140	150
1.75	2.07	2.14
2.00	2.37	2.45
2.25	2.66	2.74
2.50	2.96	3.06
2.75	3.24	3.37
3.00	3.55	3.68
3.50	4.13	4.29
4.00	4.70	4.90
4.50	5.30	5.51
5.00	5.90	6.13
5.50	6.50	6.74
6.00	7.10	7.33
6.50	7.65	7.96

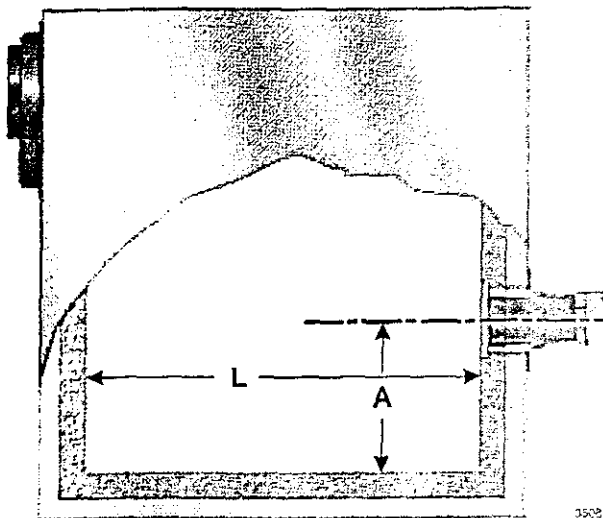
### □ Verify firing rate

- Refer to appliance manufacturer's instructions (if available) for firing rate and nozzle selection. Otherwise, the maximum recommended firing rate for the burner depends on the length of the firing chamber and the distance from the burner center to the chamber floor. Verify that the chamber dimensions are at least as large as the minimum values given in **Figure 1**. If the appliance dimensions are smaller than recommended, reduce the firing rate accordingly.

### □ Verify air tube

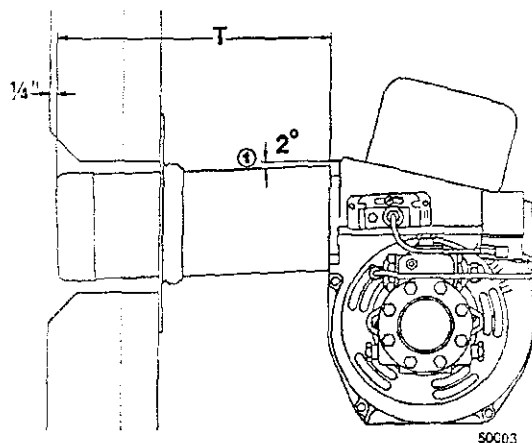
- The information in this section may be disregarded if the air tube is supplied by the appliance manufacturer.
- Tube arrangements available:
  - CF500: 1.75 to 5.50 GPH
  - CF800: A Tube — 3.00 to 7.00 GPH  
B Tube — 5.00 to 8.00 GPH
- Maximum firing capacity depends on the firebox pressure. Use **Table 2** to verify the correct air tube for the firing rate required.
- See **Figure 2** to verify the correct air tube length and air tube combination code.

**Figure 1 - Min. Combustion chamber dimensions**



Firing rate GPH	Minimum dimensions (inches)			
	With damper		Without damper	
	A	L	A	L
1.75 to 3.00	7.5	18.0	8.0	19.0
4.00	8.0	21.0	9.5	23.0
5.00	9.0	23.0	10.5	30.0
6.00	10.0	28.0	11.5	40.0
7.00	11.0	34.0	12.0	46.0
8.00	14.0	38.0	14.0	51.0

**Figure 2 - Air tube mounting dimensions**



① Install the burner with a 2° pitch as shown.

Air tube length (Dimension T)	A.T.C. Codes (A.T.C. = Air Tube Combination)		
	CF500	CF800	
		Tube A	Tube B
3.00"	CF 60 KK	CF 60 KH	CF 60 KJ
3.00"	CF 80 KK	CF 80 KH	CF 80 KJ
10.00"	CF 100 KK	CF 100 KH	CF 100 KJ
14.00"	CF 140 KK	CF 140 KH	CF 140 KJ
16.00"	CF 160 KK	--	--
17.00"	--	CF 170 KH	CF 170 KJ

**Table 2 - Air tube capacity vs. firebox pressure**

Firebox pressure (In. w.c.)	CF500	CF800	
	Tube KK (GPH)	Tube KH (GPH)	Tube KJ (GPH)
	No reserve air		
0.0	5.50	7.00	8.00
0.1	4.75	6.25	7.50
0.2	4.00	5.50	6.75
0.3	3.50	4.50	6.25
0.4	2.75	3.75	5.50
0.5	2.00	3.00	5.00

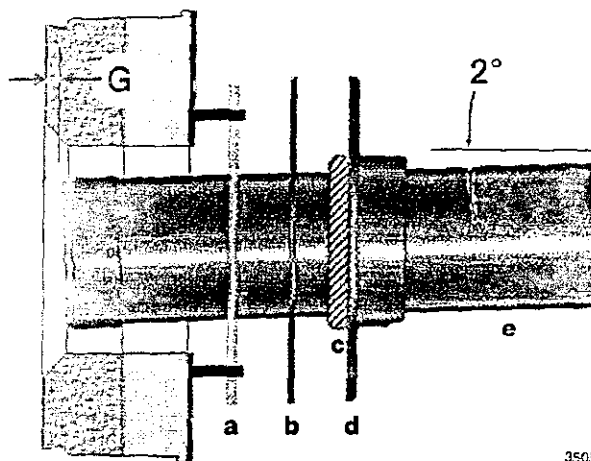
Note: The above ratings may vary 5% due to variations in actual job conditions.

# Mount the burner

## □ Mount flange(s) on air tube

- This section does not apply to burners with welded flanges.
- Do not install air tube on burner.
- For *non-pressure firing flange*, refer to **Figure 3**: Install gasket (item a) and flange (item d). Ignore the next paragraph.
- For *pressure-firing flange*, refer to **Figure 3**: Slide gasket (item a) onto the air tube, making sure the top of the air tube is up. Pre-drill holes in the pressure firing plate (item b) to match the appliance studs. Slide the pressure firing plate (item b) and flange (item d) onto the air tube as shown. Wrap ceramic fiber rope (item c) around the air tube and press tightly into the inside diameter of the flange (item d).
- Slide the air tube (item e) into position in the appliance front. Tighten the flange-mounting-stud nuts. Set the insertion of the air tube so dimension G is 1/4" nominal.
- Pitch the air tube at 2° from horizontal as shown and secure the flange to the air tube.

Figure 3 - Mount flange(s) on air tube



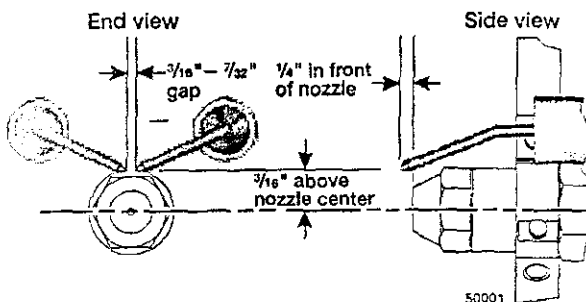
## □ Mount air tube to burner

- Attach the air tube to the burner with the screws provided.

## □ Install nozzle

- See **Figure 4**. Install the oil nozzle in the nozzle adapter. Use a 3/4" open-end wrench to steady the nozzle adapter and a 5/8" open-end wrench to turn the nozzle. Tighten securely but do not over-tighten.
- Check, and adjust if necessary, the critical dimensions shown in the drawing. Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

Figure 4 - Nozzle and nozzle line assembly



### WARNING

Failure to properly set and maintain the electrode and nozzle spacing dimensions can cause incorrect burner ignition or poor combustion. This could result in severe personal injury, death or substantial property damage.



### □ Install nozzle line assembly

- Insert the nozzle line assembly into the burner air tube.
- Slide the secondary adjusting plate (**Figure 6**, item f) completely to the left on the indicator adjusting plate (item e). Finger-tighten acorn nut c to secure the two plates together. Slide both plates completely to the right (Indicator plate will read 0). Tighten fastener d.
- Install the spline nut on the end of the nozzle line, leaving the nut loosely placed so the plates can be moved.

### □ Set dimension Z

- Loosen fastener c in **Figure 6**. Slide the nozzle line and plate assembly until dimension Z in **Figure 5** is:

CF500 —  $1\frac{9}{16}'' \pm \frac{1}{16}''$

CF800 —  $1\frac{3}{4}'' \pm \frac{1}{16}''$

When dimension Z (from end of air tube to flat area of front face of head) is correctly set, tighten acorn nut c.

- Attach the oil line from the oil valve to the nozzle line end. Tighten securely.
- Before proceeding, check dimension Z once again. Loosen acorn nut c if necessary to reposition the nozzle line. Once dimension Z is set, *do not loosen acorn nut again*. For the setting of fastener d, refer to page 12.

### □ Insert burner

- Position the burner in the front of the appliance and loosely tighten the nuts on the mounting studs. The burner should be pitched downward 2° as shown in **Figure 3**.

Figure 5 - Nozzle line assembly in burner

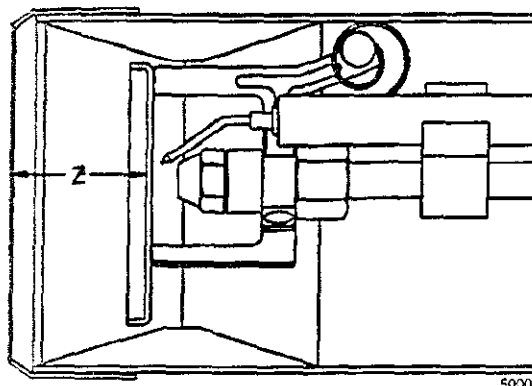
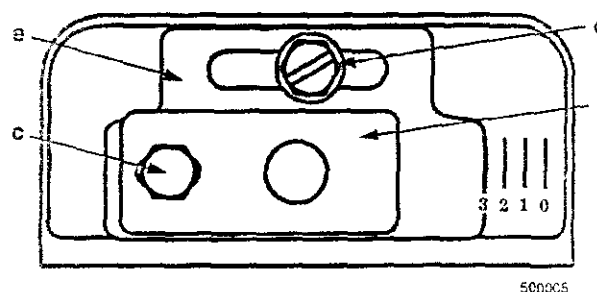


Figure 6 - Adjusting plate assembly



#### Legend

- c acorn nut
- d fastener
- e Indicator adjusting plate
- f Secondary adjusting plate

## Connect fuel line(s)

**WARNING:** Install the oil lines using the following guidelines. Failure to comply could lead to equipment damage and present a risk of severe personal injury, death or substantial property damage due to leakage of oil and potential fire hazard.

Use only flare fittings at joints and connections. Never use compression fittings.

Install fittings only in accessible locations to assure any leak will be detected.

Where joint sealing is needed, use only pipe dope. Never use Teflon tape. Tape strands can break free and damage the fuel unit.

Never use a one-pipe oil system with a lift in excess of 8 feet with **B** fuel unit. On two-pipe oil systems, verify that the suction line vacuum does not exceed the fuel unit manufacturer's recommendation.

**WARNING:** The fuel unit is shipped without the by-pass plug installed for CF500/CF800 ON/OFF burners. You must install this plug on two-pipe systems. **DO NOT** install the by-pass plug in the fuel unit if connected to a one-pipe oil system. Failure to comply could cause fuel unit seal failure, oil leakage and potential fire and injury hazard.

### ☐ Fuel unit by-pass plug

- The CF500/CF800 burner is shipped **without** the by-pass plug installed in the fuel unit.
- The by-pass plug **must not** be installed in the fuel unit for one-pipe oil systems.
- You **must** install the by-pass plug if using on a two-pipe oil system.

### ☐ Oil supply/return lines

- Install the oil tank and oil lines in accordance with all applicable codes.
- Size the oil supply and return lines using the guidelines given in the fuel unit literature included in the literature envelope. Oil line flow rate will equal the burner rate for one-pipe systems. For two-pipe systems, refer to **Table 3** for the fuel unit gearset capacity - the rate at which fuel is recirculated when connected to a two-pipe system. Size two-pipe oil lines based on this flow rate.
- Use continuous lengths of heavy-wall copper tubing, routed under the floor where possible. Do not attach fuel lines to the appliance or to floor joists if possible. This will reduce vibration and noise transmission problems.
- Install an oil filter sized to handle the fuel unit gearset flow capacity (**Table 3**) for **two-pipe systems**. Size the filter for the firing rate for **one-pipe systems**. Locate the filter immediately adjacent to the burner fuel unit.
- Install two high-quality shut-off valves in accessible locations on the oil supply line. Locate one valve close to the tank. Locate the other valve close to the burner, upstream of the fuel filter.

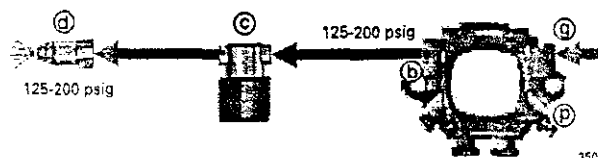
### □ Burner fuel flow

- **One-pipe systems** – See **Figure 7** for the fuel flow path.
  - Oil supply connects to one of the fuel unit inlet ports.
- **Two-pipe systems** – See **Figure 8** for the fuel flow paths for two-pipe oil systems.
  - Oil supply connects to one of the fuel unit inlet ports. Oil return connects to the fuel unit return port. (*Install the by-pass plug in the fuel unit for two-pipe systems.*)
- **Nozzle pressure** – The fuel unit nozzle port pressure is factory set at 140 psig. Some original equipment manufacturer burner applications may call for a lower pressure to obtain a required firing rate. Do not change this pressure unless directed to do so by the appliance manufacturer.

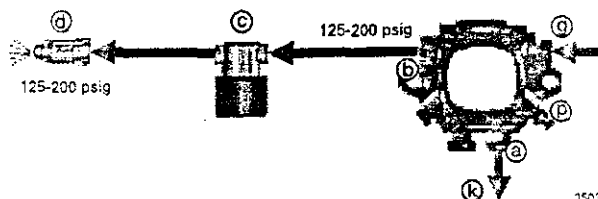
**Table 3 – Fuel unit gearset capacities**

Fuel unit model number	Gearset capacity (GPH)
A2VA-7116	17
A2YA-7916	20
B2VA-8216	21
B2YA-8916	25
B2TA-8248	21

**Figure 7 – One-pipe oil flow with “B” pump**



**Figure 8 – Two-pipe oil flow with “B” pump**



### Legend

- |                    |                           |
|--------------------|---------------------------|
| a Return port      | g Inlet port              |
| b Nozzle port      | k Return line to oil tank |
| c Oil valve        | p Air bleed valve         |
| d Nozzle & adapter |                           |

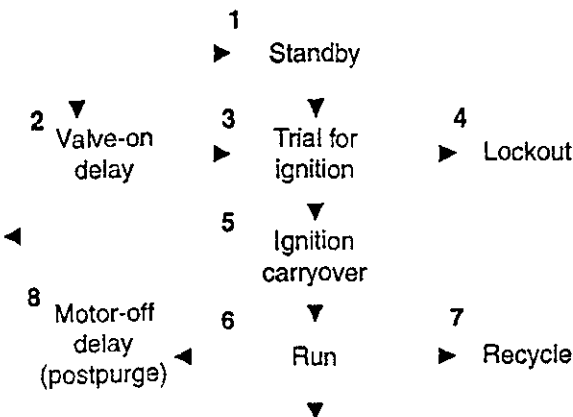
# Wire the burner — R7184

Install the burner and all wiring in accordance with the National Electrical Code and all applicable local codes or requirements.

Wire the burner in compliance with all instructions provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines. See **Figure 9a** for a typical wiring diagram, with **R7184** oil primary, for reference purposes only.

## Sequence of operation — typical

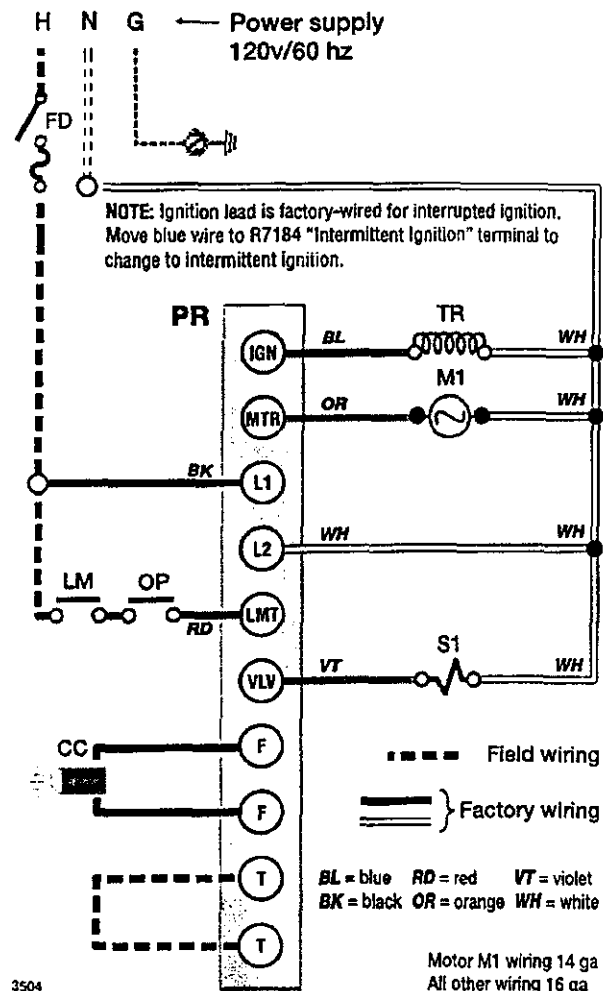
1. Standby — The burner is idle, waiting for a call for heat. When a call for heat is initiated, there is a 2- to 6-second delay while the control performs a safe start check.
2. Valve-on delay — As applicable, the ignition and motor are turned on for a 15-second prepurge.
3. Trial for ignition (TFI) — The fuel valve is opened, as applicable. A flame should be established within the 15-second lockout time (30-second lockout time is available).
4. Lockout — If flame is not sensed by the end of the TFI, the control shuts down on safety lockout and must be manually reset. If the control locks out three times in a row, the control enters restricted lockout. Call a qualified service technician.
5. Ignition carryover — Once flame is established, the ignition remains on for 10 seconds to ensure flame stability. It then turns off.
6. Run — The burner runs until the call for heat is satisfied. The burner is then sent to burner motor-off delay, as applicable, or it is shut down and sent to standby.
7. Recycle — If the flame is lost while the burner is firing, the control shuts down the burner, enters a 60-second recycle delay, and then repeats the ignition steps outlined above. If the flame is lost three times in a row, the control locks out to prevent continuous cycling with repetitious flame loss caused by poor combustion.
8. Burner motor-off delay — If applicable, the fuel valve is closed and the burner motor is kept on for the selected postpurge time before the control returns the burner to standby.



**WARNING:** Do not by-pass any safety control. By-passing a safety control could result in severe personal injury, death or substantial property damage.

**WARNING:** Electrical shock hazard - can cause injury or death. Disconnect power before installing or servicing. Provide ground wiring to the burner in accordance with the National Electrical Code.

Figure 9a - Typical wiring



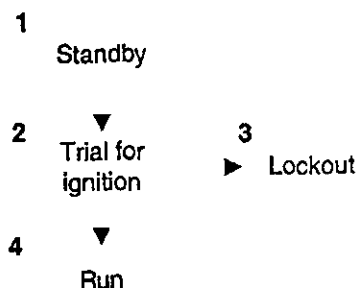
**Install the burner and all wiring in accordance with the National Electrical Code and all applicable local codes or requirements.**

**Wire the burner in compliance with all instructions provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines.**

See **Figure 9b** for an alternate wiring diagram, with R8184 oil primary, for reference purposes only.

**1. Standby** — The burner is idle, waiting for a call for heat.

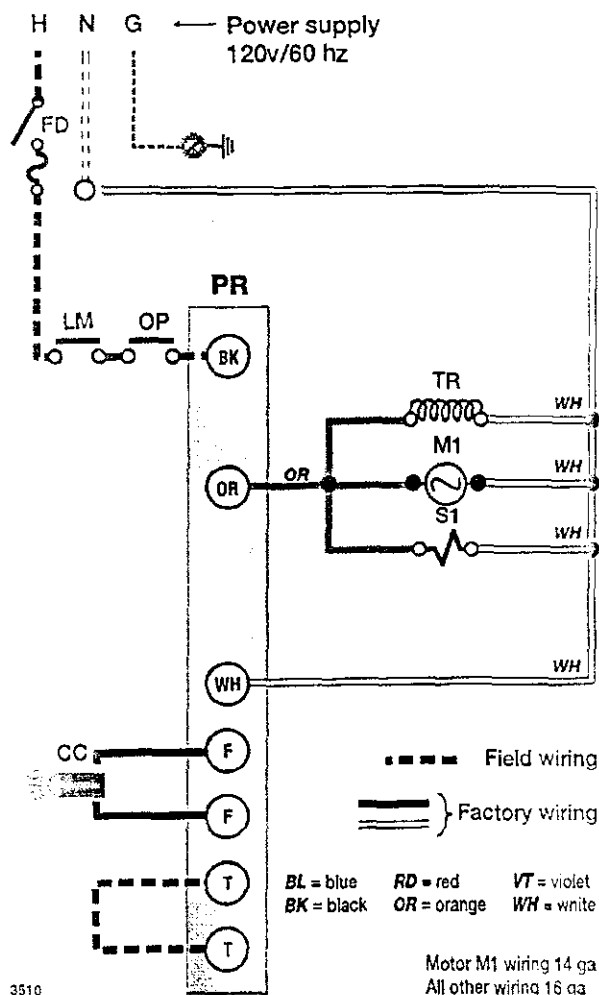
2. **Trial for ignition (TFI)** — The fuel valve is opened, as applicable. A flame should be established within the 15-second lockout time (30-second lockout time is available).
3. **Lockout** — If flame is not sensed by the end of the TFI, the control shuts down on safety lockout and must be manually reset.
  - To reset the control after lockout, wait 2 to 3 minutes after lockout to give the internal switch time to cool.
  - Then push the reset button on the primary control, allowing the burner to operate in normal sequence.
  - Troubleshoot the reason for the flame sense failure.
4. **Run** — The burner runs until the call for heat is satisfied.



**WARNING** Do not by-pass any safety control. By-passing a safety control could result in severe personal injury, death or substantial property damage.

**WARNING:** Electrical shock hazard - can cause injury or death. Disconnect power before installing or servicing. Provide ground wiring to the burner in accordance with the National Electrical Code.

**Figure 9b – Alternate wiring R8184**



### Legend

<b>FD</b> Fused disconnect, by others	<b>TR</b> Ignition transformer
<b>LM</b> Limit controls, by others	<b>M1</b> Burner motor
<b>OP</b> Operating controls, by others	<b>S1</b> Oil valve
<b>PR</b> Oil primary control, R3184 typical	<b>T-T</b> 24-volt thermostat/limit terminals
<b>CC</b> Flame sensor, cad cell typical	<b>F-F</b> Cad cell flame sensor terminals

# Prepare the burner for start-up

## Start-up checklist – Verify the following before attempting to start burner.

- ☐ Combustion air supply and venting have been inspected and verified to be free of obstructions and installed in accordance with all applicable codes.
- ☐ Oil nozzle has been selected correctly and securely installed in the nozzle adapter.
- ☐ Fuel unit by-pass plug *has not* been installed for one-pipe oil system.  
By-pass plug *has been* installed for two-pipe oil system.
- ☐ Fuel connection to nozzle line assembly is secure.
- ☐ Dimension **Z** has been set per this instruction manual.
- ☐ Fuel supply line is correctly installed, the oil tank is sufficiently filled, and shut-off valves are open.
- ☐ Burner is securely mounted in appliance, with pressure firing plate and gasket installed for pressurized chamber application.
- ☐ Appliance has been filled with water (boilers) and controls have been operationally checked.
- ☐ Burner has been installed in accordance with appliance manufacturer's instructions (when available).
- ☐ Also refer to appliance manufacturer's instructions (when available) for start-up procedures.

### Z dimension

- Should be set per these instructions (see page 7). The acorn nut (**Figure 6**, item **c**, page 7) should never be loosened once the **Z** dimension is initially set.

### Initial head position

- The indicator plate assembly markings correspond to head position settings.
- Loosen the fastener (**Figure 6**, item **d**, page 7) and slide the indicator plate until the number on the plate corresponds to the initial head setting given in **Table 4** for the desired firing rate.
- When the head position has been set, tighten the fastener and spline nut.

### Initial air settings

- Loosen the air band and shutter, and adjust to the settings for the applicable firing rate shown in **Table 5**.
- These initial settings should be adequate for starting the burner. Once the burner is in operation, the air settings will

be adjusted for best performance as discussed later in this manual.

- Follow the procedures given later in this manual for fine-tuning the air settings.

### Set appliance limit controls

- Set the appliance limit controls in accordance with the appliance manufacturer's recommendations.

### Prepare the fuel unit for air venting

- To vent air from one-pipe oil systems, attach a clear hose to the vent plug on the fuel unit. Provide a container to catch the oil. Loosen the vent plug.
- Vent the air as described under **Start the burner**, page 13, when using the R7184 control.

**Table 4 – Initial indicator adjustment plate settings (head position)**

Rate GPH	Approximate head settings		
	CF500	CF800	
		Tube A	Tube B
1.75	0	--	--
2.25	0	--	--
3.00	4	0	--
3.50	5	1	--
4.00	5	2	--
5.00	6	4	3
5.50	6	4	4
6.00	--	4	4
7.00	--	6	5
8.00	--	--	6

**Table 5 – Initial air settings**

Rate GPH	Approximate air settings					
	CF500		CF800			
			Tube A		Tube B	
	Shutter	Band	Shutter	Band	Shutter	Band
1.75	1	0	--	--	--	--
2.25	2	0	--	--	--	--
3.00	10	1	1	0	--	--
3.50	10	2	3	0	--	--
4.00	10	3	4	0	--	--
5.00	10	5	9	0	8	2
5.50	10	10	9	5	9	4
6.00	--	--	10	3	10	3
7.00	--	--	10	8	10	5
8.00	--	--	--	--	10	10

# Start the burner

**WARNING** Do not proceed unless all prior steps in this manual have been completed. Failure to comply could result in severe personal injury, death or substantial property damage.

**WARNING** Do not attempt to start the burner when excess oil has accumulated, when the appliance is full of vapor or when the combustion chamber is very hot. Do not attempt to re-establish flame with the burner running if the flame should be extinguished during start-up, venting or adjustment. Allow the unit to cool off and all vapors to dissipate before attempting another start. Failure to comply with these guidelines could cause an explosion or fire, resulting in severe personal injury, death or substantial property damage.

**NOTICE** If control is not an R7184 refer to manufacturer's literature for specific control.

## □ Starting the burner and venting air

### Priming the pump

1. Initiate a call for heat.
2. While the ignition is on, press and release the reset button (hold ½-second or less). If the control has not locked out since its most recent complete heat cycle, the lockout time will be extended to 4 minutes (45 seconds in earlier units), and the ignition will remain on the entire heat cycle.
3. Bleed the pump until all froth and bubbles are purged. If prime is not established within the extended lockout time, the control will lock out. Press the reset button to reset the control and return to step 2.

**NOTICE** The reset button can be held for 30 seconds at any time to reset the control's lockout counter to zero and send the control to standby.

4. Repeat steps 2 and 3, if needed, until the pump is fully primed and the oil is free of bubbles. Then terminate the call for heat, and the control will resume normal operation.

### Resetting from restricted lockout

- If the control locks out three times in a row without a complete heat cycle between attempts, the lockout becomes restricted. A qualified service technician should be called to inspect the burner.

### Disable function

- Any time the motor is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held and will return to standby when released.

### Cad cell resistance check

- While the burner is firing, and after the ignition has been turned off, press and release the reset button (hold ½-second or less) to check the cad cell resistance. The LED will flash 1 to 4 times, depending on the cad cell resistance (see the table below). For proper operation, it is important that the cad cell resistance is below 1600 Ohms.

LED flashes	Cad cell resistance
1	0-400 Ohms
2	400-800 Ohms
3	800-1600 Ohms
4	more than 1600 Ohms

### LED Indicator key

LED	Status
On	Flame sensed
Off	Flame not sensed
Flashing (½-second on, ½-second off)	Lockout/ Restricted lockout
Flashing (2 seconds on, 2 seconds off)	Recycle

## Start the burner *continued*

### ☐ Set air adjusting plate

1. Allow the burner to run until the appliance has warmed sufficiently.
2. Visually check the flame. The flame should not be dark orange or smoky.  
If the flame appears to be smoking, increase the amount of air by re-adjusting the air band to a higher number.
3. Once the appliance has warmed, the air setting can be checked and adjusted.
4. Use combustion test instruments to adjust the burner.
  - a. Adjust the air until a trace of smoke is achieved with CO<sub>2</sub> level as high as possible (lowest possible O<sub>2</sub>).  
Example: 13.5% CO<sub>2</sub> (2.5% O<sub>2</sub>) with a trace of smoke.
  - b. Increase the air to reduce CO<sub>2</sub> by 2 percentage points at a zero smoke level. (Increase O<sub>2</sub> by 3 percentage points at a zero smoke level.)  
Example: Reduce CO<sub>2</sub> from 13.5% to 11.5%, with zero smoke (or increase O<sub>2</sub> from 2.5% to 5.5%).
  - c. This procedure provides a margin of reserve air to accommodate variable conditions.
5. Check the breech draft pressure against the appliance manufacturer's recommended setting (typically + 0.1" W.C.).
6. If the breech pressure is higher or lower than recommended level, adjust the appliance breech damper to achieve the specified setting. Recheck the smoke and CO<sub>2</sub> levels. Adjust burner air if necessary.

## Maintenance and service

**WARNING:** The burner must be serviced at least annually by a qualified service technician to assure continued reliable operation. Operation and adjustment of the burner requires technical knowledge and the use of combustion test instruments. Do not tamper with the burner or controls. Failure to comply could result in failure of the burner or system, resulting in severe personal injury, death or substantial property damage.

### Annual service

— by qualified service technician

Have the burner inspected, tested and started at least annually by a qualified service technician. This annual test/inspection should include at least the following:

- ☐ Replace oil nozzle.
- ☐ Clean burner and blower wheel (if needed to remove lint or debris).
- ☐ Test ignition and combustion and verify air settings.
- ☐ Test oil supply line vacuum - verify that it is within allowable range indicated in fuel unit literature.
- ☐ Check pump pressure to nozzle.
- ☐ Inspect fuel system (including tank, lines and all connections).

- ☐ Inspect combustion air and vent systems.
- ☐ Replace oil filter.
- ☐ Oil motor (if not permanently lubricated).

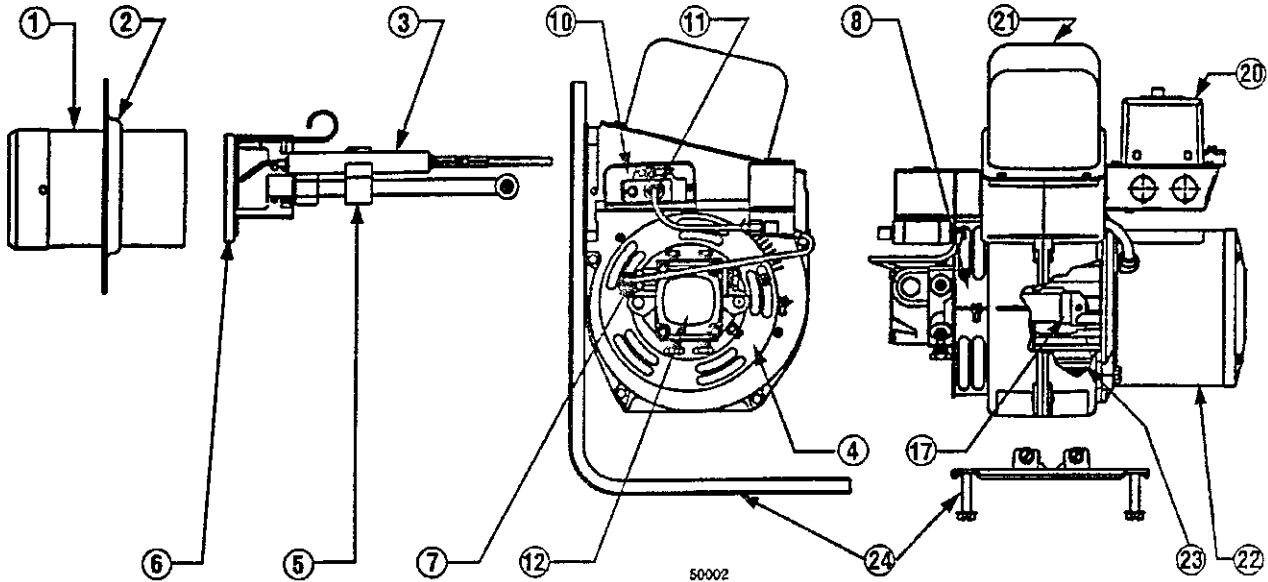
### Monthly maintenance

— by owner

- ☐ Observe combustion air openings and vent system for integrity. Openings must be clean and free of obstructions.
- ☐ Check oil lines and fittings to verify there are no leaks.
- ☐ Observe burner ignition and performance to verify smooth operation.
- ☐ Shut the system down if you observe abnormal or questionable operation. Call a qualified service agency for professional inspection and service.

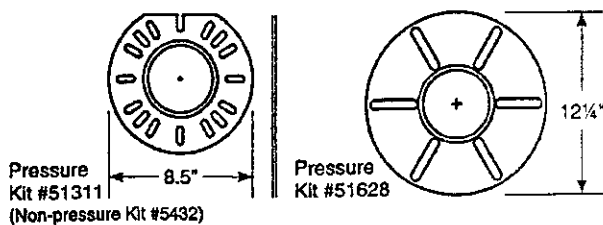


# **Replacement parts**



Item	Part name	Description	Part number
1	Air tube	Refer to Figure 2, page 5	
2	Flange kit	Refer to Figure 10, below	
3	Electrode assembly		Specify
4	Air shutter		3215
5	Nozzle line assembly	Refer to Figure 2, page 5	
6	Head assembly	CF500 — KK CF800 — KH (Tube A) CF800 — KJ (Tube B)	51401U 51252P 51302P
7	Fuel lines	Specify lengths	
8	Air band		3819
10	Adjusting plate assembly		51286
11	Spline nut		3666
12	Fuel pump	Refer to Table 3, page 9	
17	Coupling		2433
20	Control	Specify	
21	Ignitor	14,000 volt France 14,000 volt Allanson	7440 7438
—	Transformer		2289
22	Motor	1/2 HP	21341U
23	Blower wheel	CF500 — 5 1/2" x 2 1/2" CF800 — 6 1/8" x 2 1/8"	21448U 21339U
24	Pedestal kits	Extended Standard	5606 5685

**Figure 10 — Adjustable mounting plates for CF500/CF800**



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**R.W. BECKETT CORPORATION**

U.S.A.: P.O. Box 1289 • Elyria, Ohio 44036 • 800-645-2876 • 440-327-1060 • FAX 440-327-1064  
Canada: R. W. Beckett Canada, Ltd. • 430 Laird Road • Guelph, Ontario, N1G 3X7 • 800-665-6972 • FAX 519-763-5656



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