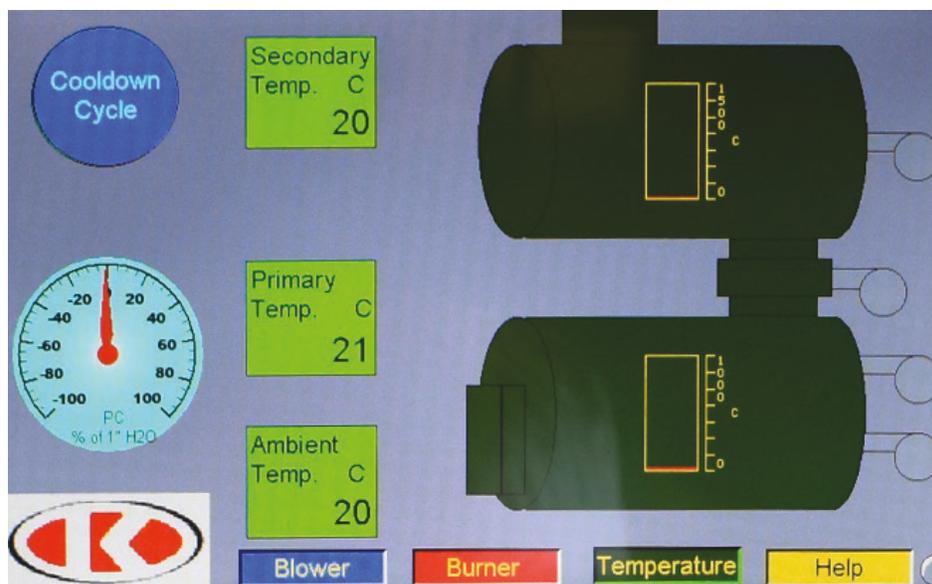


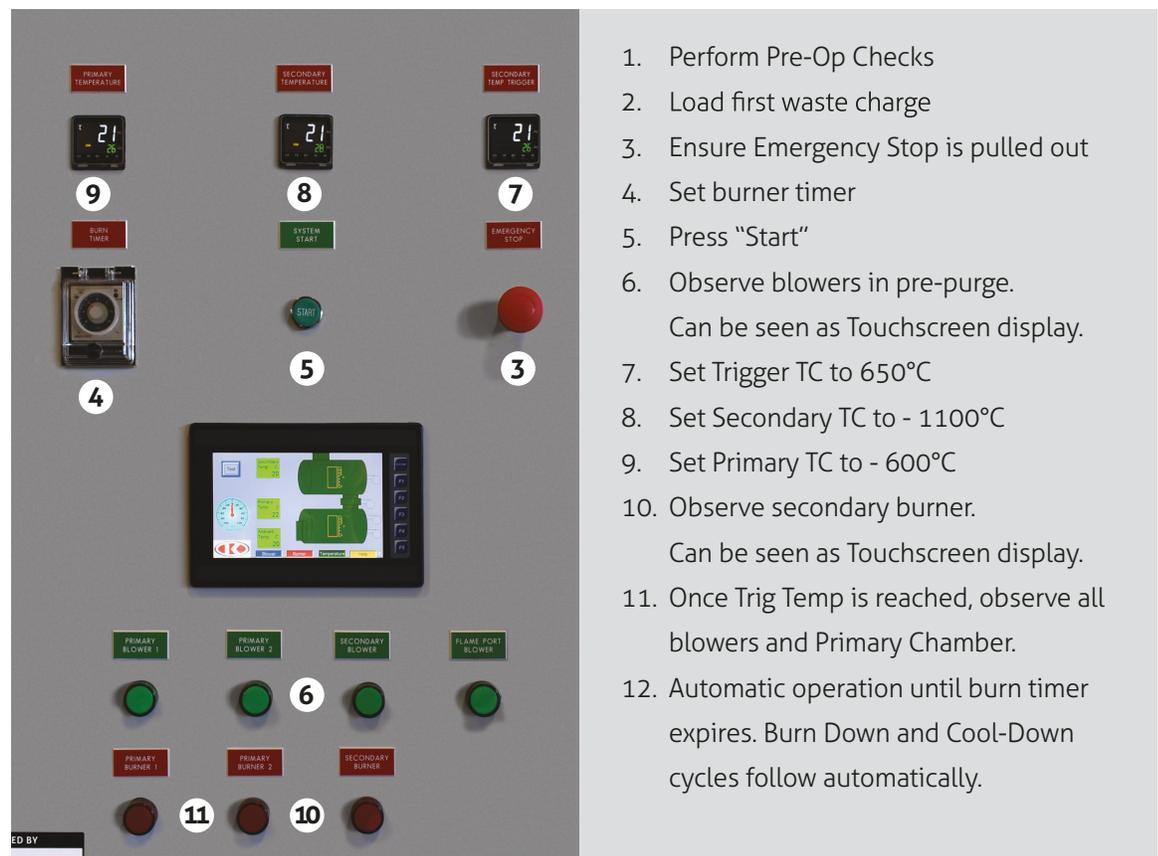
13. Approximately one hour after the rake, check the waste status again. If not burned, rake it and close the door. If waste seems burned and you do not need to burn another batch, then manually run the burn timer to zero. If you need to burn more batches, lower the set point on "Burn Timer" to 0 by pressing the "▲" down arrow. Give about 30-60 minutes for the Primary Chamber to cool down.
14. Load the next batch in the Primary Chamber and turn the timer to 12 hours.
15. Repeat steps 11 to 13 for other batches of the day.
16. For the final batch of the day turn the timer to about 5-6 hours. Rake in between if required.
17. After the timer runs out, the primary burners will no longer produce flames, but the blowers will continue to run. At this time the secondary chamber burner will still keep running for another half hour.



18. After secondary burners shut down, all the blowers will keep running for another 5-6 hours to give enough time for the incinerator to cool down and prevent any damage to the burners. If after the cool down process the temperature in the chambers is still above 250°C, the blowers will continue to run until the temperature drops below the 250°C value.
19. The pre-operational checklist should be given to the supervisor for documentation and any further procedures. Pre-Operational Checklist should be filed and kept for record.
20. The touchscreen digital display records the incineration operations. It comes standard with 32 Gb of memory. The PLC records operations such as blower operation, burner and door feed, and incinerator chamber temperature. To go back to the home screen please push the Ketek symbol, located bottom left of screen.

**Note:**

- a. Do not operate the incinerator if something is not functioning properly. Immediately tell your supervisors.
- b. Do not overload the incinerator
- c. It is important that waste should neither be open-burned nor burned in a barrel
- d. Wear all required PPE (gloves, face-shield, dust mask, flame retardant coveralls, etc.)
- e. If flame detection control locks out, try resetting it by pressing red button on the burner control. If it keeps resetting, let your supervisor know immediately.
- f. Always ask if unsure about something.

**FIGURE 10 OPERATING SEQUENCE**

Note: Temperatures in Steps 8 and 9 may be governed by regulations:  
If so, SET TEMPERATURE TO THE REGULATORY VALUES

### 6.7 Waste charging:

For Batch feeding (recommended) see **Figure 11**.

1. After de-ashing the cooled-down incinerator, load waste on the hearth. Refer to training notes and operating experience.
2. Ensure Burn Timer is set to 4-5 hours, depending on load size. Pressing "Start" button begins a new cycle.
3. Primary burners will start once Secondary Chamber is at trigger temperature (TC3 set-point typically at 650°C)
4. After three hours, open door, check state of ash, rake if needed.

### FIGURE 11. PROCEDURE FOR BATCH WASTE CHARGING

Additional Notes to **Figure 11**:

\*\* The main danger is from exposure to heat radiation, and from waste catching fire before it is inside the Primary Chamber. Precautionary steps include:

- (a) Wear proper PPE,
- (b) Make sure waste batch can go through the charge door easily,
- (c) Open door, charge waste and close door as quickly as possible.

\*\*\* The time for complete combustion varies, depending on batch size, weight and composition. Check burning conditions from charge door. Rake if necessary.

### 6.8 Waste Incineration Records

To demonstrate appropriate operation and maintenance of the incinerator, we recommend that the facility maintain records containing at least the following information (or as per permits/regulations):

- A list of all staff who have been trained to operate the incinerator; type of training conducted and by whom; dates of training; dates of refresher courses.
- All preventative maintenance activities undertaken on the equipment.
- Records of operation of the incinerator.
- Records of quantities of waste incinerated.
- Summarized annual auxiliary fuel usage.
- A list of all shipments/disposal of incinerator residues, including the weight transported and disposed of by type if necessary, and the location of the disposal site.
- Results of any stack emission monitoring and ash sampling information.

All raw data records from the operation of the incinerator will be retained for inspection by the appropriate authorities for a period of three years (or any other time period as deemed necessary).

### 6.9 Burn-Down and Cool-Down: see Figure 12

For Batch feeding (recommended) see Figure 11.

1. Automatic Burn-Down cycle begins after burner timer expires. Primary burners shut down immediately.
2. Automatic Cool-Down cycle follows. Secondary burner shuts down.
3. Blowers automatically shut down once chambers have cooled to 250°C. Cycle is complete.

### FIGURE 12. PROCEDURE FOR BURN DOWN.

### 6.10 Maintenance and Inspection

In addition to the routine inspection and maintenance previously mentioned, only the burner(s) and the blower(s) require maintenance, which is quite minimal; see manuals in the binder. The following inspection steps are recommended:

**TABLE 8 RECOMMENDED INSPECTIONS**

How Often	Component	Inspection and checking
Daily	Thermocouples <b>PC_T</b> and <b>SC_T</b>	Check that the readings of temperature controllers are close to the estimated temperatures of the Primary and Secondary Chambers
	Contact switches <b>PC_S</b>	Free movement, no obstruction
	Gasket/seal waste feed door <b>PC_D</b>	Wear and tear; proper sealing
	Refractory in primary chamber <b>PC</b>	No large (not expansion) cracks; pieces falling out. Repair if necessary.
Weekly	Blowers <b>PC_B</b> , <b>SC_B</b> , <b>FP_B</b>	Inspect clean in-takes, clean if necessary
Monthly	External surfaces of <b>PC</b> and secondary chamber <b>SC</b>	"Spotty" discoloration may indicate damage to refractory and/or insulation
Annual	Refractory in <b>SC</b>	No large (not expansion) cracks; repair if necessary

### 6.1.1 Trouble Shooting

Table 9 shows a list of operational problems that may be encountered, the possible causes and corrective measures. No list can cover all potential problems. Please report problems or unusual observations, even if you have corrected them yourself.

**TABLE 9 TROUBLESHOOTING GUIDELINES**

Phase	Observation	Points/Items to look at.
Start UP	Incinerator won't start	<ul style="list-style-type: none"> <li><input type="checkbox"/> Make sure there is power.</li> <li><input type="checkbox"/> Check emergency stop is not engaged.</li> <li><input type="checkbox"/> Timer is set to an actual value and mode.</li> <li><input type="checkbox"/> Make sure there is power on all phases/legs coming into the incinerator.</li> </ul>
Pre-Purge Phase	Skipping or not starting the Pre-purge.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check that pre-purge timer works correctly.</li> <li><input type="checkbox"/> Check emergency stop is not engaged.</li> <li><input type="checkbox"/> Make sure there is power on all phases/legs coming into the incinerator.</li> </ul>
	Auxilia burner blower(s) won't run in pre-purge cycle.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check Breakers.</li> <li><input type="checkbox"/> Check burner blower contacts are energized.</li> <li><input type="checkbox"/> Check that overload switch on the motor is not tripped.</li> <li><input type="checkbox"/> Check there is power at the burner on the wire supplying power to the motor (Use Multi meter)</li> <li><input type="checkbox"/> Check for a seized motor by manually spinning the blower wheel. (Make sure power is off and locked out)</li> </ul>
Pre-heat Phase	Secondary burner wont ignite	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check Breakers.</li> <li><input type="checkbox"/> Check there is power at the Genisys Control.</li> <li><input type="checkbox"/> Check that Genisys control is not locked out.</li> </ul>
	Burner keeps Locking out after manual reset.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check all fuel valves are on.</li> <li><input type="checkbox"/> Check Burner contacts are energized.</li> <li><input type="checkbox"/> Check there is sufficient fuel in the tank.</li> <li><input type="checkbox"/> Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present. If diesel is gelled (due to cold weather) it will not let the burner operate efficiently.</li> <li><input type="checkbox"/> If there is no fuel coming out of the pump and the motor is running then it could be a damaged coupling or seized pump.</li> <li><input type="checkbox"/> If bubbles do not disappear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight.</li> <li><input type="checkbox"/> Check that CAD cell is clean.</li> <li><input type="checkbox"/> Try and hear the spark at the electrodes.</li> </ul>
Burn Phase	Primary burner(s) won't ignite.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check Door Switch(s) are engaged.</li> <li><input type="checkbox"/> Check Fuses.</li> <li><input type="checkbox"/> Check there is power at the Genisys Control.</li> <li><input type="checkbox"/> Check that Genisys control is not locked out.</li> </ul>

	Burner keeps Locking out after manual reset.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check all fuel valves are on.</li> <li><input type="checkbox"/> Check Burner contacts are energized.</li> <li><input type="checkbox"/> Check there is sufficient fuel in the tank.</li> <li><input type="checkbox"/> Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present. If diesel is gelled it will not let the burner operate efficiently.</li> <li><input type="checkbox"/> If there is no fuel coming out of the pump and the motor is running then it could be damaged coupling or seized pump.</li> <li><input type="checkbox"/> If bubbles do not disappear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight.</li> <li><input type="checkbox"/> Check that CAD cell is clean.</li> <li><input type="checkbox"/> Try and hear the spark at the electrodes.</li> </ul>
	Flame port Blower won't start	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check Breakers.</li> <li><input type="checkbox"/> Check blower contacts are energized.</li> <li><input type="checkbox"/> Check there is power at the electrical box on the wire supplying power to the motor (Use Multimeter)</li> <li><input type="checkbox"/> Check for a seized motor by manually spinning the blower wheel. (Make sure power is off and locked out)</li> </ul>
General	Auxiliary burner(s) ignite for a while and then stop while system is still calling for them to be on.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Bleed the pump at the 3/8" bleed screw and make sure there is fuel flow and no air bubbles are present.</li> <li><input type="checkbox"/> If bubbles do not disappear after a while then there is a possible minute leak in the supply line. Make sure all the fittings and joints are tight.</li> </ul>
	Omron Temperature controller showing "S.err"	<ul style="list-style-type: none"> <li><input type="checkbox"/> Make sure wire connections are tight at the thermocouple and on the controller inside the panel.</li> <li><input type="checkbox"/> Check thermocouple is not damaged. To do this follow steps below:</li> <li><input type="checkbox"/> If you connect red and yellow wire together at the thermocouple and the error goes away, then go ahead change the thermocouple.</li> <li><input type="checkbox"/> If error does not go away after connecting the wires together then most probably the wire is damaged or a small chance of a faulty controller.</li> </ul>
	Liquid dripping from the door.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Check that the door seals are not damaged.</li> <li><input type="checkbox"/> Check there are no deposits on the door or the door frame. Scrape off any deposits. It is a good practice to do it once a week.</li> </ul>

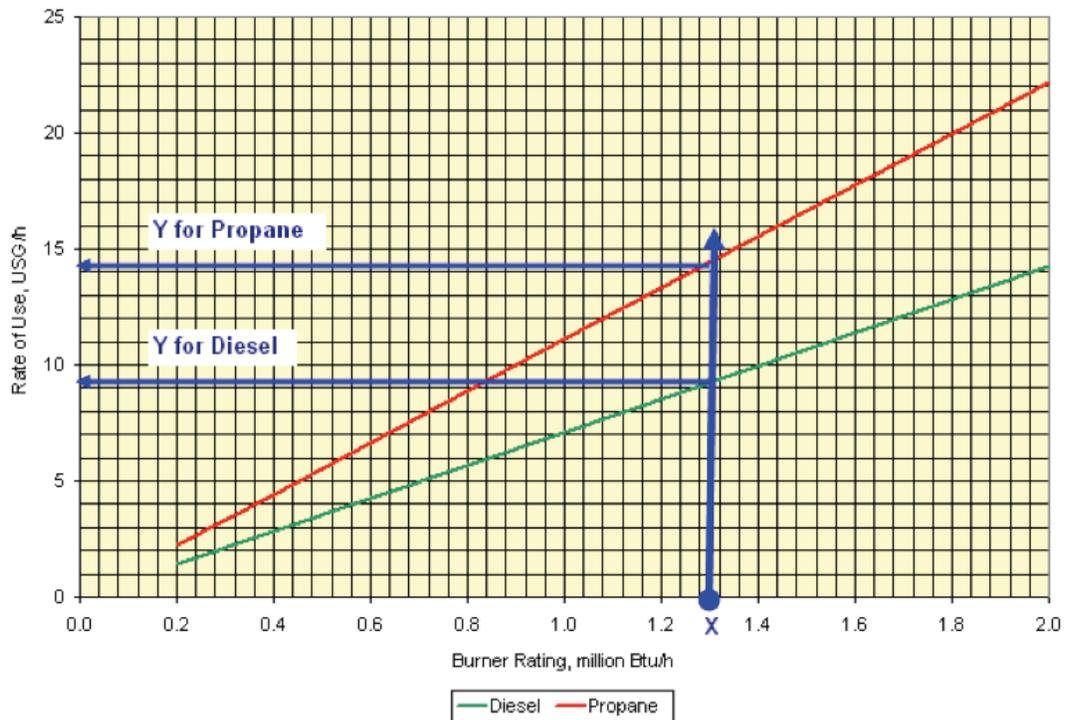
For further troubleshooting of burners or blowers please refer to equipment specific manuals (attached at the end of this manual).

Before conducting any work, make sure all power is locked/tagged out and that any site specific safety procedures are followed before any maintenance occurs.

**6.12 Auxiliary Fuel Consumption Rate**

Figure 13 shows the volumetric flow rates of propane and diesel as a function of burner rating. If the TOTAL burner rating is X million Btu/h, and the operating time from start-up to the end of burn-down is t hours, the maximum fuel needed is:

$V = Y * t$  USG where Y is the fuel consumption rate for X million Btu/h rating, as shown in the graph.



**FIGURE 13 CONSUMPTION RATES OF PROPANE AND DIESEL**



1. **SUGGESTED SPARE PARTS LIST**
2. **BURNER WIC 201**
3. **BURNER WIC 301**
4. **BLOWER DAYTON 4C 108**
5. **INSPECTION CHECKLIST**
6. **WIRING DIAGRAM**

## 7.1 Suggested Spare Parts List

## CY-100-CA-D RECOMMENDED SPARE PARTS LIST

Description	Qty	KETEK Part No.
Gun Burner Beckett, WIC 201 16" (5.5GPH)	2	129230
Gun Burner Beckett, WIC 301 10-1/4" (7.0GPH)	1	129240
Dayton 4C-108 Flameport Blower	1	129305
Air Tube Combination for WIC 201 6 5/8	2	129420
Air Tube Combination for WIC 301 10-1/4"	1	129455
Motor for WIC 201	2	129480
Motor for WIC 301	1	129520
Coupling, Flex for WIC 201	4	129400
Coupling, Flex for WIC 301	2	129510
Fuel Pump A2YA-7916 Suntec	2	129320
Fuel Pump B2TA-8851 Suntec	1	129321
Blower Wheel for WIC 201	2	129410
Blower Wheel for WIC 301	1	129411
Transformer, Ignition "S" for WIC 201	2	129360
Transformer, Ignition "S" for WIC 301	1	129530
Nozzle (5.5 GPH 60° B)	2	144700
Cad Detector Call (If Applicable)	4	120730
Beckett Genysis Control (If Applicable)	2	177800
Timer, H3CR-A 11pin	1	152760
Omron Temperature Controller	1	131850
Panel Fuse Package	8	No item #
Thermocouple Ceramic (Secondary Chamber) – 12.75"	2	130140
Thermocouple Ceramic (Primary Chamber) – 12.75"	2	163670
Proximity Switch Door	1	132600
Limit Switch Assembly	1	130090
Gasket, Ceramic Fibre ¾" x 2" (price per foot)	100 ft.	132610
Gasket Cement, HT Silicone Tube	4	132620
Spark Arrester, Stainless Steel (Crating Not Included in Price)	1	130341
Filter Adapter (For Fuel Tank)	1	147840
Filter, Fuel LFF2 (For Fuel Tank)	2	133460

# SF/SM

## Oil Burner Manual

*Beckett*

RESIDENTIAL BURNERS



### **WARNING**

#### **Potential for Fire, Smoke and Asphyxiation Hazards**



***Incorrect installation, adjustment, or misuse of this burner could result in death, severe personal injury, or substantial property damage.***

##### **To the Homeowner or Equipment Owner:**

- Please read and carefully follow all instructions provided in this manual regarding your responsibilities in caring for your heating equipment.
- Contact a professional, qualified service agency for installation, start-up or service work.
- Save this manual for future reference.

##### **To the Professional, Qualified Installer or Service Agency:**

- Please read and carefully follow all instructions provided in this manual before installing, starting, or servicing this burner or heating system.
- The Installation must be made in accordance with all state and local codes having jurisdiction.

**To the Owner:**

**Thank you for purchasing a Beckett burner** for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your oil burner.

Your Beckett burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

**We recommend annual inspection/ service of your oil heating system by a qualified service agency.**

**Daily** – Check the room in which your burner/appliance is installed. Make sure:

- Air ventilation openings are clean and unobstructed
- Nothing is blocking burner inlet air openings
- No combustible materials are stored near the heating appliance
- There are no signs of oil or water leaking around the burner or appliance

**Weekly**

- Check your oil tank level. Always keep your oil tank full, especially during the summer, in order to prevent condensation of moisture on the inside surface of the tank.

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QUALIFIED SERVICE TECHNICIANS ▼**

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# Limited Warranty Information

The R. W. BECKETT CORPORATION (“Beckett”) warrants to persons who purchase its “Products” from Beckett for resale, or for incorporation into a product for resale (“Customers”), that its equipment is free from defects in material and workmanship. To qualify for warranty benefits, products must be installed by a qualified service agency in full compliance with all codes and authorities having jurisdiction, and used within the tolerances of Beckett’s defined product specifications.

To review the complete warranty policy and duration of coverage for a specific product, or obtain a written copy of warranty form 61545, please choose one of the following options:

Visit our website at: [www.beckettcorp.com/warranty](http://www.beckettcorp.com/warranty)

Email your request to: [rwb-customer-service@beckettcorp.com](mailto:rwb-customer-service@beckettcorp.com)

Write to: R. W. Beckett Corporation, P. O. Box 1289, Elyria, OH 44036

**NOTE: Beckett is not responsible for any labor cost for removal and replacement of equipment.**

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes, nor authorizes any person to assume for Beckett, any other liability or obligation in connection with the sale of this equipment. Beckett’s liability and Customer’s exclusive remedy is limited to the cost of the product.



**USA:** P.O. Box 1289 • Elyria, Ohio 44036

**Canada:** R.W. Beckett Canada, Ltd. • Unit #3, 430 Laird Road • Guelph, Ontario N1G 3X7  
[www.beckettcorp.com](http://www.beckettcorp.com)

# General Information

## Hazard Definitions:

	Indicates a hazardous situation that, if not avoided, <i>will</i> result in <b>death or serious injury</b> .
	Indicates a hazardous situation that, if not avoided, <i>could</i> result in <b>death or serious injury</b> .
	Indicates a hazardous situation that, if not avoided, <i>could</i> result in <b>minor or moderate injury</b> .
	Used to address practices not related to physical injury.
	Safety instructions signs indicate specific safety-related instructions or procedures.

## **WARNING** Owner's Responsibility



*Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.*

Contact a professional, qualified service agency for the installation, adjustment and service of your oil heating system. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

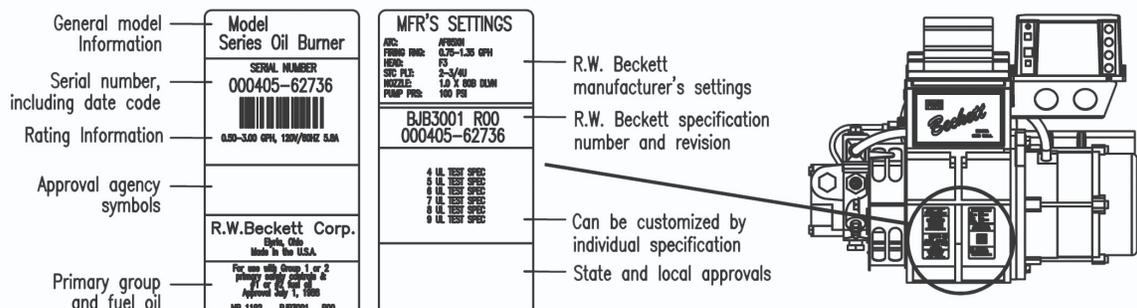
Please carefully read and comply with the following instructions:

- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner/appliance by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

**NOTICE** This manual contains information that applies to both SM and SF burners. These burners may appear to be basically identical, but there are differences in design and performance. Please review the comparison chart below:

Feature	SM	SF
Firing Rate Range	1.25 to 3.00 gph	1.25 to 5.50 gph
Motor	1/5 HP	1/4 HP
Fuel Pump Capacity	3 gph (standard)	7 gph (standard)
UL Air Tube Combinations	See <b>Table 2</b>	See <b>Table 2</b>
Blocking Oil Solenoid Valve	Optional	Required above 3 gph
Primary Control Lockout Timing	15 to 45 seconds (optional)	15 seconds maximum
Primary Control	Beckett GeniSys 7575P	Beckett GeniSys 7505 or 7575
Option to ship less Primary Control for Pressure Washer Industry	Yes (Model 7575P Primary Control with "valve-on delay" and "motor-off delay" required in final installation.)	No

**Figure 1 – Burner Label Location**





**Frozen Plumbing and Water Damage Hazard**

*If the residence is unattended in severely cold weather, burner primary control safety lockout, heating system component failures, power outages or other electrical system failures could result in frozen plumbing and water damage in a matter of hours. For protection, take preventive actions such as having a security system installed that operates during power outages, senses low temperature and initiates an effective action. Consult with your heating contractor or a home security agency.*

**Table 1 – Burner Specifications**

Model SM Capacity (Note1)	Firing rate range: 01.25 – 3.00 GPH Input: 175,000 – 420,000 Btu/hr
Model SF Capacity (Note1)	Firing rate range: 1.25 - 5.50 GPH Input: 175,000 – 770,000 Btu/hr
Certifications/ Approvals	Model SM - UL listed to comply with ANSI/UL296 and CSA-B140.0. Model SF - UL listed to comply with ANSI/UL 296 and CSA-B140.0.
Fuels	<p><b>DO NOT USE GASOLINE, CRANKCASE OIL, OR ANY OIL CONTAINING GASOLINE.</b></p> <p><b>U.S.</b> #1 or #2 fuel oil only (ASTM D396) <b>Canada</b> #1 stove oil or #2 furnace oil only</p>
Electrical	<p><i>Power supply:</i> 120 volts AC, 60 Hz, single phase</p> <p><i>Operating load (SM):</i> 5.8 Amps max <i>Operating load (SF):</i> 7.1 Amps max</p> <p><i>Motor (SM):</i> 1/5 hp, 3450 rpm, NEMA 'N' flange, manual reset over load protection <i>Motor (SF):</i> 1/4 hp, 3450 rpm, NEMA 'N' flange, manual reset over load protection</p> <p><i>Ignition:</i> Continuous duty solid-state igniter</p>
Fuel pump	Outlet pressure: Note 2
Air tube	ATC code: See <b>Table 2</b>
Dimensions (Standard)	<p><i>Height:</i> 12.5 in. <i>Width:</i> 15 in. <i>Depth:</i> 8.50 in. <i>Air tube diameter:</i> 4.00 in.</p>
Air tube	ATC code: See <b>Table 2</b>

**Note 1:** Approval agency listed rating for Model SM is 1.25 to 3.00 gph and Model SF is 1.25 to 5.50 gph. However, the firing rate range is limited by the specific air tube combination being used. Refer to Table 2.

**Note 2.** UL Recognized to 4.0 GPH with a CleanCut pump for use in pressure washers.

**Note 3.** See appliance manufacturer's burner specifications for recommended pump discharge pressure.

**NOTICE**

**Special Requirements**

- THE INSTALLATION OF A BURNER SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- For recommended installation practices in the U.S. refer to the latest edition of NFPA 31. (CSA-B139 and CSA-B140 in Canada).
- Concealed damage — If you discover damage to the burner or controls during unpacking, notify the carrier at once and file the appropriate claim.
- When contacting Beckett for service information — Please record the burner serial number (and have available when calling or writing). You will find the serial number on the silver label located on the left rear of the burner. Refer to **Figure 1**.

**Table 2 – Air Tube Combination (ATC) codes**

Firing Rate (gph)	Head	Static plate size (in.)	ATC Codes for usable air tube lengths ('A' in inches; See Figure 3.)			
			6-5/8	9	13	16
SF Burner Only						
1.25-2.25	F12	2-3/4	SF65VW	SF90VW	SF130VW	SF160VW
1.75-2.75	F22	2-3/4	SF65VP	SF90VP	SF130VP	SF160VP
1.75-3.25	F220	None	SF65FD	SF90FD	SF130FD	SF160FD
2.5-5.5	F310	None	SF65FU	SF90FU	SF130FU	SF160FU
SM Burner Only						
1.25-2.00	F12	2-3/4	SM65VW	SM90VW	SM130VW	SM160VW
2.00-3.00	F220	None	SM65FF	SM90FF	SM130FF	SM160FF
2.00-3.00	F22	None	SM65VM	SM90VM	SM130VM	SM160VM

**Table 3 – Chamber Dimensions**

Chamber Dimensions (inches)					
Firing Rate (GPH)	Round I.D.	Rectangular		Height	Floor to nozzle
		Width	Length		
1.25	11	10	11	12	5-6
1.50	12	11	12	13	6-7
2.00	14	12	15	13	6-7
2.50	16	13	17	14	7-8
3.00	18	14	18	15	7-8
3.50	19	15	19	15	7-8
4.00	20	16	21	16	8-9
5.00	23	18	23	18	9-10
5.50	24	19	24	19	10-11

**WARNING**

**Professional Service Required**



*Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.*

Please read and understand the manual supplied with this equipment. This equipment must be installed, adjusted and put into operation only by a qualified individual or service agency that is:

- Licensed or certified to install and provide technical service to oil heating systems.
- Experienced with all applicable codes, standards and ordinances.
- Responsible for the correct installation and commission of this equipment.
- Skilled in the adjustment of oil burners using combustion test instruments.

The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard for the installation of Oil-burning Equipment, NFPA 31 (or CSA-B139 and CSA-B140 in Canada). Regulation by these authorities take precedence over the general instructions provided in this installation manual.

**Inspect/Prepare Installation Site**

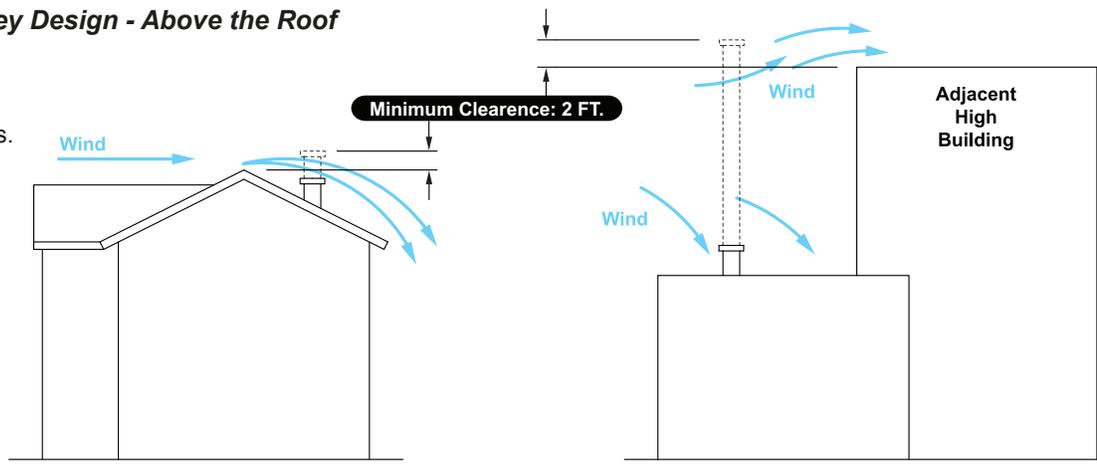
**WARNING**

**Fire, Smoke & Asphyxiation Hazard**

- Carefully inspect the chimney or exhaust vent system.
- Make sure it is properly sized and in good working condition.
- Follow the instructions supplied by the appliance manufacturer.
- The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard NFPA 31 for the installation of chimneys and vent sizing, (or CSA-B139 and CSA-B140 in Canada).
- Regulation by these authorities take precedence over the general instructions provided in this installation manual.

**Figure 2 – Chimney Design - Above the Roof**

**NOTE:** Correct chimney design is shown by dotted lines. Incorrect chimney design, as shown by the solid lines, may result in down-drafts.



### Inspect Chimney or Direct Vent System

1. Starting with minimum gph firing rate, the minimum size recommended is 6" flue pipe with 8" X 8" inside chimney, unless specified otherwise by the appliance manufacturer.
2. A chimney flue shall extend at least 3 feet above the highest point at which the chimney comes in contact with the roof, and not less than 2 feet above the highest roof surface or structure within 10 feet horizontally of the chimney. Refer to **Figure 2**.
3. Any accumulation of soot or debris in chimney offsets should be removed.
4. Any obstructions such as a protruding joint or a piece of broken tile wedged in the chimney should be removed.
5. No other appliance connection should be made to the same flue pipe.
6. The flue pipe should have an upward pitch toward the chimney of at least 1/4" per foot of length. It should fit tightly and should not project into the chimney.
7. Any leakage between tiles, around clean-out doors, or around the vent pipe should be sealed.

#### Insulated Stainless Steel Chimney Liners

The new designs of high efficiency oil furnaces and boilers in conjunction with flame retention oil burners are more efficient. One result of increased efficiency is lower flue gas temperatures. As flue gases rise in the chimney, they will cool and condense when they reach the dew point. The condensation will mix with the sulphur in the flue gases creating sulphuric acid. The acid will attack the chimney mortar, brick and clay liners causing corrosion, deterioration and blockage of the chimney. Eventually the blockage could prevent exhausting the flue gases. Instead, the flue gases could vent out the barometric damper into the living space.

Therefore, it is strongly recommended that an approved insulated stainless steel liner be installed.

- For those installations not requiring a chimney, such as through-the-wall vented appliances, follow the instructions given by the appliance and power venter (if used) manufacturers.

### Combustion Air Supply

See NFPA 31 Standard for complete details.



**WARNING**

#### **Adequate Combustion and Ventilation Air Supply Required**

***Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment, asphyxiation, explosion or fire hazards.***

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest editions of the NFPA 31 and CSA-B139 regarding providing adequate air for combustion and ventilation.

#### Appliance located in confined space

The confined space should have two (2) permanent openings: one near the top of the enclosure and one near the bottom of the enclosure. Each opening shall have a free area of not less than (1) one square inch per 1,000 BTU's per hour of the total input rating of all appliances within the enclosure. The openings shall have free access to the building interior, which should have adequate infiltration from the outside.

### Exhaust Fans and Other Air-Using Devices

Size air openings large enough to allow for all air-using devices in addition to the minimum area required for combustion air. If there is any possibility of the equipment room developing negative pressure (because of exhaust fans or clothes dryers, for example), either pipe combustion air directly to the burner or provide a sealed enclosure for the burner and supply it with its own combustion air supply.

### Clearances to Burner and Appliance

- Provide space around burner and appliance for easy service and maintenance.
- Check minimum clearances against those shown by the appliance manufacturer and by applicable building codes.

### Combustion Chamber — Burner Retrofitting

Verify that the appliance combustion chamber provides at least the minimum dimensions given in **Table 3**.

**WARNING****Protect Steel Combustion Chamber From Burnout**

**Failure to comply could result in damage to the heating equipment and result in fire or asphyxiation hazards.**

- When retrofitting appliances that have unlined stainless steel combustion chambers, protect the chamber by lining the inside surfaces with a ceramic fiber blanket, such as a wet-pac or other suitable refractory material.
- Some steel chambers may not require liners because the appliance was designed and tested for use with flame retention burners. Refer to the manufacturer's instructions.

## Prepare the Burner

### Burner Fuel Unit

Verify that the burner fuel unit is compatible with the oil supply system. For more details, refer to the pump manufacturer's instructions provided with the burner.

### Attach Air Tube (if not already installed)

If using a flange and gasket, slide them onto the air tube. Then attach the air tube to the burner chassis using the four sheet metal screws provided. Refer to **Figure 4** for details.

### Install Burner Nozzle (if not already installed)

**WARNING****Correct Nozzle and Flow Rate Required**

**Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, sooting, puff-back of hot gases, smoke and potential fire or asphyxiation hazards.**

Use only nozzles having the brand, flow rate (gph), spray angle and pattern specified by the appliance manufacturer.

Follow the appliance manufacturer's specifications for the required pump outlet pressure for the nozzle, since this affects the flow rate.

- Nozzle manufacturers calibrate nozzle flow rates at 100 psig.
- When pump pressures are higher than 100 psig, the actual nozzle flow rate will be greater than the gph stamped on the nozzle body. (Example: A 1.00 gph nozzle at 140 psig = 1.18 gph)

Securely tighten the nozzle (torque to 90 inch pounds). For typical nozzle flow rates at various pressures refer to **Table 4**.

1. Remove the plastic plug protecting the nozzle adapter threads
2. Place a  $\frac{3}{4}$ " open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and finger tighten. Finish tightening with a  $\frac{5}{8}$ " open-end wrench. Use care to avoid bending the electrodes.
3. If the nozzle is already installed, remove the nozzle line assembly to verify that the nozzle size and spray pattern are correct for the application (per appliance manufacturer's information). Verify that the electrode tip settings comply with **Figure 3**.
4. If the nozzle is not installed, obtain a nozzle having the capacity and spray angle specified in the appliance manufacturer's information. For conversions or upgrades, when information is not available for the application:
  - Refer to **Table 5** to select the mid-range nozzle spray angle for the head type being used.
  - Fire the burner and make sure the combustion is acceptable and the flame is not impinging on chamber surfaces.
  - If a shorter flame is needed, select a wider spray angle. If a longer flame is needed, select a narrower spray angle.
  - Either hollow or solid spray patterns may be used. If combustion results are not satisfactory with the selected spray pattern, try the other pattern.

**Table 4 – Nozzle Flow Rate by Size**

Nozzle flow rate U. S. gallons per hour of No. 2 fuel oil when pump pressure (psig) is:					
Nozzle size (rated at 100 psig)	125 psi	140 psi	150 psi	175 psi	200 psi
1.25	1.39	1.48	1.53	1.65	1.77
1.35	1.51	1.60	1.65	1.79	1.91
1.50	1.68	1.77	1.84	1.98	2.12
1.65	1.84	1.95	2.02	2.18	2.33
1.75	1.96	2.07	2.14	2.32	2.48
2.00	2.24	2.37	2.45	2.65	2.83
2.25	2.52	2.66	2.76	2.98	3.18
2.50	2.80	2.96	3.06	3.31	3.54
2.75	3.07	3.25	3.37	3.64	3.90
3.00	3.35	3.55	3.67	3.97	4.24
3.25	3.63	3.85	3.98	4.30	4.60
3.50	3.91	4.14	4.29	4.63	4.95
3.75	4.19	4.44	4.59	4.96	5.30
4.00	4.47	4.73	4.90	5.29	-
4.50	5.04	5.32	5.51	-	-
5.00	5.59	-	-	-	-
5.50	-	-	-	-	-

**Table 5 – Nozzle Spray Angles**

Recommended nozzle spray angles	
"F" head	70°, 80° or 90° nozzle

Note: Always follow the appliance manufacturer's nozzle specification, when available.

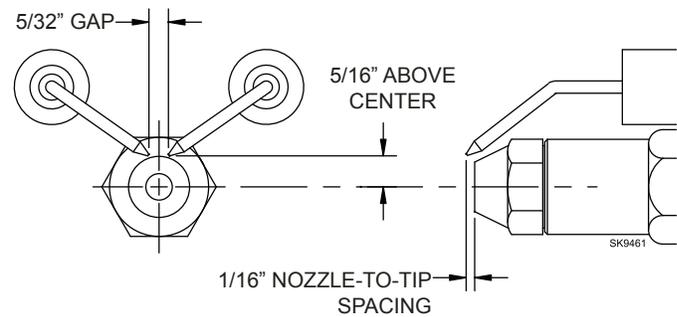
### Check/Adjust Electrodes

Check the electrode tip settings. Adjust if necessary to comply with the dimensions shown in **Figure 3**. To adjust, loosen the electrode clamp screw and slide/rotate electrodes as necessary. Securely tighten the clamp screw when finished.

### Servicing Nozzle Line Assembly

1. Turn off power to burner before proceeding.
2. Disconnect oil connector tube from nozzle line.
3. Loosen the two screws securing igniter retaining clips and rotate both clips to release igniter baseplate. Then tilt igniter back on its hinge.
4. Remove splined nut.
5. "F" head air tube. - Remove nozzle line assembly from burner, being careful not to damage the electrodes or insulators while handling. To ease removal of long assemblies (over 9 inches), rotate assembly 180° from installed position after pulling partially out of tube.
6. To replace the nozzle assembly, reverse the above steps.

**Figure 3 – Electrode Tip Adjustment**



Check/Adjust 'Z' Dimension - 'F' Heads

See **Figure 4** for complete details.

## Mount Burner on Appliance

### Mounting Options



**WARNING**

**Do Not use Adjustable Mounting Flange on Mobile Units**

*The shock and vibration could cause loss of burner alignment and insertion problems resulting in flame impingement, heavy smoke, fire and equipment damage.*

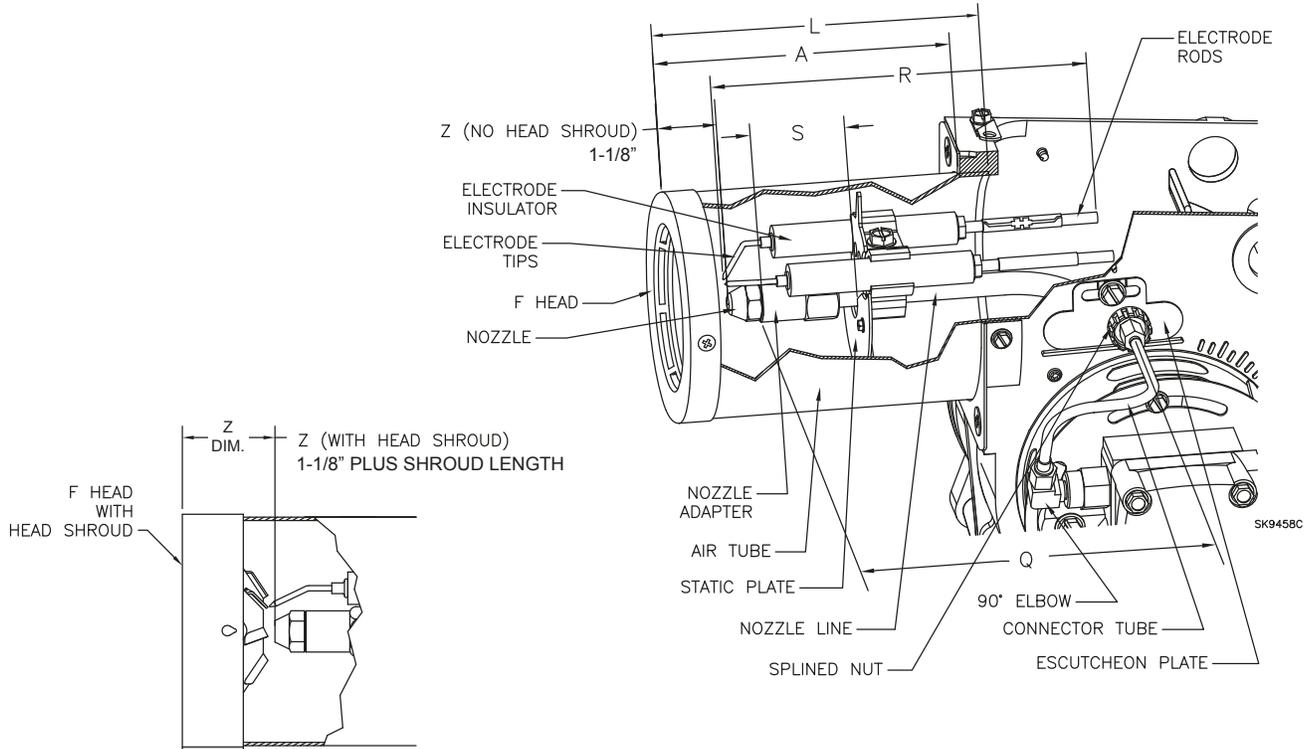
- Only use specified factory-welded flange and air tube combinations.

Bolt the burner to the appliance using the factory-mounted flange or an adjustable flange.

### Mounting Dimensions

1. When using the Beckett universal adjustable flange, mount the air tube at a 2° downward pitch unless otherwise specified by the appliance manufacturer.
2. Verify that the air tube installed on the burner provides the correct insertion depth. See **Figure 5**.
3. The end of the air tube should normally be 1/4" back from the inside wall of the combustion chamber. Never allow the leading edge of the head assembly to extend into the chamber, unless otherwise specified by the heating appliance manufacturer. Carefully measure the insertion depth when using an adjustable flange. Verify the insertion depth when using a welded flange.

Figure 4 – Check/Adjust ‘Z’ Dimension for ‘F’ Heads



**WARNING**

Adjust the ‘Z’ dimension to the required specification.

**Incorrect Adjustments could cause combustion problems, carbon deposition from flame impingement, heavy smoke generation and fire hazard.**

- Make all adjustments exactly as outlined in the following information.

1. The important ‘Z’ dimension is the distance from the face of the nozzle to the flat face of the head (or heat shield, if applicable). This distance for F heads is 1-1/8” (1-3/8” if the air tube has a heat shield). The “Z” dimension is factory set for burners shipped with the air tube installed. Even if factory set, verify that the “Z” dimension has not been changed.
2. Use the following procedure to adjust the “Z” dimension, if it is not correct:
  - Turn off power to the burner.
  - Disconnect the oil connector tube from the nozzle line
  - See above figure. Loosen the splined nut from the nozzle line. Loosen the hex head screw securing the escutcheon plate to the burner housing.
  - Place the end of a ruler at the face of the nozzle and, using a straight edge across the head, measure the distance to the face of the head. A Beckett T501 or T650 gauge may also be used.

- Slide the nozzle line forward or back until the Z dimension for F heads is 1-1/8” (1-1/8” plus shroud length, if using a straight edge).
  - Tighten the hex head screw to secure the escutcheon plate to the burner chassis. Then tighten the splined nut and attach the oil connector tube.
3. Recheck the “Z” dimension periodically when servicing to ensure the escutcheon plate has not been moved. You will need to reset the “Z” dimension if you replace the air tube or nozzle line assembly. The Beckett Z gauge (part number Z-2000) is available to permit checking the F head “Z” dimension without removing the burner from the appliance.

**Burner Dimensions - Models SM & SF**

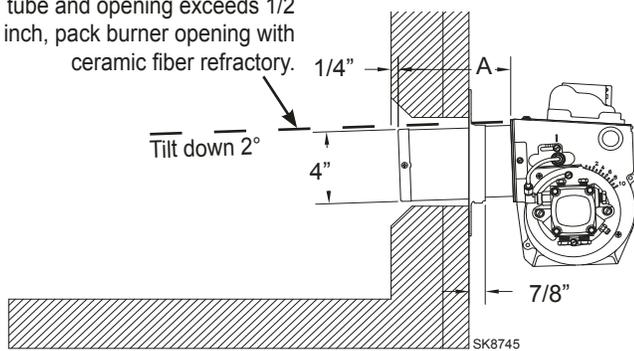
Dimension (inches)	F Head
<b>A</b> = Usable air length (inches)	(Measure accurately)
<b>L</b> (Total tube length)	A Dim. + 1/2
<b>R</b> (electrode length), ± 1/4	A Dim. + 2-1/4
<b>S</b> (adapter to static plate), ± 1/16	(Note 1)
<b>Q</b> (nozzle line length),	A Dim. + 15/16
<b>Z</b> (F head w/o head shroud) (F head-with head shroud)	1-1/8 1-1/8 + shroud length. (Note 2)

Note 1: 1-3/8 for dimension A less than 4”; 1-5/8 for dimension A from 4” through 4-1/2 “, 2-13/32” for dimension A greater than 4-1/2”.

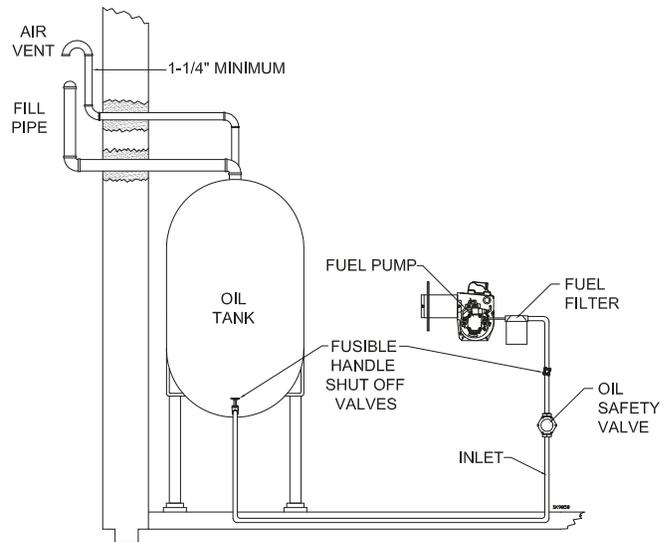
Note 2: When using a straight edge.

**Figure 5 – Mounting Burner in Appliance**

If space between burner air tube and opening exceeds 1/2 inch, pack burner opening with ceramic fiber refractory.



**Figure 6 – Inside Tank Gravity Feed System**



### Installing the Oil Tank and Supply System



#### **WARNING** Oil Leak and Fire Hazard

Install the oil tank following applicable standards in the U.S. by referring to the latest edition of NFPA 31 or CSA-B139 & CSA-B140 in Canada, and all authorities having jurisdiction.



#### **CAUTION** Do Not Use Teflon Tape

Damage to the pump could cause impaired burner operation, oil leakage and appliance soot-up.

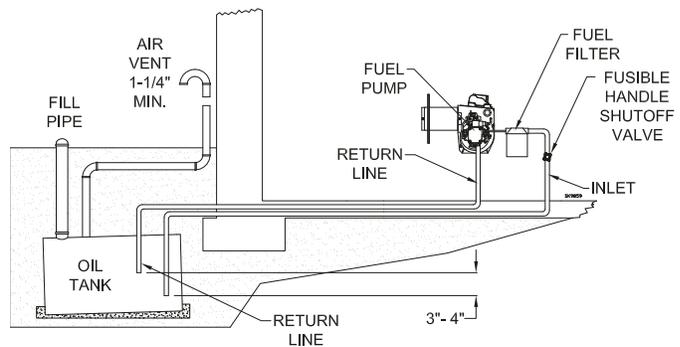
- Never use Teflon tape on fuel oil fittings.
- Tape fragments can lodge in fuel line components and fuel unit, damaging the equipment and preventing proper operation.
- Use oil-resistant pipe sealant compounds.

**Note:** to determine the proper fuel line size, refer to the fuel pump manufacturer's instructions provided with the burner. Refer to **Figure 6** or **Figure 7** for typical installation layouts.

#### **NOTICE**

To further protect the fuel supply system and reduce nozzle orifice plugging, a dual filtration system can be installed. This typically consists of a 50 micron primary filter, located near the fuel tank and a secondary filter rated for at least 10 microns located near the burner.

**Figure 7 – Outside Buried Tank-Lift System**



### Connect Fuel Lines

Carefully follow the fuel unit manufacturer's literature and the latest edition of NFPA 31 for oil supply system specifications (CSA B-139 in Canada).

#### Fuel supply level with or above burner –

The burner may be equipped with a single-stage fuel unit for these installations. Connect the fuel supply to the burner with a single supply line if you want a one-pipe system (making sure the bypass plug is NOT installed in the fuel unit.) Manual bleeding of the fuel unit is required on initial start-up. If connecting a two-pipe fuel supply, install the fuel unit bypass plug.

Fuel supply below the level of the burner –

When the fuel supply is more than eight feet below the level of the burner, a two-pipe fuel supply system is required. Depending on the fuel line diameter and horizontal and vertical length, the installation may also require a two-stage pump. Consult the fuel unit manufacturer's literature for lift and vacuum capability.

Fuel Line Installation –
 **Oil Supply Pressure Control Required**

**Damage to the filter or pump seals could cause oil leakage and a fire hazard.**

- The oil supply inlet pressure to the burner **cannot exceed 3 psig**.
- Insure that a pressure limiting device is installed in accordance with the latest edition of NFPA 31.
- **Do NOT install valves in the return line.** (NFPA 31, Chapter 8.)
- **Gravity Feed Systems:** Always install an oil safety valve (Webster OSV or Suntec PRV) in the oil supply line or a solenoid valve (RWB Part # 2182602U) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

Continuous lengths of 0.035" nominal wall (0.032" minimum) copper tubing are recommended. **Always use flare fittings. Never use compression fittings.**

- Always install fittings in accessible locations. Proper routing of fuel lines is required to prevent air cavitation and vibration.

Fuel Line Valve and Filter –

- Install two high quality, oil duty rated, fusible-handle design shutoff valves in accessible locations on the oil supply line to comply with the NFPA 31 Standard and authorities having jurisdiction. Locate one close to the tank and the other close to the burner, upstream of the filter for service access.
- Install a generous capacity filter inside the building between the fuel tank shutoff valve and the burner, locating both the filter and the valve close to the burner for ease of servicing. Filter should be rated for 50 microns or less.

## Wire Burner

### Burner Packaged with Appliance

 **Electrical Shock Hazard**


**Electrical shock can cause severe personal injury or death.**

- Disconnect electrical power before installing or servicing the burner.
  - Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation.)
  - Perform all wiring in compliance with the National Electrical Code ANSI/NFPA 70 (Canada CSA C22.1)
- Refer to appliance manufacturer's wiring diagram for electrical connections.

### Burner Installed at Jobsite

- Refer to **Figures 9a and 9b**, for typical burner wiring, showing cad cell primary controls. Burner wiring may vary, depending on primary control actually used.
- Refer to the appliance manufacturer's wiring diagram prior to connecting the burner wiring. All wiring must be in accordance with the latest revision of National Electric Code NFPA 70 and all local codes and regulations. In Canada, all wiring is to be in accordance with the Canadian Electrical Code, Part 1.

Both the 7505 and 7575 primary controls with valve-on delay (pre-time) and burner motor-off delay (post-time) require a constant 120 volts AC power source supplied to the BLACK wire on the control. The RED wire goes to the appliance limit circuit. **Please note that other control manufacturers may use different wire colors for power and limit connections.**

# Burner Controls

SM burners shipped less Primary Control from RWB shall require Model 7575P Primary Control be installed with valve-on delay and motor-off delay to meet CSA B140.0 per wiring in **Figure 9B**.

## GeniSys 7505 & 7575

SM burners shall use the 7575P only.

**WARNING** Fire or Explosion Hazard

*Can cause severe injury, death, or property damage.*

- The control can malfunction if it gets wet, leading to accumulation of oil or explosive oil vapors.
- Never install where water can flood, drip or condense on the control.
- Never use a control that has been wet - replace it.

## Features

- Thermostat / Operating and Limit Control Compatible
- Welded Relay Protection
- Limited Recycle
- Limited Reset
- 3 Status Lights
- Valve-On Delay / Motor-Off Delay (Field programmable with 52082 Contractor Tool)
- 15 Second Lockout Time
- Interrupted or Intermittent Duty Ignition
- Technician Pump Priming Mode
- Disable Function
- Communication Port(s)

## Wiring

**WARNING** Explosion, Fire, Scald, and Burn Hazard

*All heating appliances must have HIGH LIMIT protection to interrupt electrical power and shutdown the burner if operating or safety controls fail and cause a runaway condition.*

- Follow the appliance manufacturer's wiring diagrams and note all required safety controls.
- Typical safety controls include high temperature or pressure limits, low water cutoffs, pressure relief valves and blocked flue sensing switches.
- Verify all limit and safety controls are installed and functioning correctly, as specified by the manufacturer, applicable safety standards, codes and all authorities having jurisdiction.
- Ensure that the appliance is free of oil and oil vapor before starting or resetting the burner.

**CAUTION** Incorrect Wiring Will Result in Improper Control Operation

- GeniSys wiring label colors may not match the wire colors of the burner or other manufacturers' controls.
- The GeniSys Control should be wired according to the appliance manufacturer's instructions.

Figure 8A – 7505 Control



Figure 8B – 7575 Control (all connections are located on the bottom of the control.)

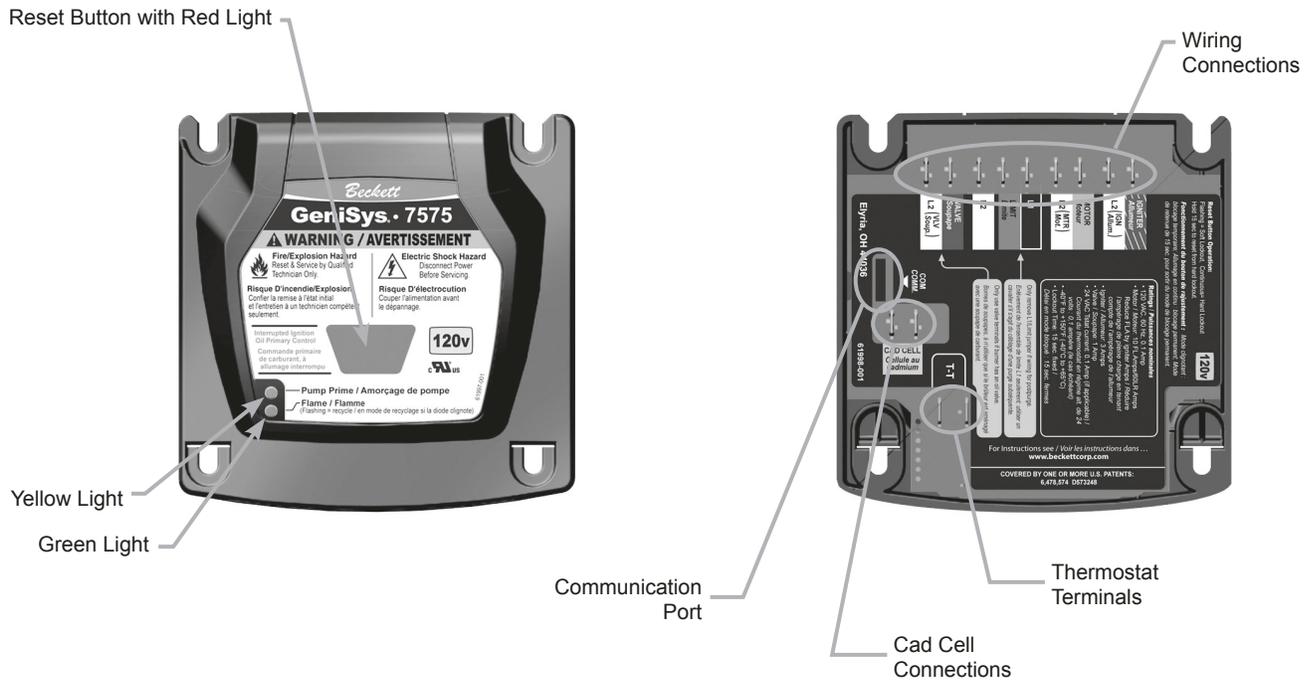


Figure 8C – Optional Components:

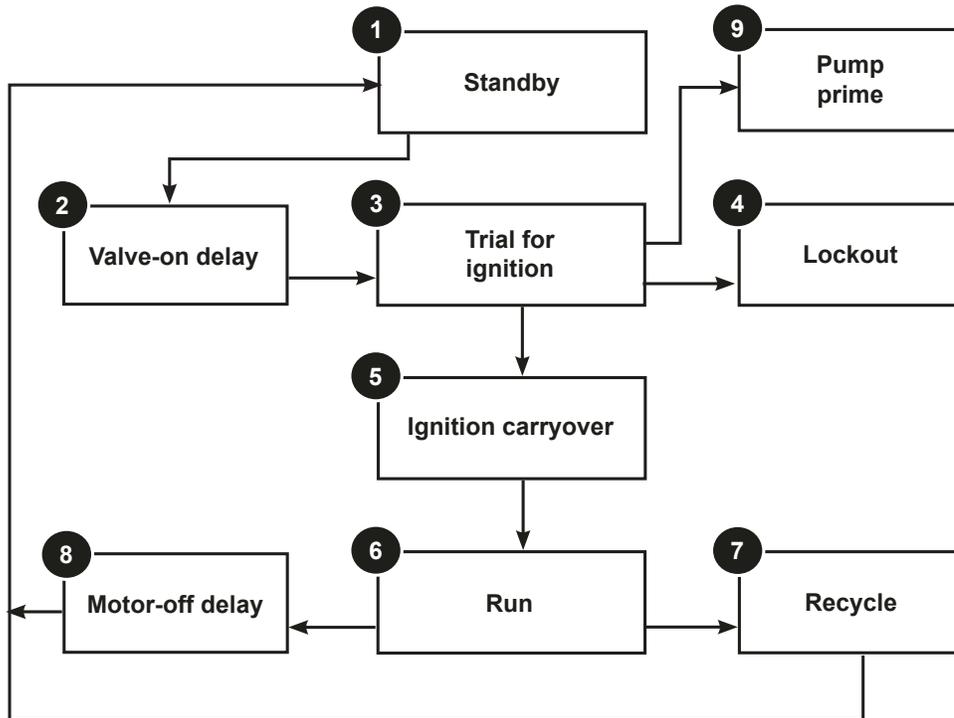


**Contractor's Tool:** Hand-held device for programming and diagnostics



**Alarm Module:** For adding isolated low voltage alarm contacts to the base control. See Alarm Module Instructions for specifications.

**Typical Burner Sequence of Operation for GeniSys 7505 and 7575 Controls.**  
 Refer to the appliance manufacturer's wiring diagram for actual specifications.



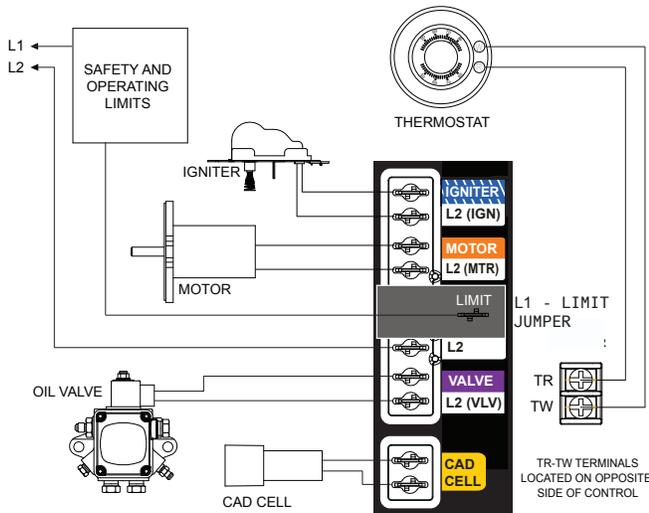
1. **Standby:** The burner is idle, waiting for a call for heat.
2. **Valve-On Delay:** The igniter and motor are on while the control delays turning on the oil solenoid valve for the programmed time.
3. **Trial For Ignition:** The oil solenoid valve is energized. A flame should be established within the factory set trial for ignition time (lockout time).
4. **Lockout:** The control has shut down for one of the following safety reasons:
  - a. The trial for ignition (lockout) time expired without flame being established.
  - b. The cad cell detected flame at the end of the Valve On Delay state.

To reset the control from lockout click the button 1-second.

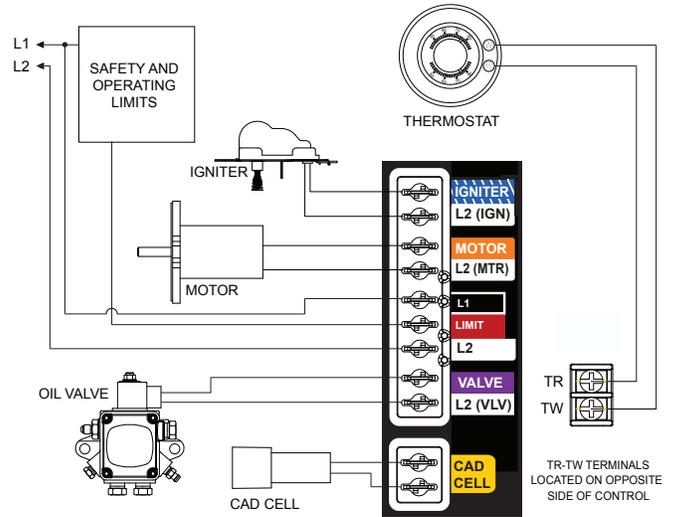
**NOTE:** A recurrence of the above failure modes or a failed welded relay check could cause the control to enter a **Hard Lockout** state that must be reset only by a qualified service technician. To reset from Hard Lockout, hold the reset button for 15 seconds until the yellow light turns on.

5. **Ignition Carryover:** Once flame is established, the igniter remains on for 10 additional seconds to ensure flame stability.
6. **Run:** The flame is sustained until the call for heat is satisfied. The burner is then sent to Motor-Off Delay, if 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 repeats the ignition sequence. The control will continue to Recycle each time the flame is lost, until it reaches a pre-set time allotment. The control will then go into Hard Lockout instead of recycle. This feature prevents excessive accumulation of oil in the appliance firing chamber.
8. **Motor-Off Delay:** If applicable, the oil solenoid valve is turned off and the control delays turning the motor off for the set motor-off delay time before the control returns to standby.
9. **Pump Prime:** The igniter and motor are on with the oil solenoid valve energized for 4 minutes. During Pump Prime mode, the cad cell is disregarded, allowing the technician to prime the pump without having to jumper the cad cell.

**Figure 9a – Interrupted ignition, valve-on delay only (no motor-off delay) – for SF Burners only.**



**Figure 9b – Interrupted ignition, valve-on delay and motor-off delay – for SF and SM Burners.**



### Reset Button Operation

**Table 2** explains what action the control will take when the reset button is pressed for different lengths of time during the various burner operating states.

**Table 2 – Reset Button Operation**

If the burner is in the below state:	Pushing the reset button will:		
	Button Click (press < 1 second)	Button Hold (press > 1 second)	Button Hold (press 15+ seconds)
Lockout	Reset from Soft Lockout		Reset from Restricted (Hard) Lockout
Valve-on Delay, Trial for Ignition, Ignition Carryover	Go to Pump Prime (see “Priming the Pump” above)	Disable the Burner: Any time the burner is running, press and hold the reset button to disable the burner. The burner will remain off as long as the button is held.	Enables Pump Priming: After the reset button has been held for 15 seconds, the button can then be clicked during the next ignition sequence to enter Pump Prime mode.
Run (igniter is shut off)	No action		
Motor-Off Delay, Standby	No action		
Pump Prime	No action	Exit Pump Prime mode and return to Standby	

**Table 3 – Status Lights**

Light Color	On Continuously	Flashing
Red	Restricted (Hard) Lockout	Soft Lockout
Green	Flame Sensed during normal operation (Could be stray light during standby)	Recycle
Yellow	Control is in Pump Prime mode or Reset button currently held for 15+ seconds.	N/A

## Wire Burner

### NOTICE

**Some Thermostats Are Polarity Sensitive. Reversed polarity could cause erratic cycling of the burner control.**

Connect the wire from the RH or R terminal on the thermostat to the TR terminal on the control. Connect the wire from the W terminal on the thermostat to the TW terminal on the control.

- Make connections to the control's terminals as shown in **Figures 9a and 9b**. Refer to the label on the underside of the control for wiring details.
- Note: Motor-off delay on a 7505P/7575P will be disabled if the safety and operating limits as shown in **Figures 9a and 9b** interrupt power to the control terminal L1.
- Connect thermostat leads to the TR and TW terminals on the control or jumper the TR and TW terminals on the control, as directed by the appliance wiring diagram.
  - Thermostat anticipator Current: 0.1 amp
  - Thermostat voltage: 24 volts AC

**Note that** if the thermostat short cycles or operates improperly, it may require an isolation relay for proper operation. The Beckett A/C Ready Kit (part no. 51950U) provides this function. Wiring instructions are included with the A/C Ready Kit.

## Start Up Burner/Set Combustion



### Explosion and Fire Hazard



**Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.**

- Do not attempt to start the burner when excess oil has accumulated in the appliance, 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 becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

1. Open the shutoff valves in the oil supply line to the burner.

2. If the air control is not preset, close air band and partially open air shutter. This is an initial air setting for the pump bleeding procedure only. Additional adjustments must be made with instruments to prevent smoke and carbon monoxide generation.
3. Set the thermostat substantially above room temperature.
4. Close the line voltage switch to start the burner. If the burner does not start immediately you may have to reset the safety switch of the burner primary control.
5. Bleed air from fuel unit as soon as burner motor starts rotating.
  - To bleed the fuel unit, attach a clear plastic hose over the vent fitting. Loosen the fitting and catch the oil in an empty container. Tighten the fitting when all air has been purged from the oil supply system.
  - If the burner locks out on safety during bleeding, reset the safety switch and complete the bleeding procedure. Note — Electronic safety switches can be reset immediately; others may require a three- to five-minute wait.
  - If burner stops after flame is established, additional bleeding is probably required. Repeat the bleeding procedure until the pump is primed and a flame is established when the vent fitting is closed.
  - For 7505/7575 primary controls, see Technician's Quick Reference Guide, part number 61666 for special pump priming sequence.
  - Prepare for combustion tests by drilling a 1/4" sampling hole in the flue pipe between the appliance and the barometric draft regulator.
6. Initial air adjustment — Test the flue gas for smoke. Adjust the air shutter (and air band, if necessary) to obtain a clean flame. Now the additional combustion tests with instruments can be made.

## Cad Cell Resistance Measurement

- The GeniSys Contractor Tool, part 52082U, can be used to read the cad cell resistance on the LCD screen.
- If this is not available, the cad cell leads can be unplugged from the control and the resistance measured with a meter in the conventional way. Conduct these tests with flame present.

Flame Detection Range
Normal = 0 to 1600 ohms
Limited = 1600 ohms to lockout

## Resetting From Restricted or Hard Lockout

- If the control continues to lockout without a satisfied call for heat, or fails the motor relay check, the control enters Hard (restricted) Lockout in order to limit accumulation of unburned oil in the combustion chamber.

- To reset, hold the button down for 15 seconds until the red light turns off and the yellow light turns on.
- Always verify the control functions according to all specifications before leaving the installation site.
- Replace the control if it does not operate as specified.

## Startup / Checkout



### WARNING

### Explosion and Fire Hazard



**Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.**

- Do not attempt to start the burner when excess oil has accumulated in the appliance, 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 becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.

If the burner or control fails any of the following tests, recheck control wiring. If the burner or control still fails any tests, replace the control.

## Check Safety Features

### Safe Start Check

1. Place a jumper across the cad cell terminals.
2. Refer to the steps for "Start up burner/set combustion" and have the system call for heat.
3. Burner must not start. Verify that the green light is on continuously and that the control remains in Standby mode.
4. End the call for heat and remove the cad cell jumper.

### Simulate Flame Failure and Ignition Failure

1. Refer to the steps for "Start up burner/set combustion" and have the system call for heat.

2. After flame is established and the burner igniter turns off, close the hand valve in the oil supply line.
3. At flame loss, the control will enter Recycle mode. Verify that the green light is flashing. The control will remain in Recycle for 60 seconds.
4. After the 60 second recycle period, the control will try to restart the system.
5. After the 15 second lockout time, the control will lock out the burner and the reset button will flash. Verify that the burner motor and igniter are off and that the burner oil solenoid valve (if used) is not energized.
6. Open the hand valve in the oil line.
7. Click the reset button and verify that the red light in the reset button shuts off and that the burner lights.
8. End the call for heat.

Before leaving the installation, verify that all thermostat and boiler/furnace control wiring is correct. Consult heating appliance manual for directions.

## Set combustion with instruments



**CAUTION** OIL-BURNING EQUIPMENT SHALL BE CONNECTED TO FLUES HAVING SUITABLE PRESSURE (DRAFT) AT ALL TIMES TO ASSURE SAFE AND PROPER OPERATION OF THE BURNER.

1. Allow the burner to run for approximately 5 to 10 minutes.
2. Set the stack or over-fire draft to the level specified by the appliance manufacturer.
  - **Natural Draft Applications;** typically over-fire draft is  $-0.01''$  or  $-0.02''$  w.c.
  - **Direct Venting;** typically may not require draft adjustment.
  - **High Efficiency/Positive Pressure Appliances;** also vary from traditional appliances (see manufacturer's recommendations).
3. Follow these four steps to properly adjust the burner:
 

**Step 1:** Adjust the air shutter/band until a trace of smoke is achieved.

**Step 2:** At the trace of smoke level, measure the  $CO_2$  (or  $O_2$ ). This is the vital reference point for further adjustments. Example: 13.5%  $CO_2$  (2.6%  $O_2$ ).

**Step 3:** Increase the air to reduce the  $CO_2$  by 1.5 to 2 percentage points. ( $O_2$  will be increased by approximately 2.0 to 2.7 percentage points.) Example: Reduce  $CO_2$  from 13.5% to 11.5% (2.6% to 5.3%  $O_2$ ).

**Step 4:** Recheck smoke level. It should be Zero.

  - This procedure provides a margin of reserve air to accommodate variable conditions.

- If the draft level has changed, recheck the smoke and CO<sub>2</sub> levels and readjust the burner, if necessary
- 4. Once combustion is set, tighten all fasteners on air band, air shutter and escutcheon plate.
- 5. Start and stop the burner several times to ensure satisfactory operation. Test the primary control and all other appliance safety controls to verify that they function according to the manufacturer's specifications.

## Perform Regular Maintenance



### WARNING

#### Annual Professional Service Required



*Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.*

- DO NOT TAMPER WITH THE UNIT OR CONTROLS - CALL YOUR QUALIFIED SERVICE TECHNICIAN OR SERVICE PERSONNEL.
- To ensure continued reliable operation, a qualified service technician must service this burner annually.
- More frequent service intervals may be required in dusty or adverse environments.
- Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

- Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- Remove and clean the pump strainer if applicable.
- Replace the nozzle with the exact brand, pattern, gph flow rate and spray angle..
- Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- Check electrode tip settings. Replace electrodes if tips are rounded.
- Inspect the igniter spring contacts.
- Clean the cad cell lens surface, if necessary.
- Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- Inspect the combustion head and air tube. Remove any carbon or foreign matter. Replace all damaged units with exact parts.
- Clean the blower wheel, air inlet, air guide, burner housing and static plate of any lint or foreign material.

- If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.
- Check motor current. The amp draw should not exceed the nameplate rating.
- Check all wiring for secure connections or insulation breaks.
- Check the pump pressure and cutoff function.
- Check primary control safety lockout timing.
- Check ignition system for proper operation.
- Inspect the vent system and chimney for soot accumulation or other restriction.
- Clean all flue passages and flue pipe. Replace corroded or damaged pipes.
- Clean the appliance thoroughly according to the manufacturer's recommendations.
- Check the burner performance. Refer to the section "Set combustion with test instruments".
- It is good practice to make a record of the service performed and the combustion test results.

## Shutting the Burner Off



### CAUTION

**ALWAYS KEEP THE FUEL OIL SUPPLY VALVE SHUT OFF IF THE BURNER(S) IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.**

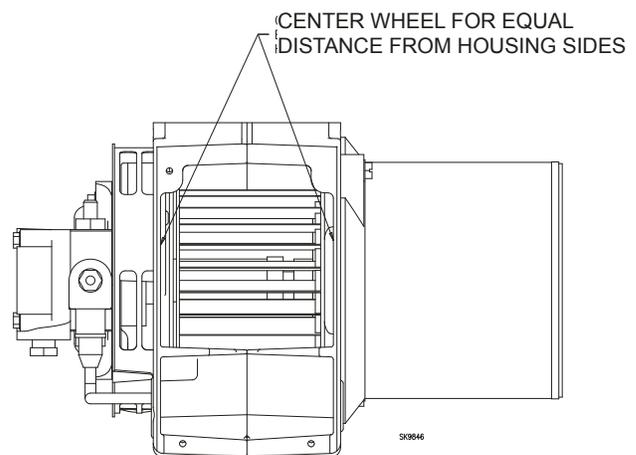
Turn off all electric power to the burner.

**Note:** There could be more than one disconnect switch.

## Replacing the blower wheel:

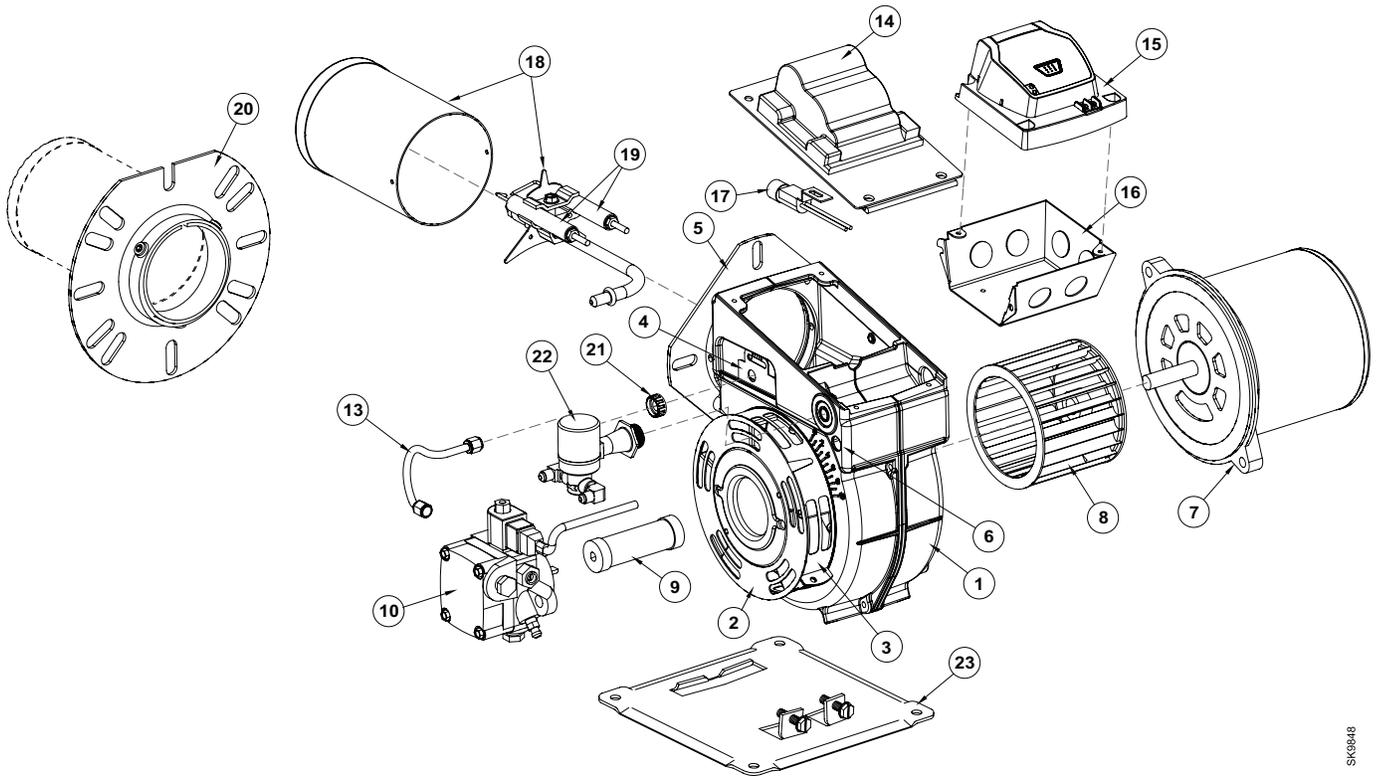
When replacing the blower wheel, insure that the wheel is centered between the two sides of the burner housing as shown below.

**Figure 10 – Blower Wheel Assembly**



# Replacement Parts

For best performance specify genuine *Beckett* replacement parts



SK0648

#	Part No.	Description
1		Burner Housing Assembly with Inlet Bell
2	3215	Air shutter, 10 Slot
3	3819	Bulk Air Band, 10 Slot
4	3493	Nozzle-line Escutcheon Plate
5	Specify ** 3399	Unit Flange or Square Plate
	3416	Air Tube Gasket (not shown)
6	2139	Hole Plug - Wiring Box
7	2900U 2364U	Drive Motor, 1/5 HP (SM Models) Drive Motor, 1/4 HP (SF Models)
8	2383U	Blower Wheel (6-1/4 X 3-7/16)
9	2433	Flexible Coupling (Fits 5/16" pump shaft)
10	2591U 21188U	Fuel Units SF only Single-Stage 'A' Two-Stage 'B'
	2184404U 2460	Fuel Units SM only CleanCut Single-Stage 'A'
--	2256	Pump outlet fitting (not shown)
--	482	Pump holding screws (not shown)

#	Part No.	Description
13	5394	Connector tube assembly, pump to nozzle line
14	51824U	Igniter and Base Plate
14	2289U	Ignition Transformer (10,000 V/23mA)
15	7505A/7575A	Replaces R7184A - Interrupted Ignition
	7505B/7575B	Replaces R7184B - Pre-time
	7505P/7575P	Replaces R7184P - Pre and Post-time (7575P used for all SM burners)
16	5770	Electrical Box
17	7006U	Cad Cell Detector
18	Specify **	Air Tube Combination
19	5780	Electrode Kit - F Head up to 9"
	5782	Electrode Kit - F Head over 9"
20	5432 3616	Universal Flange w/ Gasket Gasket Only
21	3666	Splined Nut
22	2182602U	Blocking Oil Solenoid Valve
23	5685	Base Pedestal Kit
** Contact your Beckett Representative for part number and pricing.		



**Beckett**  
COMMERCIAL

**CF1400**  
**CF2300**

**OIL BURNER MANUAL**

**Operation: Low/High**

**Rate: CF1400: 4.0 to 13.6 GPH**

**CF2300: 7.0 to 19.9 GPH**



**WARNING**

**Potential for Fire, Smoke and Asphyxiation Hazards**



***Incorrect installation, adjustment, or misuse of this burner could result in death, severe personal injury, or substantial property damage.***

**To the Homeowner or Equipment Owner:**

- Please read and carefully follow all instructions provided in this manual regarding your responsibilities in caring for your heating equipment.
- Contact a professional, qualified service agency for installation, start-up or service work.
- Save this manual for future reference.

**To the Professional, Qualified Installer or Service Agency:**

- Please read and carefully follow all instructions provided in this manual before installing, starting, or servicing this burner or heating system.
- The Installation must be made in accordance with all state and local codes having jurisdiction.

## 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** - Beckett's website.

### To the Owner:

Thank you for purchasing a Beckett burner for use with your heating appliance. Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your oil burner.

Your Beckett burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, **immediately contact your qualified service agency** for consultation.

We recommend annual inspection/service of your oil heating system by a qualified service agency.

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# Hazard definitions



**DANGER** Indicates an imminently hazardous situation, which, if not avoided, will result in death, serious injury, or property damage.



**WARNING** Indicates a potentially hazardous situation, which, if not avoided, could result in death, severe personal injury, and/or substantial property damage.



**CAUTION** Indicates a potentially hazardous situation, which, if not avoided, may result in personal injury or property damage.

## NOTICE

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

*Note: Within the boundaries of the hazard warning, there will be information presented describing consequences if the warning is not heeded and instructions on how to avoid the hazard.*

## Agency approvals



- UL listed to comply with ANSI/UL296 and certified to CSA B140.0.
- Accepted by N.Y.C. M.E.A.
- Other approvals may be available and must be specified at time of order.

## Specifications

Fuels	#1 or #2 Fuel Oil
Firing Range	BCF1400 - 4.0 to 13.6 gph BCF2300 - 7.0 to 19.9 gph
Motor	<b>CF1400:</b> 1/2 HP 3450 rpm 120/60 Hz Standard 6.5 amps @ 120 VAC  <b>CF2300:</b> 3/4 HP 3450 rpm 120/60 Hz Standard 12.5 amps @ 120 VAC  <b>Optional Voltages (CF1400 &amp; CF2300):</b> 240 VAC/1-PH, 208, 240, 480 VAC/3-PH, 50 Hz
Ignition Trans.	Continuous Duty, 120V/12,000V
Housing	Cast aluminum
Fuel Unit	100 to 300 psig
Oil Nozzle	45° to 70° Solid
Dimensions	Refer to Figure 7.

## Owner's Responsibility:



### WARNING

#### Follow These Instructions Exactly



**Failure to follow these instructions, misuse, or incorrect adjustment of the burner could lead to equipment malfunction and result in asphyxiation, explosion or fire.**

Contact a professional, qualified service agency for the installation, adjustment and service of your oil burning system. Thereafter, have your equipment adjusted and inspected at least annually to ensure reliable operation. This work requires technical training, trade experience, licensing or certification in some states and the proper use of special combustion test instruments.

Please carefully read and comply with the following instructions:

- Never store or use gasoline or other flammable liquids or vapors near this burner or appliance.
- Never attempt to burn garbage or refuse in this appliance.
- Never attempt to light the burner by throwing burning material into the appliance.
- Never attempt to burn any fuel not specified and approved for use in this burner.
- Never restrict the air inlet openings to the burner or the combustion air ventilation openings in the room.

## Professional Installer/Service Agency Responsibility:



### WARNING

#### Follow These Instructions Exactly



**Failure to follow these instructions could lead to equipment malfunction and result in asphyxiation, explosion or fire.**

- Please read all instructions before proceeding. Follow all instructions completely.
- This equipment must be installed, adjusted and started by a qualified service agency that is licensed and experienced with all applicable codes and ordinances and responsible for the installation and commission of the equipment.
- The installation must comply with all local codes and ordinances having jurisdiction and the latest editions of the NFPA 31 and CSA-B139 & B140 in Canada.

### NOTICE

50 Hz Motors - The burner ratings, air settings and nozzle ratings are based on standard 60 Hz motors (at 3450 rpm). Derate all ratings 20% when using 50 hz motors. Consult factory for specific application data.

### NOTICE

High altitude installation - Accepted industry practice requires no derate of burner capacity up to 2000 feet above sea level. For altitudes higher than 2000 feet, derate burner capacity 2% for each 1000 feet above sea level.

## Pre-installation checklist

### Combustion air supply



### WARNING

#### Adequate Combustion and Ventilation Air Supply Required

**Failure to provide adequate air supply could seriously affect the burner performance and result in damage to the equipment, asphyxiation, explosion or fire hazards.**

- The burner cannot properly burn the fuel if it is not supplied with a reliable combustion air source.
- Follow the guidelines in the latest editions of the NFPA 31 and CSA-B139 regarding providing adequate air for combustion and ventilation.

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 B1139-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



### Oil Supply Pressure Control Required

**Damage to the filter or pump seals could cause oil leakage and a fire hazard.**

- The oil supply inlet pressure to the burner *cannot exceed 3 psig*.
- Do not install valves in return line.
- Insure that a pressure limiting device is installed in accordance with the latest edition of NFPA 31.
- **Gravity Feed Systems:** Always install an anti-siphon valve in the oil supply line or a solenoid valve (RWB Part # 21789) in the pump/nozzle discharge tubing to provide backup oil flow cut-off protection.

- 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.

#### 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.
- The fuel unit is shipped with the by-pass plug installed. Leave the by-pass plug installed for all low/high firing burners, regardless whether one-pipe (with by-pass loop) or two-pipe. See **Figure 9** for installation of the by-pass loop required for one-pipe fuel supply installations. See **Figure 10** for connections to the fuel unit for two-pipe fuel supply installations.

#### When fuel supply is below the burner fuel unit —

- Use a two-pipe oil system when the fuel unit must lift the oil more than 8 feet. The return line provided by the two-pipe system is needed to minimize the effects of air-related problems during operation.

## ❑ Nozzle pressure



### Correct Nozzle and Flow Rate Required



**Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, sooting, puff-back of hot gases, smoke and potential fire or asphyxiation hazards.**

Use only nozzles having the brand, flow rate (gph), spray angle and pattern specified by the appliance manufacturer.

Follow the appliance manufacturer's specifications for the required pump outlet pressure for the nozzle, since this affects the flow rate.

- Nozzle manufacturers calibrate nozzle flow rates at 100 psig.
- This burner utilizes pressures higher than 100 psig, so the actual nozzle flow rate will be greater than the gph stamped on the nozzle body. (Example: A 8.00 gph nozzle at 150 psig = 9.80 gph and at 300 psig = 13.86 gph)

For typical nozzle flow rates at various pressures see accompanying chart.

- The fuel unit nozzle port pressure is factory set at 300 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.

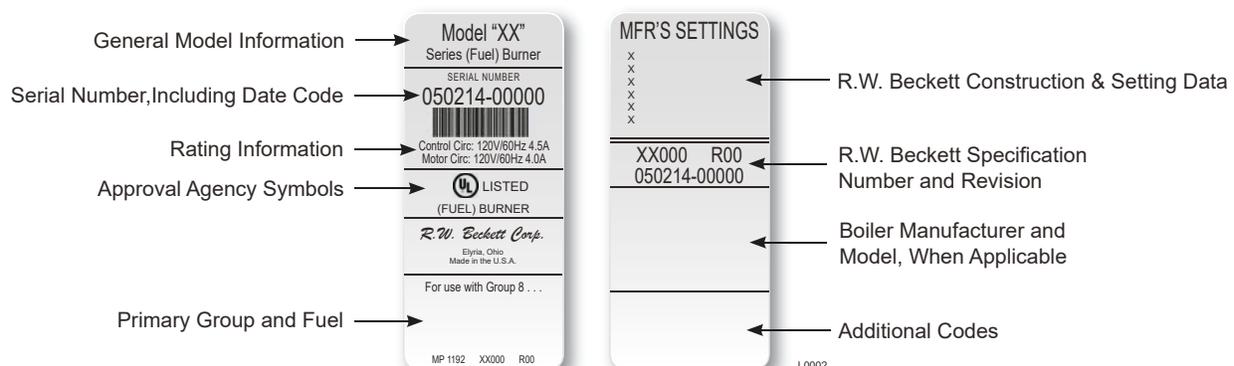
## ❑ Electrical supply

Verify that the power connections available are correct for the burner. Refer to **Figure 1**. All power must be supplied through fused disconnect switches.

## ❑ Vent system

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

**Figure 1 – Typical Nameplate**



## □ Verify burner components —

- Burner nameplate (*figure 1*), Model CF1400 or CF2300A
- Air tube assembly
- Mounting flange kit
- Pedestal mounting assembly kit (recommended)
- Oil nozzle, per *Table 1* — Use only 45° to 70° solid pattern nozzles unless otherwise shown by appliance manufacturer or on the burner nameplate rating label.

Find the required firing rate in the 300 psig column (high fire rate).

Select the corresponding nozzle from column 1 (*Rated gph @ 100 psig*).

(Example: a 500 gph nozzle @ 300 psi = 8.66 gph)

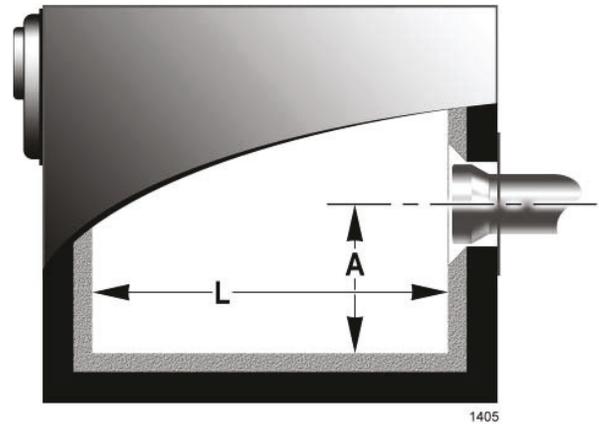
**Table 1 - Nozzle capacities**

Rated gph @ 100 psig	Pressure - Pounds per square inch							
	125	140	150	175	200	250	275	300
3.00	3.35	-	3.67	3.97	4.24	4.74	4.97	5.20
3.50	3.91	-	4.29	4.63	4.95	5.53	5.80	6.06
4.00	4.47	-	4.90	5.29	5.66	6.32	6.63	6.93
4.50	5.04	5.32	5.51	5.95	6.36	7.11	7.46	7.79
5.00	5.59	5.92	6.12	6.61	7.07	7.91	8.29	8.66
5.50	6.15	6.51	6.74	7.27	7.78	8.70	9.12	9.53
6.00	6.71	7.10	7.35	7.94	8.49	9.49	9.95	10.39
6.50	7.26	7.69	7.96	8.60	9.19	10.28	10.78	11.26
7.00	7.82	8.28	8.57	9.25	9.90	11.07	11.61	12.12
7.50	8.38	8.87	9.19	9.91	10.61	11.86	12.44	12.99
8.00	8.94	9.47	9.80	10.58	11.31	12.65	13.27	13.86
8.50	9.50	10.06	10.41	11.27	12.02	13.44	14.10	14.72
9.00	10.06	10.65	11.02	11.91	12.73	14.23	14.93	15.59
9.50	10.60	11.24	11.64	12.60	13.44	15.02	15.75	16.45
10.00	11.18	11.83	12.25	13.23	14.14	15.81	16.58	17.32
10.50	11.74	12.42	12.86	13.89	14.85	16.60	17.41	18.19
11.00	12.30	13.02	13.47	14.55	15.56	17.39	18.24	19.05
12.00	13.42	14.20	14.70	15.88	16.97	18.97	19.90	20.79

## □ 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 2*. If the appliance dimensions are smaller than recommended, reduce the firing rate accordingly.

**Figure 2 – Chamber Dimensions**



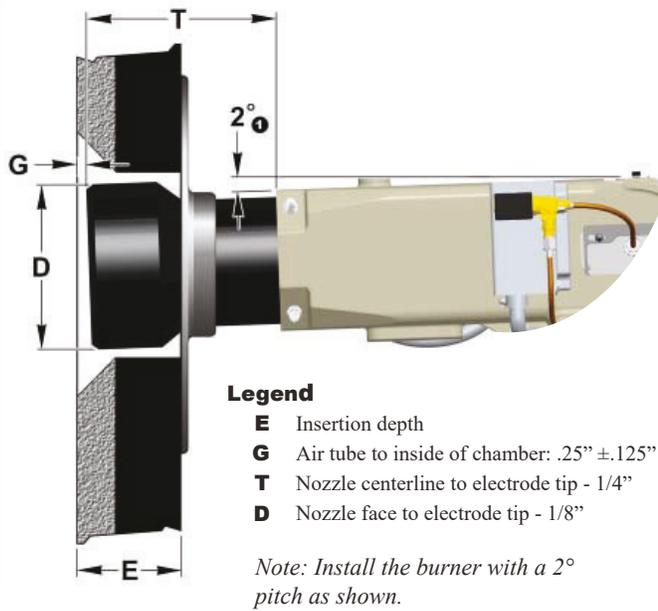
Model	Firing Rate (gph)	Minimum Dimensions			
		Refractory Lined		Wet-based Boilers	
		A	L	A	L
CF1400	0 to 5	7.0"	25.0"	7.0"	25.0"
	5 to 10	8.0"	35.0"	8.0"	40.0"
CF2300	5 to 10	8.0"	35.0"	8.0"	40.0"
	10 to 15	9.0"	40.0"	9.0"	50.0"
	15 to 20	11.0"	55.0"	11.0"	60.0"

## □ Verify air tube

The information in this section may be disregarded if the air tube is supplied by the appliance manufacturer.

- On the **CF1400**, there are two tube arrangements available –  
 Tube A — 4.0 to 11.0 GPH per Table 2  
 Tube B — 7.0 to 13.6 GPH per Table 2
- The **CF1400** maximum firing capacity depends on the firebox pressure. Use *Table 2* to verify the correct air tube type for the firing rate required. Use Tube B only when Tube A cannot provide the firing rate required.
- On the **CF2300**, there are two tube arrangements available –  
 Tube A — 7.0 to 19.9 GPH per Table 2  
 Tube B — 10.0 to 19.9 GPH per Table 2
- The **CF2300** maximum firing capacity depends on the firebox pressure. Use *Table 2* to verify the correct air tube type for the firing rate required. Use Tube B only when Tube A cannot provide the firing rate required.
- See *Figure 3* to verify the correct air tube length and air tube combination code.

**Figure 3 – Air tube mounting dimensions**



Air Tube Combination Codes					
Model	Tube	Dimension T	Dimension D	Code	Dimension E
CF1400	A	6.75"	5.5"	CF 66 KD	-
		10.25"	5.5"	CF 102 KD	-
		13.75"	5.5"	CF 136 KD	-
		17.75"	5.5"	CF 176 KD	-
	B	6.75"	5.75"	CF 66 KE	-
		10.25"	5.75"	CF 102 KE	-
		13.75"	5.75"	CF 136 KE	-
		17.75"	5.75"	CF 176 KE	-
CF2300	A	6.75"	6.5"	CF 66 KG	2.94"
		10.25"	6.5"	CF 102 KG	2.94"
		13.75"	6.5"	CF 136 KG	2.94"
		17.75"	6.5"	CF 176 KG	2.94"
	B	6.75"	8.125"	CF 66 KS	3.69"
		8.375"	8.125"	CF 86 KS	3.69"
		11.0"	8.125"	CF 110 KS	3.69"
		14.5"	8.125"	CF 144 KS	3.69"
		18.5"	8.125"	CF 184 KS	3.69"

**Table 2 - Air tube capacity Versus firebox pressure**

Air Tube Capacity vs Firebox Pressure				
Model	Tube	Firebox Pressure (In W.C.)	No Reserve Air	10% Turndown* (GPH)
CF1400	A	0.0	11.0	10.0
		0.2	10.5	9.45
		0.4	10.1	9.10
		0.6	9.6	8.64
		0.8	9.2	8.30
		1.0	8.7	7.83
	B	0.0	13.6	12.20
		0.2	13.1	11.70
		0.4	12.5	11.20
		0.6	12.0	10.80
CF2300	A	0.0	19.9	19.90
		0.2	19.2	19.10
		0.4	18.5	18.30
		0.6	17.9	17.60
		0.8	17.2	16.80
		1.0	16.5	16.00
	B	0.0	19.9	19.90
		0.2	19.7	19.60
		0.4	19.5	19.30
		0.6	19.4	19.10
		0.8	19.2	18.80
		1.0	19.0	18.50

**Note:** 10% turndown indicates sufficient reserve air to reduce the CO<sub>2</sub> in the flue to 90% of its value. The above ratings may vary 5% due to variations in actual job conditions.

\*CF2300 can fire higher but is limited by UL requirements

## ☐ Stray light

### **CAUTION** Protect Against Stray Light Lockout

*Failure to follow these instructions could cause loss of burner operation resulting in no heat, an unplanned process interruption, work stoppage and the potential for frozen plumbing or other cold weather property damage.*

- The control must detect a dark, no-flame condition in order to start the burner or it will hold in the stray light lockout mode.
- Shield the burner view window from direct exposure to intense light.

## ☐ Dust and Moisture

### **WARNING** Protect Against Dust and Moisture

*Wet, dusty environments could lead to blocked air passages, corrosion damage to components, impaired combustion performance and result in asphyxiation, explosion or fire.*

- This burner is designed for clean, dry installations.
- Electrical controls are not protected against rain or sprayed water.
- Keep the installation clear of dust, dirt, corrosive vapors, and moisture.
- Protective covers and more frequent maintenance may be required.

## Mount the burner

### ☐ Mount flange(s) on air tube

#### **CAUTION** Protect the Air Tube From Overheating

*Overheating could cause damage to the air tube and other combustion components leading to equipment malfunction and impaired combustion performance.*

- The end of the air tube must not extend into the combustion chamber unprotected unless it has been factory-tested and specified by the appliance manufacturer.
- Position the end of the air tube 1/4" back from flush with the refractory inside entry wall to prevent damage from overheating.

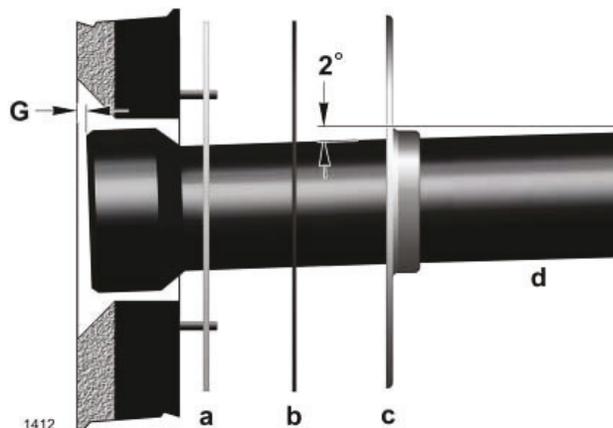
This section does not apply to burners with welded flanges.

- Do not install air tube on burner.
- For non-pressure firing flange, refer to **Figure 4**: Install gasket (item **a**) and flange (item **c**). Ignore the next paragraph.
- For pressure-firing flange, refer to **Figure 4**: Slide gasket (item **a**) onto the air tube, making sure the top of the air tube is up. Predrill 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 (not shown) around the air tube and press tightly into the inside diameter of the flange (item **c**).

- Slide the air tube (item **d**) 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 4 – Mount flange(s) on air tube**



## ❑ Mount air tube to burner

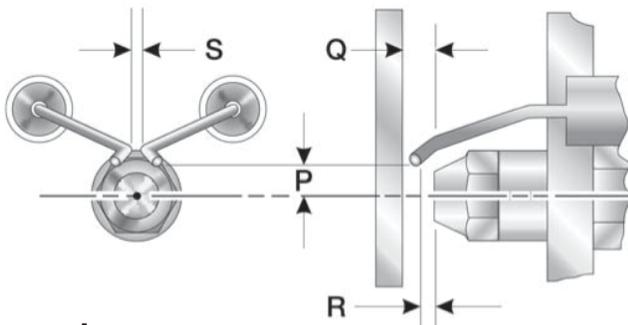
- Remove the rear access door from the back of the burner for improved access to the interior.
- Attach the air tube to the burner with the bolts and acorn nuts provided. The acorn nuts must go on the outside of the burner, with the bolts inserted from the inside.

## ❑ Install nozzle

See **Figure 5**. 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 overtighten.

Check, and adjust if necessary, the critical dimensions **P**, **Q**, **R** and **S** shown in the drawing. Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

**Figure 5 – Nozzle and nozzle line assembly**



### Legend

- S** Electrode spacing -  $3/32$ "
- Q** Nozzle to head -  $1/4$ "
- P** Nozzle centerline to electrode tip -  $1/4$ "
- R** Nozzle face to electrode tip -  $1/8$ "

## ❑ Check electrode settings

### **WARNING** Maintain Electrode Specifications

**Failure to properly maintain these specifications could cause ignition malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire hazards.**

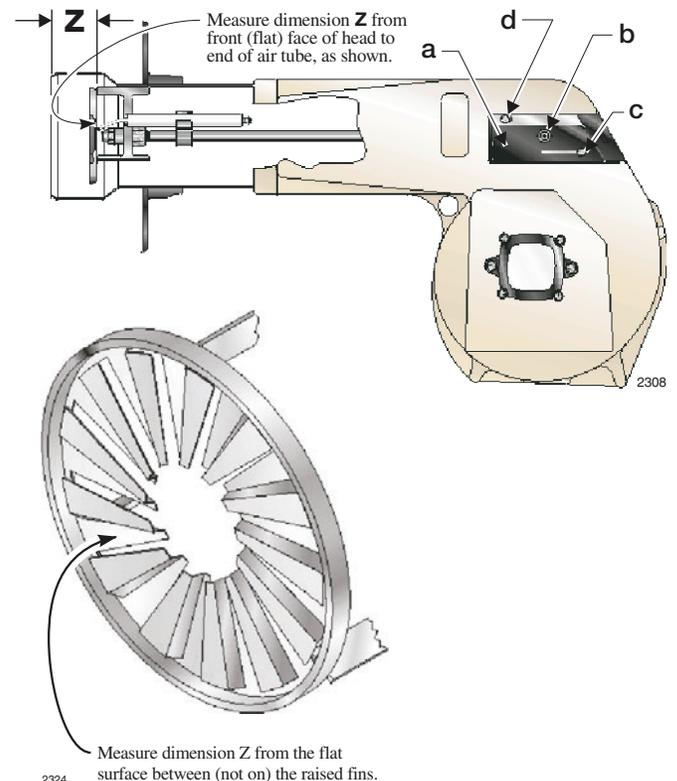
- Adjust the electrode gap and position in relation to the nozzle to the specifications shown in **Figure 5**.

Check, and adjust if necessary, the critical dimensions shown in **Figure 5**. Verify that the oil tube assembly and electrodes are in good condition, with no cracks or damage.

## ❑ Install nozzle line assembly

- Insert the nozzle line assembly into the burner air tube as in **Figure 6**.
- See **Figures 6 and 7**. Assemble the adjusting plate assembly per the instructions in the assembly packet.
- Slide the secondary adjusting plate (item **f**) completely to the left on the indicator adjusting plate (item **e**). Finger-tighten acorn nut (item **c**) to secure the two plates together. Slide both plates completely to the left on the primary adjusting plate (item **g**) and finger-tighten acorn nut (item **d**).
- Slide the completed adjusting plate assembly over the nozzle line end. Move the plate assembly and the nozzle line so the plate assembly fits into position as shown in **Figure 6**.
- Install the spline nut (**Figure 6**, item **b**) on the end of the nozzle line, leaving the nut loosely placed so the plates can be moved.
- Connect the high-voltage leads from the ignition transformer to the electrodes.

**Figure 6 – Nozzle line assembly in burner**



$$Z = 1-3/4" \pm 1/16"$$

### Legend (Figure 6)

- a** Adjusting plate assembly
- b** Spline nut for securing nozzle line
- c** Bottom acorn nut
- d** Top acorn nut (for setting dim. Z only)

## □ Set dimension Z

- Replace the rear access door on the burner, making sure that the adjusting plate assembly is now securely in the groove.
- Loosen acorn nut (item **d**) in **Figure 5**. Slide the nozzle line and plate assembly until dimension Z in **Figure 5** is  $1\text{-}3/4 \pm 1/16''$  (CF1400 and CF2300). When dimension Z (from end of air tube to flat area of front face of head) is correctly set, tighten acorn nut (item **d**). Verify that the adjusting plate assembly is properly seated in the groove.
- 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 (item **d**) if necessary to reposition the nozzle line. Once dimension Z is set, **do not loosen acorn nut (item d)** again.

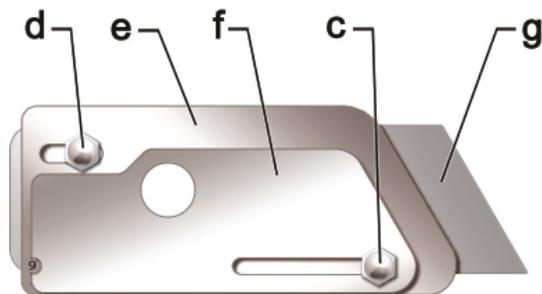
## □ Insert burner

- Position the burner in the front of the appliance and loosely tighten the nuts on the mounting studs. The burner should be pitched downward  $2^\circ$  as shown in **Figures 4 and 8**.
- See **Figure 8**. Install the pedestal support kit (recommended) by attaching the  $3/4''$  npt flange (item **a**) to the bottom of the burner using the (4) #10 screws provided. Cut and thread (one end only) a  $3/4''$  pipe nipple (item **b**) with length **11 inches less than dimension D** in **Figure 8**. Thread the pipe into the flange. Then slip the pipe end into the floor flange (item **c**).
- Secure the burner to the appliance by tightening the nuts on the burner flange mounting studs. Then secure the pedestal support floor flange set screw to the pipe.

**Figure 7 – Adjusting plate assy.**

### Legend

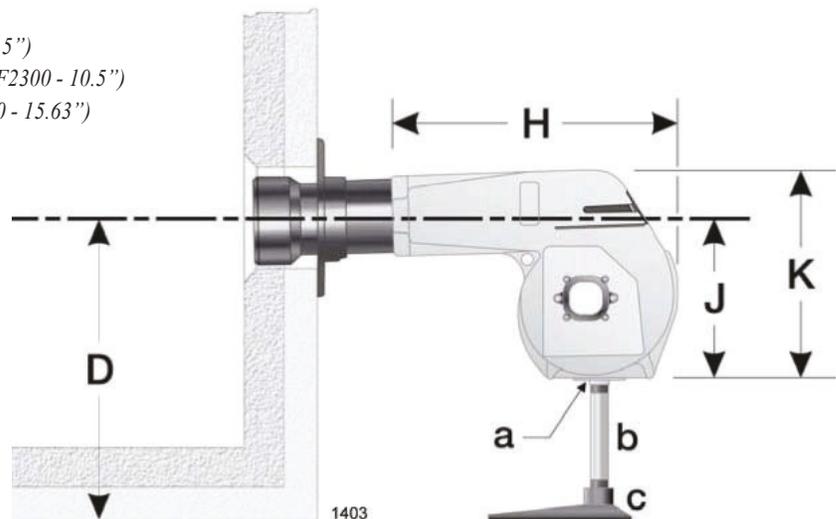
- a** Adjusting plate assembly
- b** Spline nut for securing nozzle line
- c** Bottom acorn nut
- d** Top acorn nut (for setting dim. Z only)
- e** Indicator adjusting plate
- f** Secondary adjusting plate
- g** Primary adjusting plate



**Figure 8 – Burner installed in appliance front**

### Legend

- H** Housing total length (CF1400 - 18", CF2300 - 18.5")
- J** Center to bottom of housing (CF1400 - 10.88", CF2300 - 10.5")
- K** Overall housing height (CF1400 - 13.63", CF2300 - 15.63")



## □ Fuel unit by-pass plug



### WARNING

#### Install Oil Supply To Specifications



**Failure to properly install the oil supply system could cause oil leakage, equipment malfunction, puff-back of hot gases, heavy smoke, asphyxiation, explosion and fire**

- Carefully install the oil supply lines, fittings and components using the guidelines provided in this section.
- The oil supply must comply with the latest edition of NFPA 31 (Canada CSA B139) and all applicable codes.
- Do NOT install valves in the return line.
- If the oil supply inlet pressure to the pump exceeds 3 psig or for gravity feed systems, install an oil safety or pressure reducing valve (Webster OSV, Suntec PRV or equivalent).

The burner is shipped with a by-pass plug installed in the fuel unit. For low/high operation, the by-pass plug must be left in the fuel unit, regardless of the fuel system used (one-pipe with by-pass loop or two-pipe). Do not remove the by-pass plug.

## □ One-pipe oil system by-pass loop



### WARNING

#### Factory-Installed Pump Bypass Plug

**Failure to follow these guidelines will cause the fuel pump seals to rupture and result in oil leakage, burner malfunction and potential fire and injury hazards.**

- Models CF1400 and CF2300 are shipped with the pump bypass plug installed.
- Do not remove the bypass plug from the pump. It is required for step-firing (Lo/Hi) operation.
- Do not operate the burner unless a return line or bypass loop is installed or the pump seal will rupture.
- Carefully comply with the following instructions provided in this section of the manual.

Refer to **Figure 9** (item **m**). Note the addition of a field-installed by-pass loop (use 3/8" copper tubing) from the fuel unit Return port to the Inlet port. This line is required for low/high operation. It simulates the flow of a two-pipe system at the fuel unit.

## □ 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 gasket 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 reduces vibration and noise transmission problems.
- Install an oil filter sized to handle the fuel unit gasket flow capacity (**Table 3**) for two-pipe systems. However, 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 shutoff 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

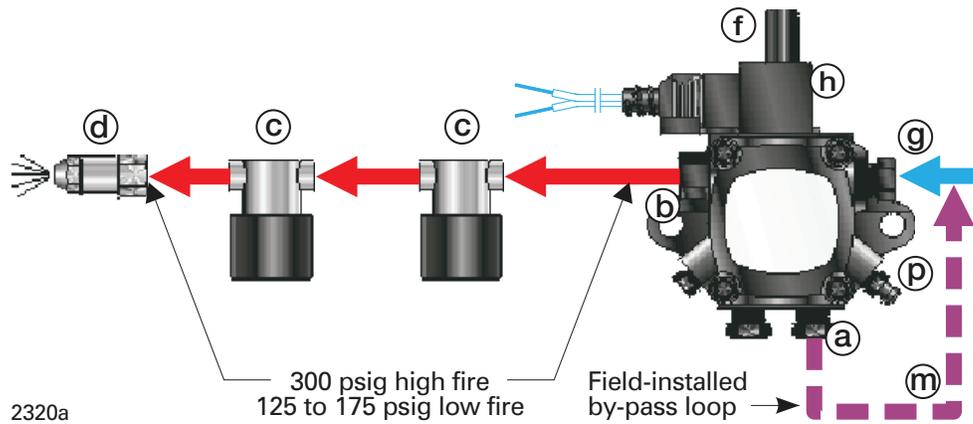
**One-pipe systems** – See **Figure 9** for the fuel flow paths for high-fire and low-fire operation. The low-fire by-pass regulation is done internally for type **B** fuel units. Oil supply connects to one of the fuel unit Inlet ports.

**Two-pipe systems** – See **Figure 10** for the fuel flow paths for high-fire and low-fire operation. The low-fire by-pass regulation is done internally for type **B** fuel units. Oil supply connects to one of the fuel unit Inlet ports. Oil return connects to the fuel unit Return port.

**Low-fire/high-fire operation** – The fuel unit nozzle port pressure is factory set at 300 psig.

- At high fire, full pressure (300 psig) is applied at the oil nozzle, causing full input.
- At low fire, the by-passing is done inside the fuel unit when the by-pass valve operates.
- This by-passing of oil reduces the oil pressure at the nozzle (to between 125 psig and 175 psig), reducing the input.

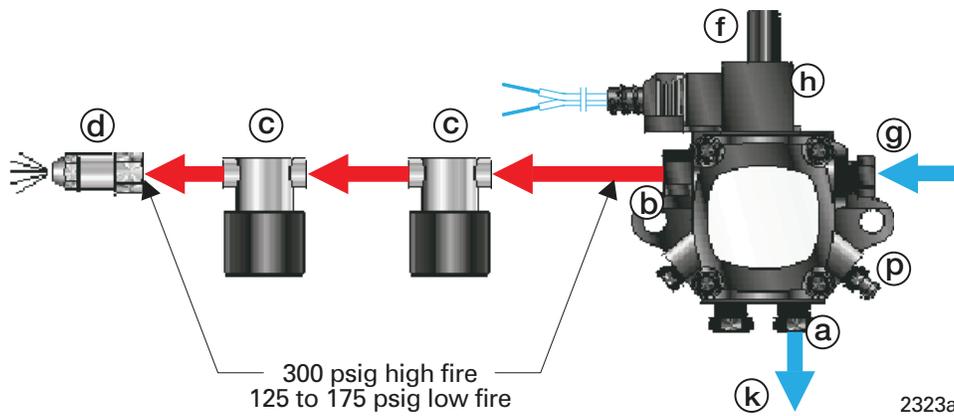
**Figure 9 – One-pipe oil flow with “B” pump**



**Legend (figure 9 & 10)**

- a** Return port
- b** Nozzle port
- c** Oil valves
- d** Nozzle & adapter
- f** By-pass pressure regulator
- g** Inlet port
- h** By-pass valve (“B” pump)
- k** Return line to oil tank
- m** One-pipe by-pass loop, 3/8”
- p** Air bleed valve

**Figure 10 – Two-pipe oil flow with “B” pump**



**Table 3 – Fuel unit gearset capacities**

Model	Fuel Unit Model Number	Gearset Capacity (gph)
CF1400	B2TA-8245	21
CF2300	B2TA-8852	39

- **Nozzle pressure** – The fuel unit nozzle port pressure is factory set at 300 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.

# Wire the burner — R7184B

## **WARNING** Electrical Shock Hazard

**Electrical shock can cause severe personal injury or death.**

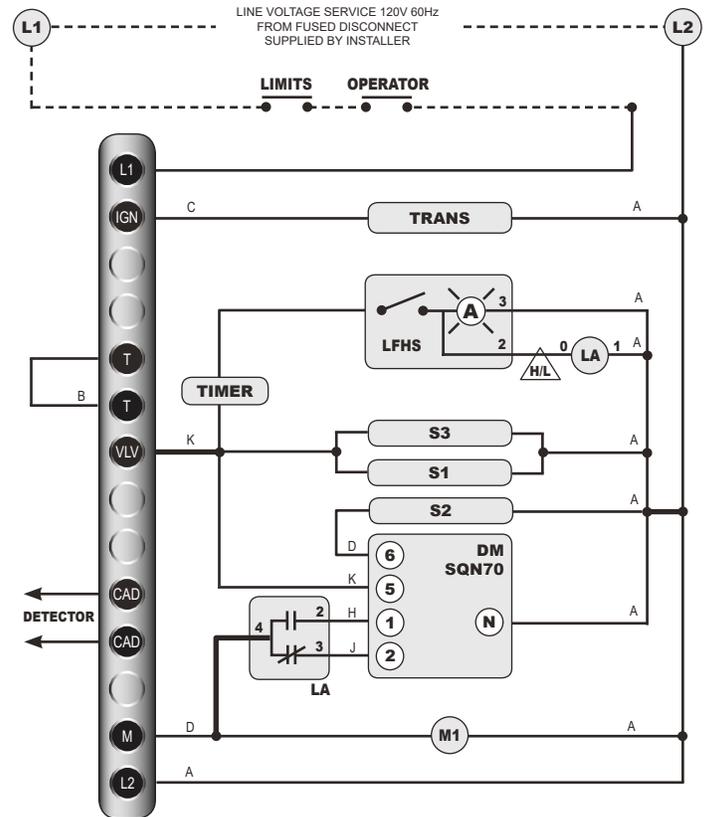
- Disconnect electrical power before installing or servicing the burner.
- Provide ground wiring to the burner, metal control enclosures and accessories. (This may also be required to aid proper control system operation)
- Perform all wiring in compliance with the National Electric Code ANSI/NFPA 70 (Canada CSA C22.1).

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 11** for a typical wiring diagram, with R7184 oil primary, for reference purposes only.

**Figure 11. - Typical wiring (R7184B)**



### Legend

- CC** Flame sensor, cad cell typical
- DM** Damper motor
- FD** Fused Disconnect, by others
- F-F** Cad cell flame sensor terminals
- H/L** Low/high control wiring tag
- LFHS** Low fire hold switch
- LM** Limit controls, by others
- M1** Burner motor
- OP** Operating controls, by others
- PR** Oil primary control, R7184 typ.
- S2** High/low valve
- S1, S3** On/off valve
- TR** Ignition transformer
- T-T** 24-volt thermostat/limit terminals

# Sequence of operation — typical

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

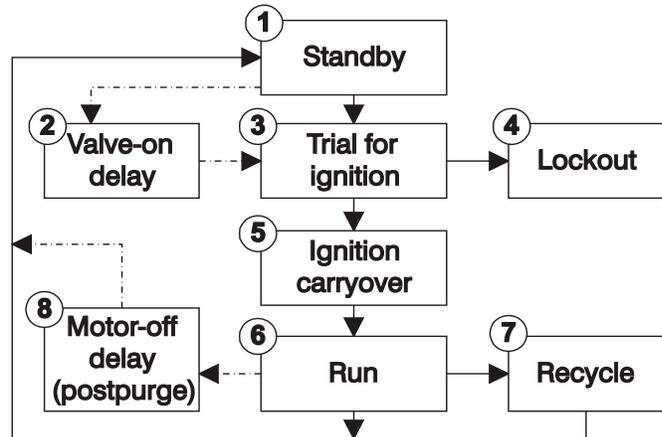
Wire the burner in compliance with all instructions provided by the appliance manufacturer. Verify operation of all controls in accordance with the appliance manufacturer's guidelines.

## 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 3- to 10-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 (postpurge)** — 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.

## Resetting to OHM

- 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.



# Prepare the burner for start-up



## WARNING

### Professional Installation and Service Required

***Incorrect installation and mishandling of start-up could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

- This burner must be installed and prepared for start-up by a qualified service technician who is trained and experienced in commercial oil burner system installation and operation.
- Do not attempt to start the burner unless you are fully qualified.
- Do not continue with this procedure until all items in the “Prepare the burner for start-up” section have been verified.
- Carefully follow the wiring diagrams, control instruction sheets, flame safeguard sequence of operation, test procedures and all appliance manufacturer’s directions that pertain to this installation.
- If any of these items are not clear or are unavailable, call Beckett at 1-800-645-2876 for assistance.



## WARNING

### Do Not Bypass Safety Controls

***Tampering with, or bypassing safety controls could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

- Safety controls are designed and installed to provide protection.
- Do not tamper with, or bypass any safety control.
- If a safety control is not functioning properly, shut off all main electrical power and fuel supply to the burner and call a qualified service agency immediately.



## CAUTION

### Keep Service Access Covers Securely Installed

***These covers must be securely in place to prevent electrical shock, damage from external elements, and protect against injury from moving parts.***

- All covers or service access plates must be in place at all times except during maintenance and service.
- This applies to all controls, panels, enclosures, switches, and guards or any component with a cover as part of its design.

### 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 10**). The top acorn nut (**Figure 12**, item **d**) should never be loosened once the Z dimension is initially set.

### Adjusting plate assembly (**Figure 12**)

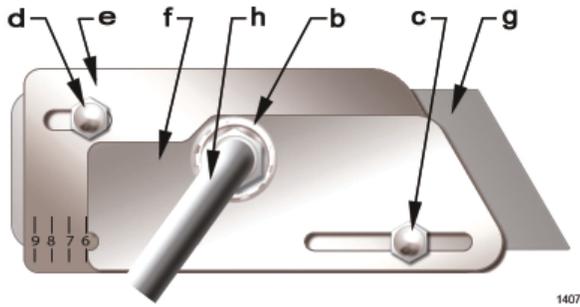
Make sure spline nut (item **b**) and bottom acorn nut (item **c**) are loose before proceeding to next section.

### Initial head position (**Figure 12**)

The indicator plate assembly (item **e**) markings correspond to head position settings.

- Slide the secondary adjusting plate (item **f**) toward the rear of the burner until the number on the indicator plate corresponds to the initial head setting given in **Tables 4a** and **4b** for the desired firing rate and burner (high-fire).
- **Figure 12** shows a typical example, with a head setting of 6.
- When the head position has been set, tighten the bottom acorn nut (item **c**) and the spline nut (item **b**).

**Figure 12 – Adjusting plate initial setting, typical**



**Legend**

- b** Spline nut for securing nozzle line
- c** Bottom acorn nut (for head adjustments)
- d** Top acorn nut (for setting dim. Z only - do not loosen after setting Z)
- e** Indicator adjusting plate
- f** Secondary adjusting plate
- g** Primary adjusting plate
- h** Copper oil line from oil valve to nozzle line

**Table 4a. CF1400 Initial indicator adjustment plate settings**

Tube	Head Position		Damper Position	
	Approximate Head Setting	Firing Rate (gph)	Approximate Air Damper Setting	Firing Rate (gph)
A	0	4.00	0	--
	1	4.50	10	--
	2	5.00	20	4.00
	3	6.00	30	5.00
	4	7.00	40	7.00
	5	7.50	50	8.00
	6	8.00	60	10.00
	7	9.00	70	11.00
	8	9.50	80	--
	9	10.00	90	--
	10	11.00	100	--
	--	--	110	--
B	0	7.00	0	--
	1	7.50	10	--
	2	8.00	20	--
	3	9.00	30	--
	4	10.00	40	7.00
	5	10.50	50	8.00
	6	11.00	60	10.00
	7	12.00	70	11.00
	8	13.00	80	12.00
	9	13.25	90	12.50
	10	13.60	100	13.00
	--	--	110	13.25
--	--	120	13.60	

**Table 4b. CF2300 Initial indicator adjustment plate settings**

Tube	Head Position		Damper Position	
	Approximate Head Setting	Firing Rate (gph)	Approximate Air Damper Setting	Firing Rate (gph)
A	0	11.0	0	--
	1	12.0	10	7.0
	2	13.0	20	10.0
	3	14.0	30	13.0
	4	15.0	40	14.0
	5	16.0	50	15.0
	6	17.0	60	16.0
	7	18.0	70	17.0
	8	19.0	80	18.0
	9	20.0	90	19.0
	--	--	100	20.0
B	0	12.5	0	--
	1	13.0	10	10.0
	2	14.0	20	13.0
	3	15.0	30	14.0
	4	16.0	40	15.0
	5	17.0	50	16.0
	6	18.0	60	17.0
	7	18.5	70	18.0
	8	19.0	80	18.5
	9	20.0	90	19.0
--	--	100	20.0	

## □ Initial air settings

The following steps outline the procedure for initially setting the damper. Refer to **Figure 13** and **Tables 4a** or **4b** for this procedure.

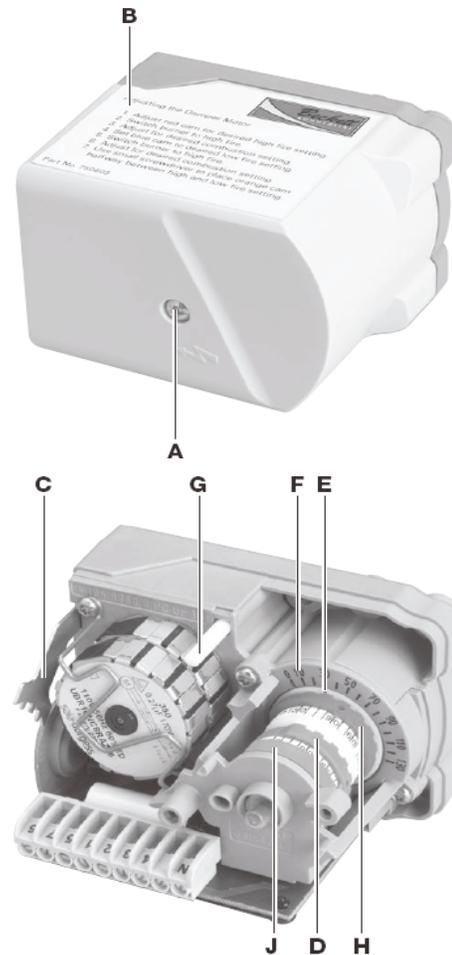
1. Remove the cover screw (A) then the cover (B) and place to one side.
2. Using the wrench (C) supplied with the damper motor, adjust the blue low fire cam (D) to the initial setting listed in **Tables 4a** or **4b**.
3. Using the same wrench, adjust the red high fire cam (H) to the initial settings listed in **Tables 4a** or **4b**.
4. Ensure the damper plate is in the correct position. The cam notch (E) should align with the low fire setting on the damper motor scale (F).
5. If the damper plate is not in the correct position, disengage the motor by pushing in on the motor pin (G), then rotating the damper plate until the cam notch and motor scale setting are aligned. Re-engage the pin.
6. To adjust the high fire transition, use a small straight edge screw driver, turn the white adjustment screw, located in the orange transition cam, either clockwise or counterclockwise until the cam indicator is half way between the high and low settings on the scale.
  - Rotate the air adjusting plate until the lower edge of the pointer is opposite the number from **Tables 4a** or **4b** corresponding to the desired low fire rate.
  - This initial setting should be adequate for starting the burner at low fire. Once the burner is in operation, the air setting will be adjusted for best performance as discussed later in this manual.
  - Follow the procedures described later in this manual to fine tune the air settings.

### NOTICE

The damper plate is attached by screws to its shaft, and bears against a flat on the shaft for alignment. The shaft is secured to the damper motor by a sleeve coupling with two setscrews bearing against the damper shaft and two more against the motor shaft. The motor shaft has a flat matching the one on the damper shaft. The flats on the damper shaft and the motor shaft should be aligned so that the position indicator in the damper motor reads accurately. The best way to align the flats is to tighten the setscrews that bear against the flats on the shafts first, and then tighten the ones that bear against the round surface of the shafts afterward.

The test for proper alignment is to disengage the damper motor from its shaft using the disengaging pin (Item G in **Figure 13B**) and rotate the damper plate to its full closed position. The position indicator should point to 0° within + 5° tolerance.

**Figure 13 - Damper Motor**



### Legend (figure 13)

A	Cover screw	F	Damper motor scale
B	Cover	G	Disengaging pin
C	Wrench	H	High fire cam (red)
D	Low fire cam (blue)	J	Transition cam (orange)
E	Cam notch		

## □ Set appliance limit controls

- Set the appliance limit controls in accordance with the appliance manufacturer's recommendations.
- Move the low-fire hold switch (not shown) to the low fire hold position. This will hold the burner in low fire during initial start-up.

## □ 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'.

# Start the burner



## Explosion and Fire Hazard



**Failure to follow these instructions could lead to equipment malfunction and result in heavy smoke emission, soot-up, hot gas puff-back, fire and asphyxiation hazards.**

- Do not attempt to start the burner when excess oil has accumulated in the appliance, 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 becomes extinguished during start-up, venting, or adjustment.
- **Vapor-Filled Appliance:** Allow the unit to cool off and all vapors to dissipate before attempting another start.
- **Oil-Flooded Appliance:** Shut off the electrical power and the oil supply to the burner and then clear all accumulated oil before continuing.
- If the condition still appears unsafe, contact the Fire Department. Carefully follow their directions.
- Keep a fire extinguisher nearby and ready for use.



## Professional Service Required



**Incorrect installation, adjustment, and use of this burner could result in severe personal injury, death, or substantial property damage from fire, carbon monoxide poisoning, soot or explosion.**

Please read and understand the manual supplied with this equipment. This equipment must be installed, adjusted and put into operation only by a qualified individual or service agency that is:

- Licensed or certified to install and provide technical service to oil heating systems.
- Experienced with all applicable codes, standards and ordinances.
- Responsible for the correct installation and commission of this equipment.
- Skilled in the adjustment of oil burners using combustion test instruments.

The installation must strictly comply with all applicable codes, authorities having jurisdiction and the latest revision of the National Fire Protection Association Standard for the installation of Oil-burning Equipment, NFPA 31 (or CSA B139 and B140 in Canada).

Regulation by these authorities take precedence over the general instructions provided in this installation manual.

Do not proceed unless all prior steps in this manual have been completed.

## Start burner and vent air from oil line



## Hot Gas Puff-back and Heavy Smoke Hazard



**Failure to bleed the pump properly could result in unstable combustion, hot gas puff-back and heavy smoke.**

- Do not allow oil to intermittently spray into a hot combustion chamber while bleeding.
- Install a gauge in the nozzle discharge port tubing or fully open the pump bleed valve to prevent oil spray from accumulating in the combustion chamber when venting air from the fuel pump.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump air bleed valve.

## 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 1/2 second or less) to check the cad cell resistance. The LED will flash 1 to 4 times, depending on the cad cell resistance (refer to the table below).

Number of LED flashes	Cad Cell Resistance (ohms)
1	Normal (0 to 400)
2	Normal (400 to 800)
3	Normal (800 to 1600)
4	Limited (1600-Lockout)*

\* Lockout can occur above 4000 ohms.

LED Indicator	Status
On	Flame sensed
Off	Flame not sensed
Flashing (1/2 sec off - 1/2 sec on)	Lockout/Restricted Lockout
Flashing (2 sec off - 2 sec on)	Recycle

## ❑ Operating the burner

1. Move the **low-fire hold** switch to the **low fire hold** position (to hold burner in low fire when started).
2. Verify that the air adjusting cam (*Figure 13b*, item **d**) has been set to the initial low-fire air setting as described under Initial air settings.
3. Open the oil shutoff valves in the oil supply (and return) line(s) to the burner.
4. Set the thermostat (or operating control) to call for heat.
5. Close the line switch to the burner. The burner motor should start immediately.
6. If the burner motor does not start, reset the motor overload switch (if so equipped) and press the reset switch of the burner primary control.
7. Vent the fuel unit as soon as the burner motor starts rotating. To vent —
  - Attach a clear plastic tube to the air bleed valve (*Figure 9 or 10 as applies, item p*).
  - Place the end of the tube in a container to catch the oil. Then loosen the fuel unit air vent valve.
  - Tighten the air vent valve after all air has been purged.
  - **IF burner stops during venting** —
    - The burner primary control will lockout if flame is not established within its time limit. This is typically 15 seconds for R7184B primary controls, but may be less for other flame supervisory controls.
    - The burner may lockout several times during the period needed to purge all the air. To extend air venting time, press the red reset button for 1/2 second during the prepurge cycle to continue purging.
  - **IF burner stops after flame established** —
    - Additional venting is probably required. Repeat the air venting procedure.
8. Once flame is steady, proceed to Set high-fire air.

## ❑ Set high-fire air

1. Allow the burner to run at **low fire** 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 readjusting the damper indicator to a higher number.

3. Once the appliance has warmed, the **high-fire** setting can be checked and adjusted.
4. Locate the approximate air adjusting plate setting for **high fire** in *Table 4a* or *4b*.
5. Place the **low-fire hold** switch in the **high-fire position**. The damper motor will begin to rotate after four seconds.
6. Use combustion test instruments to adjust the burner.
  - a. Adjust the air by moving the red cam to a lower number 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 by increasing the red cam number 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. A margin of reserve air has been added to accommodate variable conditions.
7. Check the breech draft pressure against the appliance manufacturer's recommended setting (typically + 0.1" W.C.).
8. 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.
9. Once all settings are complete and satisfactory, proceed to 'Set low-fire air'.

## ❑ Set low-fire air

1. Move the **low-fire hold** switch from the "**High Fire position**" to the "**Low Fire Hold**" position.
  - a. The damper will return to the **low-fire** air setting.
2. Check the smoke and CO<sub>2</sub> (O<sub>2</sub>) levels.
  - a. Pull a smoke sample from the flue.
  - b. The sample should be clean (zero smoke level).
  - c. Check the CO<sub>2</sub> (O<sub>2</sub>) level:  
CO<sub>2</sub> should be at 11 to 12% (O<sub>2</sub> at 5.9 to 4.5%).  
If the CO<sub>2</sub> is less than 11% (O<sub>2</sub> more than 5.9%), decrease the air and check the smoke level.
3. Operate the burner from **low fire** to **high fire** and back to verify operation.
4. Turn the burner off. Wait one or two minutes (for chamber to clear) and then turn on again to verify starting characteristics.
5. Perform limit circuit performance test specified by appliance manufacturer to verify operation of burner/appliance combination.

# Maintenance and Service



## WARNING

### Annual Professional Service Required



***Tampering with or making incorrect adjustments could lead to equipment malfunction and result in asphyxiation, explosion or fire.***

- Do not tamper with the burner or controls or make any adjustments unless you are a trained and qualified service technician.
- To ensure continued reliable operation, a qualified service technician must service this burner annually.
- More frequent service intervals may be required in dusty or adverse environments.
- Operation and adjustment of the burner requires technical training and skillful use of combustion test instruments and other test equipment.

- Check motor current. The amp draw should not exceed the nameplate rating.
- Check all wiring for secure connections or insulation breaks.
- Check the pump pressure and cutoff function.
- Check primary control safety lockout timing.
- Check ignition system for proper operation.
- Inspect the vent system and chimney for soot accumulation or other restriction.
- Clean the appliance thoroughly according to the manufacturer's recommendations.
- Check the burner performance. Refer to the section "Set combustion with test instruments".
- It is good practice to make a record of the service performed and the combustion test results.

## Annual Service

- Replace the oil supply line filter. The line filter cartridge must be replaced to avoid contamination of the fuel unit and nozzle.
- Inspect the oil supply system. All fittings should be leak-tight. The supply lines should be free of water, sludge and other restrictions.
- Remove and clean the pump strainer if applicable.
- Replace the nozzle with the exact brand, pattern, gph, flow rate and spray angle.
- Clean and inspect the electrodes for damage, replacing any that are cracked or chipped.
- Check electrode tip settings. Replace electrodes if tips are rounded.
- Inspect the igniter spring contacts.
- Clean the cad cell lens surface, if necessary.
- Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- Inspect the combustion head and air tube. Remove any carbon or foreign matter. Replace all damaged units with exact parts.
- Clean the blower wheel, air inlet, air guide, burner housing and static plate of any lint or foreign material.
- If motor is not permanently lubricated, oil motor with a few drops of SAE 20 nondetergent oil at each oil hole. DO NOT over oil motor. Excessive oiling can cause motor failure.

## 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.

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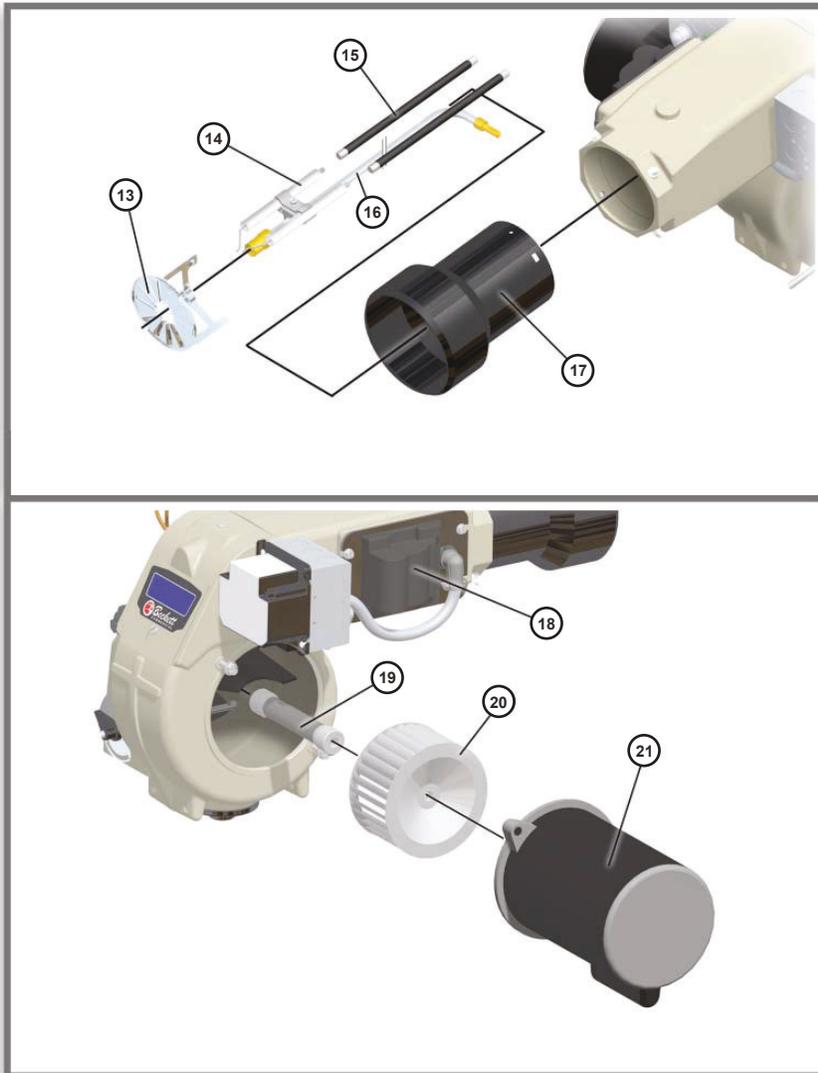
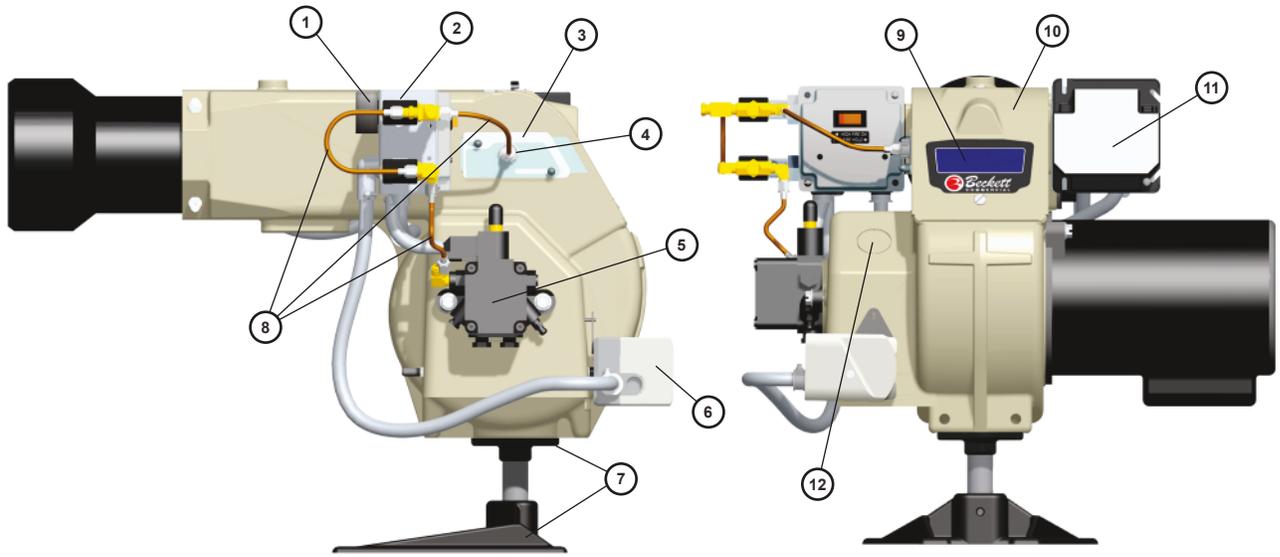
See next page for *Beckett* replacement parts ►

# Replacement Parts

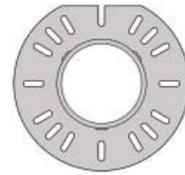
For best performance specify genuine *Beckett* replacement parts

Item	Part Name	Description	Part No.
1	Timer	Nozzle valve delay	21295U
2	Oil Valve	Box mounted	21789U
3	Knurled Nut	All models	3666
4	Adjusting plate assembly	w/ cast aluminum door w/ stamped sheet-metal door	5994U 5201701U
5	Fuel pump	B2TA-8245 H3PAN-C150H	21313U 21309U
6	Damper motor	2-stage	750601U
7	Pedestal kit	All models	51193
8	Fuel lines	Specify length	-
9	Sight glass	All models	31346
10	Rear cover door assembly	w/ cast aluminum door* w/ stamped sheet-metal door*	CF1400 5994U CF2300 51204U CF1400 5201301U CF2300 5201302U
11	Control	Specify	-
12	Coupling hole plug Coupling access door	use with threaded hole use with rectangular opening	32439U 16703GY
13	Head assembly	CF1400 CF2300	5978 51203
14	Electrode assembly	All models	51212
15	Ignition leads	8-1/4" long 11-3/4" long 15-1/4" long 19-1/4" long	5990082 5990116 5990152 5990192
16	Nozzle line assembly	Refer to <b>Figure 5, Page 9</b>	
17	Air tube	Refer to <b>Figure 4, Page 8</b>	
18	Transformer	12,000 volt	51214
19	Coupling	B pump H pump	21290 21308
20	Blower wheel	CF1400 - 5.59" x 3.09" CF2300 - 6.75" x 3.13"	21268U 21267U
21	Motor	120/208-230 single phase 208-230/460 three phase	CF1400 21401U CF2300 21402U CF1400 21638U CF2300 21499U
	Motor relay (not shown)	120V single phase 208V single phase three phase	7273 7300 2194301
	Adjustable flange	see <b>Figure 15</b> on opposite page	

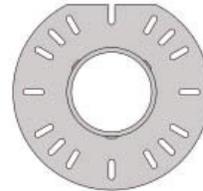
**Figure 14 – Burner Replacement Parts**



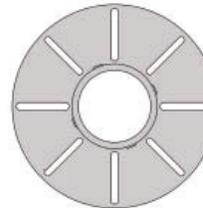
**Figure 15 – Adjustable mounting plates**



**Flange A**



**Flange B**



**Flange C**

Model	Flange A	Flange B	Flange C
CF1400	51312 (10.00" DIA.)	n/a	51629 (12.25" DIA.)
CF2300	51313 (12.44" DIA.)	51498 (13.92" DIA.)	51630 (16.00" DIA.)

## Limited Warranty Information

# Limited WARRANTY

## For Residential, Commercial and Specialty Burners

The R. W. BECKETT CORPORATION (“Beckett”) warrants to persons who purchase its Beckett burners from Beckett for resale or for incorporation into a product for resale (“Customers”) that its equipment is free from defects in material and workmanship under normal use and service for 60 months from the date of manufacture for Residential Burners and 18 months from the date of manufacture for Commercial and Specialty Burners. *Residential burner models include:* AF, AFG, AFII, NX, SF, SR and SMG. *Commercial burner models include:* CF375, CF500, CF800, CF1400, CF2300A, CF2500, CF3500A, CG10, CG15, CG25 and CG50. *Specialty burner models include:* ADC, ADCP, ARV, SDC and SM. The provisions of this warranty are extended to individual major burner components as follows:

- a) 60 months from date of manufacture for all Beckett-branded major components, except for 12 Vdc components.
- b) 18 months from date of manufacture for all non-Beckett-branded major components and Beckett branded 12 Vdc components.

Note: Normal service items found to be defective upon receipt by the customer are covered by this warranty.

**THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT SUBJECTED TO MISUSE, NEGLIGENCE, OR ACCIDENT: NOR DOES THIS WARRANTY APPLY UNLESS THE PRODUCT COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND LOCAL CODES REQUIRE, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS, IN ACCORDANCE WITH THE LATEST EDITION OF NFPA NO. 31 OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE LATEST EDITION OF THE NATIONAL FUEL GAS CODE (NFPA NO. 54) AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND NATIONAL CODES HAVING JURISDICTIONAL AUTHORITY.**

Equipment, which is defective in material or workmanship and within the warranty period, may be returned for credit as follows:

Beckett Burners, Beckett-branded major components and non-Beckett-branded major components that came as original equipment on a Beckett burner or were sold as a replacement part by Beckett should be returned, freight prepaid, to Beckett’s home office. Credit will be issued to the customer unless the returned equipment is determined by Beckett to be out of warranty or damaged by user, in which case the equipment will be scrapped.

**Note: Beckett is not responsible for any labor cost for removal and replacement of equipment.**

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL BECKETT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE. Beckett neither assumes nor authorizes any person to assume for Beckett any other liability or obligation in connection with the sale of this equipment, Beckett’s liability and Customer’s exclusive remedy being limited to credit as set forth above.

**R.W. BECKETT CORPORATION**

P.O. Box 1289 Elyria, Ohio 44036

Form No. 61545 R72905

The Oilheat Manufacturers’ Association supports the use of low sulfur fuels as defined by ASTM D396, Grades No. 1 Low Sulfur and No. 2 Low Sulfur, as the preferred heating fuel for the following reasons:

- Low sulfur fuels reduce deposits on heat exchanger surfaces, extending the service interval between cleanings.
- The reduced deposits increase the efficiency of the appliance.
- Low sulfur fuels reduce particulate emissions.
- Low sulfur fuels reduce oxides of nitrogen emissions.

**R.W. BECKETT CORPORATION**

U.S.A.: P.O. Box 1289 · Elyria, Ohio 44036

[www.beckettcorp.com](http://www.beckettcorp.com)

Canada: R.W. Beckett Canada, Ltd. · Unit #3, 430 Laird Road · Guelph, Ontario N1G 3X7

## MODEL A SINGLE STAGE TWO-STEP MODEL B TWO-STAGE TWO-STEP FUEL UNITS AND MODEL B TWO-STAGE HIGH PRESSURE FUEL UNITS

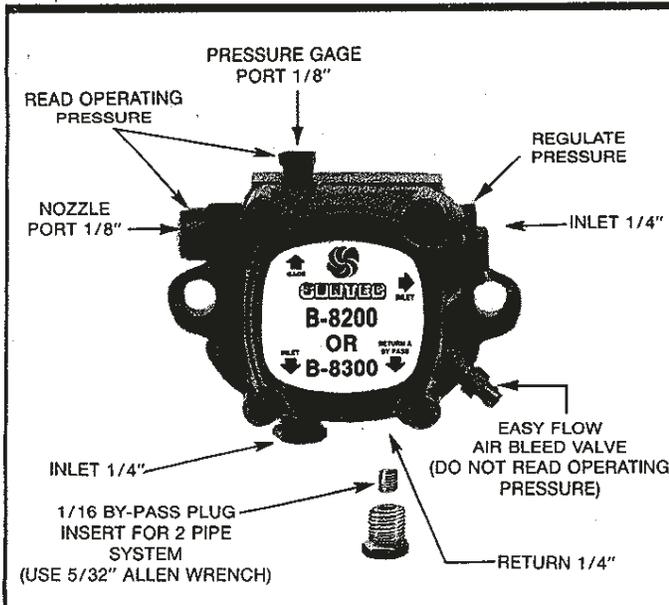


FIGURE 1

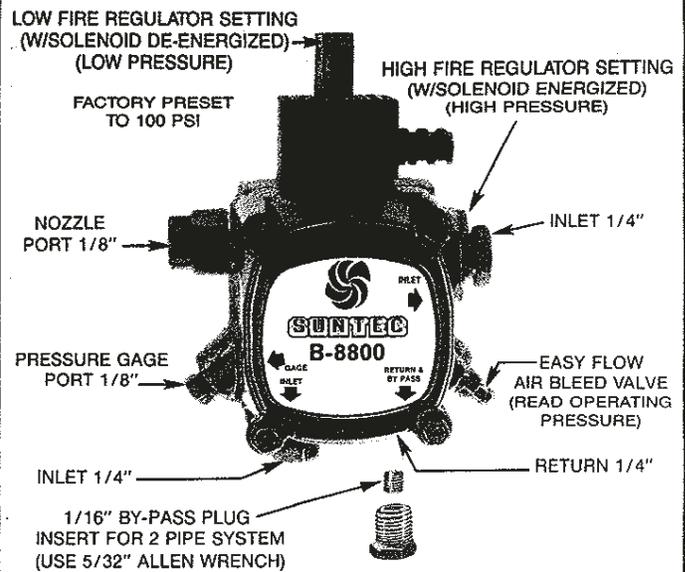


FIGURE 2

### ONE-PIPE SYSTEM • FIGURE 3

**DO NOT INSTALL BYPASS PLUG!** Connect inlet line to pump inlet. Start burner. Arrange primary burner control for continuous operation during purging. Open easy flow bleed valve 1 turn CCW. Bleed unit until all air bubbles disappear — HURRIED BLEEDING WILL IMPAIR EFFICIENT OPERATION OF UNIT. Tighten easy flow bleed valve securely.

### TWO-PIPE SYSTEM • FIGURE 4

**REMOVE 1/16\"** BY-PASS PLUG FROM PLASTIC BAG ATTACHED TO UNIT. Remove 1/4\" plug from return port. Insert by-pass plug (See Figure 1 or 2), tighten plug. Attach return and inlet lines. Start burner — Air bleeding is automatic. Opening Easy Flow Air Bleed Valve will allow a faster bleed if desired. Return line must terminate 3-4\" above supply line inlet. (See Figure 4). Failure to do this may introduce air into the system and could result in loss of prime.

### TWO-STEP PUMPS • FIGURE 2

**MODEL SHOWN IS RIGHT HAND ROTATION; ALL PORTS ARE REVERSED FOR LEFT HAND ROTATION.**

**SOLENOID WIRING** Refer to burner manufacturer's manual for instructions.

**NOTE:** Wiring of the solenoid in parallel with the safety control circuit will bypass the low fire regulator.

**REGULATOR SETTING** Install pressure gage in gage port (remove after adjustment) with proper nozzle in nozzle line

- Low Fire — Factory preset to 100 PSI with rated nozzle.
- High Fire — With solenoid energized adjust high fire regulator to desired pressure. (Range 200 to 300 PSI)

**NOTE:** EXTERNAL CUTOFF VALVE (120V MAXIMUM) IS REQUIRED.

### GENERAL INFORMATION • ALL SYSTEMS

**IMPORTANT INFORMATION** Long or oversized inlet lines may require the pump to operate dry during initial bleeding period. In such cases, the priming may be assisted by injecting fuel oil into the pump gearset. Under lift conditions, oil lines and fittings must be air tight. To assure this, "Pipe Dope" may be applied to both the used and unused inlet and both return fittings. **DO NOT USE TEFLON TAPE!! DO NOT USE COMPRESSION FITTINGS!!**

**MOUNTING POSITION** Model "A" Single Stage Fuel Unit may be mounted in any position. Model "B" Two Stage Fuel Unit may be mounted in any position except upside down (1/8\" ports pointed down).

**VACUUM CHECK** A Vacuum Gage may be installed in either of the 1/4\" inlet ports or in the 1/8\" return port (on single pipe installations), whichever is most convenient. The Model "A" pump should be used where the vacuum does not exceed 6\" hg. single pipe and 12\" hg. two pipe. The Model "B" should be used where vacuum does not exceed 17\" hg. Running vacuum is the total of all pressure drops ( $\Delta P$ ) from the tank to the inlet of the pump.

### CAUTION

Pressurized or gravity feed installations must not exceed 10 P.S.I. on inlet line or return line at the pump. A pressure greater than 10 P.S.I. may cause damage to the shaft seal.

## ONE-PIPE SYSTEM • MODEL A

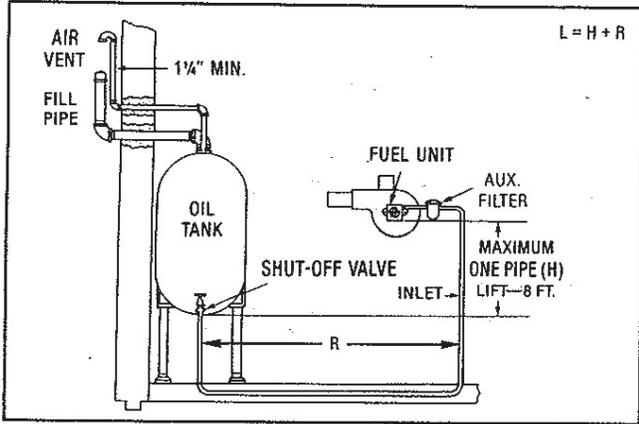


FIGURE 3

The SUNTEC MODEL "A"-70 FUEL UNIT may be installed ONE-PIPE with Gravity Feed or Lift.

The maximum allowable lift is 8 ft. — See Figure 3.

**IMPORTANT:** One-pipe installations must be absolutely air tight or leaks or loss of prime may result. Bleed line and fuel unit completely. Bleed for 15 seconds after last air is seen from easy flow to be certain lines are air free.

L = Line Length in Feet H = Head in Feet Q = Firing Rate in GPH

$$3/8" \text{ line } L = \frac{6 - .75H}{.0086 Q}$$

$$1/2" \text{ line } L = \frac{6 - .75H}{.00218 Q}$$

If tank is above pump change - to +. Fittings, valves, and filters will reduce total length allowed.

## TWO-PIPE SYSTEM • MODEL A AND B

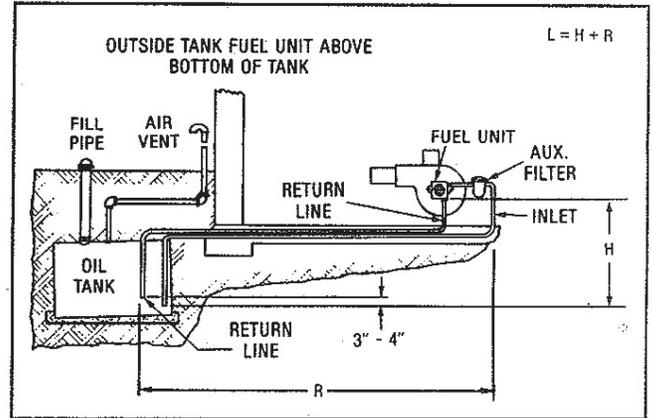
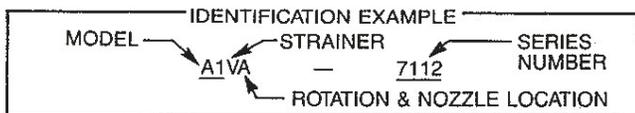


FIGURE 4

Always terminate return line as shown in Figure 4. Line lengths include both vertical and horizontal lengths.

MODEL A SINGLE-STAGE TWO-STEP • TWO-PIPE MAXIMUM LINE LENGTH (H + R)							MODEL B TWO-STAGE TWO-STEP AND TWO-STAGE HIGH-PRESSURE • TWO-PIPE MAXIMUM LINE LENGTH (H + R)						
Lift "H" Figure 4	3450 RPM						Lift "H" Figure 4	3450 RPM					
	3/8" OD Tubing		1/2" OD Tubing			5/8" OD Tubing		3/8" OD Tubing		1/2" OD Tubing			5/8" OD Tubing
	10 GPH	16 GPH	10 GPH	16 GPH	23 GPH	23 GPH		10 GPH	16 GPH	10 GPH	16 GPH	23 GPH	23 GPH
0'	33'	29'	100'	100'	72'	100'	0'	70'	60'	100'	100'	100'	100'
1'	31'	27'	100'	100'	66'	100'	2'	64'	55'	100'	100'	100'	100'
2'	28'	25'	100'	98'	59'	100'	4'	58'	50'	100'	100'	100'	100'
3'	25'	23'	100'	89'	53'	100'	6'	52'	44'	100'	100'	100'	100'
4'	23'	20'	92'	80'	46'	100'	8'	45'	39'	100'	100'	100'	100'
5'	21'	18'	82'	72'	40'	100'	10'	39'	34'	100'	100'	100'	100'
6'	18'	16'	72'	63'	34'	100'	12'	33'	28'	100'	100'	94'	100'
7'	16'	14'	62'	55'	27'	88'	14'	27'	23'	100'	91'	76'	100'
8'	13'	12'	52'	46'	20'	72'	16'	21'	18'	81'	70'	59'	100'
9'	11'	9'	43'	37'	14'	56'	18'	—	—	57'	49'	41'	100'
10'	—	—	33'	29'	8'	39'							

## PUMP USAGE IDENTIFICATION



STRAINER TYPE	UL Strainer Rating (GPH)* #2 Fuel Oil
V	3
Y	7
T	23
G	34

\*Max. firing rate not to exceed max. nozzle capacity or strainer rating whichever is LESS. A greater firing rate requires a suitable external strainer.

ALL INSTALLATIONS SHOULD BE MADE WITH LOCAL AND NATIONAL CODES.

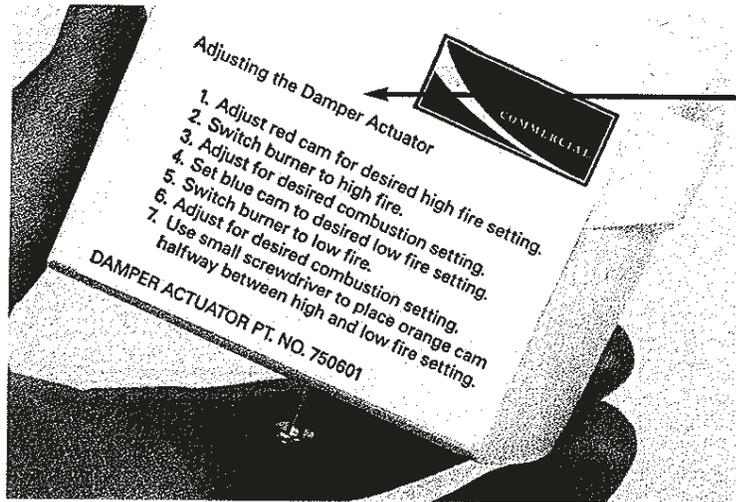


GLASGOW, KY 42142-5000

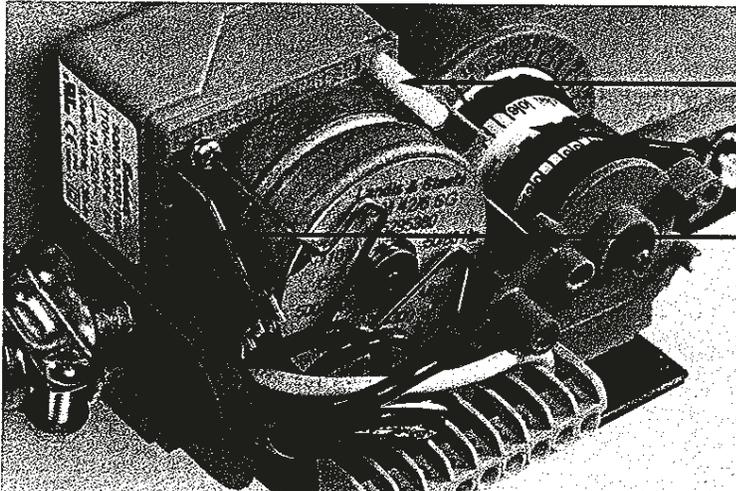
... working harder to serve you even better.

# Beckett

## Damper Actuator For Commercial Two-Stage Burners Adjustment Instructions

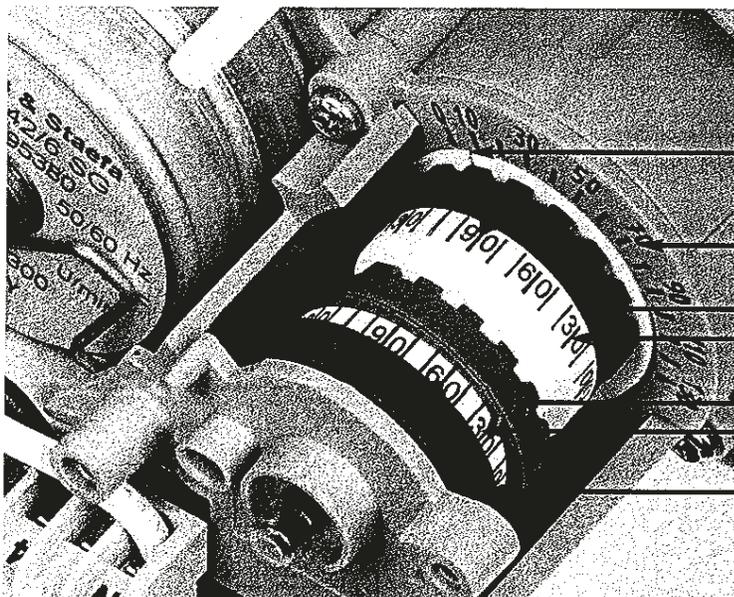


Adjustment Instructions  
Printed on Cover



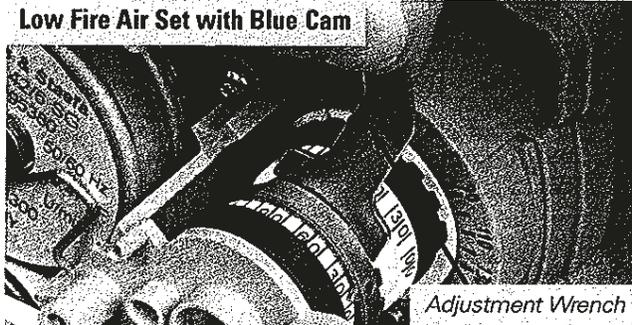
The **Disengaging Pin** allows the Damper and Cam Stack to be rotated by hand.

*The Disengaging Pin must be in the engaged position (out) when the burner is operating.*



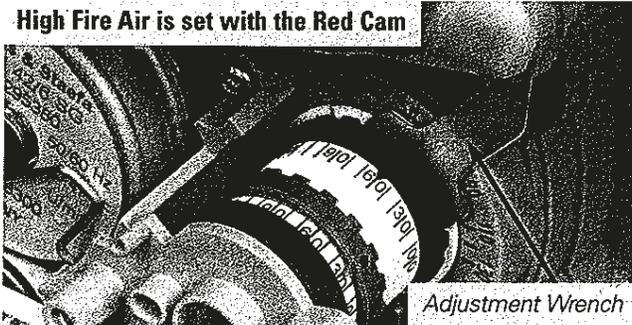
## Setting the High Fire Air and Low Fire Air

Low Fire Air Set with Blue Cam



Adjustment Wrench

High Fire Air is set with the Red Cam



Adjustment Wrench

An old air setting specification of 7 is equal to 70° on the damper position scale of this new damper actuator.

If adjusting the air settings while the burner is operating, it is necessary to cycle the burner from High to Low Fire or Low to High by using the lighted low fire hold switch.

## Setting the Transition

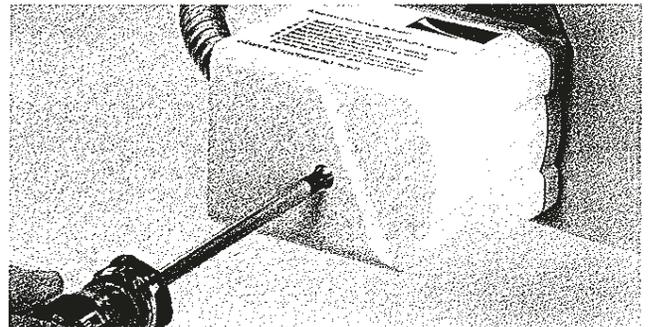
Cam is disengaged



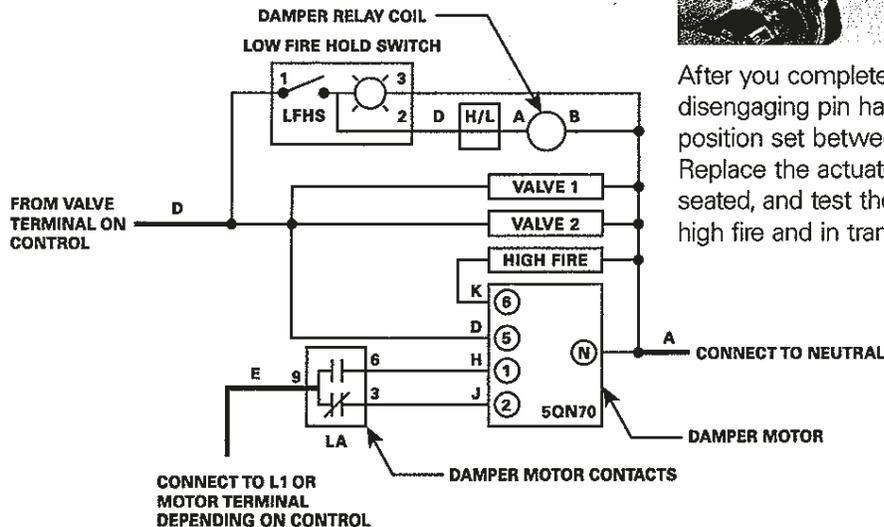
Transition Cam is set with Screwdriver

The **ORANGE CAM** sets the transition point between Low Fire Oil and High Fire Oil.

It should be set halfway between the settings of the RED Cam and the BLUE Cam.



After you complete your adjustments make certain the disengaging pin has been reengaged with the damper position set between the high fire and low fire limits. Replace the actuator cover, making sure it is correctly seated, and test the burner for proper firing at low fire, high fire and in transition between low and high.



For more information, contact:

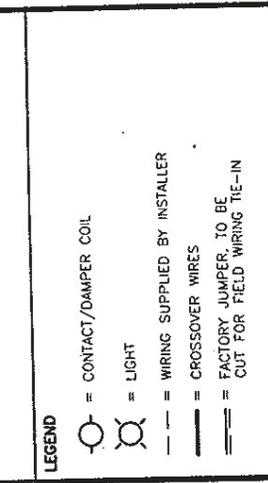
[www.beckettcorp.com](http://www.beckettcorp.com)

R.W. Beckett Corporation • P.O. Box 1289 • Elyria, Ohio 44036 • (800) 645-2876 • (440) 327-1060 • FAX (440) 327-1064

R.W. Beckett Canada Ltd. • Unit 3 - 430 Laird Road • Guelph, Ontario, Canada N1G 3X7 • (800) 665-6972 • FAX (519) 763-5656

KEY

DM = DAMPER MOTOR  
 H/L = LO/HI CONTROL WIRING TAG  
 LA = LOW FIRE AIR RELAY  
 LFHA = LOW FIRE HOLD AQUASTAT  
 LFHS = LOW FIRE HOLD SWITCH  
 LWCO-P = LOW WATER CUTOFF - PRIMARY  
 LWCO-S = LOW WATER CUTOFF - SECONDARY (IF USED)  
 M = MOTOR  
 MC = MOTOR CONTACTOR  
 S1, S3 = ON/OFF VALVE  
 S2 = HIGH/LOW VALVE  
 TRANS = IGNITION TRANSFORMER

LEGEND  


WIRE COLOR  
 A - WHITE  
 B - BLACK  
 C - BLUE  
 D - ORANGE  
 E - BROWN/RED  
 F - RED  
 G - BROWN  
 H - RED/WHITE  
 J - BLUE/WHITE  
 K - VIOLET  
 L - BLACK/RED  
 M - BLACK/WHITE  
 P - GREEN  
 MOTOR WIRE - 14GA  
 ALL OTHER WIRE - 16 GA.  
 UNSPECIFIED WIRE COLORS  
 BASED ON COMPONENTS

LIGHT COLOR  
 R = RED  
 G = GREEN  
 A = AMBER

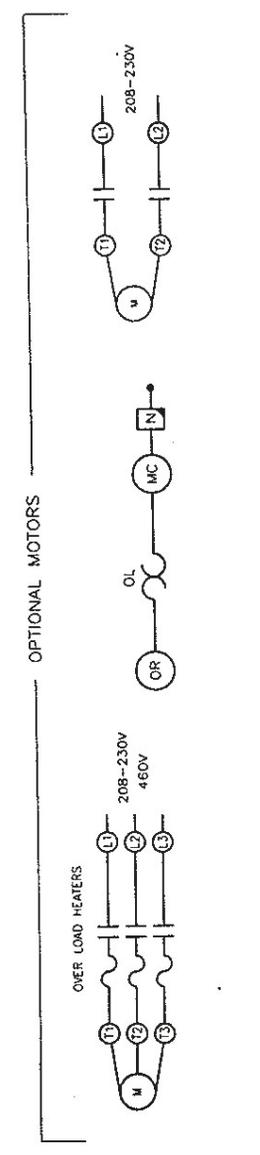
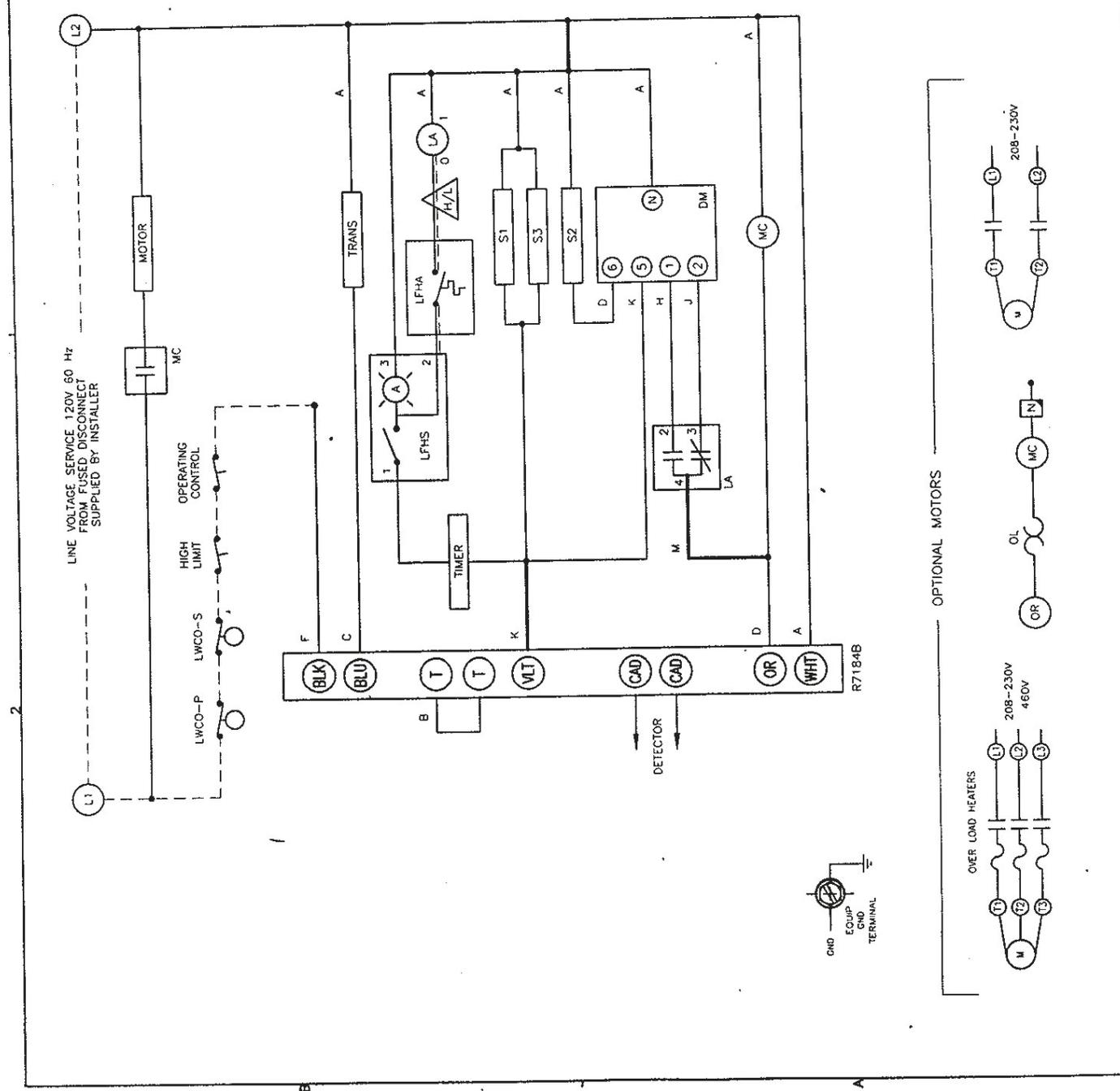
NOTES  
 1. LOCATE HIGH/LOW OPERATOR BETWEEN DAMPER MOTOR AND LFHS.

CF1400 / CF2300  
 LOW/HIGH/OFF  
 R7184B CONTROL

DATE: 12/07/06  
 REVISED BY: RM  
 DRAWN BY: TB  
 USER CHANGE: NONE  
 ADDITIONAL: AGUASTAT

REVISION: 1

6998004





OPERATING INSTRUCTIONS & PARTS MANUAL

HIGH PRESSURE DIRECT-DRIVE BLOWERS

MODELS 2C940, 2C820, 4C108, 4C329 AND 4C330

FORM 5S2052  
06820  
0390/073/5M

**READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.**

**Description**

Dayton direct-drive high pressure blowers are used for small exhaust systems where air is laden with dust or where dust-collection bags are necessary. Applications include handling long stringy material, paper trim, fibrous material such as textile scrap, wool and ensilage. Not suitable for coarse material. Heavy or abrasive dust. Dynamically balanced self-cleaning cast aluminum wheels. 16 GA housing and motor base. Maximum operating temperature 180°F (82°C). Finished in baked-on gray enamel. Blower can be assembled for CW or CCW rotation and any one of eight standard discharge positions. See Figure 2. Dayton motors packed separately when blowers are ordered complete.

**General Safety Information**

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Blower must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system by using a separate ground wire connected to the bare metal of blower frame, or other suitable means.
3. Always disconnect power source before working on or near a motor or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.
4. Be careful when touching the exterior of an operating motor — it may be hot enough to be painful or cause injury. With modern motors this condition is normal when operated at rated load and voltage — modern motors are built to operate at higher temperatures.
5. Protect the power cable from coming in contact with sharp objects.
6. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
7. Make certain that the power source conforms to the requirements of your equipment.
8. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.
9. Not recommended as an explosion proof blower. Do not use where explosive fumes or gases are present.
10. If blower is operated without an inlet or outlet duct, guard openings in accordance with OSHA regulations to prevent contact with rotating blower wheel.

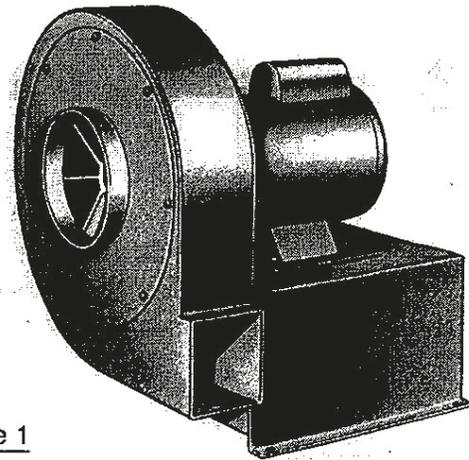


Figure 1

**▲ WARNING ▲**

**KEEP HANDS AWAY FROM INLET WHILE BLOWER IS IN OPERATION.**

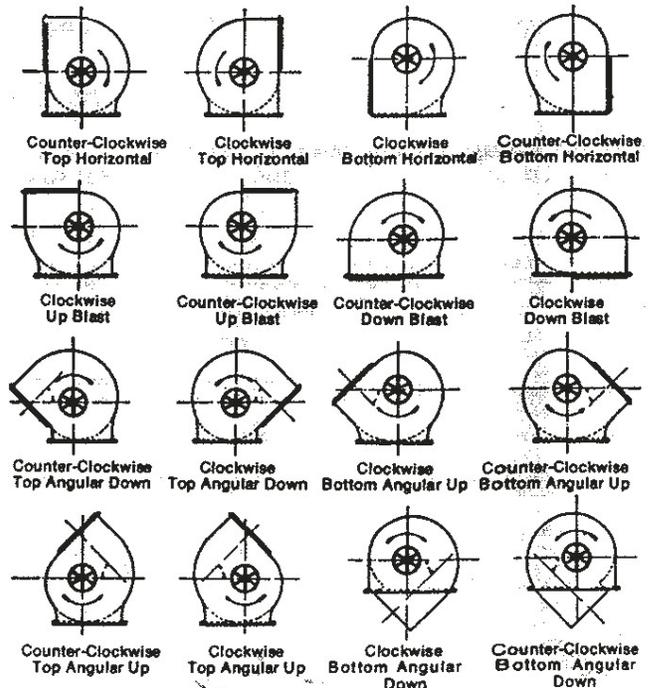


Figure 2

**Specifications**

MODEL	WHEEL			HIGH-PRESSURE BLOWER DIMENSIONS															X ADJ. MIN.	X ADJ. MAX.	
	DIA.	W	BORE	A	B	C	D	E	F	G	H	J	K	L	O	P	R	S			V
2C940	7 <sup>3</sup> / <sub>4</sub> "	2 <sup>5</sup> / <sub>16</sub> "	1/2"	11"	8"	3"	3"	5"	7"	1/2"	5 <sup>3</sup> / <sub>8</sub> "	4 <sup>7</sup> / <sub>8</sub> "	5 <sup>7</sup> / <sub>8</sub> "	5 <sup>7</sup> / <sub>8</sub> "	12 <sup>1</sup> / <sub>4</sub> "	4"	6 <sup>5</sup> / <sub>8</sub> "	5 <sup>1</sup> / <sub>2</sub> "	—	8 <sup>1</sup> / <sub>4</sub> "	9 <sup>3</sup> / <sub>4</sub> "
2C820	9"	2 <sup>13</sup> / <sub>16</sub> "	1/2"	12 <sup>1</sup> / <sub>8</sub> "	8"	3 <sup>1</sup> / <sub>2</sub> "	3 <sup>1</sup> / <sub>2</sub> "	5 <sup>5</sup> / <sub>8</sub> "	7"	1/2"	6 <sup>3</sup> / <sub>8</sub> "	5 <sup>3</sup> / <sub>4</sub> "	6 <sup>7</sup> / <sub>8</sub> "	6 <sup>3</sup> / <sub>4</sub> "	12 <sup>3</sup> / <sub>4</sub> "	5"	7 <sup>1</sup> / <sub>2</sub> "	6 <sup>3</sup> / <sub>8</sub> "	—	9 <sup>1</sup> / <sub>8</sub> "	10 <sup>5</sup> / <sub>8</sub> "
4C108	10 <sup>9</sup> / <sub>16</sub> "	3"	5/8"	14 <sup>3</sup> / <sub>8</sub> "	9"	4"	3 <sup>1</sup> / <sub>2</sub> "	6 <sup>7</sup> / <sub>8</sub> "	7 <sup>1</sup> / <sub>2</sub> "	3/4"	7 <sup>1</sup> / <sub>4</sub> "	6 <sup>1</sup> / <sub>2</sub> "	8"	7 <sup>5</sup> / <sub>8</sub> "	14"	6"	8 <sup>5</sup> / <sub>8</sub> "	8 <sup>1</sup> / <sub>4</sub> "	—	11 <sup>3</sup> / <sub>8</sub> "	12 <sup>7</sup> / <sub>8</sub> "
4C329	12 <sup>1</sup> / <sub>2</sub> "	3"	7/8"	17"	11 <sup>1</sup> / <sub>4</sub> "	5"	4"	8"	9 <sup>3</sup> / <sub>4</sub> "	3/4"	8 <sup>1</sup> / <sub>4</sub> "	7 <sup>1</sup> / <sub>2</sub> "	9"	9 <sup>5</sup> / <sub>8</sub> "	17"	7"	10"	7 <sup>1</sup> / <sub>8</sub> "	—	10 <sup>5</sup> / <sub>8</sub> "	10 <sup>5</sup> / <sub>8</sub> "
4C330	13 <sup>1</sup> / <sub>2</sub> "	4 <sup>3</sup> / <sub>8</sub> "	1 <sup>1</sup> / <sub>8</sub> "	17 <sup>1</sup> / <sub>2</sub> "	11 <sup>1</sup> / <sub>4</sub> "	7 <sup>1</sup> / <sub>8</sub> "	5 <sup>3</sup> / <sub>4</sub> "	8"	9 <sup>1</sup> / <sub>2</sub> "	1"	10 <sup>1</sup> / <sub>2</sub> "	9 <sup>5</sup> / <sub>8</sub> "	11 <sup>3</sup> / <sub>8</sub> "	11"	18 <sup>7</sup> / <sub>8</sub> "	8"	11 <sup>1</sup> / <sub>2</sub> "	8 <sup>1</sup> / <sub>8</sub> "	7 <sup>1</sup> / <sub>4</sub> "	12 <sup>5</sup> / <sub>8</sub> "	12 <sup>5</sup> / <sub>8</sub> "

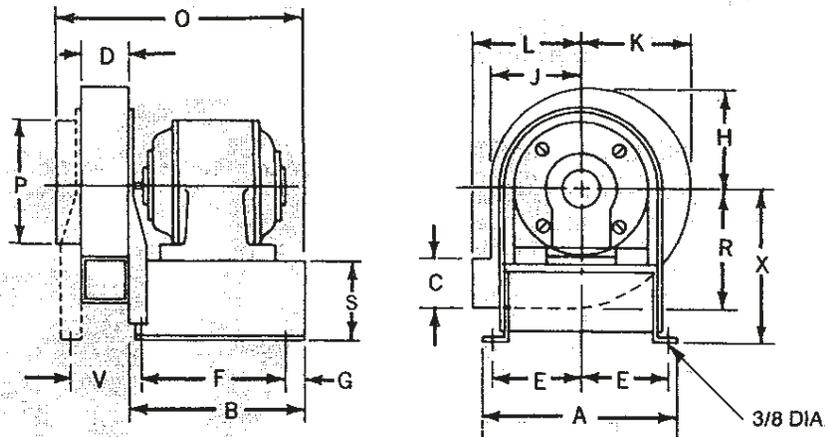


Figure 3

**Performance**

MODEL	HP REQ'D.	MOTOR FRAME	VOLTS	MOTOR TYPE	CFM AIR DELIVERY AT 3450 RPM								SHPG. WT.	
					1" SP	2" SP	3" SP	4" SP	5" SP	6" SP	7" SP	8" SP		
2C940	1/3	48	115	Split	290	230	160	—	—	—	—	—	—	13
2C820	1/3	48	115	Split	530	470	415	335	165	—	—	—	—	17
4C108	1	56	115/230	Cap. (†)	800	745	680	610	510	375	225	—	—	25
4C329	3	145T	230/460	3-Ph.	1200	1140	1070	1010	940	870	790	695	—	37
4C330	5	182T	230/460	3-Ph.	2140	2030	1930	1820	1710	1615	1500	1375	—	64

(†) Also available in 208-230/460, 60Hz, 3-Phase.

Based on standard test codes of (AMCA) Air Moving and Conditioning Association

**CAUTION**

**Must not be used where static pressure is less than shown in table. Severe motor overload will result. Motor overload protection, closely matched to motor full-load current, is highly recommended.**

**LIMITED WARRANTY**

**DAYTON ONE-YEAR LIMITED WARRANTY.** High pressure direct drive blowers, Models 2C940, 2C820, 4C108, 4C329, & 4C330, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specified legal rights which vary from state to state.

**LIMITATION OF LIABILITY.** To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

**WARRANTY DISCLAIMER.** Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

**PRODUCT SUITABILITY.** Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of the Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

**PROMPT DISPOSITION.** Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648

**Assembly**

1. Attach base upright to the motor mounting base as shown in the exploded view. Hand tighten (4) 1/4-20 x 1/2" bolts, washers, and nuts through slotted holes in base upright. Place motor on motor base and align the center hole of the base upright with the motor shaft. Secure the four 1/4-20 bolts. Models 4C329 and 4C330 have a welded motor base assembly.
2. Bolt the housing to the base upright in the desired discharge position using #10 x 3/8 or 5/16-18 x 3/4" self tapping bolts. Blower is clockwise rotation. Refer to exploded view showing clockwise bottom horizontal discharge.
3. With the motor shaft through the center hole of the base upright, align the mounting holes of the motor to the pre-drilled holes in the motor base. Install two bolts to retain proper motor alignment but do not tighten. Mount the wheel to the motor shaft. Refer to exploded view drawing.
4. Mount the inlet ring to the housing and secure with #10 x 3/8" or 5/16-18 x 3/4" self tapping bolts.
5. Slide the wheel toward the inlet ring so there is at least 1/4" clearance between the wheel and cone. The motor shaft should extend through the hub of the wheel so when the setscrews are securely tightened, they will make contact with the motor shafts.
6. Install the remaining nuts, bolts, and washers (not provided) to the motor mounting holes of the motor and secure to the blower motor base.

**Installation**

1. Make sure all bolts and screws are tightened before mounting on a rigid, flat, level foundation. Bolt the blower securely into position.
2. Check the interior of the fan housing to be sure it is free of debris. Rotate the wheel to insure that it is not rubbing or binding. Check the clearance of the

wheel and the inlet ring. If rubbing exists, loosen the bolts on the ring and shift the ring until clearance is obtained. If still rubbing, loosen the set screw on the wheel and shift the wheel rearward to obtain clearance. Retighten the set screw.

**Operation**

1. Before connecting the motor to the electric supply, check the electrical characteristics as indicated on the motor nameplate to insure proper voltage and phase.

**CAUTION**

**A ground wire must run from the blower motor housing to a suitable electrical ground such as a properly grounded metallic raceway or a ground wire system.**

2. After electrical connections are completed, apply just enough power to start the unit. Be sure that the rotation of the wheel is correct as indicated by directional arrows on the unit. If proper rotation, apply full electrical power.
3. With the air system in full operation and all ducts attached, measure current input to the motor and compare with the nameplate rating to determine if the motor is operating under safe load conditions.

**Maintenance**

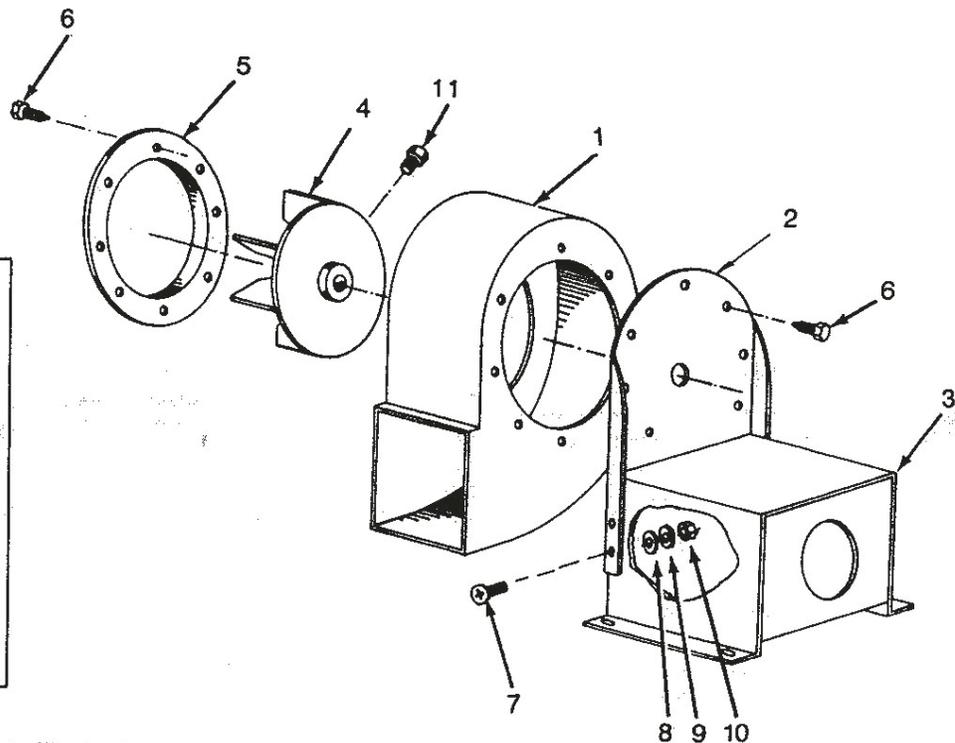
**CAUTION**

**Before attempting any repair work, be certain that all power to the motor and electrical accessories are turned off and locked in the off position.**

- A. Periodically remove dirt from blower wheel and housing.
- B. Check tightness of wheel setscrews.
- C. After disconnecting the power source, check the wiring to see if insulation is damaged or frayed.
- D. Relubricate motor per manufacturer's instructions. Remove any excess lubricants.

**Troubleshooting Chart**

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Noise.	1. Foreign objects in housing. 2. Loose setscrew on wheel. 3. Incorrect wheel rotation.	1. Remove. 2. Tighten. 3. Reverse rotation.
Motor bearing noise.	Lack of bearing lubrication.	Lubricate.
Excessive vibration.	1. Loose wheel on shaft. 2. Loose mounting bolts. 3. Motor out of balance. 4. Wheel out of balance. 5. Accumulation of material on wheel.	1. Tighten setscrews. 2. Tighten. 3. Replace. 4. Replace or rebalance. 5. Clean.
Motor overloaded.	System static pressure less than 1" water column.	Increase system static pressure.



**ORDER REPLACEMENT PARTS  
BY CALLING TOLL FREE**

**1-800-323-0620**

Please provide the following information:

- Model Number
- Serial Number (if any)
- Parts Description and Number as shown in Parts List

Address parts correspondence to:

Parts Company of America  
1657 Shermer Road  
Northbrook, IL 60062-5362

Figure 4 -- Replacement Parts Illustration

**Replacement Parts List**

REF. NO.	DESCRIPTION	PART NO. FOR MODEL:				
		2C940	2C820	<b>4C108</b>	4C329	4C330 (†)
1	Housing scroll	201-08-4005-5	201-09-4003-5	201-11-4005-5	201-12-4004-5	201-14-4005-5
2	Base upright	618-08-7001-5	618-09-7001-5	618-11-7002-5	—	—
3	Motor base assembly	203-08-7001-5	203-09-7001-5	203-11-7005-5	203-12-4016-5	203-14-4011-5
4	Wheel	602-08-4001-5	602-09-4001-5	602-11-4002-5	602-12-4004-5	602-14-4003-5
5	Inlet ring	609-08-4002-5	609-09-4001-5	609-11-4003-5	602-12-4003-5	609-14-4001-5
6	Hex hd. screw	#10 x 3/8" 8 Req'd.	#10 x 3/8" 14 Req'd.	#10 x 3/8" 14 Req'd.	5/16-18 x 3/4" 16 Req'd.	5/16-18 x 3/4" 16 Req'd.
7	Slotted machine screw*	1/4-20 x 1/2" 4 Req'd.	1/4-20 x 1/2" 4 Req'd.	1/4-20 x 1/2" 4 Req'd.	—	—
8	Flat washer*	1/4 4 Req'd.	1/4 4 Req'd.	1/4 4 Req'd.	—	—
9	Split washer*	1/4 4 Req'd.	1/4 4 Req'd.	1/4 4 Req'd.	5/16 16 Req'd.	5/16 16 Req'd.
10	Hex nut*	1/4"-20 4 Req'd.	1/4"-20 4 Req'd.	1/4"-20 4 Req'd.	—	—
11	Setscrew	†	†	†	†	†

NOTE — Models 4C329 and 4C330 have welded 1 piece motor base & upright assembly.  
 (†) Model 4C330 has inlet upright supports (not shown) to support housing. Order by P/N 617-13-7002-5.  
 (\*) Standard hardware item, available locally.  
 (†) Available with wheel.



# Inspection Checklist for Supervisors

Facility:		Date:		
	Activity	Yes	No	Remarks
<b>A.</b>	<b>Safety</b>			
1.	Is there adequate personal protective equipment (PPE)?			
2.	Is the PPE being used?			
3.	Is the PPE in good condition?			
4.	Is there restricted entry to the waste incineration/ash disposal site?			
5.	Is there functional fire safety equipment?			
6.	Do the operators know how to use the equipment?			
7.	Is there adequate first aid kit?			
8.	Are the operators conversant with use of the kit?			
9.	Is flammable material stored away from the incinerator?			
10.	Are warning signs distinctly displayed?			
Additional Comments on Safety:				

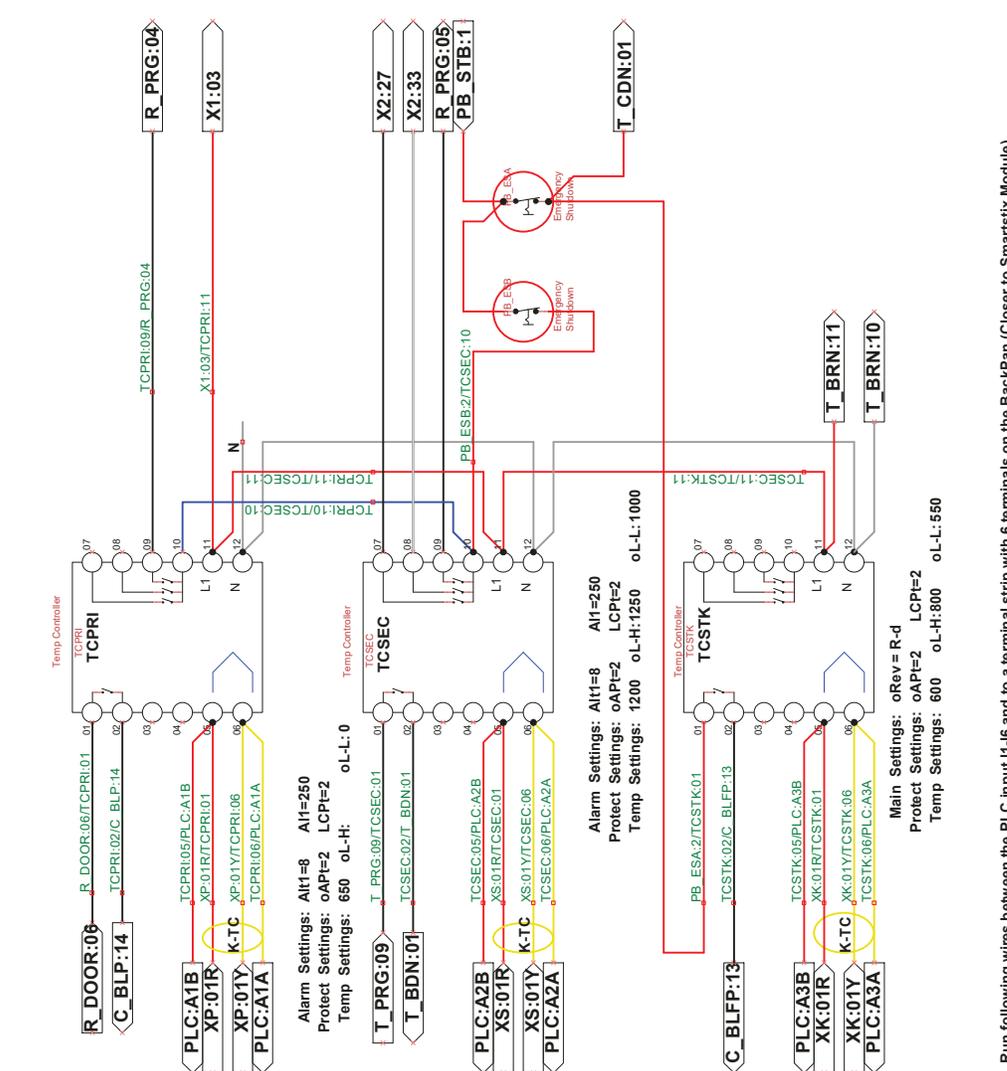
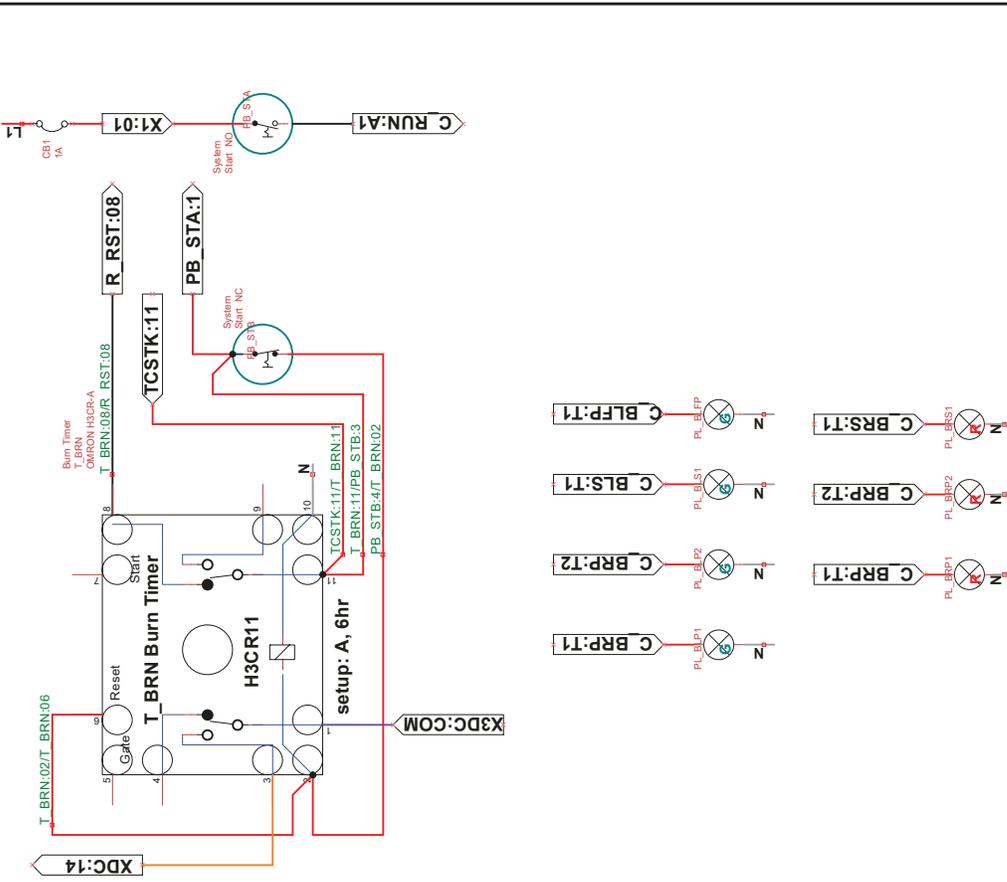
# Inspection Checklist for Supervisors

<b>B.</b>	<b>Operation</b>			
	<b>Activity</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
1.	Is there a sufficient supply of fuel?			
2.	Is the procedure for preparation of waste for incineration being followed?			
3..	Is the incinerator cleaned daily?			
4.	Is the waste weighed upon reception?			
5.	Is the waste temporarily stored neatly?			
6.	Is the loading of incinerator done in the right way?			
7.	Is the temperature regulated adequately during the burn?			
8.	IS the incinerator allowed to burn down and cool before cleaned?			
9.	Is the ash properly disposed as specified by compliance procedures?			
10.	Are the following tools and equipment available?			
a.	Ash Rake			
b.	Shovel			
c.	Hand brush/Dustpan			
d.	Hard broom			
e.	Non-Combustible Ash Disposal Drums			
f.	Weighing Scale			
g.	Fire Extinguisher			
h.	Fire Retardant Gloves			
i.	Eye Protection/ Face Mask			
j.	Fire Retardant Coveralls or suitable clothing to cover the upper body, including the lower arms			
k.	Safety First Aid Kit			
Additional Comments on Operation:				



# Inspection Checklist for Supervisors

<b>C.</b>	<b>Maintenance</b>			
	<b>Activity</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
1.	Is there evidence of cracks in the refractor? ( Do not include heat expansion cracks)			
2.	Is there good housekeeping?			
3.	Is the status of the ash handling and disposal system good?			
Additional Comments on Maintenance:				
<b>D.</b>	<b>Records</b>			
	<b>Activity</b>	<b>Yes</b>	<b>No</b>	<b>Remarks</b>
1.	Are the relevant forms available?			
2.	Are the forms filled accurately and completely?			
3.	Are incidents recorded?			
4.	Are reports of the waste incinerated done on time?			
Additional Comments on Records:				
Name of Supervisor:		Signature:		Designation:



Alarm Settings: AI1=8 AI1=250  
 Protect Settings: oAPt=2 LCPT=2  
 Temp Settings: 1200 oL-H:1250 oL-L:1000

Main Settings: oRev = R-d  
 Protect Settings: oAPt=2 LCPT=2  
 Temp Settings: 600 oL-H:800 oL-L:550

Run following wires between the PLC input I1-16 and to a terminal strip with 6 terminals on the BackPan (Closer to Smartstix Module)

- 6 16GA Orange

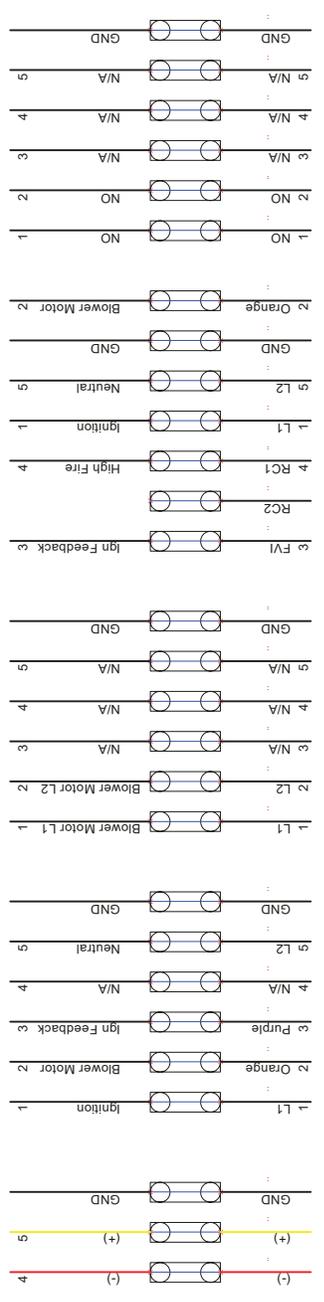
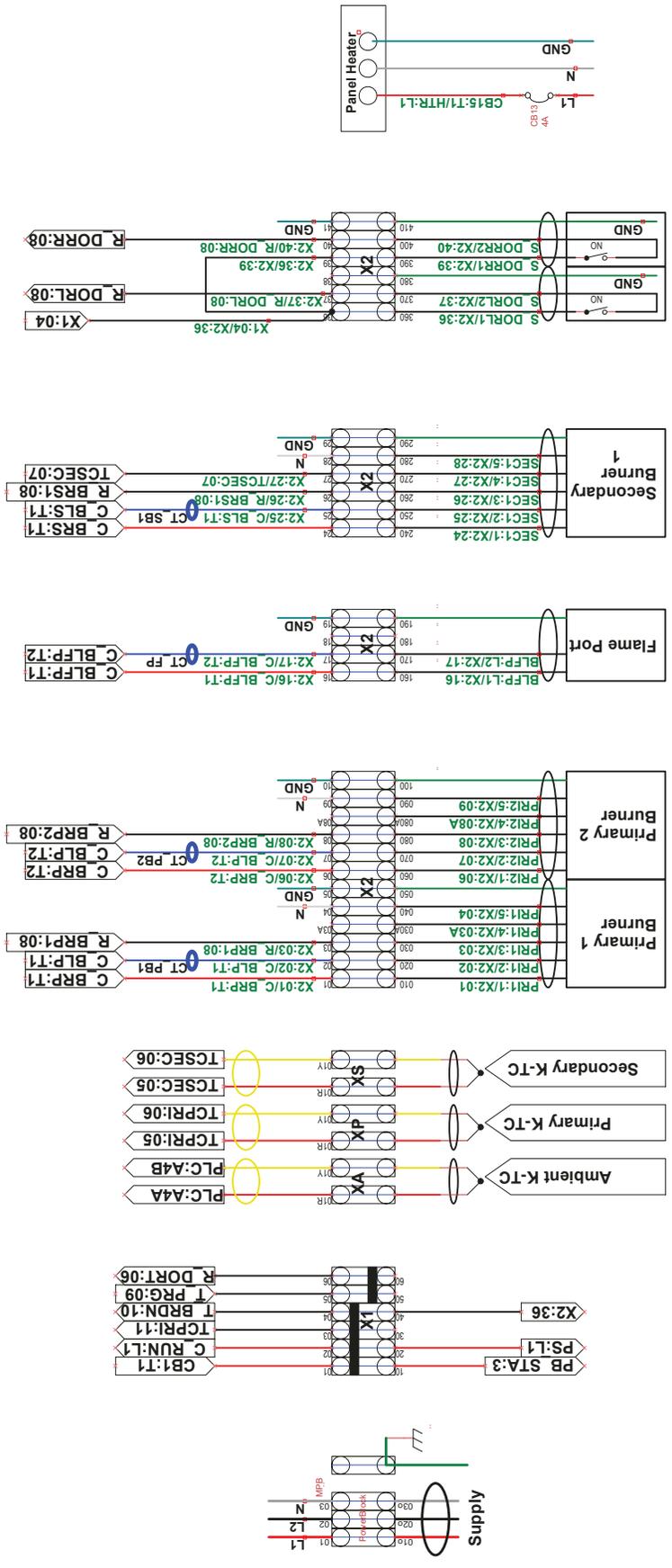
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Title	TCPRI, TCSEC, TCSTK Temperature Controllers
Author	Jeffrey Prado
File	Y101_DblSchemHomer20190510kk_hb_ip.dsn
Revision	1:18
Date	2019-03-25
Document	Sheets
	1 of 6

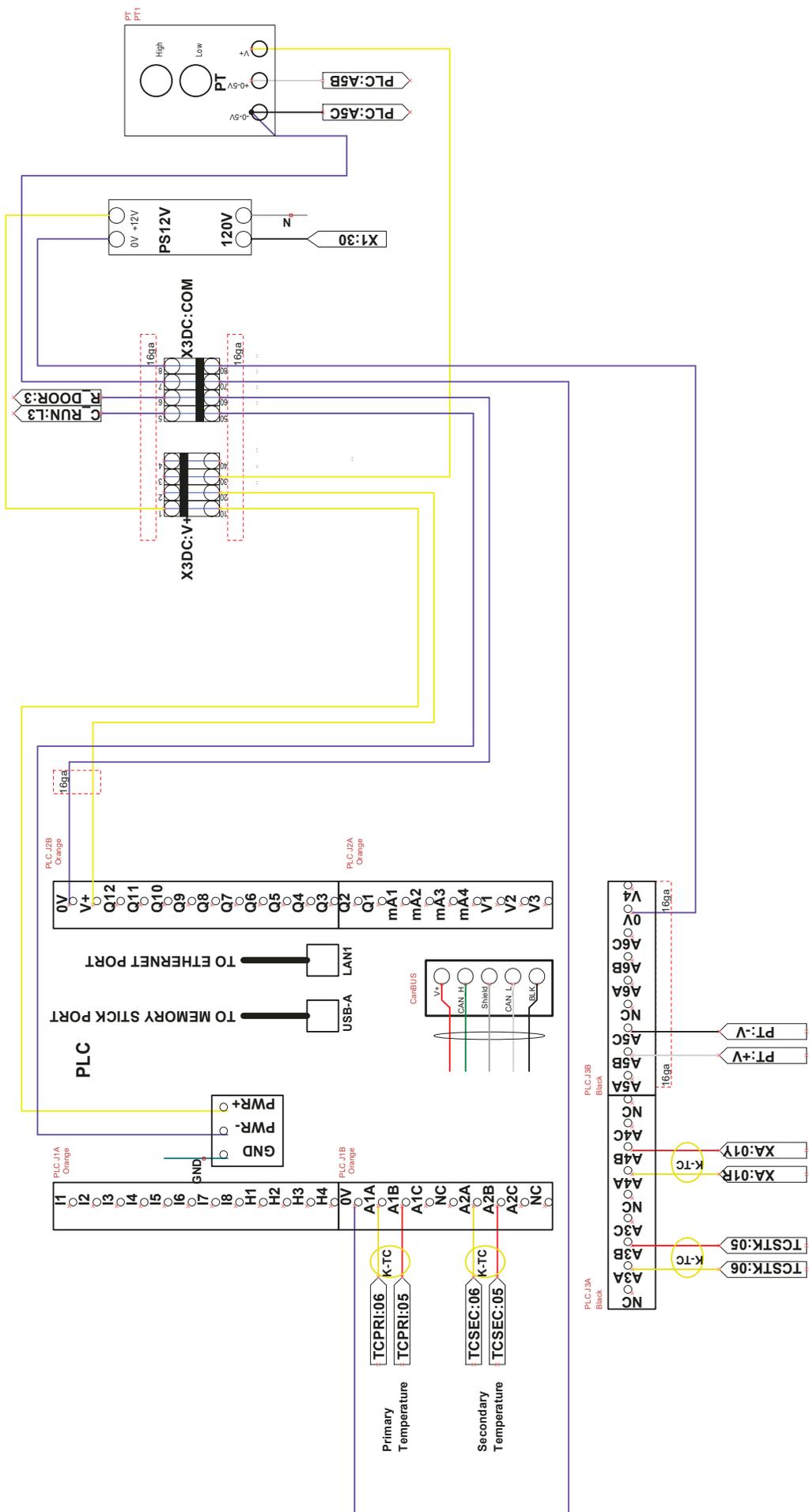








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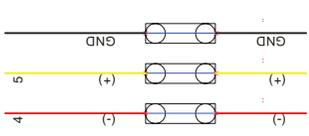


ALL DC WIRING TO BE 16GA.

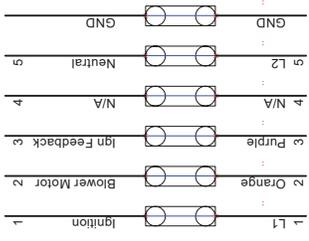
Title	PLC and DC
Author	Jeffrey Prado kurt.kingbell
File	>Y101_DblSchemHomer20190510kk_hb_ip.dsn
Revision	1.19
Date	2019-04-08
Revision	1.19
Sheets	5 of 7



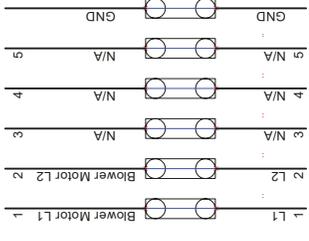
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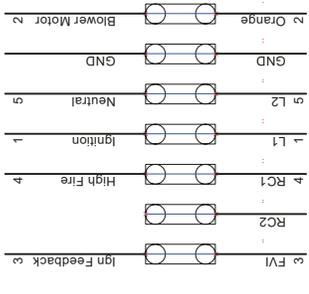
**Thermocouple**



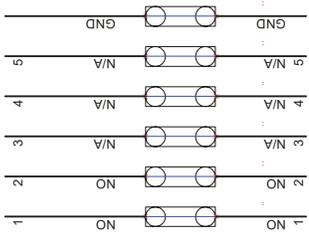
**Primary Burners 1 & 2**



**Blower**



**Secondary Burners**



**Door Switch L & R**

Title		Burner Terminations	
Author		Jeffrey Prado kurt.kingbell	
File		D:\101_DblSchem\Homer20190510kk_hb_ip.dsn	
Revision		Date	
1.18	2019-03-25	Document	
Sheets		6 of 6	





# CERTIFICATE OF REGISTRATION

This is to certify that

**Ketek Group Inc.**

**Edmonton Operation Centre**

20204 110 Avenue NW, Edmonton, Alberta, T5S 1X8, Canada

Refer to Attachment to Certificate of Registration dated March 17, 2021 for additional certified sites  
operates a

**Quality Management System**

which complies with the requirements of

**ISO 9001:2015**

for the following scope of certification

**Design and manufacture of oilfield, construction and solid waste treatment equipment and  
maintenance of pumps and gensets.**

Certificate No.: CERT-0115970  
File No.: 1647520  
Issue Date: March 17, 2021

Original Certification Date: July 17, 2013  
Certification Effective Date: March 18, 2021  
Certification Expiry Date: March 17, 2024

Frank Camasta  
Global Head of Technical Services  
SAI Global Assurance



**KETEK GROUP INC.**

Warranty - New

1. Ketek Group Inc. hereby warrants to the Purchaser, for a one (1) year period of time from the date of acceptance and upon the conditions hereinafter set forth, each new product sold by it, to be free from defects in material and workmanship (specifically excluding there from component parts and accessories manufactured, furnished, and supplied by others) under normal use, maintenance and service. Except for the above Warranty, it is agreed and understood that no other WARRANTY or CONDITION whether express, implied, or statutory is made by Ketek Group Inc.
2. The obligation of Ketek Group Inc. under this Warranty shall be limited to the repair or replacement (**not in excess of its factory labour rate**) of its units; which, upon examination by Ketek Group Inc., shall disclose to their satisfaction to have been defective in material and/or workmanship under normal use, maintenance, and service. The foregoing shall be the Purchaser's sole and exclusive remedy whether in contract, tort, or otherwise; and Ketek Group Inc. shall not be liable for injuries to persons, for damage to property or for loss of any kind which results (whether directly or indirectly) from such defects in material or workmanship, or for any other reason; and, it is agreed and understood that the Purchaser shall keep Ketek Group Inc. indemnified against any such claim. In no event shall Ketek Group Inc. be liable for incidental or consequential damages, or commercial losses, or for any loss or damage except as set forth in paragraph 2 herein.
4. This Warranty does not apply to, and no warranty or condition is made by Ketek Group Inc. regarding any purchased components, parts, and accessories; manufactured, supplied and/or furnished by others, or any non-standard features or items specified by the Purchaser; nor does this Warranty expand, enlarge upon, or alter in any way, the warranties provided by the makers and suppliers of such component parts and accessories.
5. The liability of Ketek Group Inc. under this Warranty shall cease and determine if:
  - (a) The Purchaser shall not have paid in full all invoices as submitted by Ketek Group Inc., or affiliated companies on or before their due dates;
  - (b) Representatives of Ketek Group Inc., are denied full and free right of access to the units;
  - (c) The Purchaser permits persons other than the agents of Ketek Group Inc. or those approved or authorized by Ketek Group Inc. to effect any replacement of parts, maintenance, adjustments, or repairs to the units;
  - (d) The Purchaser has not properly maintained the units in accordance with instructions, pamphlets or directions given or issued by Ketek Group Inc. at the time of the sale and/or from time to time thereafter;
  - (e) The Purchaser uses any spare parts or replacements not manufactured by or on behalf of Ketek Group Inc. and supplied by it, or by someone authorized by it, or fails to follow the instructions for the use of the same;
  - (f) The Purchaser misuses, or uses this unit for any purpose other than that for which it was intended or manufactured;
  - (g) The defective parts are not returned to Ketek Group Inc. within 15 days of repair.
6. No condition is made or is to be implied, nor is any Warranty given or to be implied as to the life or wear of the units supplied; or that they will be suitable for use under any specific conditions; notwithstanding that such conditions may be known or made known to the seller.
7. Defects in material and/or workmanship must be brought to the attention of Ketek Group Inc. by written notification within ten (10) days of discovery, and repairs must be commenced within forty-five (45) days thereafter.
8. It is agreed and understood that the Purchaser is responsible for and must pay for the transporting of the defective goods or of the replacement parts to the place of repair. Premium freight charges (such as air express or air fare charges for transportation of personnel, tools and for replacement parts) and other expenses, apart from servicemen's regular straight time travel, mileage, and regular straight time labour required to repair or replace defective parts and the cost of the parts, will be paid for by the customer at Ketek Group Inc. regular billing rates on usual credit terms.
9. The liability of Ketek Group Inc. under this Warranty is limited to the purchase price of the unit and in no case shall a claim be advanced for more than such amount.
10. All repairs and replacements are made and furnished subject to the same terms, conditions, warranties, disclaimer or warranty and limitations of liability and remedy as applied to each new unit sold.
11. This warranty and the Purchaser's rights under it, is not transferable, or is it assignable.

DATE IN SERVICE: \_\_\_\_\_ PURCHASED BY: \_\_\_\_\_

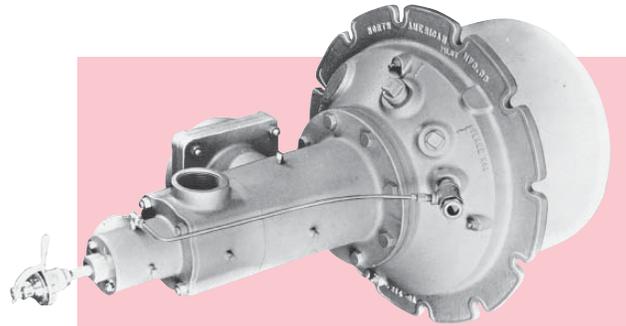
MODEL NUMBER: \_\_\_\_\_ SELLING BRANCH: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

**APPENDIX C • TECHNICAL SPECIFICATIONS OF WASTE OIL BURNER**

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- Dual Fuel Burner – gas or oil (light or heavy grade oil)
- Conventional forward flame pattern
- 1.8 to 30 million Btu/hr
- Chambers up to 2400F (with alloy nose)
- Includes low pressure fuel oil atomizer



6514 Burner Complete shown with optional (recommended) Sensitrol™ Oil Valve.

6514 FIRE•ALL Dual-Fuel Burners are nozzle mix, sealed-in burners for gas, light oil, or heavy oil. Capable of efficient operation throughout a wide temperature range, these burners are equally at home on low temperature ovens and high temperature forge and melting furnaces.

Ruggedly built for sustained, maintenance-free operation, 6514 Burners also provide for quick change of fuels without disturbing process operations.

Sealed mountings help maintain furnace pressure, controlled atmosphere, and closer air/fuel ratio control—all contributing to better product quality.

Fire•All Burners are a proven workhorse on all types of furnaces.

**COMBUSTION CHARACTERISTICS**

**Oil.** Oil viscosity at the burners must not exceed 100 SSU. Oil pressure at air/fuel Ratiotrol™ should be between 25 and 30 psi. Oil pressure at rated capacity is 10 to 15psi at Sensitrol™ and less than 1 psi at burner. Minimum atomizing air pressure at the burners is 14 osi for light oil, 22 osi for heavy oil.

**Gas.** Atomizing air (4 osi minimum) should be left on to protect the atomizer. Maximum required natural gas pressure at the burner for stoichiometric ratio is less than 4osi.

**Air/Fuel Ratio.** 6514 Dual-Fuel Burners are stable throughout a wide range from excess fuel to excess air. They can operate with excess fuel without forming carbon, but additional air for complete combustion must be available in the furnace near the burner.

For limits in a specific case, either rich or lean, consult Fives North American.

**Turndown.** Fire•All Burners can be turned down to atomizing air only (with fuel to match) except when burning residual oils in a cold, tight furnace.

**Total air capacities (including main and atomizing air)**

Burner designation	16 osi air pressure drop across the burner				24 osi air pressure drop across the burner				Approx. flame lengths with 16 osi main air (in open furnace)
	Air <sup>①</sup> scfh	Light oil <sup>②</sup> gph	Heavy oil <sup>③</sup> gph	Gas <sup>④</sup> scfh	Air scfh	Light oil gph	Heavy oil gph	Gas scfh	
6514-6	17 900	13	12	1 790	21 900	16	15	2 190	4' - 5'
6514-7	28 400	21	19	2 840	34 800	26	23	3 480	5' - 6'
6514-8-A	48 900	36	33	4 890	60 000	44	40	6 000	8' - 9'
6514-8-B	81 500	60	54	8 150	100 000	74	67	10 000	9' - 12'
6514-9	165 000	122	110	16 500	202 000	150	135	20 200	15' - 18'
6514-10	247 000	183	165	24 700	303 000	224	202	30 300	20'

① For Btu/hr, multiply by 100    ② Light oil at 135 000 Btu/gal.    ③ Heavy oil at 150 000 Btu/gal.    ④ Natural gas at 1000 Btu/cf.

Burner designation	Main air capacities in scfh						Atomizing air capacities in scfh					
	1	5	6	8	12	16	14	16	18	20	22	24
6514-6	3 710	8 300	9 100	10 500	12 900	14 900	2 800	3 000	3 180	3 360	3 510	3 660
6514-7	6 100	13 600	15 000	17 200	21 000	24 400	3 770	4 030	4 270	4 500	4 720	4 900
6514-8-A	10 600	23 700	26 000	30 000	36 700	42 400	6 050	6 500	7 000	7 300	7 600	7 850
6514-8-B	17 600	39 200	43 000	49 600	60 500	70 000	10 600	11 300	12 000	12 700	13 200	13 800
6514-9	36 600	82 000	89 500	104 000	127 000	146 000	17 200	18 400	19 600	20 700	21 600	22 500
6514-10	54 500	122 000	135 000	154 000	189 000	218 000	27 200	29 100	30 900	32 600	34 100	35 500

**Flame Supervision.** An ultraviolet cell† will monitor pilot or main flame on gas or oil. For maximum safety, Fives North American urges **interrupted** pilots when flame safeguards are used--pilots should be on only for a preset ignition period (usually 15 seconds), after which flame supervision detects main fire only. Adapters for mounting flame detection devices on 6514 Burners are tabulated on Bulletin 8832.

**Tile/Installation.** Burner tiles are cast refractory rated for 2800F furnace temperature. They should be supported securely in the furnace wall by castable refractory (not insulation) at least 9" thick all around the tile, extending back to the furnace shell and securely anchored to it. (See Supplement DF-M1.)

Tiles are replaceable in the field except for the 6514-10, whose mounting must be returned to the factory for tile replacement (or purchase a spare mounting plate with a tile cast onto it).

**Complete burners include** tile, mounting plate, and an observation port into which a small quantity of atomizing air is introduced to keep the glass clear. Order pilot tips and Sensitrol™ Oil Valve separately. See 6514 Dimension Sheet for recommended Sensitrol™ oil valve and premix pilot tip.

**Jacketed Tile** options are available for applications where the tile is not supported by furnace refractory. Jackets are available in three different metals and have maximum temperature ratings for each. They must be protected with sufficient insulation so as not to exceed rated temperature. The maximum temperature rating depends upon frequency of heat-up/cool-down cycles. As an example, batch annealing furnaces that are heated and cooled every day should use the "intermittent exposure" ratings. Continuous annealing furnaces that remain at the same temperature for months at a time, can use the higher "continuous" rating.

Designation	Jacket Metal	Continuous max.temp.	Intermittent exposure
6514- -LC	carbon steel	700 F	700 F
6514- -L4	304 stainless	1600 F	1500 F
6514- -L9	309 stainless	1900 F	1800 F

† Cleaning air must be introduced into the port downstream of the sensor to keep oil and poc's off the lens.

**CLEARANCE DIMENSIONS** (for details, see Dimensions 6514)

Burner designation	dimensions in inches									Wt. lbs.
	A <sup>†</sup>	B	C	D	E	F	G	H	I	
6514-6	3	2	1½	¾	18¾	9	15	10¾	19½	195
6514-7-	4	2½	2	¾	20 <sup>13</sup> / <sub>16</sub>	8 <sup>7</sup> / <sub>8</sub>	16	11¾	20½	225
6514-8-A	6	2½	2½	¾	27 <sup>7</sup> / <sub>16</sub>	10	17¾	12¾	22¾	335
6514-8-B	6	3	3	¾	31¼	12 <sup>7</sup> / <sub>8</sub>	19	13½	24	450
6514-9	8	4	4	½	38 <sup>5</sup> / <sub>8</sub>	13 <sup>7</sup> / <sub>16</sub>	23	16	28	795
6514-10	10	6	6	½	45 <sup>5</sup> / <sub>8</sub>	13 <sup>3</sup> / <sub>8</sub>	27½	20½	32½	1035

† SW connection standard for -9 and -10 only.

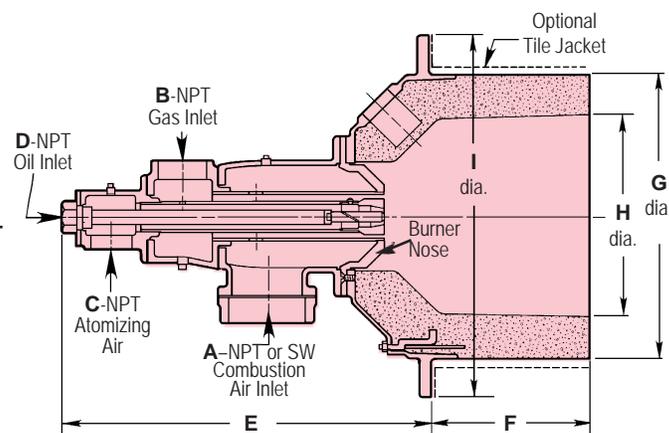
**Burner Nose** options are available for sizes shown below and can be specified in the product number. The burner nose establishes main combustion air flow and influences flame propagation. Nose material is either cast iron that is suitable for cold air applications up to 1800F, or cast stainless alloy for preheated air (maximum 700F) applications up to 2400F.

Mat'l	Cap'y	-6	-7	-8A	-8B	-9	-10
Cast iron	1.0	√	√	√	√	√	√
Cast Alloy	1.0	√	√	√	√	√	√
Cast iron	1.1		√	√	√	√	√
Cast Alloy	1.1		√	√	√	√	√
Cast iron	1.2			√	√	√	√
Cast Alloy	1.2			√	√	√	√
Cast iron	1.3			√	√	√	√
Cast Alloy	1.3			√	√	√	√

The product designation 1.0 represents standard main air capacity shown on page 1. Use of an extra capacity burner nose will result in either more air at 16 psi or standard air flow at lower pressure. Extending the capacity of the burner by increasing air pressure beyond 16 psi, or using the extra capacity nose, is acceptable for most gas and light oil applications. Specific applications involving either low Btu fuels or heavy oil and extra capacity should be reviewed with Fives North American.

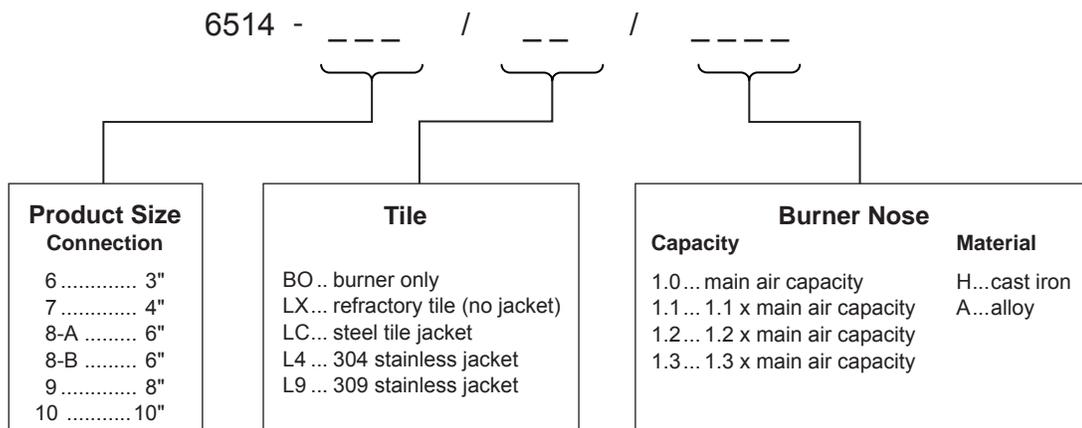
Also, when firing extra capacity, the combustion air flow velocity within the supply piping, and associated pressure loss, can be excessive for some burners. The -8B, -9 and -10 products when operated at 1.2 or 1.3 capacity will develop high pipe velocity based on the burner's air connection size. As an alternative to increasing blower pressure, an oversized air inlet can be purchased separately for these size burners. The connections are SW-type (slip-on sleeve or welded construction) and are one pipe size larger than the standard supply. Nose and oversize air connection part numbers can be found in supplement literature (see Parts List and Burner Options documents).

**Options** are available for the 6514 burner but require consultation with your Fives North American for application and ordering information. See Sheet 6514-3 for an overview of burner options.



DIMENSIONS SHOWN ARE SUBJECT TO CHANGE. PLEASE OBTAIN CERTIFIED PRINTS FROM FIVES NORTH AMERICAN COMBUSTION, INC. IF SPACE LIMITATIONS OR OTHER CONSIDERATIONS MAKE EXACT DIMENSION(S) CRITICAL.

## Ordering Information



Example 1 6514-8-A/LC/1.2A Fireall gas burner complete with carbon steel jacketed tile and 1.2 capacity alloy nose

Example 2 6514-6/BO/1.0H Fireall gas burner only with standard capacity iron nose

Example 3 6514-9/LX/1.2H Fireall gas burner complete with refractory tile and 1.2 capacity iron nose

*Note: See Supplement 6514-6 for cross referencing old product numbers.*

**WARNING:** Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and insurance Underwriters recommendations, and care in operation.

Fives North American Combustion, Inc. - 4455 East 71st Street - Cleveland, OH 44105 USA - Phone 216.271.6000  
 Fax 216.641.7852 - email: [fna.sales@fivesgroup.com](mailto:fna.sales@fivesgroup.com) - [www.fivesgroup.com/fivesna](http://www.fivesgroup.com/fivesna)

**APPENDIX D • REGISTRATION FORM FROM THE NUNAVUT DEPARTMENT OF ENVIRONMENT: USED OIL AND WASTE FUEL APPLIANCE**

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## APPENDIX 4 – REGISTRATION FORM: USED OIL AND WASTE FUEL APPLIANCE

A copy of the Used Oil and Waste Fuel Appliance registration form and user's guide is available by contacting the Nunavut Department of Environment or by downloading the documents at <http://env.gov.nu.ca/programareas/environmentprotection>. Although registration is voluntary, it enables Nunavut's Department of Environment to better manage used oil and waste fuel by maintaining an up-to-date inventory of certified appliances operating in Nunavut.

### Instructions

1. The following information must be provided in order to register a used oil or waste fuel appliance and obtain a registration number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Environmental Protection Division, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to [EnvironmentalProtection@gov.nu.ca](mailto:EnvironmentalProtection@gov.nu.ca).
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying user's guide for further assistance on completing the generator registration form.
5. There is no fee for registering a used oil or waste fuel appliance with the Department of Environment.

### Section 1 - Identification

Applicant (Legal Name) Agnico Eagles Mines Limited- Meliadine Project

Mailing Address Suite 879- Rankin Inlet, Nunavut, Canada

Postal Code X0C 0G0

Principle Contact Person Martin Theriault Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171 Email martin.theriault@agnicoeagle.com

### Section 2 – Description of Operation

General Type of Business Mining Industry

Site Location(s) Where the Waste is Generated Meliadine project, Rankin Inlet- Incinerator area

Make, Model and Size of the Appliance 5000L waste oil tank- Hassco- 5000L DW S601

Waste Oil tank level switch- Ketch industrail FS301-01: Mixer- NP HGL 3.3

### Section 4 - Certification

*I certify that the information provided on this form is correct, accurate and complete.*

Signature of Contact Person \_\_\_\_\_ Date (dd/mm/yy) 2019-01- 16

Print Name of Contact Person Martin Theriault Title Compliance counselor

Phone 1-819-759-3555; EX: 4608171 Email martin.theriault@agnicoeagle.com

#### For Department Use Only

Appliance Registration Number NUA# \_\_\_\_\_ Approved by \_\_\_\_\_ Date \_\_\_\_\_