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# AFII

## 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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# General Information

## Hazard Definitions

**DANGER** Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

**WARNING** Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

**CAUTION** Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

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.

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

**CAUTION** **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.*

**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.

**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.

**WARNING** Impaired Burner Performance and Fire Hazard.

Do NOT operate the burner beyond specifications outlined in the following Table.

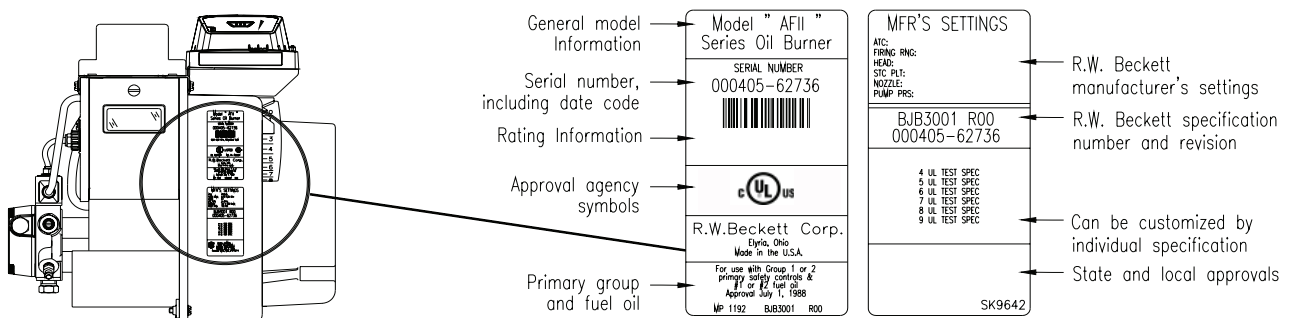
- For applications beyond these limits, consult Beckett Technical Service at 1-800-645-2876.
- NOTE: Some packaged appliances with burners may be agency listed as a unit to operate beyond these limits. Consult the appliance manufacturer's specifications and agency approvals for verification.

**Table 1 – Burner Specifications**

Capacity	'HLX' Heads Firing rate: 0.40 – 1.50 GPH Input: (Min./Max.) 56,000 /210,000 Btu/h  'FBX' Heads Firing rate: 0.40 – 1.35 GPH Input: (Min./Max.) 56,000/189,000 Btu/h
Certification/ Approvals	UL listed to comply with ANSI/UL296 and CSA-B140.0
Fuels	USA: No. 1 or No. 2 heating oil only (ASTM D396) Canada: No. 1 stove oil or No. 2 furnace oil only  <b>CAUTION</b> DO NOT USE GASOLINE, CRANKCASE OIL, OR ANY OIL CONTAINING GASOLINE.
Electrical	Power supply: 120 volts AC, 60 Hz, single phase Operating load: 5.8 Amps max Motor: 1/7 hp, 3450 rpm, NEMA 48M frame PSC rotation CCW when facing shaft end. Ignition: Continuous duty solid-state igniter
Fuel pump	Outlet pressure: Note 1
Air tube	ATC code: See Table 2
Dimensions (with cover)	Height (Maximum): 13 inches Width (Maximum): 14 inches Depth: 6-11/16 inches Air tube diameter: 3-1/2 inches
Ambient Operating Temperature	+32° F. (0° C.) Minimum +115° F. (+46° C.) Maximum (See Burner Specifications Warning to the left)
Moisture	5% to 95% RH, non-condensing and non-crystallizing

\*Note 1. See appliance manufacturer's burner specifications for recommended outlet pressure.

**Figure 1. Burner label location**



**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 & 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**.

## Inspect/Prepare Installation Site

### Clearances to Burner and Appliance

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

### Combustion Chamber and Burner Retrofitting

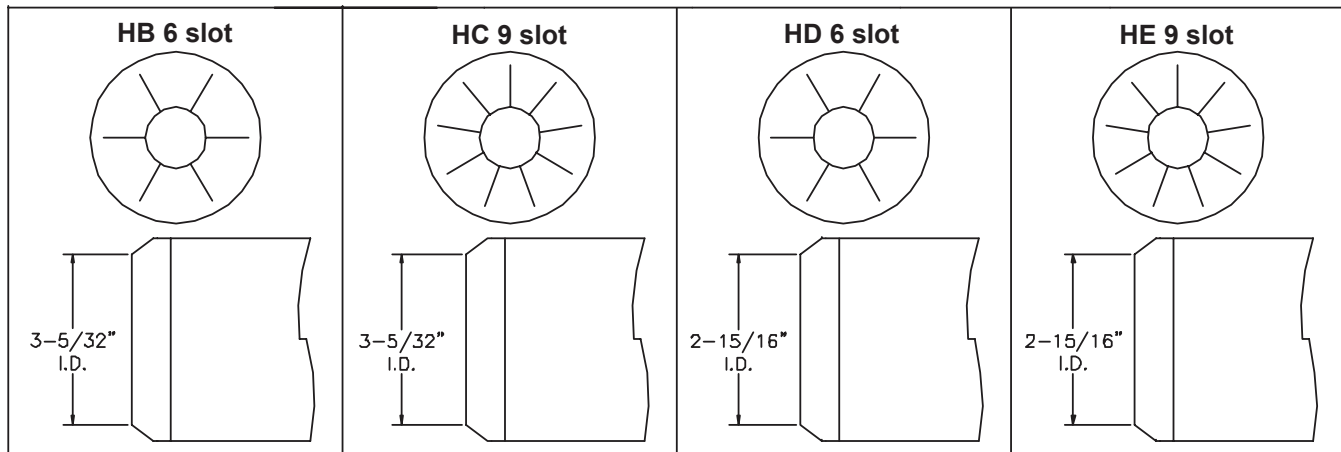
Verify that the combustion chamber provides at least the minimum dimensions given in **Table 3**.

### 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**.

**Table 2 – Air Tube Combinations (ATC) & Dimensions**

	ATC codes for usable air tube lengths dim. "A" (Figure 3)						Firing rate range (gph)Min-Max		
	3"	5"	7"	9"	ATC Code	Head	AFII 85	AFII 100	AFII 150
Adjustable w/stop screw Head Design	HLX30	HLX50	HLX70	HLX90	HB	AF2-6	0.4-0.85 gph	0.65-1.00 gph	0.75-1.35 gph
	HLX30	HLX50	HLX70	HLX90	HC	AF2-9	N/A	0.65-1.00 gph	0.75-1.50 gph
	HLX30	HLX50	HLX70	HLX90	HD	AF2-6	0.40-0.85 gph	0.65-1.00 gph	0.75-1.10 gph
	HLX30	HLX50	HLX70	HLX90	HE	AF2-9	N/A	0.65-1.00 gph	0.75-1.35 gph
Head Design - Fixed	FBX30	FBX50	FBX70	FBX90	HFXS	FB0	0.40-0.65 gph	0.55-0.75 gph	0.75-1.00 gph
	FBX30	FBX50	FBX70	FBX90	HGXS	FB3	0.55-0.85 gph	0.55-1.10 gph	0.85-1.20 gph
	FBX30	FBX50	FBX70	FBX90	HHXS	FB4	N/A	0.75-1.10 gph	1.10-1.25 gph
	FBX30	FBX50	FBX70	FBX90	HIXS	FB6	N/A	0.85-1.15 gph	1.15-1.35 gph



**Table 3 – Minimum Combustion Chamber Dimensions (inches)**

Firing Rate (gph)	Round I.D.	Rectangular		Height	Floor to nozzle
		Width	Length		
0.50	8	7	8	12	5 to 6
0.75	9	8	9	12	5 to 6
1.00	10	9	10	12-1/2	5 to 6
1.25	11	10	11	12-1/2	5 to 6
1.50	12	11	12	13	6 to 7

- Any accumulation of soot or debris in chimney offsets should be removed
- Any obstructions such as a protruding joint or a piece of broken tile wedged in the chimney should be removed.
- No other appliance connection should be made to the same flue pipe.
- 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.
- Any leakage between tiles, around clean-out doors, or around the vent pipe should be sealed.

**INSULATED STAINLESS STEEL CHIMNEY LINERS**

**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.

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.

## Combustion Air Supply Information



### 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.

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

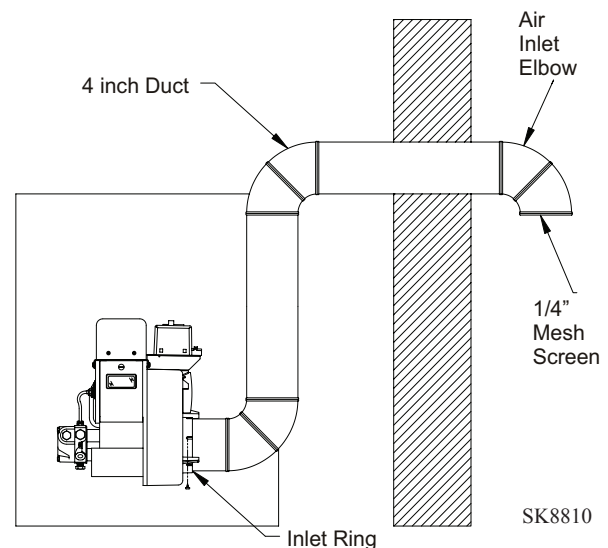
**Exhaust fans and other air-using devices:** Size air openings large enough to supply all air-using devices in addition to the minimum size required for combustion air. If there is any possibility of the equipment room developing a negative pressure due to exhaust fans, clothes dryers, etc., either pipe combustion air directly to

the burner or provide a sealed enclosure for the burner and supply it with its own combustion air supply.

## Direct/Sidewall Venting Application

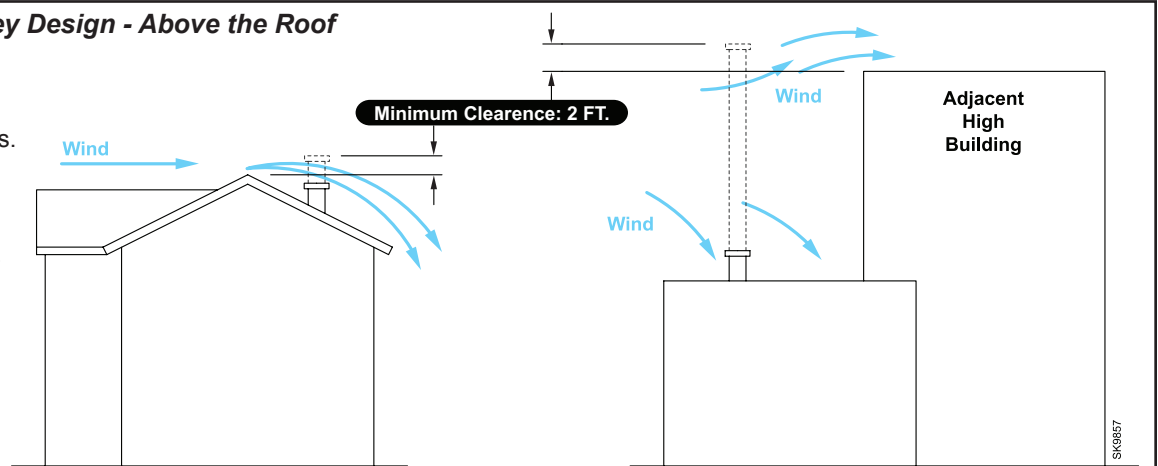
- When sidewall venting appliances, carefully follow appliance and power venter instructions for installation and wiring.
  - AFII burners are equipped with a removable air inlet to allow use of a 4" duct to supply outside air for combustion. Do not exceed 50 equivalent feet. Allow 6 feet for each elbow.
1. Remove the inlet cover.
  2. Insert 4" duct into the inlet ring.
  3. Fasten duct into place using at least 3 sheet metal screws evenly spaced around the inlet ring. Refer to **Figure 3**.
  4. Remove the barometric draft control unless it is in the same atmospheric pressure zone as the inlet.

**Figure 3. Outside Air Connection**



**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.



- On the outside of the home use a 90° elbow pointed downward with a 1/4" mesh screen over its opening. The air inlet elbow must be located above the snow line and in such a way as to prevent leaves and/or other debris from blocking the air flow. Such debris will prevent proper operation of the burner. Refer to local codes for proper location of inlet.

## 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.

For fuel line installation, continuous lengths of heavy wall copper tubing are recommended. Always use flare fittings. Never use compression fittings.

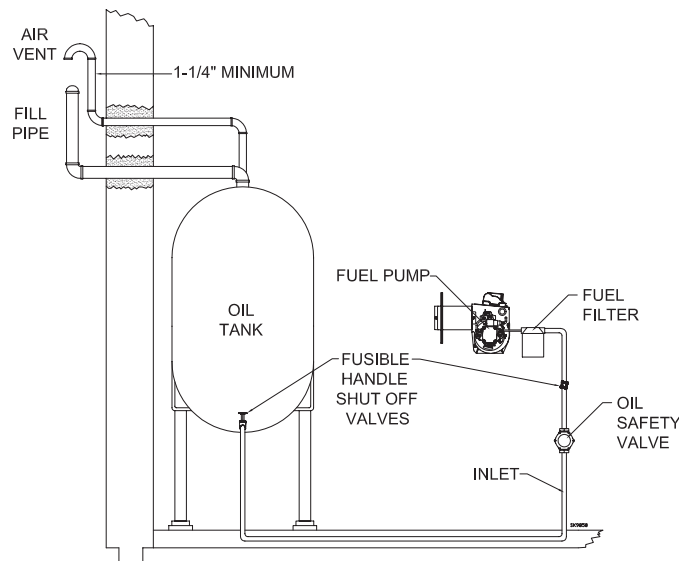
**Note:** to determine the proper fuel line size, refer to the fuel pump manufacturer's instructions provided with the burner. Refer to **Figure 4** or **Figure 5** for typical installation layouts.

Always install fittings in accessible locations. To avoid vibration noise, fuel lines should not run against the appliance or ceiling joists.

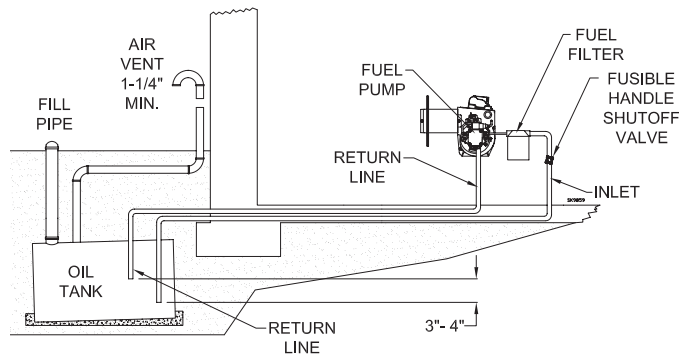
### Fuel Line Valves and Filter

Install two high quality, oil duty rated, fusible handle design shutoff valves in accessible locations on the oil supply line. Locate one close to the tank and the other close to the burner, upstream of the filter for service access.

**Figure 4. – Inside Tank Gravity Feed System**



**Figure 5. – Outside Buried Tank-Lift System**



## Prepare the Burner

### General

In most cases, the burner is ready to mount to the appliance. There can be situations where the burner needs to be reconfigured to perform properly in the appliance. Review the appliance manufacturer's specifications prior to installing to determine if any modification is required to properly configure the burner. Instruction on how to perform the following burner preparation tasks can be found in the Professional Maintenance section.

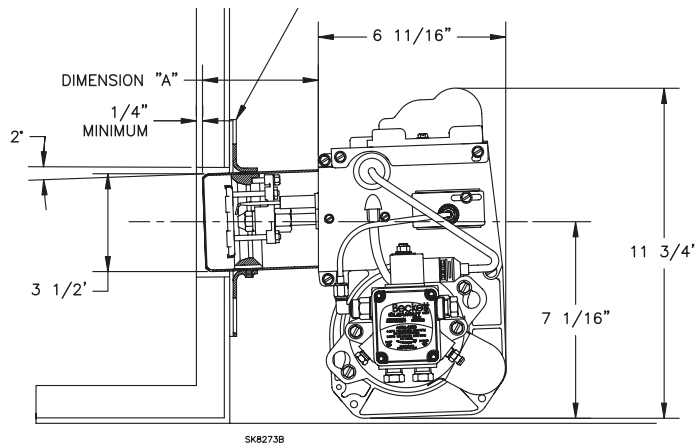
- Remove / install burner nozzle
- Check head/air adjusting plate



## Mount Burner on Appliance

Verify that the air tube installed on the burner provides the correct insertion depth. Refer to **Figure 6**.

**Figure 6. – Mounting Burner in Appliance**



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 retention ring to extend into the chamber, unless otherwise specified by the appliance manufacturer.

Bolt the burner to the appliance using the factory-welded flange.

## Connect Fuel Lines

### **WARNING** Do Not Install By-pass Plug with 1-Pipe System

**Failure to comply could cause immediate pump seal failure, pressurized oil leakage and the potential for a fire and injury hazard.**

- The burner is shipped without the by-pass plug installed.
- Install the by-pass plug in two-pipe oil supply systems **ONLY**.

The burner is supplied with either a one-stage pump or a two-stage pump based on the oil supply system requirements. Consult the instructions provided with the pump for installation specifications.

When installing a **one-pipe system**, connect the inlet line to the pump inlet. The fuel pump may be installed with gravity feed or lift. The maximum allowable lift for a single pipe installation is 8 ft.

When installing a **two-pipe system**, remove the 1/16" pipe by-pass plug from plastic bag attached to fuel unit. Remove 1/4" plug from return port. Insert and tighten the by-pass plug. Attach return and inlet lines. The return line should terminate approximately 3 to 4 inches above supply line inlet. Failure to do this may introduce air into the system and could result in loss of prime.

## Wire Burner

### Burner packaged with appliance

#### **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 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 8a and 8b, 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.

The 7505 primary control with valve-on delay (pre-time) and burner motor-off delay (post-time) requires 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.

### Special wiring required with covered burners

The mounting plate is not a conduit connection point. Pass conduit and attached connector through the opening in the mounting plate and attach it directly to the burner-mounted 4x4 electrical box.

If attaching a burner cover to a previously installed burner, attach the mounting plate and then slide the conduit into the "J" shaped conduit slot.

# Burner Controls

## GeniSys Model 7505 Control

**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 52067 GeniSys Display)
- 15 Second Lockout Time
- Interrupted or Intermittent Duty Ignition
- Technician Pump Priming Mode
- Disable Function
- Communication Ports

## 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.

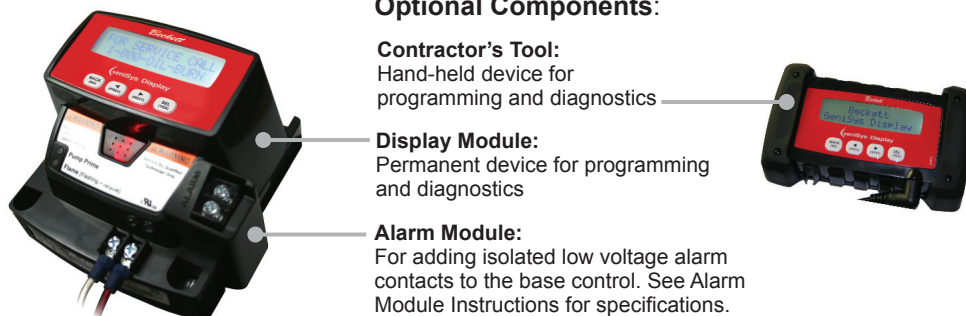
**CAUTION** Incorrect Wiring Will Result in Improper Control Operation

- 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 7 - 7505 Control

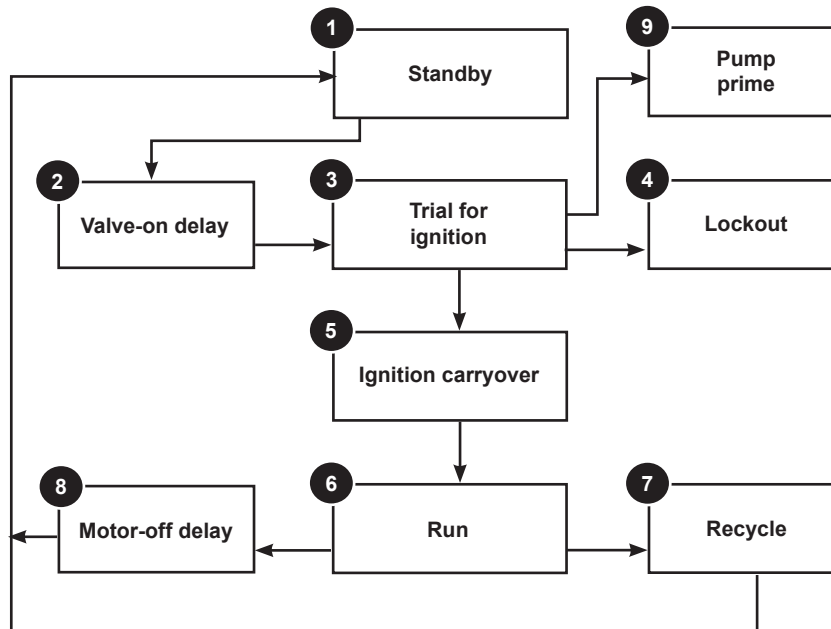


### Optional Components:



**Typical Burner Sequence of Operation for GeniSys 7505 Control.**

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.

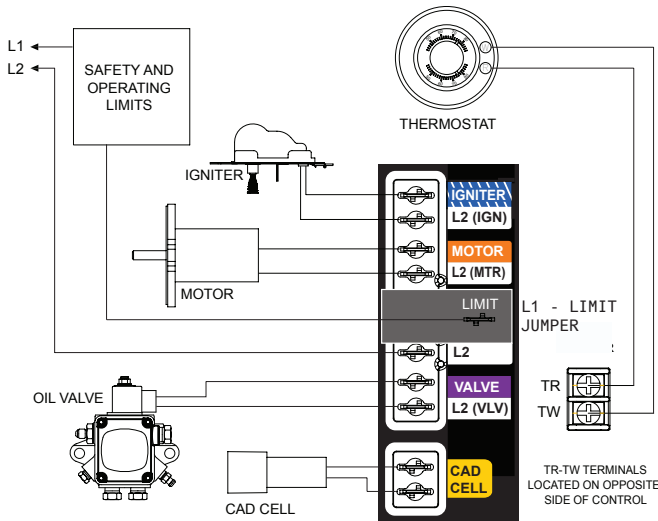
To reset from Hard Lockout, hold the reset button for 15 seconds until the yellow light turns on.

5. **Ignition Carryover:** Once flame is established,

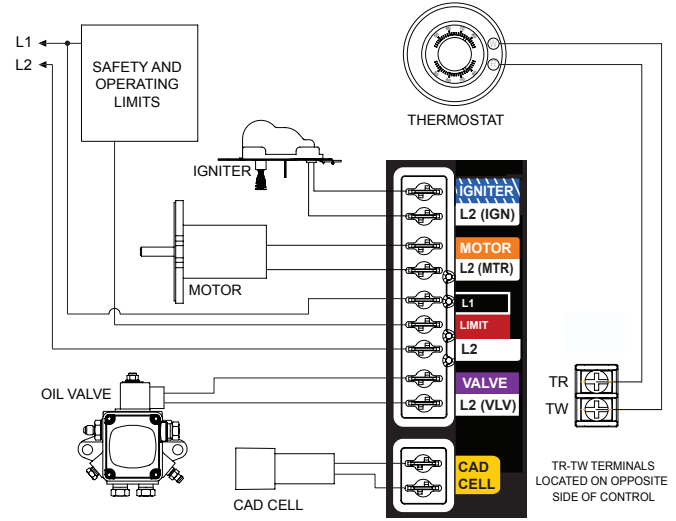
the igniter remains on for 10 additional seconds to ensure flame stability.

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 8a. – Interrupted ignition, valve-on delay only (no motor-off delay)**



**Figure 8b. – Interrupted ignition, valve-on delay and motor-off delay**



**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.

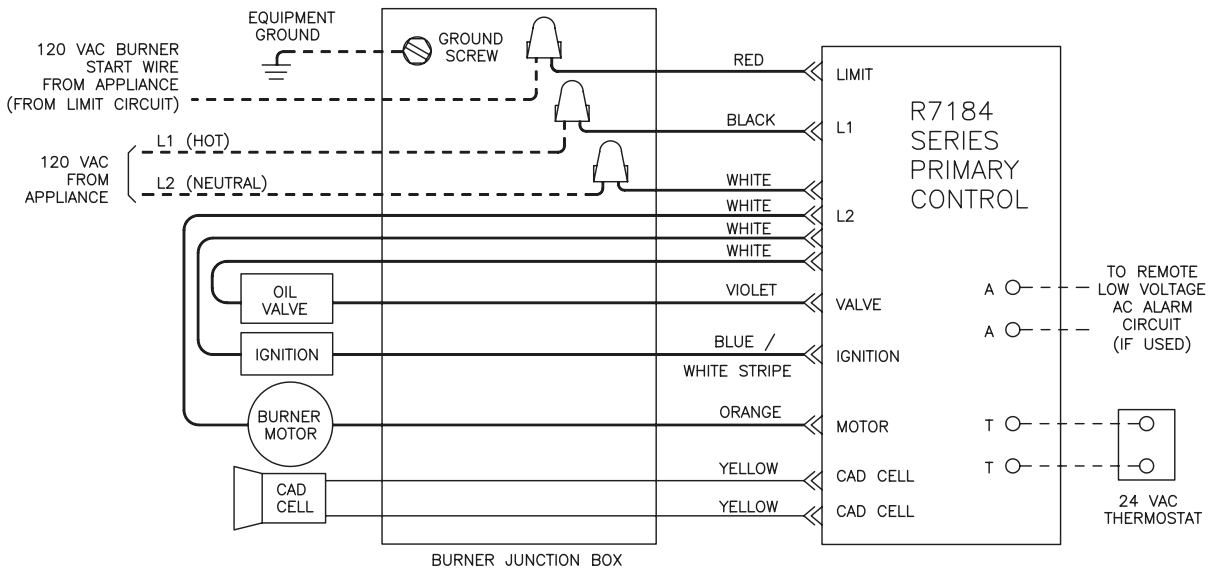
**Table 2 - Reset Button Operation**

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

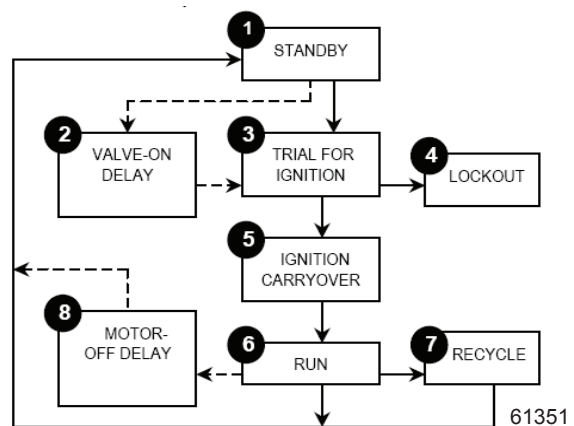
**Figure 9 - Typical Burner Wiring & Burner Sequence of Operation for R7184P Control.**  
Refer to the appliance manufacturer's wiring diagram for actual specifications.



SK9359D    - - - - = 120 VAC FIELD WIRING    ——— = LOW VOLTAGE FIELD WIRING    = WIRENUT    = WIRE WITH 1/4" QUICK CONNECT RECEPTACLE  
 ——— = 120 VAC FACTORY WIRING    ——— = LOW VOLTAGE FACTORY WIRING

1. **STANDBY.** The burner is idle, waiting for a call for heat. When a call for heat is initiated, there is a 3-10 second delay while the control performs a safe start check.
2. **VALVE-ON DELAY.** The ignition and motor are turned on for a 15 second valve-on delay.
3. **TRIAL FOR IGNITION (TFI).** The fuel valve is opened. A flame should be established within the 15 second lockout time.
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.
5. **IGNITION CARRYOVER.** Once flame is established, the ignition remains on for 10 seconds to ensure flame stability before turning off. If the control is wired for intermittent duty ignition, the ignition unit stays on the entire time the motor is running.
6. **RUN.** The burner runs until the call for heat is satisfied. The burner is then sent to burner 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 then repeats the above ignition sequence. If flame is lost three times in a row, the control locks out to prevent cycling with repetitious flame loss due to poor combustion.
8. **BURNER MOTOR-OFF DELAY.** The fuel valve is closed and the burner motor is kept on for the selected motor-off delay time before the control returns the burner to standby.



**Control System Features**

Feature	Interrupted ignition	Limited reset, Limited recycle	Valve-on delay	Burner motor off delay	Alarm Contacts
R7184A	YES	YES	—	—	—
R7184B	YES	YES	YES	—	—
R7184P	YES	YES	YES	YES	Optional



## Wire Burner

### NOTICE

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

Connect the wire from the R<sub>H</sub> 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 8a** and **8b**. Refer to the label on the underside of the control for wiring details.
- Note: Motor-off delay on a 7505P will be disabled if the safety and operating limits as shown in **Figures 8a and 8b** 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 and Set Combustion

### **WARNING** Hot Gas Puff-Back and Heavy Smoke Hazard


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

- Do not allow oil to spray into a hot combustion chamber while bleeding air from the pump.
- 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 during the air bleed procedure.
- Ensure that all bubbles and froth are purged from the oil supply system before tightening the pump bleed valve.
- Ensure that the appliance is free of oil and oil vapor before starting or resetting the burner.

1. Open the shutoff valves in the oil supply line to the burner.
2. Open the air dial. This is an initial air setting for the pump bleeding procedure only. Additional adjustments must be made with instruments.

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. Priming the Pump
6. Prepare the burner for priming by attaching a clear plastic hose over the bleed port fitting and fully opening the pump bleed port. Use a suitable container to collect purged oil.
7. Initiate a call for heat.
8. After the burner starts, press and hold the reset button for 15 seconds until the yellow light turns on. This indicates that the button has been held long enough.
9. Release the reset button. The yellow light will turn off and the burner will start up again.
10. At burner start up, click the reset button while the igniter is still on. This will transition the control to a dedicated Pump Prime mode, during which the motor, igniter, and valve are powered for four minutes. The yellow light will be on.
11. Bleed the pump until all froth and bubbles are purged. If desired, terminate the call for heat or hold the reset button for at least one second to exit Pump Prime mode and return to Standby.
12. At the end of 4 minutes, the yellow light will turn off and the control will automatically return to standby mode.
13. If prime is not established during the four minute pump prime mode, return to the previous steps to re-enter Pump Prime mode. Repeat Step 5 until the pump is fully primed and the oil is free of bubbles..
14. For R7184 primary controls, see part number 61351 or 61465, for special pump priming sequence.
15. Prepare for combustion tests by drilling a 1/4" sampling hole in the flue pipe between the appliance and the barometric draft regulator.
16. Initial air adjustment — Using a smoke tester, adjust the air dial (and change firing pin on HLX ATC's, if necessary) to obtain a clean flame. Now the additional combustion tests with instruments can be made.

### 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 dial until a trace of smoke is achieved.
- Step 2:** At the trace of smoke level, measure the CO<sub>2</sub> (or O<sub>2</sub>) . This is the vital reference point for further adjustments. Example: 13.5% CO<sub>2</sub> (2.6% O<sub>2</sub>)
- Step 3:** Increase the air to reduce the CO<sub>2</sub> by 1.5 to 2 percentage points. (O<sub>2</sub> will be increased by approximately 2.0 to 2.7 percentage points.) Example: Reduce CO<sub>2</sub> from 13.5% to 11.5% (2.6% to 5.3% O<sub>2</sub>).
- 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 dial, rear access door, 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.

The following guidelines are provided for routine maintenance.

- 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 an exact replacement as specified by the appliance manufacturer.
- 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 cables and connections.
- Clean the cad cell grid 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 nozzle line assembly 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.

## 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 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.

## 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.

## Removing Nozzle Line for Service

**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 (90 torque inch pounds). For typical nozzle flow rates at various pressures refer to **Table 5**.

**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 (factory std.)	150 psi	175 psi	200 psi
0.40	0.45	0.47	0.49	0.53	0.56
0.50	0.56	0.59	0.61	0.66	0.71
0.60	0.67	0.71	0.74	0.79	0.85
0.65	0.73	0.77	0.80	0.86	0.92
0.75	0.84	0.89	0.92	0.99	1.06
0.85	0.95	1.01	1.04	1.13	1.20
0.90	1.01	1.07	1.10	1.19	1.27
1.00	1.12	1.18	1.23	1.32	1.41
1.10	1.23	1.30	1.35	1.46	1.56
1.20	1.34	1.42	1.47	1.59	1.70
1.25	1.39	1.48	1.53	-	-
1.35	1.51	-	-	-	-

1. Turn off power to burner before proceeding.
2. Disconnect copper oil connector tube from nozzle line.
3. Loosen the screw that fastens the rear access door.
4. Remove splined nut.
5. Remove the nozzle line assembly from the burner, being careful not to damage the electrodes or insulators while handling. Stop halfway to remove igniter/transformer wires.
6. To replace the nozzle assembly, reverse the above steps. "HLX" head air tubes – Be sure stop screw is fastened securely. Seat stop screw on back of choke ring to set the position of the head. "FBX" head air tubes – Use T gauge to set the "Z" dimension to 1-1/8" +/- 1/32"

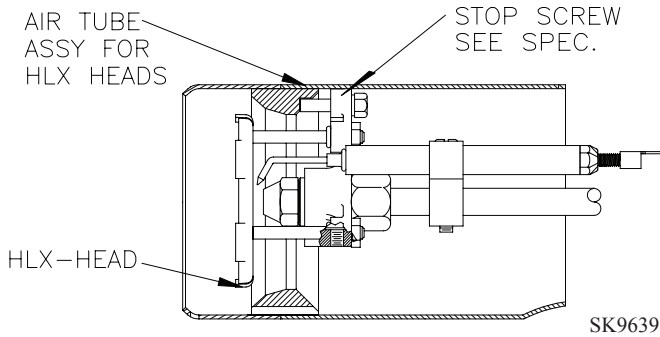
## Nozzle Installation

Perform the following steps when replacing a nozzle.

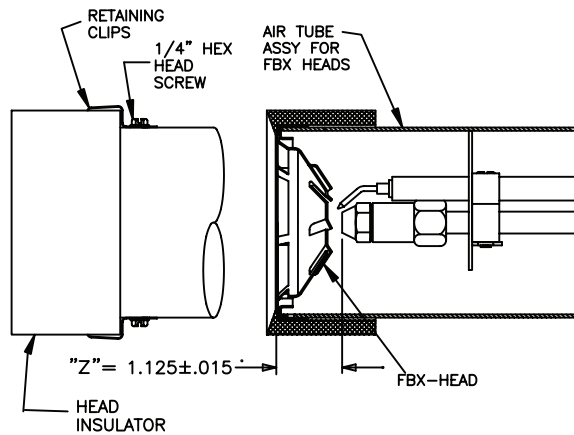
1. Remove the nozzle line assembly to gain access to the nozzle.
2. Use a 3/4" open-end wrench to hold the nozzle adapter. DO NOT attempt to remove or replace the nozzle without securing the adapter, as nozzle alignment could be seriously affected.
3. Do not squeeze the electrodes when handling the nozzle line assembly. Excessive force could change the electrode tip settings or damage the ceramic electrode insulators.
4. Use a 5/8" open-end wrench to carefully remove the existing nozzle.
5. Inspect the nozzle adapter before installing the new nozzle. If it is grooved or scratched on the sealing surface, replace the nozzle line assembly. If the surface is damaged, oil could leak at the nozzle to adapter joint, causing serious combustion problems.
6. Protect the nozzle orifice and strainer when installing. If the orifice gets dirt in it or is scratched, the nozzle will not function properly.
7. To install a new nozzle, place a 3/4" open-end wrench on the nozzle adapter. Insert the nozzle into the adapter and secure finger tight. Finish tightening with a 3/8" open-end wrench. Use care to avoid bending the burner head support legs or electrodes.
8. Do not over-torque the nozzle when installing. This will cause deep grooves in the nozzle adapter, preventing a seal when a new nozzle is installed.
9. Carefully check and realign the electrode tips after replacing a nozzle, ensuring the electrode settings comply with **Figure 11a** or **11b**.

10. If the head was removed when replacing the nozzle, carefully reconnect the head to the nozzle adapter. Push the head support until it stops against the nozzle shoulder. Verify the dimension between the nozzle face and the back of the head is  $5/32"$ .

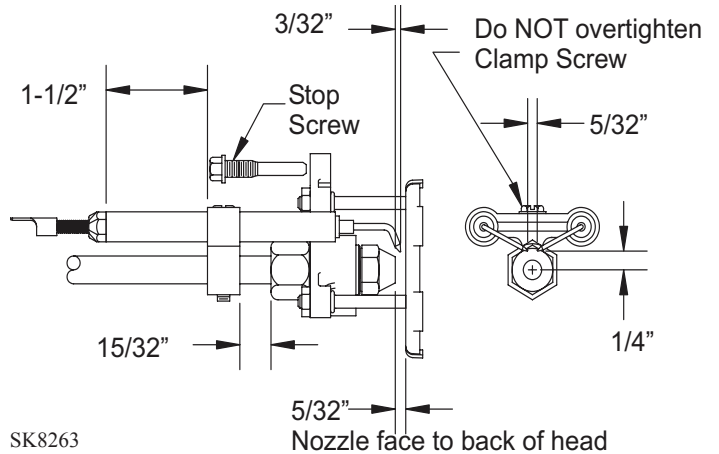
**Figure 10a. HLX Air Tube**



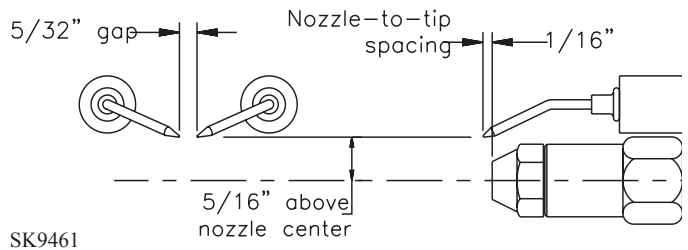
**Figure 10b. FBX Air Tube**



**Figure 11a. Electrode Settings-HLX Air Tube Combinations**



**Figure 11b. Electrode Settings-FBX Air Tube Combinations**



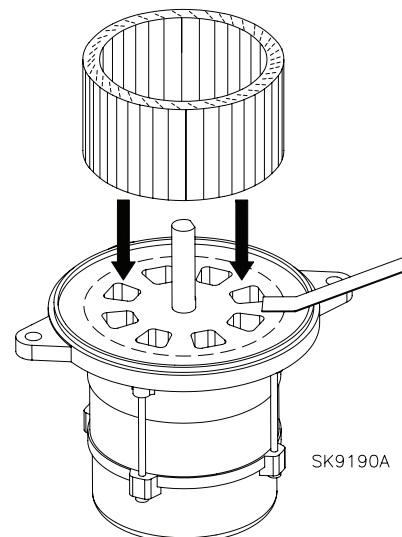
### Check/Adjust Electrodes

Check the electrode tip settings, as shown in **Figure 11a** or **11b**. If necessary, adjust by loosening the electrode clamp screw and slide/rotate the electrodes as necessary. When the adjustment is complete, securely tighten the clamp screw.

### Blower Wheel Replacement

For installation or replacement of a blower wheel, insure that there is a space between the blower wheel and the motor face of  $0.062"$  ( $1/16" \pm 1/64"$ ). Refer to **Figure 12**.

**Figure 12. – Blower Wheel Replacement**



**HLX Firing Rate**

Stop Screw	AFII 85	AFII 100	AFII 150
0	0.40-0.65	0.5-0.65	0.75-1.00
1	-	0.6-0.75	0.85-1.10
2	-	0.65-0.80	0.95-1.15
3	0.60-0.75	0.65-0.90	0.95-1.20
4	-	0.75-0.95	1.10-1.25
5	0.70-0.85	0.85-1.00	1.15-1.35
6	-	0.95-1.10	1.15-1.40
7	-	-	1.25-1.50
8	-	-	1.30-1.50

**HLX Air Dial Setting**

Firing Rate @ 140 psig	AFII 85	AFII 100	AFII 150
0.40-0.65	3	-	-
0.60-0.75	4	3	-
0.70-0.85	5	4	-
0.75-1.00	-	5	2
0.95-1.20	-	-	3
1.15-1.35	-	-	4
1.25-1.50	-	-	5

**FBX Firing Rate**

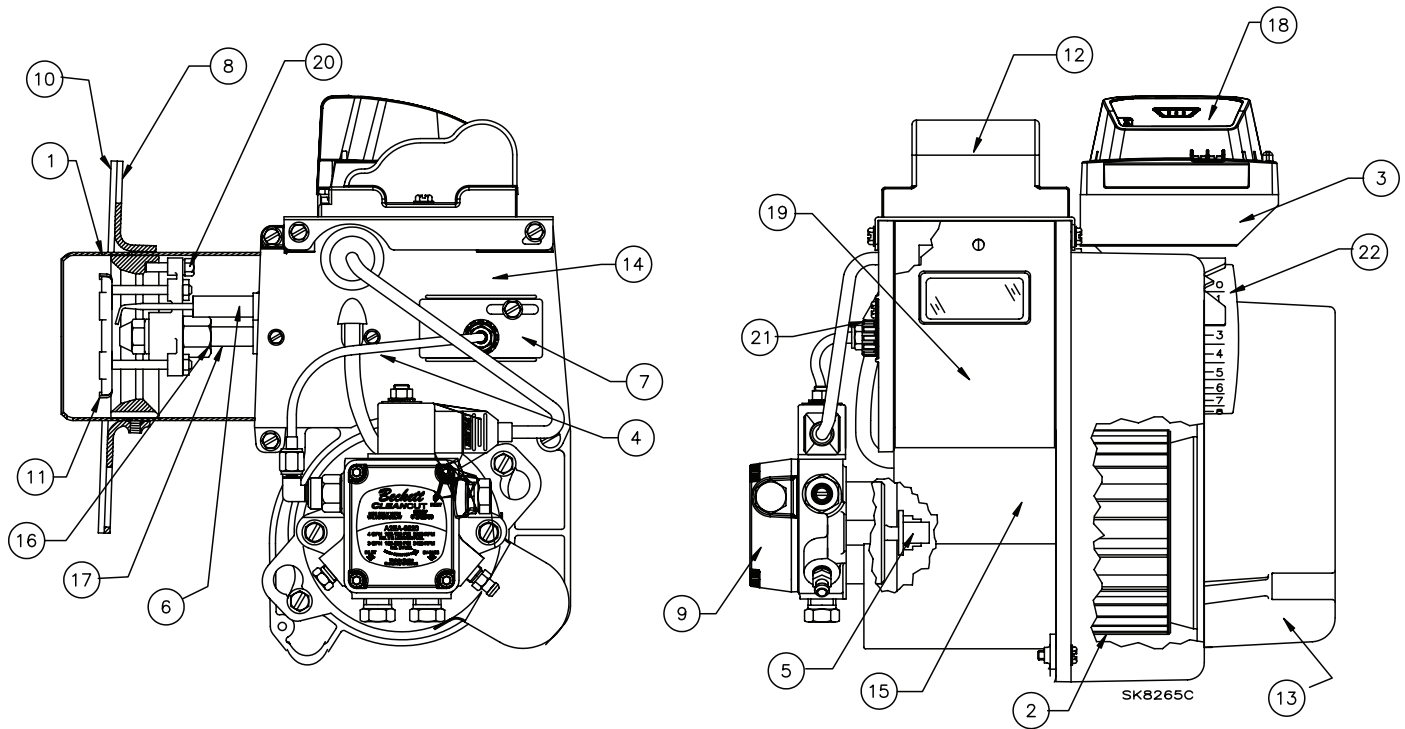
Head	AFII 85	AFII 100	AFII 150
FB0	0.40-0.65	0.55-0.75	0.75-1.00
FB3	0.55-0.85	0.55-1.10	0.85-1.20
FB4	-	0.75-1.10	1.10-1.25
FB6	-	0.85-1.15	1.15-1.35

**FBX Air Dial Setting**

Firing Rate @ 140 psig	AFII 85	AFII 100	AFII 150
0.40-0.65	3	-	-
0.60-0.75	4	3	-
0.70-0.85	5	4	-
0.75-1.00	-	5	2
0.95-1.20	-	-	3
1.15-1.35	-	-	4
1.25-1.50	-	-	5

# Replacement Parts

For best performance specify genuine *Beckett* replacement parts



Item	Description	Kit No.
1	Air tube combination	Specify*
2	Blower Wheel: AFII 85 (4-1/4") AFII 100 (4-1/2") AFII 150 (4-1/2")	21439U 21438U 21438U
3	Electrical box	31613
4	Connector tube, 8" Copper	5394
5	Coupling, Motor to Pump	21437U
6	Electrodes: HLX Heads FBX Heads	51484U 51670U
7	Escutcheon Plate: AFII Blank AFII 140psi	31623 3162302
8	Flange Kit, (adjust. 3-1/2" ID w/gasket)	51480
9	Fuel Pump: Cleancut	2184404U
10	Gasket, flange	31658
11	Head: FBX:FB0, FB3, FB4, or FB6 HLX: AF2 6 Slot Head AF2 9 Slot Head Head insulator Kit (FB0, 3, 4, 6 only)	Specify* 51671U 51672U 51685
12	Igniter, Electronic	51805U
13	Inlet air scoop, plastic, sound insulated	51485

Item	Description	Kit No.
14	Housing ass'y: AFII 85 & 100 AFII 150	51584U 51476U
15	Motor: 1/7 hp, 3450 rpm, 115V/60Hz	21444U
16	Nozzle adapter	213
17	Nozzle Line Electrode Head ass'y	Specify*
18	Replaces R7184A - Interrupted Ignition	7505A
	Replaces R7184B - Pre-time**	7505B
	Replaces R7184P - Pre and Post- time**	7505P
19	Rear Access Door	51424U
20	Stop Screw Replacement Kit	51483
21	Splined Nut	3666
22	Dial, Air Adjustment (UL approved)	51758

\*Contact your Beckett representative for part number and pricing.

\*\*Contact your Beckett representative for available pre and post time settings.

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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:

1. Visit our website at: [www.beckettcorp.com/warranty](http://www.beckettcorp.com/warranty)
2. Email your request to: [rwb-customer-service@beckettcorp.com](mailto:rwb-customer-service@beckettcorp.com)
3. 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.**

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