

Model NX Oil Burner

Beckett



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.

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.

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General Information


To the Owner:


Thank you for purchasing a Beckett NX 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 NX burner.


Your NX 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.

• **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.

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.

 **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** **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 commissioning 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.

General Information

• General Specifications

Table 1 – Burner Specifications

Capacity	Firing rate: - 0.40 – 1.75 GPH Input: Min. - 56,000 Btu Max - 245,000 Btu
Certification/ Approvals	UL certified to comply with ANSI/UL296 & tested to CSA B140.0
Fuels	U. S. No. 1 or No. 2 heating oil only (ASTM D396) Canada No. 1 stove oil or No. 2 furnace oil only
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) - 12-1/2 inches Width (maximum) - 15 inches Depth - 9-1/4 inches Air tube diameter - 3-1/4 inches

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

Table 2 – Air Tube Combinations (ATC)

Firing rate (gph)	Head	ATC codes for usable air tube lengths:		
		5"	7"	9"
(min-max)				
0.40-1.00	9-Slot	NX50LG	NX70LG	NX90LG
0.40-1.00	6-Slot	NX50LH	NX50LH	NX90LH
0.40-1.35	9-Slot	NX50LB	NX70LB	NX90LB
0.40-1.35	6-Slot	NX50LC	NX70LC	NX90LC
1.10-1.75	9-Slot	NX50LD	NX70LD	NX90LD
1.10-1.75	6-Slot	NX50LF	NX70LF	NX90LF

• Notice Special Requirements

For recommended installation practice in Canada, refer to the latest version of CSA Standard B139 & B140.

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.

• Inspect Chimney or Direct Vent System

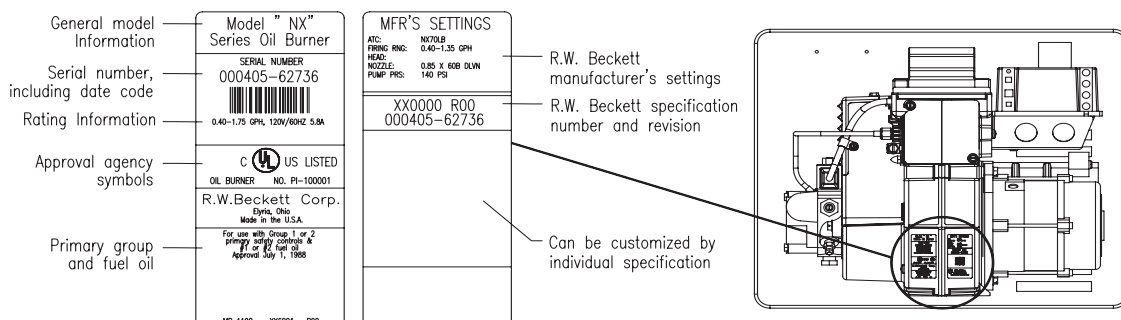
! WARNING Adequate Combustion and Ventilation Air Supply Required

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.

Inspect the chimney or vent. Make sure it is properly sized and in good working condition. Follow the instructions supplied by the appliance manufacturer.

Figure 1. Burner label location



• Combustion Air Supply Information

See NFPA Standard 31 for complete details.

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



WARNING

Connect Outside Air Duct to NX Adapter



Failure to install adapter properly could result in impaired combustion, appliance soot-up, puffback of smoke, and fire or asphyxiation hazards.

- The outside air adapter must be installed by strictly following the kit installation instructions.
- DO NOT attempt to install outside air piping without using the outside air adapter and instructions provided.
- Abundant fresh air is required for proper combustion.

For direct vent installations, follow instructions provided with appliance and direct vent system. Outside combustion air is required for direct venting.

When installing an NX outside air adapter (Beckett Part Number 1014U), refer to the instruction sheet supplied with the adapter. This kit allows combustion air to be piped directly to the burner. The NX outside air adapter kit may also be used for chimney vent applications that require outside combustion air.

Inspect/Prepare Installation Site

• Fuel Line Installation



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.

Route the fuel line through the opening in the bottom of the burner cover. Continuous lengths of heavy wall copper tubing are recommended. Always use flare fittings. Never use compression fittings.

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 fusible-handle design shutoff valves in accessible locations on the oil supply line to comply with the NFPA31 Standard. Locate one close to the tank and the other close to the burner, upstream of the filter.

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.

NOTICE

To further protect the fuel supply system and reduce nozzle orifice plugging with firing rates below 0.75 gph, 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.

Inspect/Prepare Installation Site

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

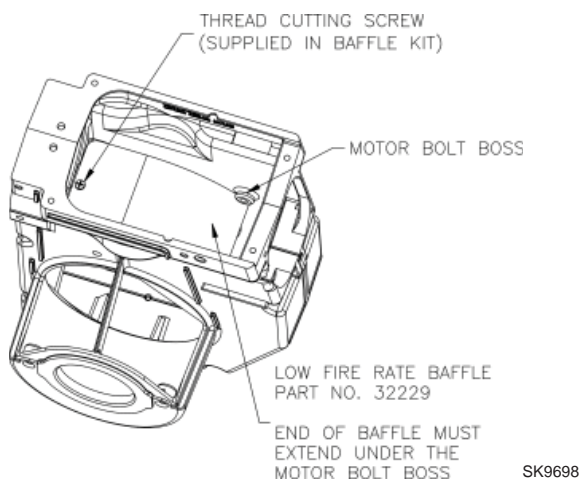
• Low Firing Rate Baffle (If specified)

The NX Low Firing Rate Baffle (LFRB), refer to Figure 2, reduces the burner airflow and pressure. Refer to the appliance manufacturer's instructions or the Beckett OEM Specification Guide part number 6711. To avoid poor burner performance, do not omit the baffle when specified or install the baffle when not specified.

Note:

The Low Firing Rate Baffle may have been factory installed. If field installation is required, insert the Low Fire Rate Baffle into the housing, aligning the mounting screw hole with the notched hole in the burner housing. Make note that the curved end of the baffle should be below the motor bolt boss. Tighten the thread cutting screw to 12-24 in-lbs.

Figure 2. – Mounting Low Fire Rate Baffle in burner housing.



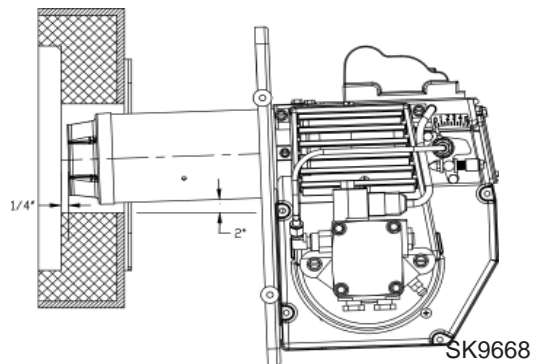
• Mount Burner on Appliance

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

Figure 3. – Mounting Burner in Appliance



• 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.

CAUTION 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 return line.**
- **Gravity Feed Systems:** Always install an anti-siphon valve 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.

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" above supply line inlet. Failure to do this may introduce air into the system and could result in loss of prime.

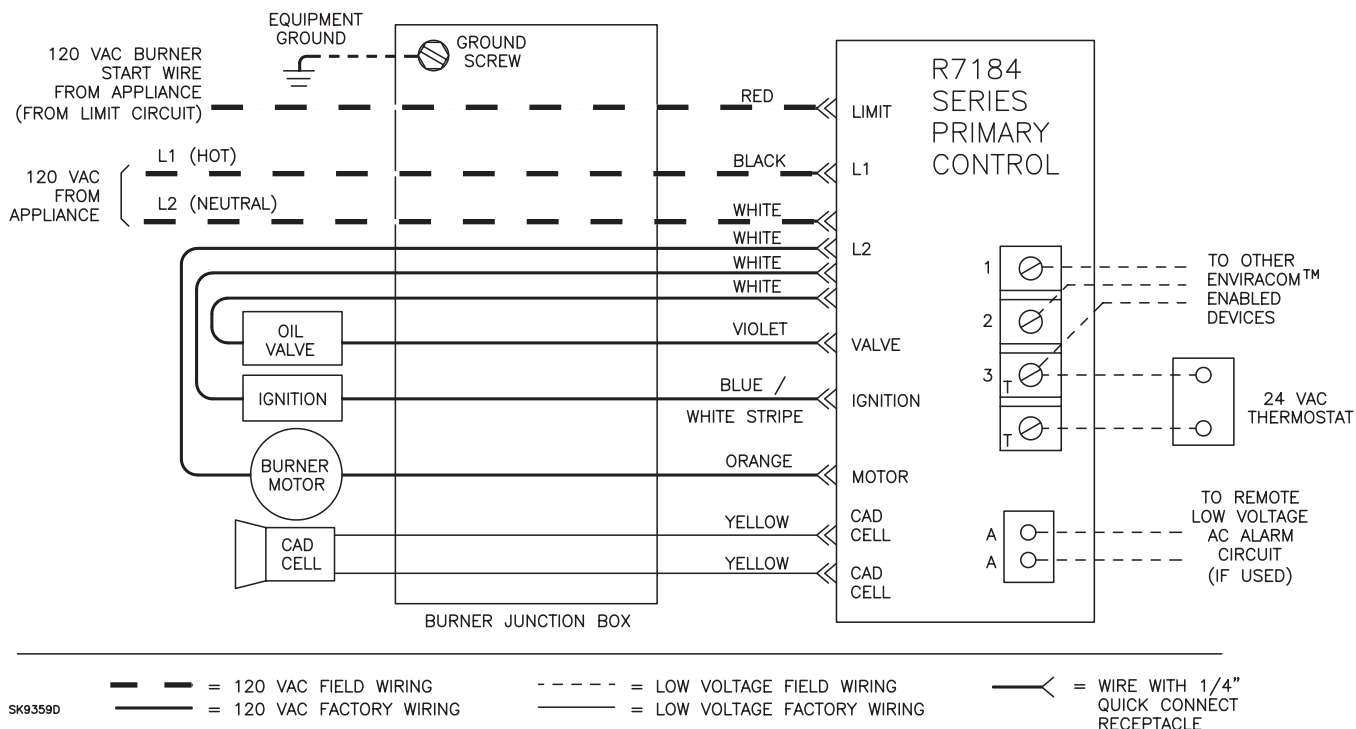
• Wiring Connections Diagram

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.

The R7184 primary control with valve-on delay and burner motor-off delay, shown in Figure 4, requires a constant 120 volt AC power source supplied to the black wire on the control. (Refer to the appliance manufacturer's instructions.) 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.

Figure 4a. – Typical Burner Control Wiring

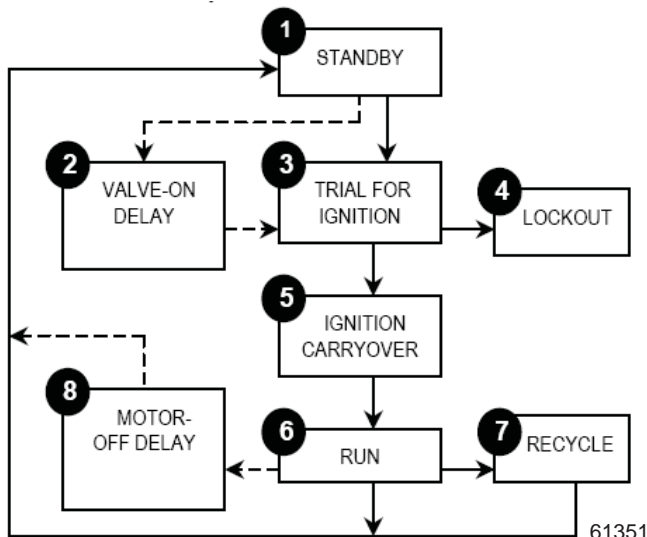
Refer to the appliance manufacturer's wiring diagram for actual specifications.



Start the Burner and Set Combustion

Figure 4b. – Typical Burner Sequence of Operation

- 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.



Start the Burner and Set Combustion

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.

• Start-up and Initial Settings

1. Open the shutoff valves in the oil supply line to the burner.
2. Referencing Figure 5a or 5b, verify and/or set the Head/Air Adjustment Pointer to the value specified by the Appliance Manufacturer. If the Appliance Manufacturer's values are not available, refer to Table 3a or 3b. **(This is an initial air setting for the pump bleeding procedure only.)** Calibrated test instruments must be used for the final head/air adjustment.
3. Adjust the thermostat or temperature controller to call for heat. *(Note: return controller(s) to the original settings upon completion of burner installation or service.)*
4. Close the line voltage switch to start the burner. If the burner does not start within the 3 to 10 second safety start check timing, you may have to reset the safety switch on the burner primary control.
5. Bleed the air from the fuel pump as soon as the burner motor begins rotating.
6. Prepare for combustion tests by drilling a 1/4" sampling hole in the flue pipe between the appliance and the barometric draft regulator. Seal this hole when testing is complete. (See appliance manufacturer's instructions for location.)

Start Burner and Set Combustion

Figure 5a. – Old Style Head/air Adjustment Plate

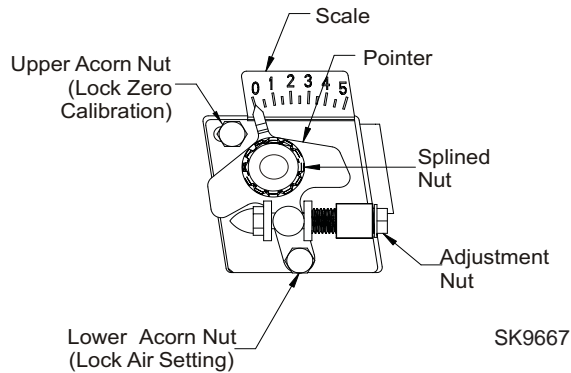
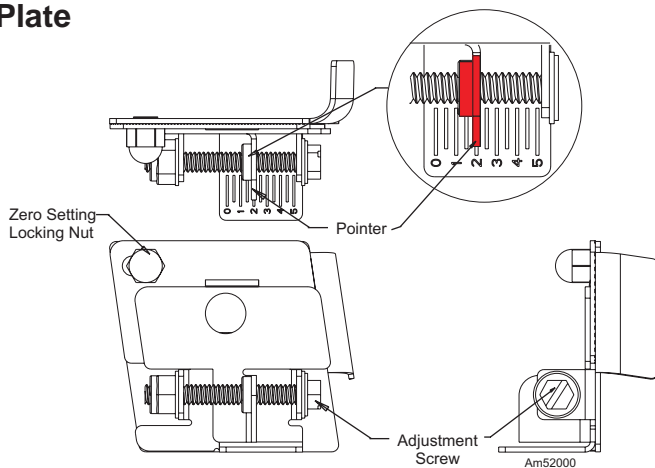


Figure 5b. – New Style Head/air Adjustment Plate



7. Check/Adjust Zero Calibration for older style Head/Air Adjustment Mechanism. Refer to Figure 5a.

- Loosen the splined nut and lower acorn nut approximately one turn. (DO NOT loosen the upper acorn nut. This is used only for setting the zero adjustment.) (See Figure 5a.)
- A 5/16" nut driver or flat blade screwdriver can be used to turn the adjustment screw for head/air setting.

8. Check/Adjust Zero Calibration for newer style Head/Air Adjustment Mechanism. Refer to Figure 5b.

- Slightly loosen the zero setting acorn.
- Turn the screw until the reading is set to zero. (Mid-point of pointer should line up with zero.)
- Turn the air adjustment screw counterclockwise to adjust the plate with the pointer to the zero position.
- Slide the nozzle line assembly forward until the retention head engages the fixed stops in the retention ring at the end of the air tube.
- Tighten the zero setting acorn nut.
- The rear door must be closed. The adjustment screw may now be turned clockwise to adjust the head/air setting.
- Turn the adjusting screw to a setting 1/2 number lower than the proper setpoint as indicated in Tables 3a and 3b. Then turn the adjusting screw counterclockwise to the proper setting.
- Tighten the spline nut after the head/air setting has been adjusted.

Table 3a. – NX Burners

Head/Air Setting	NX Air Tube & Head Combinations		
	LG - (9-slot head) LH - (6-slot head)	LB - (9-slot head) LC - (6-slot head)	LD - (9-slot head) LF - (6-slot head)
0.5	0.40 – 0.50	--	1.10 – 1.25
1.0	0.45 – 0.60	--	1.20 – 1.35
2.0	0.55 – 0.70	0.85 – 1.05	1.30 – 1.45
3.0	0.65 – 0.80	0.95 – 1.15	1.40 – 1.55
4.0	0.75 – 0.90	1.05 – 1.25	1.50 – 1.65
5.0	0.85 – 1.00	1.15 – 1.35	1.60 – 1.75

Table 3b. – NX Burner with Low Fire Rate Baffle (LFRB) Installed

Head/Air Setting	NX Air Tube & Head Combinations		
	LG - (9-slot head) LH - (6-slot head)	LB - (9-slot head) LC - (6-slot head)	LD - (9-slot head) LF - (6-slot head)
0.5	–	0.40 – 0.60	–
1.0	0.40 – 0.55	0.50 – 0.70	1.10 – 1.25
2.0	0.50 – 0.65	0.60 – 0.80	1.20 – 1.35
3.0	0.60 – 0.75	0.70 – 0.90	1.30 – 1.45
4.0	0.70 – 0.85	0.80 – 1.00	1.40 – 1.55
5.0	0.80 – 0.95	0.90 – 1.10	–

NOTICE

The NX burner has a reduced diameter air tube, precision-designed air throttle cup and combustion head for improved performance. This design provides very accurate control of the air/fuel ratio, but the light reaching the cad cell through small holes in these components is limited. Because of this, **the average cad cell resistance may be higher than conventional burners** with larger openings.

NOTICE

Use factory-set or manufacturer's recommended Head/Air Setting for 'Starting the Burner and Setting Combustion'. The Head/Air Settings shown in Figures 3, are provided for reference purposes and represent a general range of rates and settings. Individual appliances, vent systems, and field conditions will impact the overall burner set up required for satisfactory combustion performance.

Trained Service Technician's Regular Maintenance

• Set Combustion with Test Instruments

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 five steps to properly adjust the burner:

Step 1: Adjust the head/air until a trace of smoke is achieved. This can be accomplished by turning the screw on the head/air adjustment plate assembly to increase air (CCW) or decrease air (CW).

Step 2: At the trace of smoke level, measure the CO₂ (or O₂). This is the vital reference point for further adjustments. Example: 13.5% CO₂ (2.6% O₂)

Step 3: Increase the air to reduce the CO₂ by 1.5 to 2 percentage points. (O₂ will be increased by approximately 2.0 to 2.7 percentage points.) Example: Reduce CO₂ from 13.5% to 11.5% (2.6% to 5.3% O₂).

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 CO₂ levels and readjust burner, if necessary.

Step 5: Once the combustion has been set, tighten the lower acorn nut and splined nut on the air adjustment assembly. See Figure 5.

4. Chimney Vent Systems: Install the burner cover and repeat Steps 2 and 4 above. If CO₂ increases (O₂ decreases), remove the cover and adjust the air setting so the CO₂ (O₂) with the cover installed meets the requirements of Step 3.
5. Direct Vent Systems with outside air ducted to burner: Install the burner cover.
6. 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.

• Cover Installation

1. Install the four cover mounting thumb screws in the cover mounting plate.
2. Install the cover over the mounting plate while aligning the side slots with the installed cover mounting screws.

Trained Service Technician's Regular Maintenance



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 commissioning 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.

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 pump and nozzle.
- Inspect the oil supply system. All fittings should be tight and leak-free. The supply lines should be free of water, sludge and other restrictions.
- Remove and clean the pump strainer if applicable.
- Replace the used nozzle with a new nozzle that conforms to the appliance manufacturer's specifications.
- 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.

Trained Service Technician's Regular Maintenance

- ❑ Make sure Low Firing Rate Baffle is in place if required for the burner application. Omitting the baffle can result in unacceptable burner combustion.
- ❑ Inspect all gaskets. Replace any that are damaged or would fail to seal adequately.
- ❑ Clean the blower wheel, air inlet, air guide, retention head, throttle cup and throttle ring of any lint or foreign material.

WARNING Do Not Puncture, Scratch, or Remove Flame Sighting Windows



If a window is punctured, significantly scratched or removed from the throttle cup, the burner performance could be impaired, resulting in safety lockout, appliance soot-up, equipment damage, hot gas puff-back and asphyxiation hazard.

- Use a clean soft cloth and degreaser, on an annual basis, to remove any build-up or dark stains from the windows.
- If damaged, replace the nozzle line assembly with an assembly that has a windowed throttle cup.

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- ❑ **Use a clean soft cloth with a degreaser to clean any accumulated soot or oil stains from the throttle cup sight windows.**
 - ❑ 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 and clear the vent system and chimney of any 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 keep a record of the service performed and the combustion test results.

- **Removing Nozzle Line for Service** (Reference the Replacement Parts Diagram.)

WARNING Correct Nozzle and Flow Rate Required



Incorrect nozzles and flow rates could result in impaired combustion, under-firing, over-firing, soot-ing, 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 or Beckett Residential Burner OEM Spec Guide, Part #6711.

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 1.00 gph nozzle @ 140 psig = 1.18 gph)

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

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1. Before proceeding, turn off the main power switch to the burner.
 2. Remove the burner cover by loosening the four thumb screws (two on each side of burner).
 3. Disconnect the copper connector tube assembly from the nozzle line bulkhead fitting.
 4. Loosen the two screws securing the igniter retaining clips and rotate both clips to release the igniter baseplate. The igniter should pop up and be supported by the prop spring.
 5. Loosen the two screws securing the rear door. Swing the door to the right and down.
 6. Loosen the splined nut.
 7. Remove the nozzle line electrode and head assembly from the burner by drawing it straight back and out the rear door opening. The adjustment mechanism is still attached. Be careful not to damage the electrodes or insulators while handling.
 8. To replace the nozzle assembly, reverse the above procedure.

Trained Service Technician's Regular Maintenance

• Nozzle Installation

CAUTION Protect Nozzle from Damage

A damaged nozzle could cause impaired combustion, sooting, puffback of hot gases, smoke, oil leakage and potential fire or asphyxiation hazards.

- Use care when handling, removing and installing oil nozzles.
- Carefully follow the guidelines provided in this section.

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.

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	1.65	1.77
1.35	1.51	1.60	1.65	1.79	-
1.50	1.68	1.77	1.84	-	-
1.65	1.84	-	-	-	-
1.75	-	-	-	-	-

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 5/8" 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 7.
10. If the head was removed when replacing the nozzle, carefully reconnect the head to the nozzle adapter. Make sure to align the key in the support leg with the keyway in the nozzle adapter and to butt the head support to the nozzle adapter shoulder, see Figure 8.

• Check/Adjust Electrodes

Check the electrode tip settings, as shown in Figure 7. If necessary, adjust by loosening the electrode clamp screw (Figure 8) and slide/rotate the electrodes as necessary. When the adjustment is complete, securely tighten the clamp screw.

Note that if the throttle cup is moved be sure to reposition it with no gap between the nozzle adapter and hub.

Figure 6 – Electrode tip gap and spacing

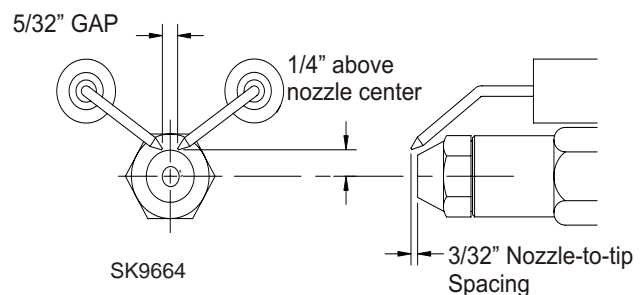
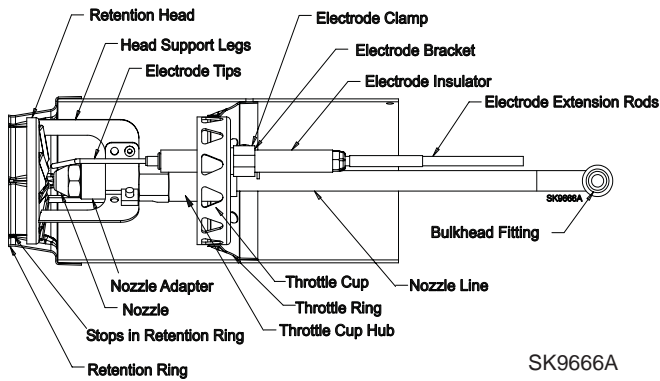


Figure 7. – Nozzle Line/Head/Air Tube Assembly (Low firing rate shown.)



- **Check Retention Head Alignment and Cad Cell Sighting (Refer to Figure 8.)**

The cad cell sighting holes in the throttle cup and the retention head must be aligned to allow the cad cell to detect the flame. Make sure the stamped key in the retention head collar lines up with the keyway in the nozzle adapter when mounting the retention head. Note that in specific applications, the retention head may not have a sighting hole.

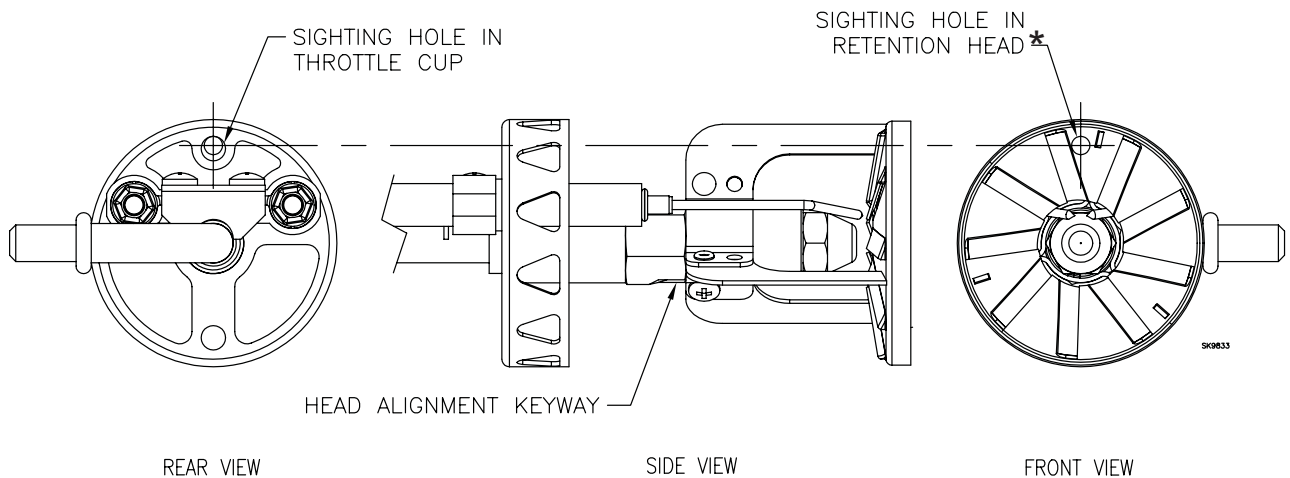
- **Check/Adjust “Zero” Calibration**

On burners with factory-installed air tubes, the zero calibration has been factory set. Make sure the retention head (Figure 8) is securely against the stops in the retention ring when the adjustment plate pointer is at “0” (Figure 5).

If the zero calibration has not been set, perform the following procedure:

1. Install the nozzle line, with the adjustment plate assembly attached, into the burner.
2. Install and tighten the rear door to hold the air adjustment plate assembly in position.
3. Slightly loosen the upper acorn nut, the splined nut, and the lower acorn nut.
4. Turn the air adjustment screw clockwise to adjust the plate with the pointer to the zero position.
5. Referring to Figure 8, slide the nozzle line assembly forward until the retention head engages the fixed stops in the retention ring at the end of the air tube.
6. Tighten the upper acorn nut securely.
7. The rear door must be kept tightly closed. The adjustment screw may now be turned to adjust the head/air setting.
8. Turn the adjusting screw to a setting that is 1/2 number lower than the proper set point as indicated in Table 1. Then turn the adjusting screw counterclockwise to the proper setting.
9. Tighten the splined nut and lower acorn nut after the head/air setting has been adjusted.

Figure 8 – Retention Head/Throttle Cup Alignment

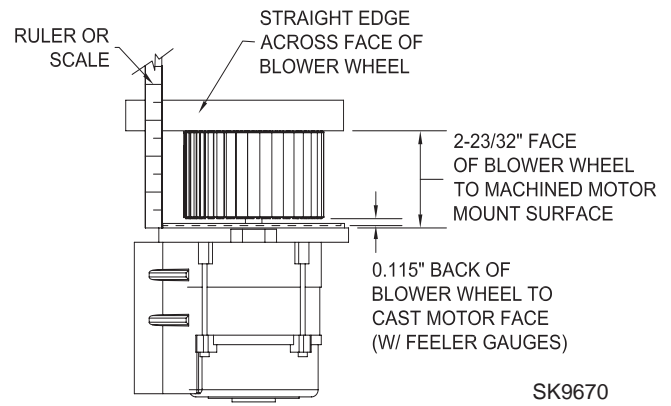


* NOTE THAT FOR SPECIFIC APPLICATIONS, THE RETENTION HEAD MAY NOT CONTAIN A SIGHTING HOLE.

- **Blower Wheel Replacement**

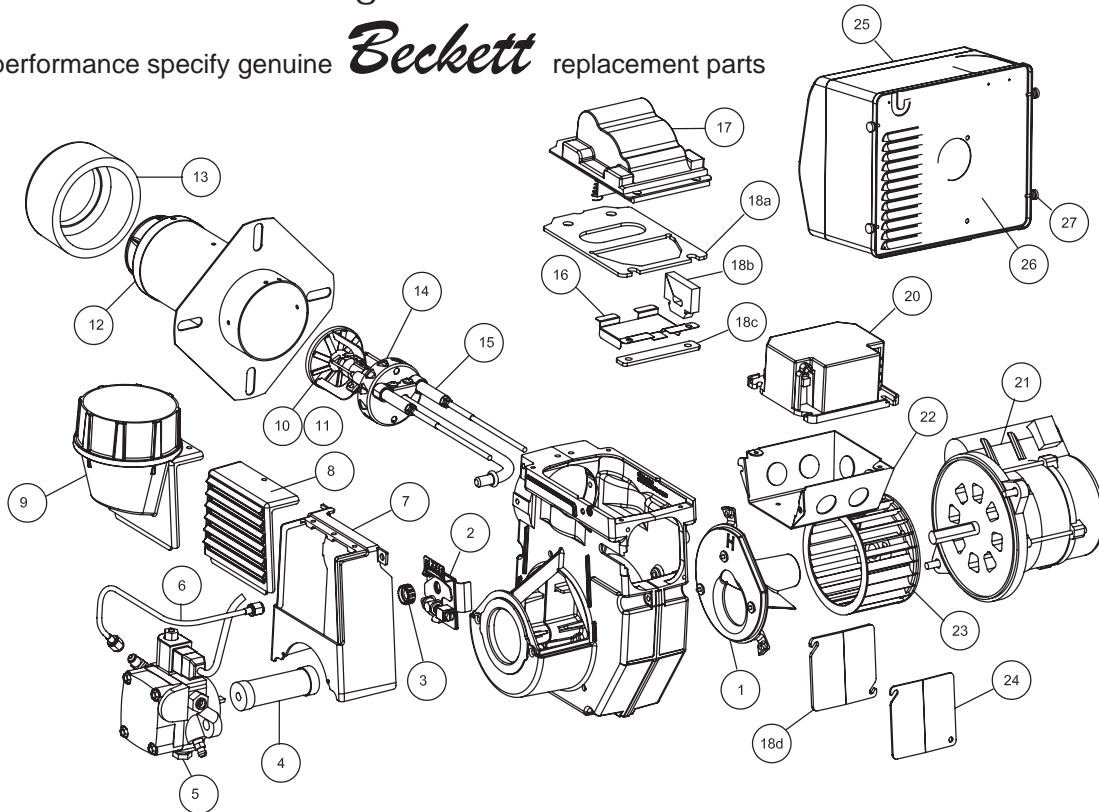
For installation or replacement of a blower wheel, insure that there is a space between the blower wheel and the motor face of 0.115". Refer to Figure 9.

Figure 9. – Blower wheel assembly



Replacement Parts Diagram

For best performance specify genuine **Beckett** replacement parts



SK967101

Replacement Parts List

Item	Description	Part No.
1	Air guide	101101U
2	Head/Air adjustment mechanism assembly	51794U
3	Splined nut	3666
4	Coupling	2454
5	CleanCut Fuel Pump, (Includes Mounting Screws ¼ -20 x 7/8" - Part # 4189)	2184404U
6	Connector tube assembly, 11"	51127
7	Inlet air box	1010U
8	Inlet air louvers	1013U
9	Inlet Air Adapter, Outside air kit	1014U
10	Retention head assembly, 6 -slot *	51785U
11	Retention head assembly, 9 -slot *	51815U
12	Air tube combination, (Includes Screws, air tube mounting #8 x 3/8 - Part # 4396)	Specify
13	Heat Shield (per specification)	Specify
14	Nozzle Line Electrode and Head Assembly, with window	Specify
15	Electrode insulator kit	51811U
16	Spring, igniter prop	32058U
17	Igniter, electronic	51771U
18	Gasket, Igniter Kit	51942U
18a	Gasket, igniter baseplate	
18b	Gasket, wiring hinge	
18c	Gasket, igniter baseplate hinge	
18d	Gasket, rear access door	
19	Low Fire Rate Baffle (per specification)	32229U
20	Primary control R7184P Valve-on/Motor Delay R7184P With Alarm Contacts	7457U 7458U
21	PSC Motor, (Requires Mounting screws ¼ -20 x 7/8" - Part # 4189)	21805U
22	Electrical box	5770
23	Blower wheel	2999U
24	Door, rear access	32119U
25	Cover, Burner	51812U
26	Mounting Plate, Burner Cover	32103U
27	Thumbscrews, Cover mounting	21899U

* For retention head assemblies that do NOT have a sighting hole, contact Beckett's customer service for appropriate part number.

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, AFIL, 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.

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