



# **Koehring**

## **MODEL K600**

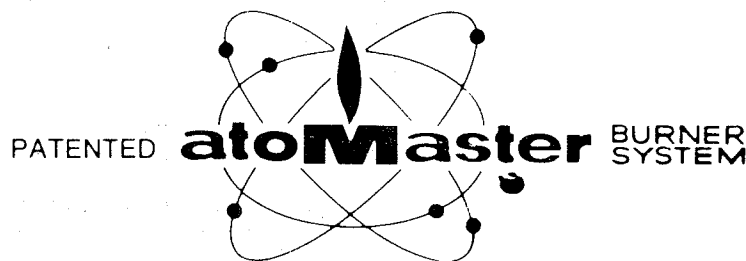
Spec. No. 5014G01

### **HIGH PRESSURE HEATER**

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# **OPERATING, MAINTENANCE and SERVICE INSTRUCTIONS with PARTS LIST**

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## **KOEHRING®**

**ATOMASTER DIVISION**  
BOWLING GREEN, KENTUCKY 42101



## WARNING — Safety Requirements

**IMPORTANT:** Read and Understand Instruction Manual before Starting or Servicing!

**IMPROPER USE OF THIS HEATER CAN RESULT IN SERIOUS BODILY INJURY DUE TO HAZARDS OF FIRE OR EXPLOSION, CARBON MONOXIDE POISONING, BURN, AND ELECTRICAL SHOCK.**

- Use **ONLY** Kerosene or Number 1 Fuel Oil. **NEVER BURN GASOLINE, NAPHTHA, PAINT THINNERS, ALCOHOL OR OTHER VOLATILE FUELS!**
- Use **ONLY** in areas **FREE OF FLAMMABLE VAPOR OR HIGH DUST CONTENT**. **NEVER USE HEATER WHERE GASOLINE, PAINT THINNER OR OTHER HIGHLY FLAMMABLE VAPORS ARE PRESENT.**
- Make sure hot air outlet is **AT LEAST 8 FEET** from **COMBUSTIBLE MATERIALS**.
- Fill fuel tank or move heater **ONLY** when heater is **UNPLUGGED**.
- **NEVER USE HEATER IN ROOMS USED FOR SLEEPING.**
- **USE ONLY IN WELL VENTILATED ROOMS.** Provide ventilation of **AT LEAST 3 SQUARE FEET FOR EACH 100,000 BTU OF RATING.** (For example, a 30,000 BTU Heater would require a two foot wide window raised six inches.)
- When used with **THERMOSTAT, HEATER MAY START ANYTIME!**
- **KEEP CHILDREN AWAY FROM HEATER AT ALL TIMES—NEVER LEAVE A HEATER PLUGGED IN WITHOUT AN ADULT PRESENT IF CHILDREN ARE LIKELY TO BE PRESENT.**
- Use **ONLY** with electrical voltage and frequency specified on model plate.
- Use **ONLY** a **PROPERLY GROUNDED THREE-WIRE EXTENSION CORD.**
- **DO NOT MOVE, HANDLE OR SERVICE WHILE HOT OR BURNING.**
- Use **ONLY** in accordance with local ordinances and codes.
- **NEVER ADD DUCT WORK TO FRONT OF HEATER.**

Safety requirements and model plate data comply with American National Standards Institute Safety requirements.

ANSI A10-1970

## TUNE UP

To keep your heater in top operating condition, perform the following services at the start of each heater season then at the interval specified below:

Clean and/or replace fuel filter .....	Clean at least twice a season. More often if heater performance indicates the need. Replace if necessary.
Clean fan .....	Clean fan after every 500 hours of operation. Clean more frequently if heater is operating in dusty areas or if there is a build-up of dirt on the blades.
Replace burner nozzle .....	Replace nozzle at least once during the heater season or more often if heater performance indicates the need.
Clean and adjust spark plug .....	After every 300 hours of operation, clean and adjust spark plug electrodes. Adjust gap or replace the plug if electrodes have been burned, eroded, or carboned.
Clean photo cell .....	Clean the photo cell face with a soft cloth at least once during the heater season. If cell face tends to soot up, check with your nearest service station to determine the cause.

## SECTION I

### INTRODUCTION

The heater is designed for use where large amounts of heat are needed. It must be used where adequate ventilation and proper electrical power are available.

This manual contains operating, maintenance and trouble-shooting instructions for the heater. A complete list is included at the end of the manual.

#### B. PRINCIPLES OF OPERATION

Operation of the heater involves three simple systems:

1. **Fuel System.** A gear-type fuel pump attached to one end of the motor shaft delivers fuel at 110 PSI from the fuel tank through a filter and a solenoid valve to the nozzle, which forces it into the combustion chamber in a fine spray

2. **Air System.** A fan attached to the other end of the motor pushes air through the heater. Part of the air enters the combustion chamber and mixes with the atomized fuel to form a combustible mixture.

The rest of the air passes over and around the combustion chamber. At the front of the heater it mixes with the hot air coming from inside the combustion chamber. This results in a jet of clean, heated air flowing out of the front of the heater.

3. **Ignition System.** A transformer provides high voltage to a spark plug which extends through the burner head into the combustion chamber. A constantly firing spark from the spark plug ignites the mixture of fuel and air.

#### NOTE

The installation of this unit shall be in accordance with the regulations of the authorities having jurisdiction.

4. **Control System.** The control system is actuated by a light sensing, instantly reacting cell used in conjunction with the safety control to initiate a safety shutdown in the event of ignition or flame failure. In addition, the control system provides a period of blower operation after normal shutoff to purge and cool the combustion chamber.

5. A thermostat, mounted on the heater, will operate it in response to the temperature setting provided that the setting is higher than the surrounding air temperature.

#### C. SPECIFICATIONS

BTU Rating .....	600,000 per hour
Air Delivery .....	CFM 4100
Voltage .....	115, 60 HZ, 1 phase
Amperes Starting .....	38.0
Running .....	10.0
Fuel .....	Kerosene or No. 1 Fuel Oil
Fuel Tank Capacity .....	36 U. S. Gallons
Nozzle .....	4.46 GPH 80° hollow cone
Motor .....	½ HP @ 1725 RPM
Weight Empty .....	285 lbs.
Full Tank .....	550 lbs.
Pump Pressure .....	110 PSI

## SECTION II

### OPERATION

#### A. OPERATING CAUTIONS

1. Use heater only with adequate ventilation. If used in a closed room, a partly-opened door or window near the heater will provide enough ventilation. Do not use this heater as a source of heat in sleeping quarters.
2. Use only kerosene or No. 1 fuel oil; do not use No. 2 or heavier fuel oil as they contain tars which will contaminate the heater. **DO NOT USE GASOLINE: IT IS VOLATILE AND DANGEROUS.**
3. Use the heater only on the electrical power specified on the instruction plate.
4. Plug the heater into a grounded receptacle or use a grounding adapter. Be sure the heater is grounded whenever it is in operation and whenever you are working on or near it.
5. Keep the heater at least 8 feet from any combustible materials.
6. **DO NOT** use the heater in the presence of flammable vapors such as paint, gasoline, or solvents.
7. Never add fuel while the heater is operating.
8. Keep the air inlet and discharge areas free of loose materials and any obstructions that would hinder the free flow of air into and out of the heater.

#### NOTE

The motor contains a manual reset overload protector. If this should stop the motor due to low voltage or overload, the motor can be re-started by pressing the red button. Be sure to disconnect the power cord before opening the heater or checking the motor, because the heater may start at any time.

#### B. PREPARING FOR OPERATION

1. Remove the heater from its shipping and take off any protective packing material which may be applied to it.
2. Check the heater for possible shipping damage. If any is found, **IMMEDIATELY** notify the agent of the carrier which delivered the heater to you, and make out a claim for the damage.
3. Fill the fuel tank with the proper fuel.

#### NOTE

If the heater is used at below zero temperatures, the fuel may congeal. To prevent this, add two tablespoons of Frostex or similar anti-icer to each 5 gallons of fuel. Be sure tank and fuel is water-free before filling.

#### C. ELECTRICAL SUPPLY

Do not use a power source other than that specified on the nameplate. It is important to use extension cords of the right size if the heater is to be operated at a distance from the electrical source.

The following table shows the minimum recommended wire sizes for various lengths of extension cords. This wire size is calculated to assure adequate voltage reaches the heater. Use of a smaller wire size than those recommended will result in slow starting and may result in malfunction of electrical components.

Length of Cord (Feet)	200	100	50
Minimum Wire Size (AWG)	8	10	12

#### D. OPERATING INSTRUCTIONS

1. Starting.
  - a. Plug heater into adequate electrical outlet receptacle.
  - b. Set the thermostat dial to the desired temperature. Operation from this point on is automatic.
2. Stopping.
  - a. Stop the heater by turning the thermostat dial to the **NO HEAT** position.
  - b. You can also stop the heater temporarily by setting the thermostat to a temperature lower than the surrounding air.
  - c. The heater flame will go out immediately, but the thermal switch will keep motor operating long enough so that air flow from the fan will cool the combustion chamber.
  - d. Do not shut the heater off by unplugging it, as this deprives it of the purge cycle.

#### NOTE

The heater should never be unplugged while in operation because this could cause damage to heater. The heater should not be restarted until the combustion chamber has cooled.

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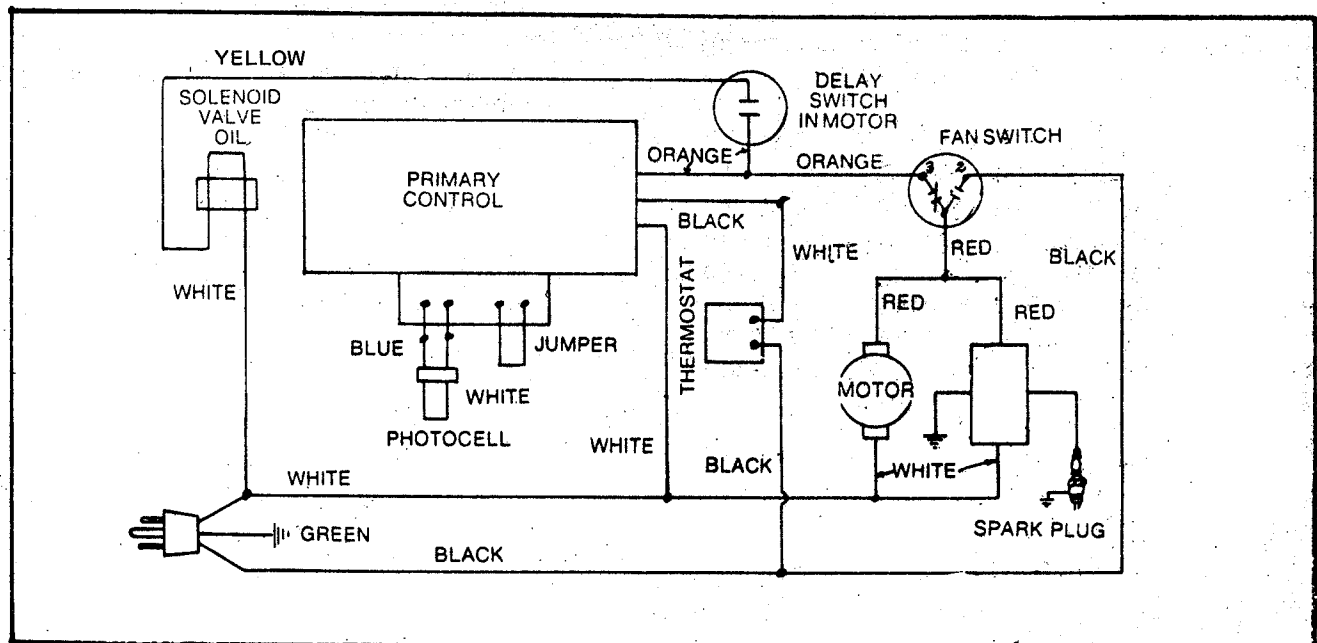


Figure 1. Wiring Diagram

## E. OPERATING SEQUENCE

The following is a description of the normal automatic operating sequence of the heater (See the Wiring Diagram, Figure 1).

1. The heater is turned on by the thermostat automatically in response to a temperature setting of the dial, provided the setting is higher than the surrounding air temperature.

2. When operation is called for, the transformer and the motor, fan and fuel pump start operating immediately.

3. After fan reaches running speed, the solenoid valve will open. This allows fuel to flow to the nozzle. The heater will then ignite.

4. After about 2 minutes, the purge circuit is energized.

5. When the thermostat setting equals the surrounding air temperature or is turned to the NO HEAT position, the solenoid valve shuts off the flow of fuel to the nozzle, and the fire goes out immediately. The fan continues to run, purging the heater.

6. When the combustion chamber cools, the thermal switch changes back to its starting position, shutting off the motor.

7. If, for some reason, the fire goes out before the thermostat is satisfied, or if the heater fails to ignite when operation is called for, the safety control will shut off the heater within 15 seconds. If this should occur, unplug the heater, and determine the cause of the shutdown. Correct the cause then press the reset button on the safety control and restart the heater.

## F. CLEANING

Test fire the heater to make sure it will function properly. If it does not, check all wiring connections according to the wiring diagram. Figure 1.

## G. FUEL PUMP MAINTENANCE & SERVICE

1. The pump operates at 110 psi. To check pressure, remove the hex head pipe plug from the port marked gage on the fuel pump and install a pressure gage. (Pressure Gage, Part No. M4574 is available from our distributors.)

2. If the pressure gage does not read 110 psi, plus or minus 5 psi, when the motor is running and pumping fuel, adjust the pump.

3. Remove the access plug on the side of the pump body marked pressure adjustment. To increase the fuel pressure, turn the slotted screw inside the port clockwise. To decrease the fuel pressure, turn the screw inside the port counterclockwise. After completion of the adjustment install the plug into the adjusting port, then remove the gage. Install the plug into the fuel pump.

4. If the fuel pressure cannot be adjusted, replace the pump.

## SECTION III

### MAINTENANCE AND SERVICE

Maintenance consists of the operations the owner or user of the heater can perform to keep the heater operating properly. If routine maintenance fails to return a heater to top-operating condition, refer to the Trouble Shooting Table. Keep the heater clean to reduce the need for extensive maintenance or repair.

#### A. FUEL SYSTEM MAINTENANCE

1. Use the cleanest fuel available. Dirt and water in the fuel will clog the filter, and may cause the heater to burn with an odor. If there is excessive water in the fuel, the flame may go out. Every 250 hours (or oftener) drain the tank and rinse it with clean, "dry" fuel (having no water in it.) Then refill with clean fuel.

2. Every 250 hours of operation, unscrew the filter can to remove the filter element. Rinse the bowl in clean kerosene and wipe dry with a clean cloth to remove all accumulated dirt. Use a new filter element and a new gasket before replacing filter bowl.

3. Check the fuel line connections occasionally to be sure they are tight.

4. If the solenoid valve should begin to stick open or closed, replace it.

#### B. AIR SYSTEM MAINTENANCE

1. If the heater is used in dusty or dirty air, the fan blades may in time build up enough dirt to reduce the over-all efficiency of the heater. Inspect them occasionally, and wipe off any loose dirt. Use a rag moistened with kerosene or non-flammable cleaning solvent to get stubborn dirt off the blades.

2. Keep the deflector plate and the air passages around the burner head free from dirt and trash.

#### C. BURNER MAINTENANCE AND SERVICE



##### WARNING

Be sure the heater is disconnected from the power line before opening up and working in the burner area.

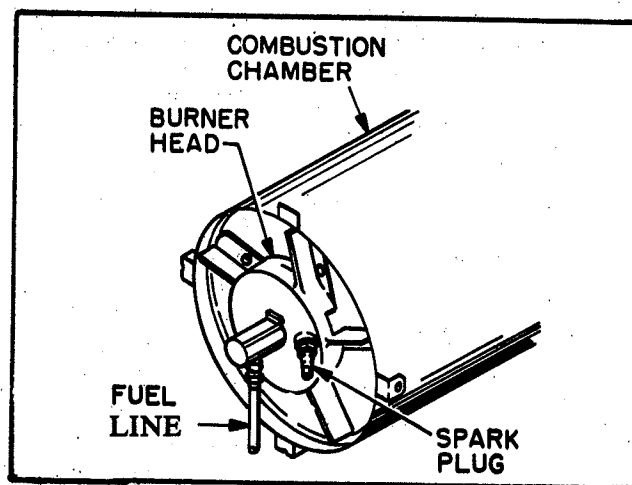


Figure 2. Burner Head, Spark Plug.

1. For access to the nozzle (Figure 7), remove the upper shell. Disconnect the fuel line, spark plug lead. Remove the screws attaching the burner head assembly to remove it from the combustion chamber.



## CAUTION

Never use a drill, wire or any other tool in the nozzle orifice as this will damage the nozzle and require its replacement. While it is out of the burner, guard the nozzle from damage or dirt. This is important! If the nozzle is damaged replace it.

## D. SPARK PLUG



## WARNING

Be sure the heater is not plugged into the outlet. The spark plug wire carries high voltage during heater operation.

1. Disconnect the spark plug wire.
2. Remove the spark plug from the burner head, and check the gap between the electrodes. The gap must be within the limits shown in Figure 4.
3. Adjust the gap by bending the outside electrode where shown in Figure 4. If you do not install the plug immediately, protect it from damage until it is reinstalled.
4. Install the plug into the burner head, if no further burner head maintenance is required. Make sure the spark plug is seated firmly in the burner head.

## E. SAFETY CONTROL CIRCUIT TESTING

### NOTE

The following testing procedures should be performed only if trouble indicates the safety control circuit may be at fault.

1. Unplug the heater cord. Disconnect the two photocell wires from the control "CAD CELL" terminals.
2. Make certain that the reset buttons on the motor and the control are pressed in. Set the thermostat to a temperature above the temperature of the surrounding air.
3. Plug in the heater and after the flame is established, quickly jumper the "cad cell" terminals marked FF on the side of the control. If the heater shuts off within 15 seconds, the control is defective and should be replaced.

If the heater continues to run for a couple of minutes, remove the jumper and the control should trip out in 15 seconds. When the control trips out, the flame will disappear, but the motor will continue to run to purge heat from the heater. If heater continues to burn, first check solenoid. If solenoid functions normally, the control is defective and should be replaced.

4. If the control functions normally from the tests above, there are two possible causes for the problem. The heater does not have a well established flame pattern or the problem is in the photocell. The photocell is a light sensitive device that changes resistance from a high resistance (greater than 100,000 ohms), when no flame is sensed, to a low resistance (less than 3000 ohms) the flame is sensed. Connect an ohmmeter across the photocell leads and check for this change in resistance. If the ohmmeter reads zero or open, the cell should be checked for dirt on the face or shorted leads. If the face of the photocell is dirty, clean with soft cloth and replace. Check for the resistance change in the photocell from no flame to flame. If the cell still reads zero or open check the wiring from one end to the other for opens and across the leads for shorts. If no problem is found replace the cell and check once again for the resistance change.

5. If the photocell and primary safety control function properly, the problem is that the heater is not burning properly.

6. If the control fails to shut down the heater, it is defective and must be replaced.

7. After replacing control system components, test fire the heater to make sure it will function properly. If it does not, check all wiring connections according to the wiring diagram, Figure 1. Repeat the testing procedure if necessary.

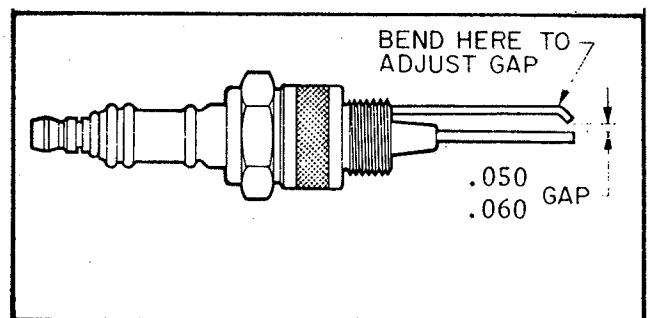


Figure 4. Spark Plug Gap Setting



## SECTION IV

### TROUBLE SHOOTING

The following table lists troubles which may occur with the heater, and each trouble gives a list of possible causes with a suggested remedy for each.

**TROUBLE SHOOTING TABLE**

<b>TROUBLE</b>	<b>POSSIBLE CAUSE</b>	<b>REMEDY</b>
Odor from heater.	Air leak in suction system.	Check filter for leakage. Tighten all fuel line connections.
	Low pump pressure.	Adjust pump pressure.
	Dirty filter.	Replace filter element and clean the filter bowl.
	Dirty burner nozzle.	Clean the burner and replace nozzle.
	Low voltage causing motor to operate below rated speed.	Voltage at heater should be not less than 90% of rated voltage. (108 volts for 120-volt heaters).
	Water droplets suspended in fuel.	Wait for water to settle out after filling tank; then drain tank and refill with fuel containing no water.
Failure to Start (Motor does not start when thermostat is set to call for operation.)	Low motor RPM.	Check voltage, if OK, check motor RPM. Motor must run at least 1700 RPM on proper voltage. If not, replace motor.
	Proper power not reaching heater.	Check that heater is connected to a live power line with good fuses, and that the voltage at the heater is correct.
	Loose electrical connections.	Check; tighten if necessary.
	Control not activated.	Press and release reset button control.
	Motor overload protector tripped.	Check for cause of motor overload. Correct cause or replace motor.
Failure to Ignite (Motor runs when thermostat is set to call for operation.)	Thermostat defective.	Replace thermostat.
	Fuel tank empty.	Fill fuel tank.
	Spark plug dirty or not properly gapped.	Reset spark plug after cleaning, according to dimensions in Figure 1.
	Solenoid valve not opening.	If electrical connections to solenoid valve are good, replace solenoid valve.
	Improperly wired after servicing.	Check wiring according to Wiring Diagram, Figure 1.
	Pump not providing fuel, or providing fuel at too-low pressure.	Check pump output pressure; adjust if necessary; replace pump if adjustment cannot be made or will not hold. Filter element needs replacing.
	Water in fuel.	Drain tank; rinse with clean fuel; clean filter housing. Replace filter element.
	Refill with clean fuel.	Refill with clean fuel.
Nuisance Trip-Outs.	Open or damaged photo cell.	Replace photo cell.
	Defective fan switch.	Replace fan switch.

## SECTION V

### PARTS LIST

This list contains all replaceable parts used in the heater covered by this manual, with index numbers for easy reference between the list and the exploded view.

When ordering parts, check the model decal for the correct model number, specification number, and serial number of the heater.

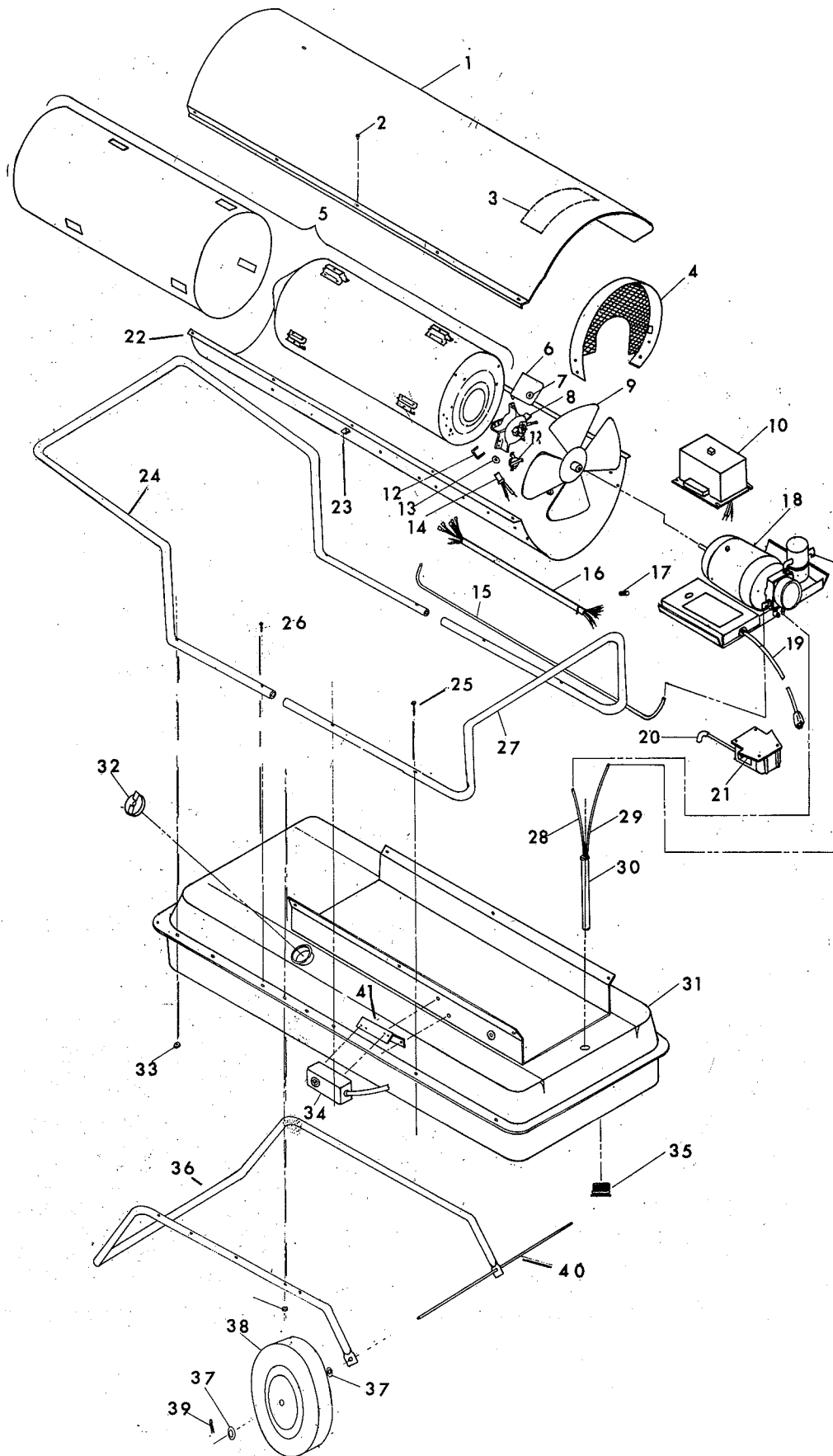
Include the MODEL SPECIFICATION, and number, and serial number of the heater. Include the MODEL, SPECIFICATION, and SERIAL numbers when ordering parts. ORDER PARTS BY PART NAME AND PART NUMBER ONLY. DO NOT use the index numbers from the illustration when ordering parts.

Index No.	Part Number	Part Name	Qty.
1	M50167AZ	Upper Shell	1
2	M11084-27	Screw #10-12 x 12	49
3	M50089	Decal, Wiring Diagram	1
4	M50186-01AA	Guard, Fan, Assembly	1
5	M50543-01	Combustion Chamber & Heat Deflector Assy.	1
6	M50157	Deflector, Air	5
7	M50104-03	Bushing	6
8	M50084-04	Burner Head Assembly	1
9	M50194	Fan	1
10	M50230	Control	1
11	M50276	Switch, Fan	1
12	M16660	Bracket Photo Cell	1
13	M50104-02	Bushing	3
14	M16656-5	Photo Cell Assembly	1
15	M50115-02	Fuel Line	1
16	M50391-2	Wire Harness Assembly	1
17	M13942-7	Connector, Wire	2
18	M50172-02	Motor-Pump Assembly (Ref. figure 6)	N/A
19	M10813-33	Power Cord	1
20	M50050	Boot Ignition	1
21	M50100-02	Transformer & Bracket Assembly	1
22	M50168-AZ	Lower Shell	1
23	M11271-6	Nut, Tinnerman	10
24	M50224	Front Handle	1
25	HC4-22C	Screw Hex., hd., 1/4-20 x 2-3/4	8
26	HC4-12C	Screw, Hex. hd., 1/4-20 x 1-1/2	6

Index No.	Part Number	Part Name	Qty.
27	M28872-01	Rear Handle	1
28	M50188-04	Fuel Line - Return	1
29	M50118-05	Fuel Line - Input	1
30	M50262-02	Assembly Screen & Bushing, Fuel	1
31	M50071-02AA	Tank, Fuel	1
32	M23284	Cap, Fuel	1
33	NTC-4C	Nut, Hex, 1/4-20	18
34	M25297-5	Thermostat Assembly	1
35	M27417	Plug, Drain	1
36	M28140-02	Frame, Wheel Support	1
37	WP-10C	Washer Flat 5/8	4
38	M50389	Wheel	2
39	C5-10C	Pin, cutter 5/32 x 1-1/4	2
40	M18774A	Axle 5/8 x 30-1/16	1
41	M25121B	Bracket Thermostat	1

#### PARTS AVAILABLE—NOT SHOWN

1	M18196	Decal, Mfg. By
2	M20532-2	Decal, Pump Pressure
3	M22743	Decal, Warning
4	M22887	Decal, Operation Instructions
5	M29800	Decal, Reset
6	M50124	Decal, Tradename, Koehring
7	M50132	Decal, Model Number - K 600
8	M11143-1	Bushing, Power Cord Strain Relief
9	M50296	Spacer, Wheel - Two (2) Required
10	M50278	Sleeve, Fan Spacer



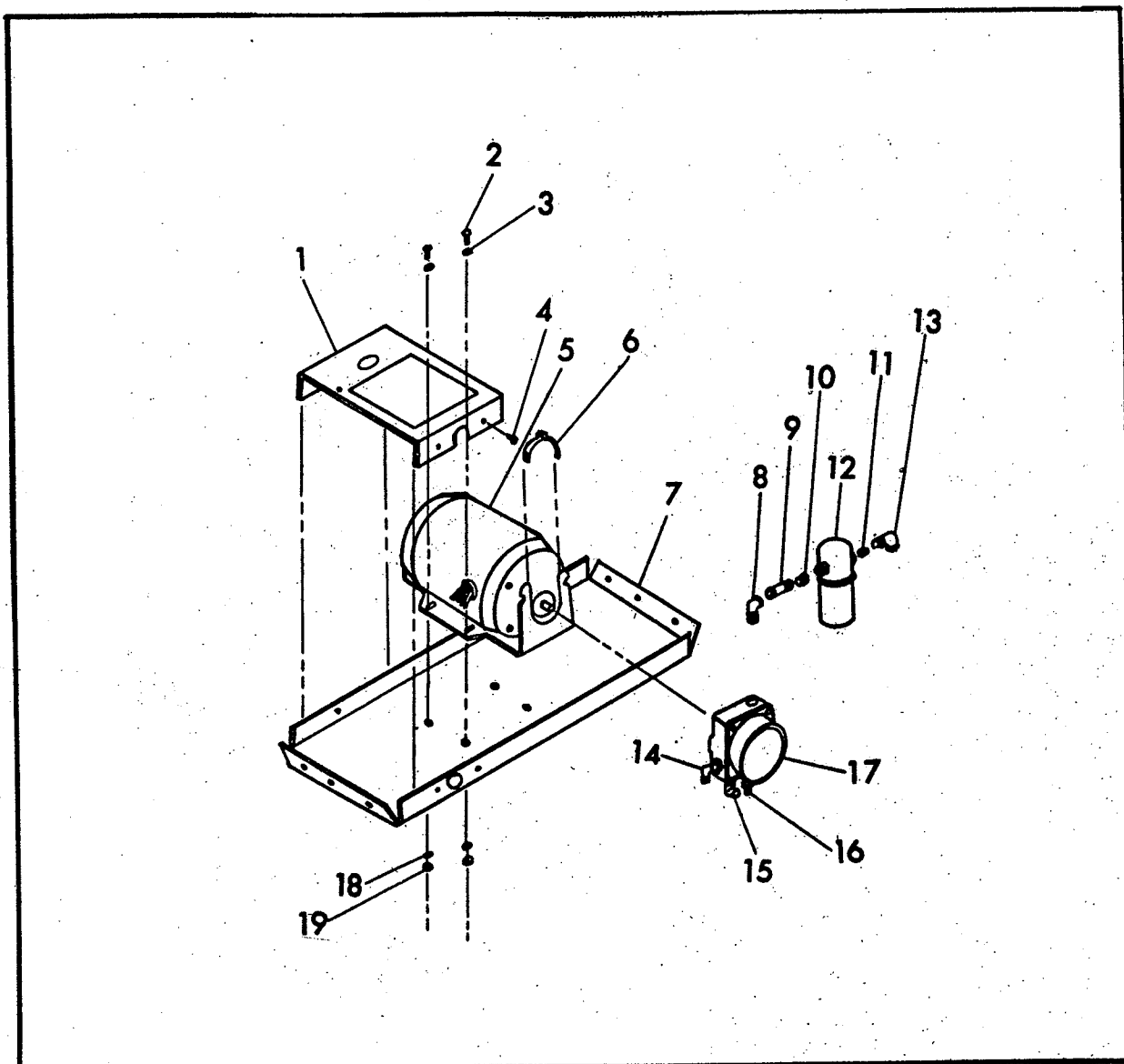


Figure 6 Motor and Pump Assembly

Item No.	Part Number	Part Name	Qty.
-	M50172-01	Motor & Pump Assembly	N/A
1	M50082AA	Cover, Wiring	1
2	HF5-5C	Screw, Hex. hd., 5/16-24 x 5/8	4
3	WLE5	Washer Lock 5/16	4
4	M11084-26	Screw Hex Slotted 10-12 x 3/8	5
5	M50064-02	Motor	1
6	M50116	Clamp, Flanged	1
7	M50161AA	Support, Motor	1
8	57413	Elbow, Street	1
9	M50393	Nipple, Long	1
10	M20137	Bushing, Pipe	1

Item No.	Part Number	Part Name	Qty.
11	M20137	Bushing, Pipe	1
12	M50398	Filter	1
		Element Filter	1
13	M50114-02	Elbow, Male	1
14	M50297	Elbow, Compression	1
15	57413	Elbow, Street	1
16	M50113-02	Fitting Straight 1/8 pt.	1
17	M50065	Pump Fuel	1
18	WLM-5	Washer, Lock 5/16	4
19	NPF-5C	Nut, Hex 5/16-24	4

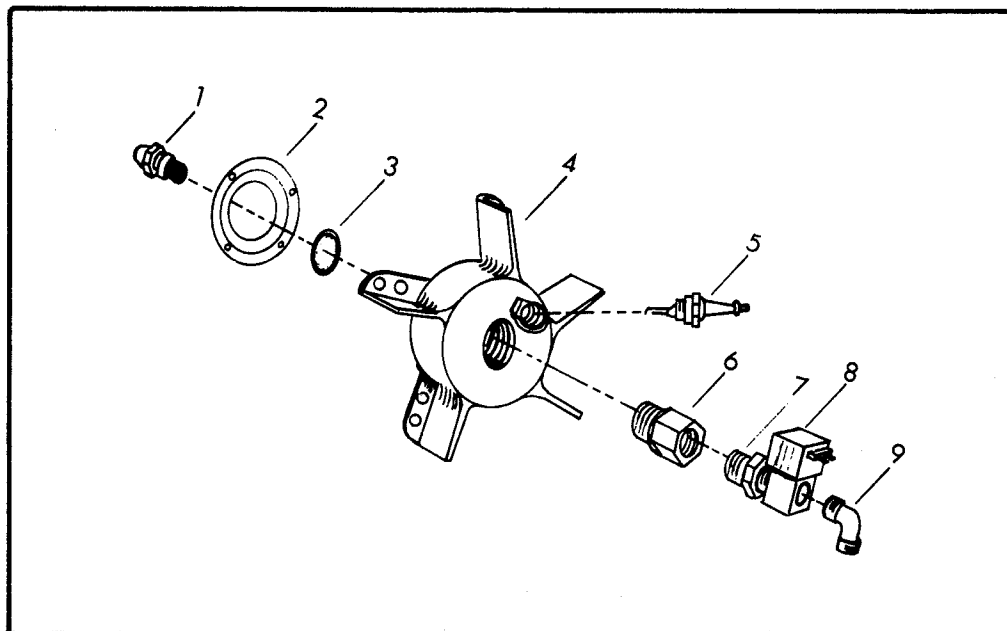


Figure 7 Burner Head Assembly

Item No.	Part Number	Part Name	Qty.
	M50084-03	Burner Head Assembly	1
1	M30765	. Nozzle	1
2	M50396	. Orifice, Burner Head	1
3	M16741-18	. Ring Retaining	1
4	M16534-02	. Burner Head	1
5	M10962-2	. Spark Plug	1
6	M50081	. Adapter, Nozzle	1
7	M50392	. Nipple, Hex	1
8	M50077	. Valve, Solenoid	1
9	M50297	. Elbow, Compression 90°	1

[illegible][illegible]

Dealer Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_