

REDDY HEATER

PORTABLE HEATERS

MODEL

M-50 AND M-50D

(Spec. No. 2992G1-1, 2992G7 and 3061G14)

REDDY

OPERATING, MAINTENANCE and SERVICE INSTRUCTIONS with PARTS LIST



**Koehring
Master Division**

SECTION I

INTRODUCTION

A. GENERAL

1. Purpose of heater. Use this heater wherever you need temporary portable heat. It must be used with adequate ventilation and proper electrical power.

2. Purpose of manual. This Service Manual gives complete instructions for operating, maintaining, trouble shooting, and servicing the heater. A complete parts list is included at the end of the manual.

B. PRINCIPLES OF OPERATION

Operation of the heater is easy to understand. It consists of three simple systems (See Figure 1.), plus a control system on Deluxe heaters.

1. Fuel System. An air pump on one end of the motor shaft forces air through the nozzle. The moving air lifts fuel from the tank by a siphon action, and forces it into the combustion chamber in a fine spray.

2. Ignition System. The electric arc of a spark plug that fires constantly while the heater is in operation ignites the mixture of fuel and air.

3. Air System. A fan on the other end of the motor shaft supplies additional air to the heater. Part of this air enters the burner through ports around its outer edge, and helps complete the combustion of the burning fuel-air mixture.

The rest of the air from the fan 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. The air then flows out of the heater as a jet of clean, heated air.

4. Control System (Deluxe heaters). A control system consisting of a light-sensitive cell, a relay, and a circuit breaker will shut the heater off in case it fails to ignite or if it runs out of fuel. (The operation of this system is explained more fully in Section V, Service and Repair Instructions.)

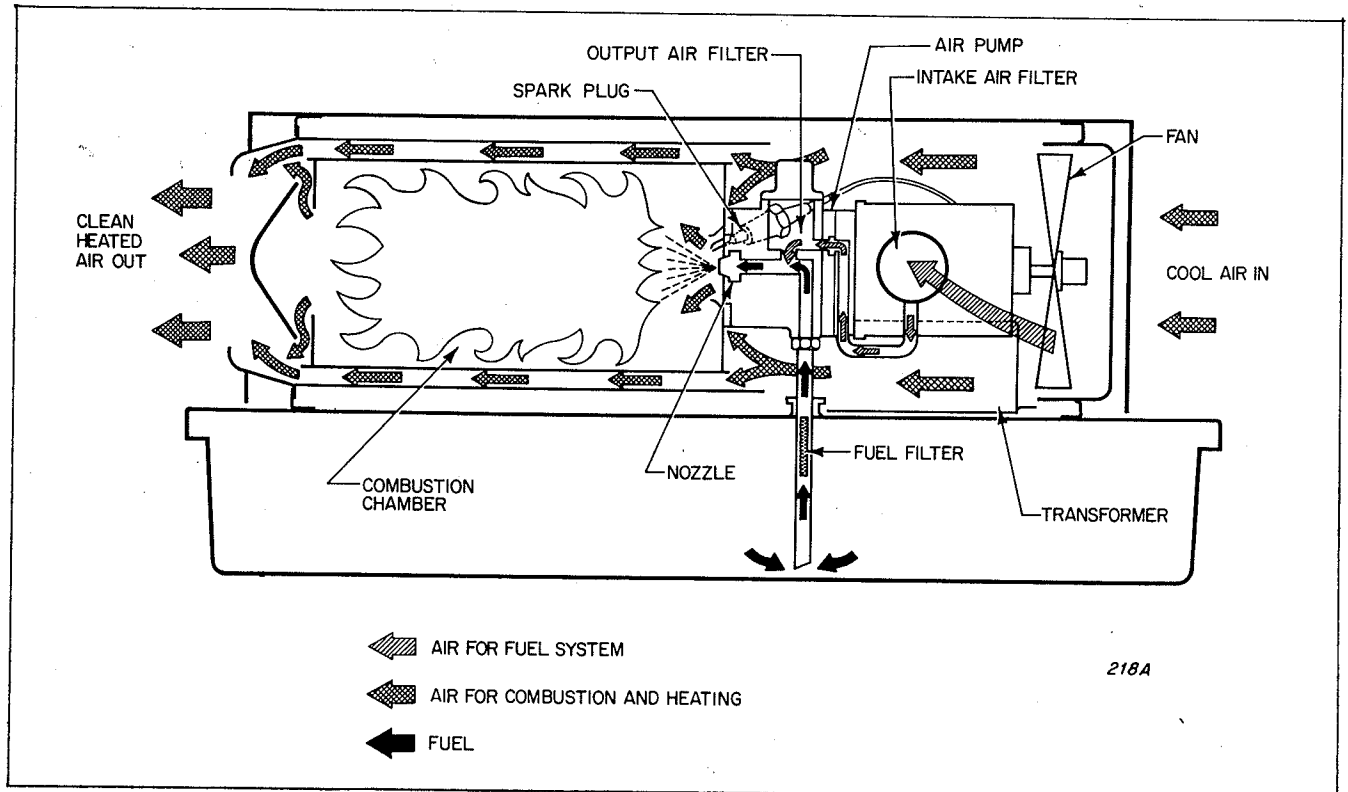


Figure 1. Flow Diagram

C. SPECIFICATIONS

Output rating	50,000 BTU per hour	Air Pump	Four-blade dry type
Air output	100 cubic feet per minute approx.	Amperage	4, during normal run
Fuel	Kerosene or No. 1 fuel oil only	Duct	None recommended
Power Requirements . . .	115 volts, 60 cycles, AC	Weight	38 lbs., approx.
Motor (Totally enclosed).	3450 RPM on heaters built for 115-volt-, 60-cycle AC	Fuel tank capacity	4.5 U.S. gallons
Fan	Five blades, 6-5/8 in. diameter, pitched to give required CFM at rated motor RPM	Fuel Consumption	Approx. 1/3 U.S. gallons per hour

D. MODEL DIFFERENCES

The heaters covered in this manual are similar in design and construction, except that the heaters built for the 1970/71 marketing season no longer use an intake air filter, body and associated parts. In addition, the heater housing is attached to the tank skirt with six screws (three on each side). Heaters

built to this configuration no longer use the housing holding clips.

E. ACCESSORIES

A thermostat Accessory, Model No. HA-1000 is available for use with these heaters. In addition, standard heaters may be converted to Deluxe operation by the installation of a Safety Control Kit, Model No. HA-2100.

SECTION II

OPERATION

A. OPERATING CAUTIONS

1. Use the heater in a well-ventilated area only. A partly-opened door or window near the heater will give enough ventilation. These heaters are not recommended for use in sleeping quarters.

2. Use ONLY kerosene or No. 1 fuel oil. DO NOT USE GASOLINE, AS IT IS VOLATILE AND DANGEROUS. Do not use No. 2 or No. 3 fuel oil, as they contain tars which will contaminate the heater.

3. Use the heater only on the specified electrical power. This is given on the heater 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 it.

5. Keep the heater at least 4 feet from any combustible material.

6. Do not use the heater in the presence of flammable vapors like those from paint or gasoline.

7. Do not add fuel while the heater is operating.

WARNING

The motor has an automatic thermal overload protector. It may stop due to low voltage or overload, then RESTART automatically. Be sure to disconnect the heater service cord before removing the upper shell or inspecting the motor.

B. EXTENSION CORD SIZES

Be sure to use an extension of the proper size to assure adequate voltage at the heater.

Length of Cord (feet)	100	200	300	400	500
Wire Size (AWG)	14	12	10	8	6

C. FUEL

Be sure the tank is clean. Fill it with kerosene or No. 1 fuel oil only. Do not use any other fuel.

When the heater is operated at extremely low temperatures beyond 10° F below zero), the fuel may congeal. To prevent this, add non-toxic anti-icer to the fuel to keep the fuel from congealing. Be sure the tank is clean before filling. Follow the mixing instructions on the anti-icer container.

D. STARTING

1. Standard Heater. To start the heater, plug

the cord into an outlet that will give power of the same voltage and frequency as the instruction plate. The heater will start operating immediately.

2. Deluxe Heater. To start the heater:

a. Plug the cord into an outlet that will give power of the same voltage and frequency as stated on the instruction plate.

b. Press the red reset button on the rear of the heater. The heater should start immediately.

c. If the heater fails to start, the red button will pop out in from 15 to 40 seconds, depending on surrounding temperature. If it pops out, wait from 3 to 5 minutes for the circuit breaker to cool, then press the red button again.

E. STOPPING

To stop the heater, unplug the heater cord from the outlet.

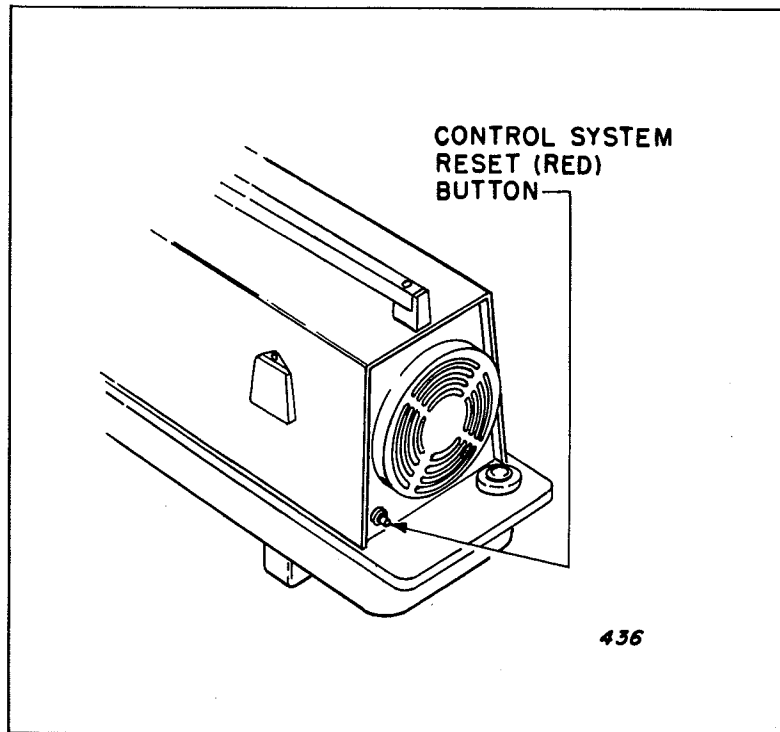


Figure 2. Control System Reset Button

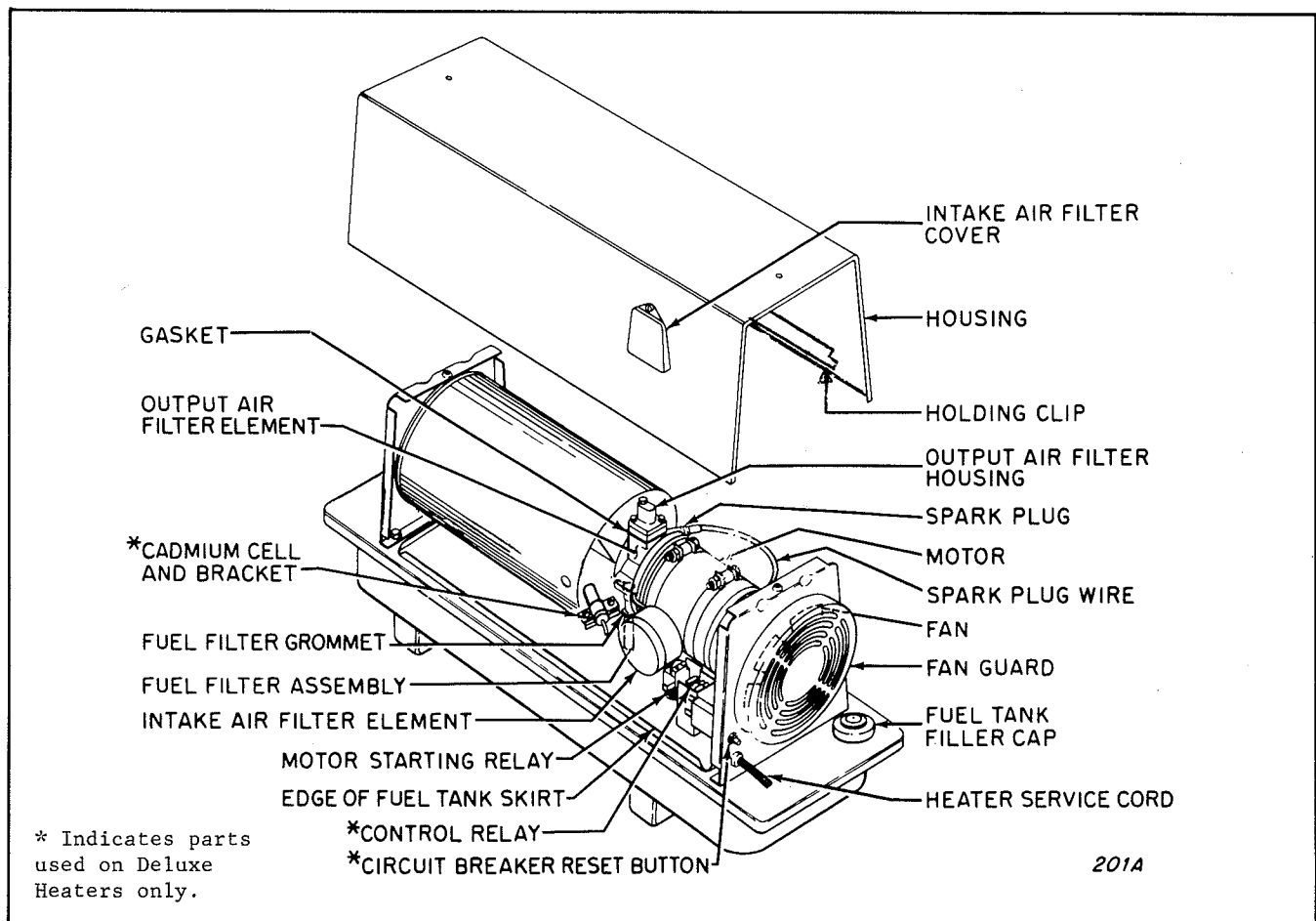


Figure 3. Maintenance Points

SECTION III

MAINTENANCE

The heater will give you long service with a minimum of attention. It is important, however, to give it the small amount of care it needs. If the heater does not seem to be operating correctly, check the Trouble Shooting Chart and perform the maintenance called for, or send the heater to an authorized service station for repair.

A. FUEL TANK

Drain the fuel tank after every 150 hours of operation and flush it out with clean fuel. Refill with new, clean kerosene or No. 1 fuel oil. Clean the tank in this manner before first starting it in every heating season.

B. REMOVING HEATER HOUSING

NOTE: You will need to remove the heater housing in order to perform some of the maintenance on the heater. The heater will not operate properly if the housing is not firmly in place, with its holding clips engaged over the tank skirt.

Remove the heater housing by taking out the two handle-attaching screws. Some heaters have six

screws attaching the heater housing to the tank skirt. Remove these, then lift off the handle and the housing. See Figure 4.

C. AIR FILTERS

1. Intake Air Filter

a. If the heater is equipped with an intake air filter, check and clean the intake air filter often. It needs cleaning if you can see a film of dust on the filter element. To check or clean, remove the screw which attaches the filter cover to the heater housing. See Figure 5.

b. Pull out the filter element and wash it with a mild detergent and hot or cold water. Dry thoroughly and replace. Replace the cover and the screw.

CAUTION: Do not oil the filter element.

2. Output Air Filter

a. Check the output air filter every 150 hours of operation, or at least twice every heating season.

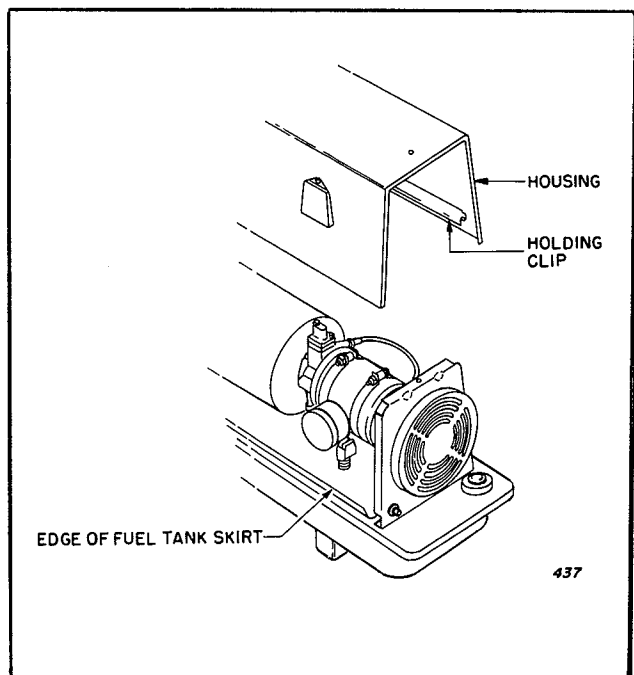


Figure 4. Removing and Replacing Housing

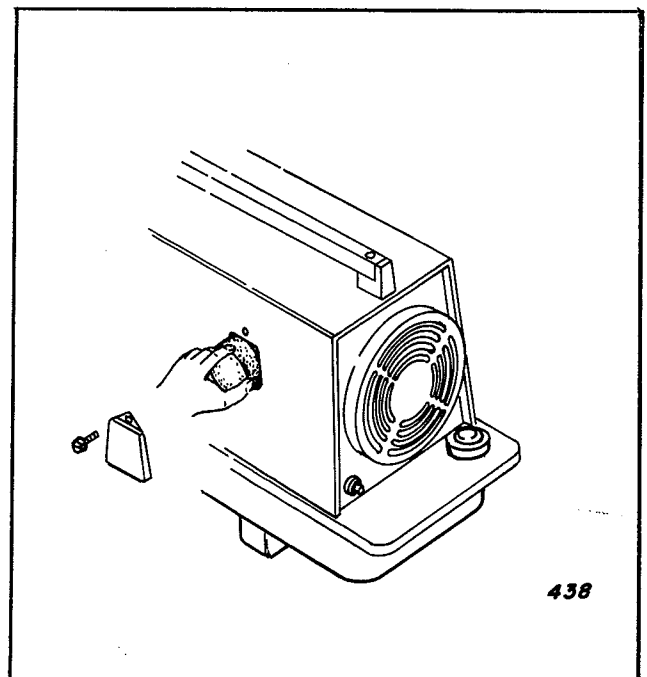


Figure 5. Removing Intake Air Filter

b. To reach the output air filter, take off the heater housing, remove the two screws and take off the valve body and gasket. Then lift out the filter element. See Figure 6.

c. Wash the filter element with a mild detergent and hot or cold water. Dry thoroughly. Do not oil filter.

d. Replace the filter element, gasket, valve body, and screws. Be sure the joint between the valve body and burner head is air tight.

NOTE: Cleaning the output air filter may cause a change in air pump output pressure. If the heater burns improperly after cleaning, check the air pump output pressure.

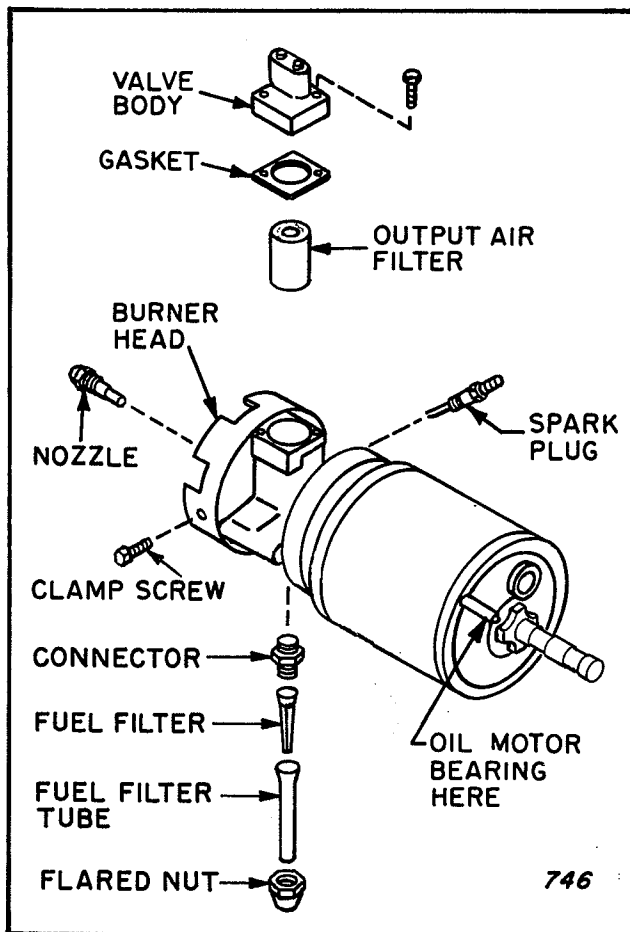


Figure 6. Maintenance of Filters and Motor

D. FAN MAINTENANCE

Clean the fan blades every 500 hours of operation, or whenever you see that they are getting dirty. A build-up of dirt on the blades will reduce air supply and cause faulty operation.

1. Remove the fan guard, at the rear of the heater.

2. Wipe the fan blades clean with a cloth moistened with kerosene or solvent. Be careful not to bend the blades. Dry the fan thoroughly.

3. Reattach the fan guard, if the motor, pump, and burner head assembly is not to be removed at this time.

E. MOTOR LUBRICATION

The ball bearing on the pump-end of the motor is lubricated for the life of the motor. Do not lubricate it.

Oil the sleeve bearing at the fan-end of the motor once a heating season with a few drops of electric motor oil, No. 30 oil, or Arctic C oil. Do not over-oil.

F. CLEANING THE FUEL FILTER

NOTE: It will be necessary to remove the combustion chamber and the motor, pump and burner head assembly in order to reach the fuel filter for maintenance.

1. Remove the nose cone, then take off the combustion chamber by loosening the screw that holds it to the burner head. You can reach this screw by inserting a screwdriver into the hole near the rear of the left side of the combustion chamber. Then, as you face the outlet of the heater, rotate the combustion chamber to the left (counterclockwise) to release it from the burner.

2. Loosen the filter and relay bracket at the left side of the heater. Disconnect the air intake tube from the pump. Remove the motor clamps. Loosen the fan guard if it is not already loose.

3. Lift out the group of parts consisting of the motor, pump, and burner head.

CAUTION: Protect the nozzle from damage while the burner is out of the heater. This is important!

4. Remove the filter from the burner head, using a wrench. (The fuel filter is in the copper tube which extends from the burner down into the fuel tank.)

5. Immerse the filter in clean fuel and rinse it several times. Blow it dry with a gentle stream of compressed air.

6. See "Reassembly" for replacement instructions.

G. NOZZLE

1. With the combustion chamber removed from the burner, carefully remove the nozzle, using a socket wrench.

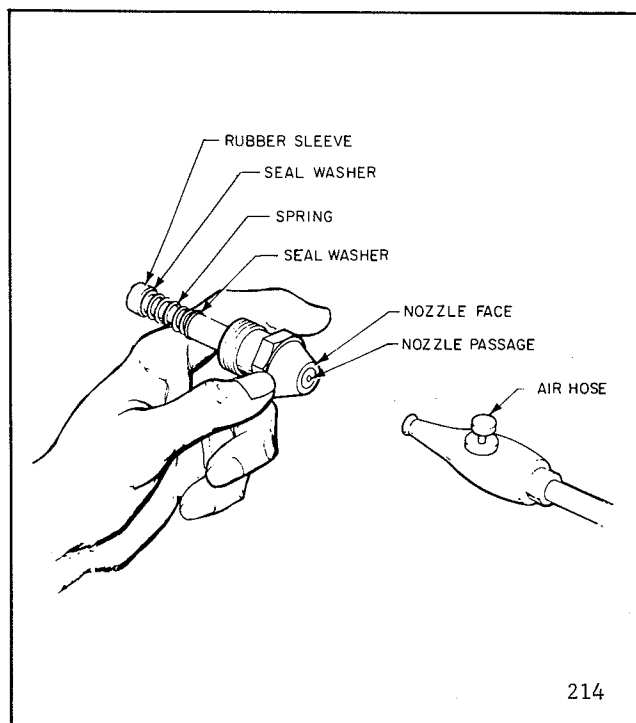


Figure 7. Blowing Out Nozzle

2. Soak the nozzle for one hour in non-flammable liquid cleaning agent. Blow it dry through the face (OUTLET END) only. See Figure 7.

CAUTION: Never attempt to open the nozzle passage with a steel drill, a wire or any other tool, as you will damage it beyond repair. Protect the nozzle face from damage while the burner is out of the heater. This is important! Do not attempt to repair the nozzle. Replace it or take the heater to an authorized service station for nozzle service or replacement.

H. 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 8.
3. Adjust the gap by bending the outside electrode. See Figure 8.

4. Reinstall the spark plug if no further maintenance is needed for the burner head. If you do not install the spark plug immediately, protect it from damage until it is reinstalled.

I. REASSEMBLY

Put the heater back together in the reverse order of disassembly, noting the following points:

1. When you reinstall the fuel filter tube be sure the filter element is in place and is undamaged. Then tighten the nut firmly onto the fitting in the burner head. The grommet must be in place in the fuel tank and the filter tube moistened with kerosene before you insert the filter tube into the tank.
2. When you reinstall the combustion chamber, be sure the end of the chamber is tight against the front face of the burner, and position the combustion chamber so that the drain holes will be at the bottom.
3. Snap the spark plug wire into place, to prevent loosening when the heater is moved.

4. Be sure all parts are in place and all screws and electrical connections are tight, before attempting to use the heater. Take care not to damage the spark plug, and to keep the proper gap between its electrodes. Check to see that the housing is installed properly.

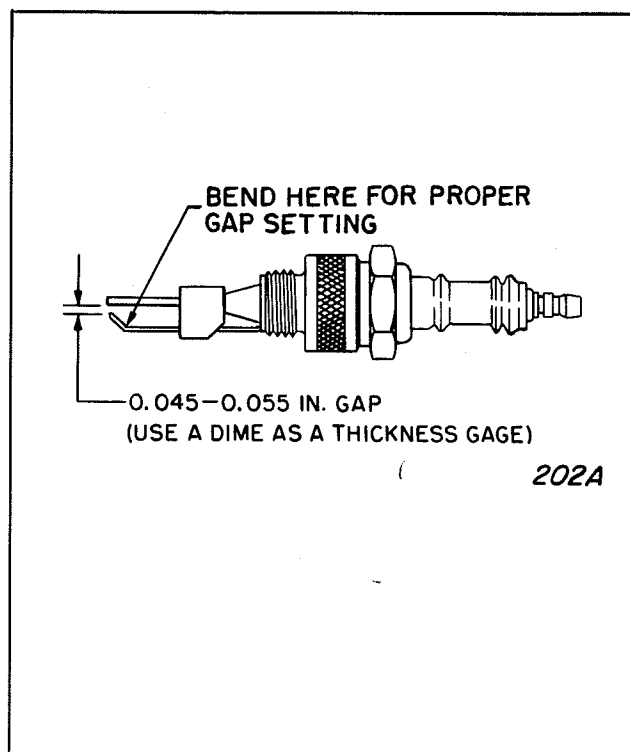


Figure 8. Spark Plug Gap Setting

SECTION IV

TROUBLE SHOOTING

A. GENERAL

If normal maintenance fails to keep a heater in good operating condition, it probably requires repair or replacement of some parts. Examine it and test-fire it to gain first-hand knowledge of why the service might be needed.

This section tells how to examine and test-fire the heater. It also contains a Trouble Shooting Chart for help in diagnosing heater troubles and finding the remedies.

B. EXAMINATION

1. Check the fuel tank for sludge and water. If you find it, expect to find a dirty nozzle and/or fuel filter.

2. Spin the fan to be sure it turns freely. If it is stiff, look for a worn or dry bearing on the fan-end of the motor, or for a binding pump rotor.

3. Check the heater for dirt and foreign materials around the pump, fan, and air filters. Be sure the heater is reasonably clean before test-firing it.

4. Check the heater cord for obvious breaks or other unsafe conditions. If the cord is doubtful, repair it or install a new one before test-firing.

C. TEST FIRING

1. Clean the tank and fill it with at least two gallons of clean fuel. A minimum of two gallons of fuel must be in the tank for proper test firing.

2. Clean the air intake filter, (Section III, paragraph C).

3. Remove the heater housing and combustion chamber (Section III, paragraphs B and F). Discon-

nect the spark plug wire. Take out the plug which is in the output air filter housing. Install the pressure gage (listed in Section V, paragraph B) into the hole.

4. Plug the heater cord into an electrical outlet. The pressure gage must read 4 pounds per square inch, plus or minus 1/16 pound. If not, adjust the pressure as described in Section V, paragraph K.

CAUTION: Tighten plug until sealed. Use soapy water to check for sealing. Do not overtighten.

NOTE: It is not possible to test-fire the heater properly if this adjustment cannot be made.

5. After making the pressure check and adjustments, reinstall the combustion chamber, the plug and the heater housing. Reconnect the spark plug wire.

6. Allow the heater to run for 15 minutes. Observe its operation during the test run.

7. If any troubles show up during the test firing, refer to the Trouble Shooting Chart to find out how to correct them.

D. TROUBLE SHOOTING

The following chart lists the problems you might find in a heater. For each problem, there is a list of "Possible Causes". The "Remedy" column tells how to correct the problem, or tells you by means of a section and paragraph number, where to find instructions for correcting it. In trouble shooting, remember that the air pump is part of the fuel system, because the air it supplies siphons the fuel from the tank and pushes it through the nozzle.

NOTE: Be sure to follow all cautions and warnings. They will help you prevent damage to the heater or injury to yourself.

TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE	REMEDY	FOR FURTHER DETAILS SEE:
1. Motor does not start. (Circuit breaker's red button stays in when pressed.)	<u>Electrical Troubles</u>		
	a. No power or low voltage at heater.	Be sure power is reaching heater; check condition of heater cord. Repair or replace as needed. Use extension cord with wires heavy enough to carry the electrical load of the heater. Be sure the voltage at the outlet is same as shown on heater instruction plate.	Sec. II, Para. B.
	b. Defective motor or starting relay.	Check motor and relay. Replace a defective motor or starting relay.	Sec. V, Para. D.
	<u>Mechanical Troubles</u>		
	c. Dry bearing on fan-end of motor.	Lubricate motor. If lubrication does not solve problem, check pump.	Sec. III, Para. E. Sec. V, Para. J.
2. Heater will not ignite, but motor runs. (Red button on circuit breaker pops out after 15 to 45 seconds.)	d. Pump rotor binding or carbon blades worn out.	Rebuild pump.	Sec. V, Para. J.
	e. Fan striking end shield due to damaged end shield or broken motor mount support.	Check for damaged end shield; repair or replace if damaged. Replace fan if damaged. Check for broken weld on motor mount. If broken return to dealer for replacing or re-welding.	Sec. V, Para. F.
	<u>Fuel System Troubles</u>		
	a. Fuel tank empty, water in fuel, wrong fuel.	Check for water in tank, clean tank and fuel filter if water is found. Fill tank with new, clean kerosene or No. 1 fuel oil.	
	b. Fuel filter clogged.	Remove and wash in clean fuel.	Sec. III, Para. F
	c. Nozzle plugged or defective.	Clean by blowing compressed air through nozzle from outlet end of nozzle. Replace nozzle if cleaning does not solve problem.	Sec. V, Para. I.
	d. Low air pump pressure.	Check pressure; adjust, rebuild or replace air pump as needed. Check rubber sleeve around shank of nozzle. Replace if leaking. Check seal between burner head and air pump port plate; be sure seal is in place.	Sec. V, Para. J & K Sec. V, Para. I. Sec. V, Para. L.

TROUBLE SHOOTING CHART (Continued)

PROBLEM	POSSIBLE CAUSE	REMEDY	FOR FURTHER DETAILS SEE:
2. Heater will not ignite, but motor runs. (Continued)		Check gasket at output air filter cover. Be sure it is holding pressure. Be sure air filters are clean.	Sec. III, Para. C
	<u>Ignition Troubles</u>		
	e. Defective spark plug. (Wrong gap, plug wet with fuel or electrodes carboned, or plug damaged.)	Measure gap between electrodes, using thickness of a dime as a gage. Adjust electrode gap. Inspect plug for broken porcelain or electrodes. Discard a damaged spark plug.	Sec. III, Para. H
	f. Spark plug wire disconnected from plug or from terminal of transformer.	<u>Disconnect heater cord!</u> Check at plug and transformer to be sure wire is tight at both ends.	
	g. Defective transformer.	Disconnect spark plug wire from transformer, and check transformer for spark; replace if no spark can be obtained.	Sec. V, Para. C.
3. Heater burns, but smoke or puffs of smoke can be seen; heater will not burn steady; heater burns with odor.	<u>Improper Fuel-Air Mixture (Not enough fuel)</u>		
	a. Heater running out of fuel; water condensation in fuel tank.	Shut heater off and check fuel tank. If you can see water in the bottom, drain and flush the tank with clean fuel. Refill with new kerosene or No. 1 fuel oil.	
	b. Dirty intake and output air filters, causing reduced air flow through nozzle, resulting in low fuel flow.	Remove and clean the air filters. Be sure air intake passage is not blocked.	Sec. III, Para. C
	c. Fuel filter connection loose, dirty, or defective fuel filter.	Remove and wash fuel filter in clean fuel. Test filter connection for leaks; check condition of filter. Use a new one if defective. Tighten nut firmly on fitting in burner head.	Sec. III, Para. F Sec. III, Para. F
	d. Dirty nozzle.	Remove and clean burner head. Blow compressed air through nozzle from <u>outlet</u> end. <u>Never</u> use a drill, wire, or other tool to open nozzle passage. Replace a defective nozzle.	Sec. V, Para. I. Sec. V, Para. I.

TROUBLE SHOOTING CHART

PROBLEM	POSSIBLE CAUSE	REMEDY	FOR FURTHER DETAILS SEE:
3. Heater burns, but smoke or puffs of smoke can be seen; heater will not burn steady; heater burns with odor. (Continued)	e. Low pump output pressure. (Low motor speed, worn pump, pump out of adjustment.)	Check pump output pressure; adjust pressure; repair pump if adjustment cannot be made. Check to see that no dirt or trash (or dirty fan blades) could cause motor slowdown. Lubricate fan-end bearing of motor.	Sec. V, Para. K. Sec. III, Para. E.
	f. (Remote possibility) Rubber sleeve on shank of nozzle is leaking.	Check for bubbles in fuel tank while heater is operating. If bubbles appear, replace rubber sleeve.	Sec. V, Para. I.
	g. (Remote possibility) Combustion chamber not tight against burner head, allowing too much air to enter combustion chamber.	Adjust fins for good fit of combustion chamber to burner head.	Sec. V, Para. L-1g
4. Flames come out front of heater.	<u>Improper Fuel-Air -- Mixture (Too much fuel, or not enough air for amount of fuel.)</u>		
	a. Dirty fan, or air passageway through heater blocked by dirt or trash.	Clean the fan. Be sure the air passageway through the heater is clean. Keep the heater clean.	
	b. Pump output pressure too high.	Check and adjust pump output pressure.	Sec. V, Para. K.
	c. Fan loose or improperly located on shaft.	Check; correct if not right.	Sec. V, Para. F.
5. Heater cycles intermittently.	d. Housing holding screws loose.	Check housing fit; correct if not tight.	
	<u>Electrical System Troubles (Motor overload protector tripping out.)</u>		
	a. Low voltage, causing trip-out of motor overload protector.	Check power line voltage. Use correct size extension cord. Be sure extension cord and heater cord are in good condition, without intermittent open circuits.	Sec. II, Para. B.
	b. Motor overload protector tripping out due to motor trouble, or binding pump.	Lubricate fan-end bearing. Keep motor and fan area clean. Replace defective motor or rebuild defective pump.	Sec. III, Para. E. Sec. V, Para. E & J

TROUBLE SHOOTING CHART (Continued)

PROBLEM	POSSIBLE CAUSE	REMEDY	FOR FURTHER DETAILS SEE:
6. <u>Control System Troubles</u>			Sec. V, Para. N.
6A. Heater ignites, but red button of circuit breaker pops out anyway.	a. Defective photo cell.	Check to see if glass face of cell is so dirty it can't "see" the flame; clean glass if dirty. Replace with a cell that is known to be good.	
	b. Defective control relay (remote possibility of this.)	Replace with a relay that is known to be good.	
	c. Defective electrical connections in circuit through cell and coil of control relay.	Be sure all solder joints and wiring connections are secure.	
6B. Circuit breaker fails to trip when a no-flame condition exists.	a. Defective circuit breaker.	Replace with a circuit breaker that is known to be good.	
	b. (Remote chance of this.) Relay contacts dirty or defective.	If contacts are accessible, clean them with the corner of a postcard. Replace defective relay with one that is known to be good.	
	c. Open connection in circuit through circuit breaker, resistor, and relay contacts.	Check solder-joints and clip-on connections.	
6C. Button on circuit breaker won't stay in when pressed.	a. Resetting is tried too soon after the breaker trips.	Wait 5 minutes and try again.	
	b. Defective circuit breaker.	Replace with a circuit breaker that is known to be good.	

SECTION V

SERVICE AND REPAIR INSTRUCTIONS

A. GENERAL

This section covers replacement of parts, repair and rebuilding of heater components, and making of adjustments.

Whenever a part needs to be replaced, you can identify it on the exploded view, and order the part by name and part number from the parts list, in Section VI.

B. SPECIAL TOOLS, EQUIPMENT, AND SUPPLIES

The following tools and equipment should be available for complete servicing of the heater.

1. Air Pressure Gage, Part No. M9148, or any gage with a 15-pound pressure range and 1/4-pound divisions, able to indicate 4-1/4 pounds accurately, plus fittings for installation into a 1/8-inch standard pipe-threaded hole.
2. Oil Burner Nozzle Wrench, or any 5/8-inch socket wrench.
3. Clean fuel, either kerosene or No. 1 fuel oil.
4. Non-flammable and non-toxic cleaning solvent.

CAUTION: Always use solvents in a well ventilated area!

5. Compressed air is advisable, but not absolutely necessary.

C. TRANSFORMER

NOTE: To begin the transformer test, first be sure the heater is NOT plugged in.

1. Remove the spark plug wire from the transformer output terminal.

WARNING

A transformer in good condition produces a high voltage at the output terminal. Be **EXTREMELY** careful when checking the transformer.

2. Plug the heater cord into an outlet of the proper voltage and frequency. Place a screwdriver with a **GOOD INSULATED HANDLE** across the output terminal and bring the tip of the screwdriver near a metal part of the heater. If no spark jumps, and the wiring to the transformer is good, the transformer is defective and must be replaced.

3. Be sure the mounting surfaces of the new transformer are scraped clean, and the mounting

screws are tight, to assure adequate grounding. Connect the spark plug wire and the primary leads. See the Wiring Diagram, Figure 9 or Figure 13.

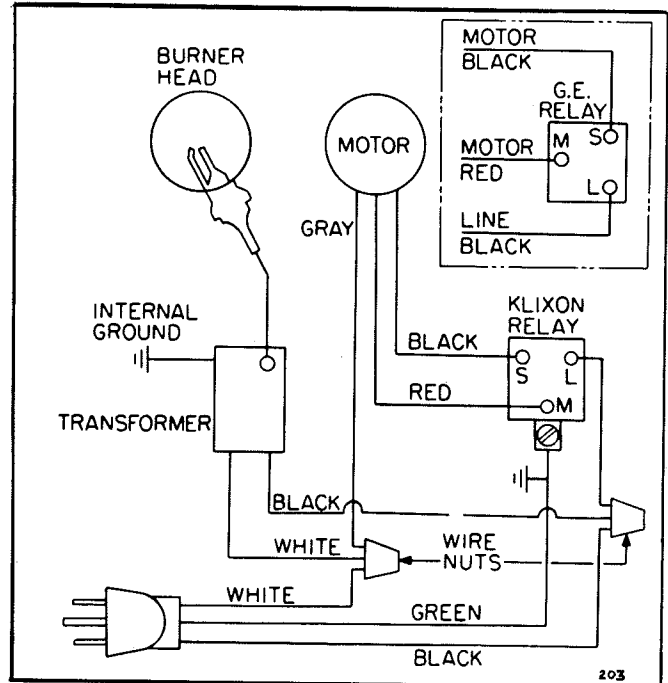


Figure 9. Wiring Diagram for Standard Heaters
(See Figure 13 for Deluxe Heater Wiring Diagram.)

D. CHECKING THE MOTOR AND RELAY

In case the motor fails to start when the heater is plugged in, check the motor and relay as follows.

1. Spin the fan by hand. Any stiffness indicates that the fan-end bearing is dry or worn, or that the pump is binding. If the motor spins freely, make the following electrical check.

2. Take the black wire from the motor off its terminal on the relay. See the Wiring Diagram. Plug the heater cord into an outlet of the proper voltage.

CAUTION: Avoid touching the bare wires.

3. Touch the black wire from the motor to the terminal of the red motor wire, on the relay. The motor should start. As soon as the motor reaches operating speed, remove the black wire from contact. The motor should continue to run.

4. If the motor starts, replace the relay.

5. If the motor fails to start, or if it fails to continue running when the black wire is disconnected, it is defective. Replace it, or return it to a factory-approved authorized service organization.

E. MOTOR SERVICE

If the motor requires service, it must be removed from the heater, as described in Section III, paragraph F.

The alignment of the motor with the air pump is critical. If any service is to be done on the motor, be sure not to loosen or remove the pump body, or this alignment will be disturbed.

Apply a few drops of oil to the fan-end bearing of a stiff motor. If this fails to correct the stiffness, rebuild the pump as described in paragraph J of this section. During rebuilding of the pump, check again for stiffness, and if it still exists, rebuild the motor.

NOTE: The motor cannot be repaired by rewinding the stator. If the electrical values of the motor are changed by rewinding, the starting relay will also be affected.

F. FAN

Replace a damaged or bent fan. Do not attempt repair, except as a temporary emergency measure. Loosen two setscrews to free the fan from the motor shaft.

When checking or replacing the fan, see that the setscrews are located in the notch in the motor shaft that is nearest the outer end of the shaft, and that the hub is toward the end of the shaft.

Be sure the replacement fan has the same blade pitch as the fan that was removed. This is important in order to retain the air flow and combustion characteristics of the heater.

G. FURTHER DISASSEMBLY

Remove the combustion chamber, and the group of parts consisting of the motor, pump, and burner head, as described in Section III, paragraph F. This will let you reach the rest of the heater parts for service.

H. FUEL FILTER SERVICE

1. Remove the fuel filter from the burner head and clean it, as described in Section III, paragraph F.

2. If there is evidence of air leakage through the fuel filter connection, tighten flare nut securing filter tube to burner head fitting. If this fails to correct the problem check threaded parts for damage. Examine flared seating surface fits properly. If leak cannot be eliminated replace fuel filter parts.

3. When reinstalling the fuel filter, be sure the filter element is in place and undamaged. Tighten the filter flared nut firmly.

NOTE: If the burner head requires further service, lay the filter aside and protect it from damage until final reassembly.

I. CLEANING BURNER AND NOZZLE

1. Remove the burner head by taking out the two attaching screws. Take out the spark plug to prevent damage. Remove the nozzle.

2. Soak the burner head for one hour in non-flammable cleaning solvent. **DO NOT USE KEROSENE OR FUEL OIL.**

3. Blow the burner head dry through all passages in the burner head.

CAUTION: NEVER try to open the nozzle passage with a drill, wire, or any other tool. Any change in the size or shape of the passage will damage the nozzle beyond repair. Do not disassemble the nozzle, as flow characteristics are changed by disassembly.

4. Replace with a new nozzle if there is any sign of damage. Blow a new nozzle out thoroughly with air, from outlet to inlet end, before installing it into the burner. (See Figure 7.) Protect the nozzle face from scratches!

CAUTION: Protect the nozzle passage from damage when installing a new nozzle. Always be careful to keep the nozzle **CLEAN** while it is out of the burner.

5. Always install a new rubber sleeve whenever you install a nozzle into the burner. The sleeve is the part that helps maintain the needed pressure difference between the air and fuel chambers of the burner head. If bubbles have appeared in the fuel tank during operation, the rubber sleeve is probably leaking and should be replaced.

6. Be sure the seal washer, spring, and second seal washer are in place on the nozzle before installing the rubber sleeve.

7. When seating the nozzle firmly against the burner head, do not apply so much pressure with the wrench that the nozzle could be distorted.

J. AIR PUMP REPAIR

NOTE: Because of the close tolerances and critical positioning involved, we recommend that only skilled mechanics attempt any repair of the air pump.

The heater's air pump consists of a carbon rotor with four carbon blades, rotating inside a pump body. The rotor is driven directly by the motor, and is supported by the ball-bearing end of the motor. The motor end plate also serves as one of the end plates of the pump.

Handle all pump parts with care and keep them clean. The parts are made with close tolerances. Dirt and oil will hinder the performance of the pump.

If pump repair is required, you may order a complete pump package, or individual pump parts, as shown in the Parts List, Section VI.

1. Replacing Carbon Blades.

a. Worn or sticking carbon blades cause loss of air pressure. If the blades are worn, or are sticking in the rotor slots, replace them. (It is not necessary to remove the rotor or pump body to replace the carbon blades.)

b. Blow dust from rotor, end cover and pump body before you install the new blades.

c. Install the carbon blades into the rotor slots.

2. Disassembly of Air Pump.

a. Remove the four screws which attach the end cover, and remove the end cover. Then take out the two screws which attach the pump body to the motor, and take off the pump body.

NOTE: Hold a clean, dry cloth under the pump while you take it apart, to catch the carbon blades as they fall out when the pump body is removed.

b. Take the carbon blades out of the rotor. Pull the rotor and insert off the motor shaft.

3. Replacing the Rotor.

Use a new pump rotor only if deep grooves or uneven wear appear on the surfaces. Check the insert for wear and replace it if worn, or if it is loose on the shaft.

To remove the rotor, first remove the pump

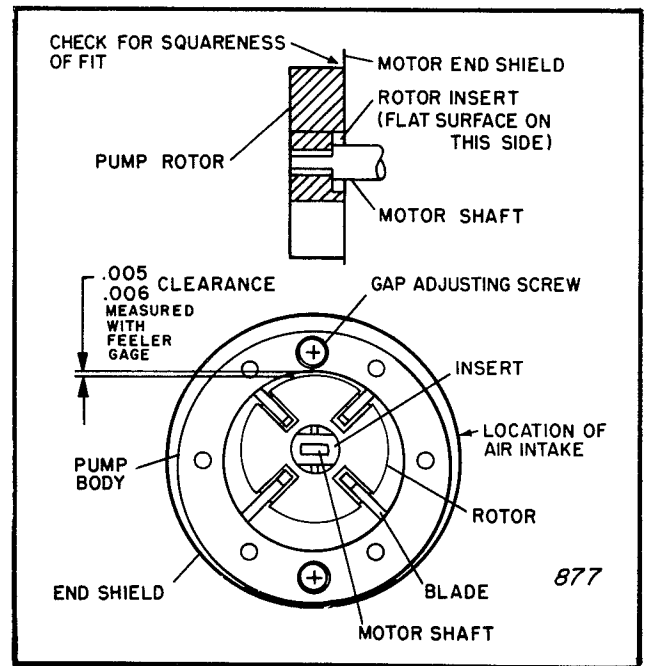


Figure 10. Air Pump Assembly and Rotor Clearance

body. When installing the rotor, take care to keep it perpendicular to the shaft.

4. Reassembly of Air Pump.

a. Install the insert in the pump rotor as shown in Figure 10, then assemble the rotor on the motor shaft. Attach the pump body to the motor with the two screws which were removed.

b. Adjust the pump body to provide 0.005 - 0.006 inch clearance at the point shown in Figure 10. Measure the clearance with a feeler gage. Spin the motor by hand to be sure the rotor does not rub on the pump body. The proper clearance must be maintained. Be sure the screws are tight after adjusting the clearance.

c. Insert the carbon blades, as described above.

d. Install the end cover, with the air line connection located as shown in Figure 10, using the four screws.

e. Install burner head, air filter, and nozzle assembly. Adjust pump pressure.

K. ADJUSTMENT OF AIR PUMP PRESSURE

1. Install the pressure gage into the output air filter housing. (See Figure 11.)

CAUTION: Tighten gage until sealed. Use soapy water to check for sealing. Do not overtighten.

2. Start the heater. (Fuel need not be in the tank.)

3. Pump pressure must be 4-1/2 pounds per square inch, plus or minus 1/8 pound without fuel in tank or housing in place. If pressure is not within this range, adjust relief valve.

4. To adjust, screw the valve stem in (clockwise) to raise the pressure; out (counterclockwise) to lower it.

L. REASSEMBLY OF HEATER

1. Reinstallation of Burner Head.

a. Be sure the seal is in place in its recess in the rear of the burner head casting. (See Figure 12.)

b. Attach the burner head to the pump and motor assembly with the two screws that were removed.

c. Be sure the filter element is in place and install the fuel filter tube into the burner head. Tighten firmly, to avoid air leakage.

d. Place the assembly of motor, pump and burner head on the bracket on the fuel tank, and attach with the clamps.

e. Install the spark plug. Be careful to protect the electrode gage setting.

f. Connect the air inlet line to the pump body. (The long end of the line goes into the pump body; the short end into the air intake filter.) Tighten the filter and relay bracket.

g. Reinstall the combustion chamber and tighten the attaching screw. If the combustion chamber does not fit tight against the face of the burner head, carefully bend the fins on the back end of the combustion chamber to eliminate all air gaps where the two parts meet. If this is necessary, loosen the motor mounting straps before installing the combustion chamber, then tighten them snugly when the combustion chamber is in place.

h. Replace end cap and nose cone assembly.

2. Completing the Reassembly.

a. Put the heater back together in the reverse order of disassembly.

b. Check all wiring to be sure it conforms to the applicable Wiring Diagram. Be sure all electrical connections are tight.

c. Remove the gage and replace the plug, and install the heater housing. (Be sure to engage the holding clips at the bottom edges of the housing over the edges of the tank skirt.

d. Be sure all other parts are in place and all attaching screws are tight before attempting to use the heater.

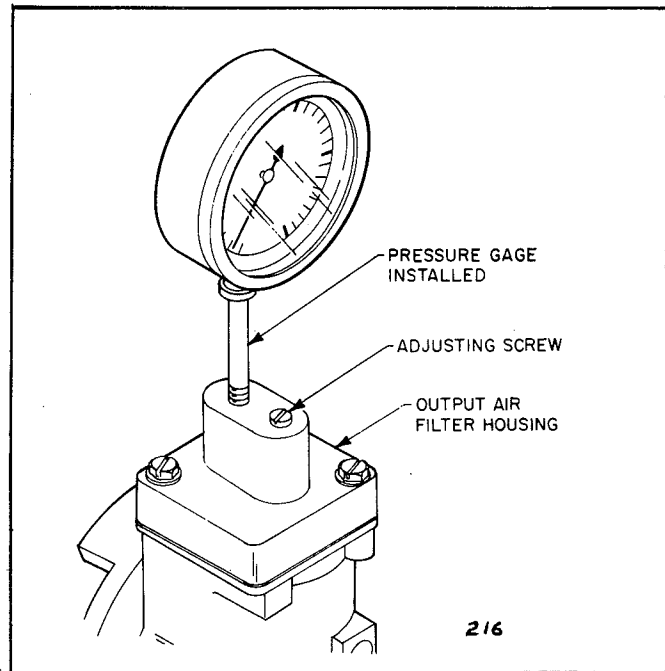


Figure 11. Pressure Gage Installation

M. FINAL CHECK

Test-fire the heater for a few minutes after all service has been completed, to be sure it will operate satisfactorily.

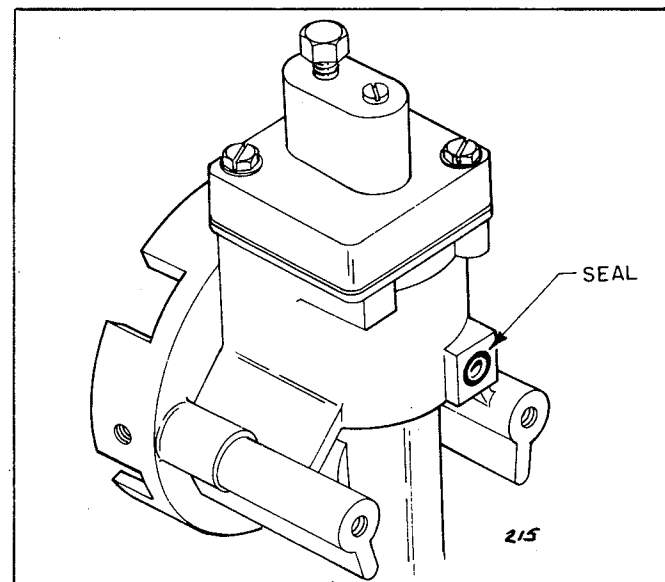


Figure 12. Burner Seal Installation

N. CONTROL SYSTEM**1. Description.**

The control system used in Deluxe heaters is designed to shut the heater off in case it does not ignite, or in case the flame should go out during operation.

The control consists of three main parts: (1) A light-sensitive cell which "sees" into the combustion chamber; (2) A control relay whose coil is controlled by the cell; and (3) A circuit breaker whose internal heating coil is controlled by the relay contacts.

2. Operation.

When the heater is first plugged in, the heating coil inside the circuit breaker starts to warm up.

If no ignition takes place, the circuit breaker will trip. When it trips, it shuts off all power to the heater.

After a trip-out, the circuit breaker must be manually reset by pressing the red button.

If ignition takes place, the cell "sees" the flame. It then allows enough current to flow to operate the control relay. The relay breaks the circuit to the internal heating coil in the circuit breaker, and the circuit breaker's main contacts will then stay closed to keep the heater operating.

If the heater should lose its fire during operation, the circuit breaker will trip after a short time, shutting off all power to the heater.

3. Service.

Since no adjustment is possible on the parts of the control system, service is limited to cleaning the glass face of the light-sensitive cell, cleaning the dirt from the exposed contacts of the relay (if the contacts are exposed), and replacing defective parts of the system with parts that are known to be good.

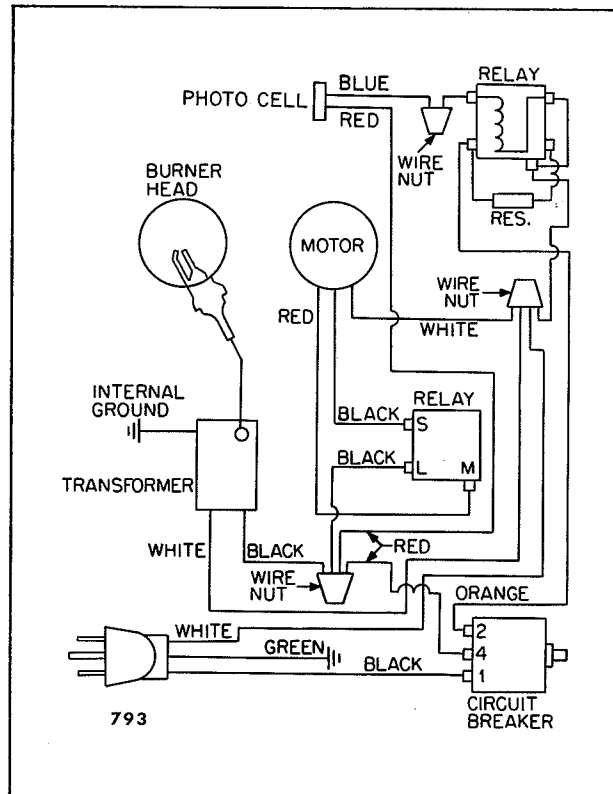
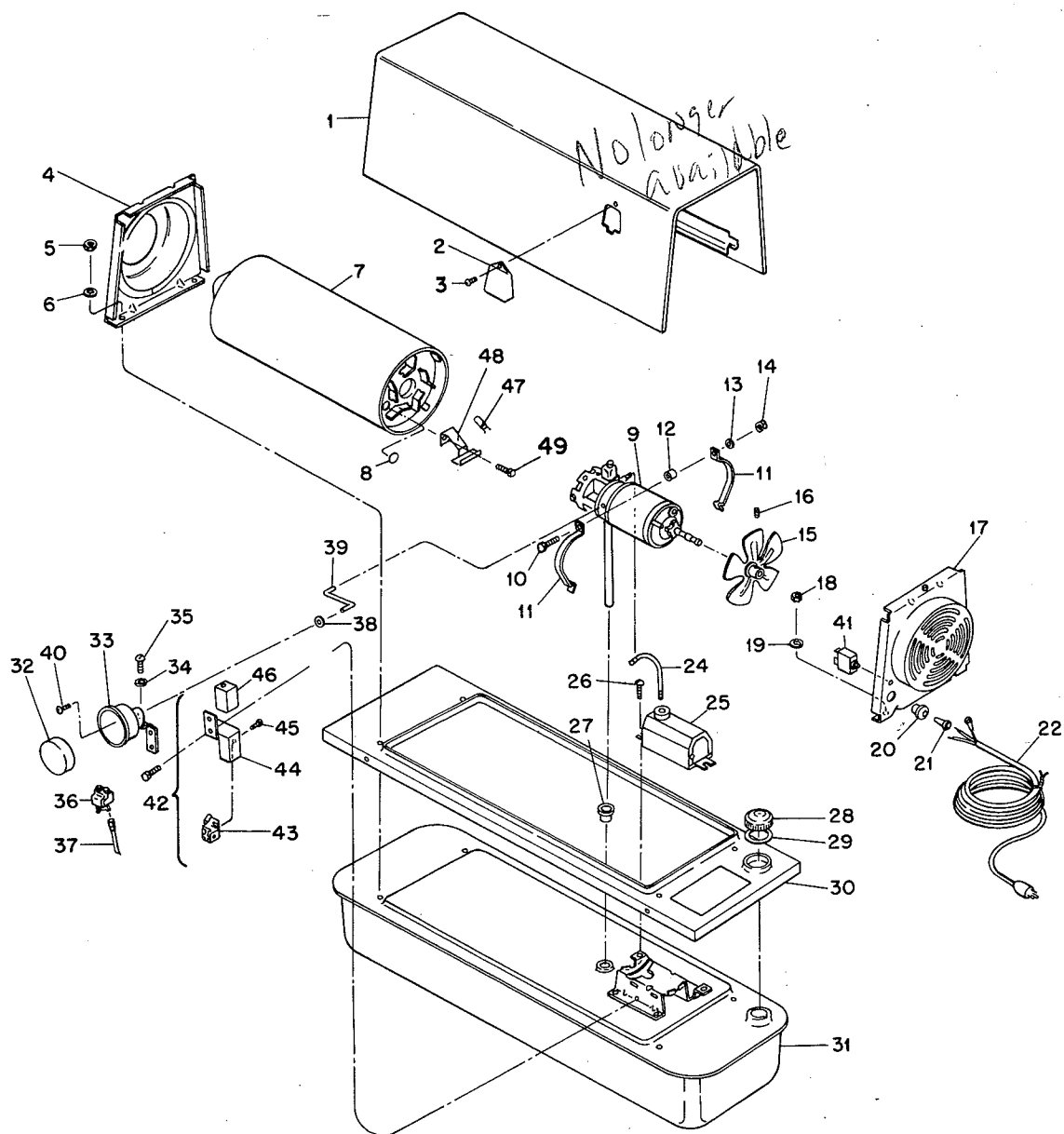


Figure 13. Wiring Diagram for Deluxe Heaters



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Figure 14. Exploded View of General Assembly

SECTION VI

ILLUSTRATED PARTS LIST

This section contains a list of all replaceable parts used in the heater covered by this manual. The only parts that are recommended for replacement by the heater's owner or user are indicated by the symbol (**). Parts indicated by the symbol (*) are standard hardware items, and may be obtained locally.

To order parts, first check the nameplate decal for the correct model number and Spec. No. of the heater. INCLUDE THE MODEL AND SPEC. NUMBER WHEN ORDERING PARTS. Do not use the index numbers from the illustration when ordering parts. Specify Color when ordering painted parts.

PARTS LIST FOR BASIC HEATER ASSEMBLY

Index No.	Part Number	Part Name or Description	Quan. Spec. No.		
			2992G1-1	2992G7	3061G14
1	M12436G1	Housing Heater	1	1	-
	M21815C	Housing, Heater	-	-	1
	*M11084-27	Screw, Self-tapping, Hex hd No. 10-12 x 1/2 in., Type "A"	-	-	6
2	M11271-6	Nut, Tinnerman	-	-	6
	M12568	Cover, Filter	1	1	-
	M21816-1C	Cover Assy	-	-	1
	M21817	Gasket	-	-	1
3	*M10908-2	Screw, Hex hd, slotted No. 6-32 x 3/8 in., Type "S"	1	1	1
4	M15767G1C	End Cap and Nose Cone	1	1	1
5	*NPC-4C	Nut, Plain hex, 1/4-20	2	2	2
6	*WLI-4C	Lockwasher, Internal tooth, 1/4 in.	2	2	2
7	M15770G2	Combustion Chamber	1	1	1
8	M15995	Plug, Button	1	-	-
9	Ref	Motor Pump and Burner Head Assembly (See Figure 15)	1	1	1
10	*HC4-10C	Screw, Rd hd, 1/4-20 x 1-1/4 in.	2	2	1
11	M16661	Clamp, Motor	4	4	2
12		Not Used			
13	*WLM-4C	Lockwasher, 1/4 in.	2	2	1
14	*NPC-4C	Nut, Plain hex, 1/4-20	2	2	1
15	**M12431	Fan, 20° Pitch	1	1	1
16	SFK4-2	Setscrew, Soc hd, cup pt, 1/4-28 x 1/4 in.	2	2	2
17	M12427G1C	Fan Guard Assy	1	1	1
18	*NPC-4C	Nut, Plain, Hex 1/4-20	2	2	2
19	*WLI-4C	Lockwasher, Internal tooth, 1/4 in.	2	2	2
20	M11143-1	Bushing, Strain relief	1	1	1
21	M13942-4	Connector (Wire Nut)	-	2	2
22	M10813G37	Cord, Service (Extension)	1	1	1
-	M10813G38	Cord Service (Extension)	-	1	1
23	-	Not Used			

Index No.	Part Number	Part Name or Description	Quan. Spec. No.		
			2992G1-1	2992G7	3061G14
24	M10816G15	Lead, Electrode (Not used with transformer No. M13277-1)	1	1	1
25	M15063	Transformer	1	1	1
26	*M15823-26	Screw, Hex hd No. 10-12 x 3/8 in., Type "B"	1	1	1
27	M10990-3	Bushing, Rubber	1	1	1
28	M11151-1	Cap, Fuel tank filler	1	1	1
29	M14246	Seal, Rubber	1	1	-
30	M12424C	Skirt, Fuel tank	1	1	1
31	M10716G1B	Fuel Tank Assy M17016-1	1	1	1
32	*M11146-1	Element, Intake air filter	1	1	-
33	M17018G1	Filter Body and Bracket Assy	1	1	-
-	M17019	Bracket, Filter	-	-	1
34	WLI-2C	Lockwasher, No. 8	2	2	2
35	*RC-2C	Screw, Rd hd., No. 8-32 x 1/4 in.	1	1	1
-	*RC2-3C	Screw, Rd hd., No. 8-32 x 3/8 in. (For ground wire)	1	1	1
36	M12462-5	Relay, Motor starting	1	1	1
37	M9900G37	Wire Assy (to Relay)	1	1	1
38	M13293	Grommet, Rubber	1	1	-
39	M12432	Tube, Air intake	1	1	-
40	*M11084-27	Screw, Self-tapping, Hex hd No. 10-12 x 1/2 in., Type "A"	2	2	2
41	M14360	Circuit Breaker	-	1	1
42	M14379G2	Relay and Bracket Assy	-	1	1
43	M14378G3	. Relay Assy, Control	-	1	-
44	M14370	. Bracket, Relay	-	1	1
45	M12461-2	. Screw, Hex hd No. 6-32 x 3/8 (Relay Mtg.)	-	1	1
46	M14983	Dust Cover, Relay	-	1	1
47	M16656G1	Photocell and Bushing Assy	-	1	1
48	M16660	Bracket, Photocell	-	1	1
49	*M10908-1	Screw, Self-tapping, hex hd No. 6-32 x 1/4 in., Type "S"	-	1	1
	M9900G36	Wire Assy, Red	-	1	1
	M13942-2	Connector, Wire	-	1	1

* Standard Hardware - Procure Locally.

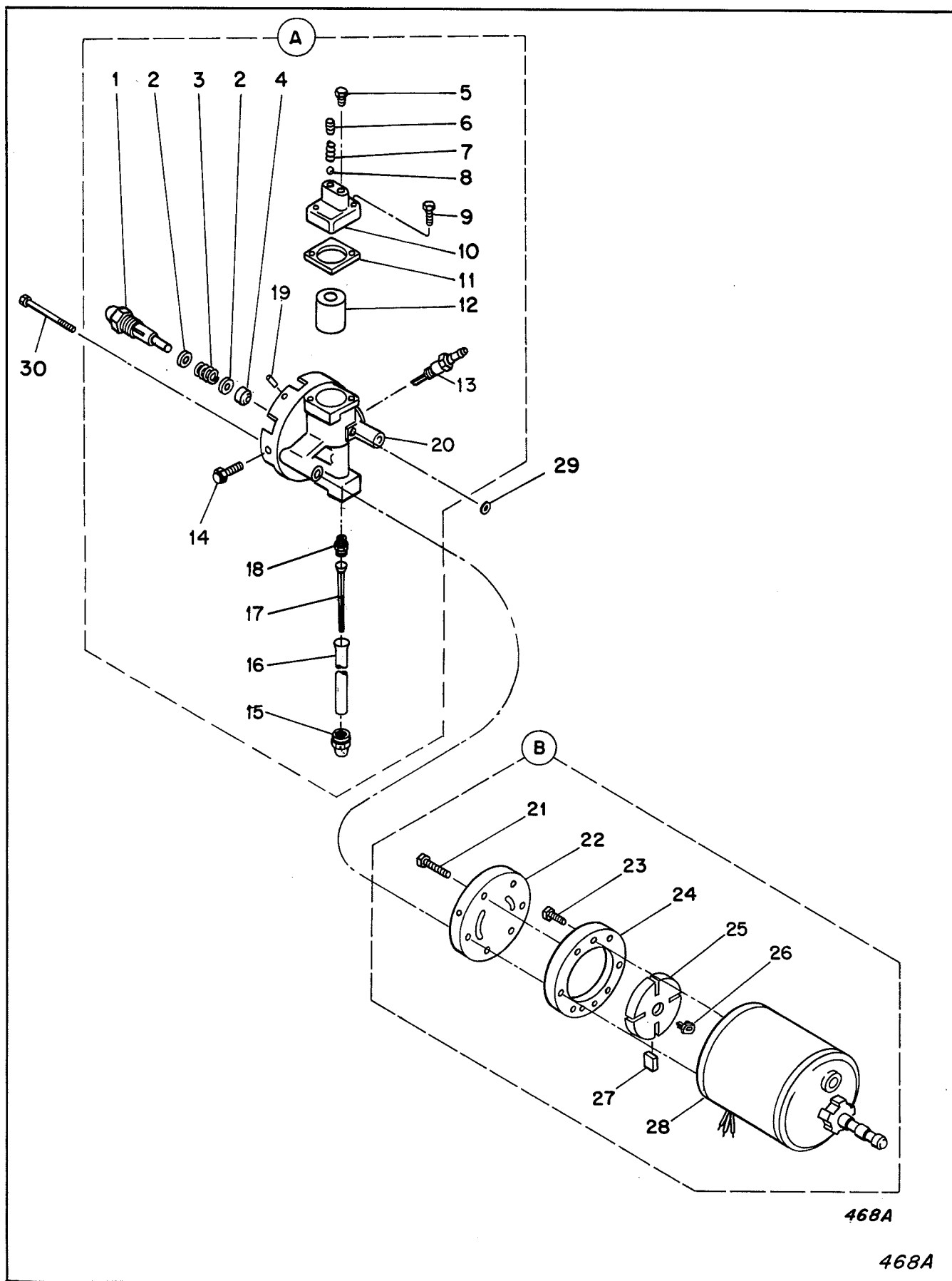


Figure 15. Motor, Pump and Burner Head Assembly

PARTS LIST FOR BASIC HEATER ASSEMBLY (Continued)

Index No.	Part Number	Part Name or Description	Quan. Spec. No.			Index No.	Part Number	Part Name or Description	Quan. Spec. No.		
			2992G1-1	2992G7	3061G14				2992G1-1	2992G7	3061G14
	M13942-4	Connector, Wire	-	2	2		M13386-3	Touch-up Paint, Aerosol Can, Black			
		TOUCH-UP PAINT					M13271	Touch-up Paint, Aerosol Can, Medium Gray			
	M13386-7	Touch-up Paint, Aerosol Can, White									

PARTS LIST FOR MOTOR, PUMP AND BURNER HEAD ASSEMBLY

Index No.	Part Number	Part Name	Quan.	Index No.	Part Number	Part Name	Quan.
	M19115-1	Motor, Pump and Burner Head Assy	1	16	M16790	Tube, Fuel Filter	1
(A)	M19113-1	Burner Head Assy	1	17	M19630	Filter, Fuel	1
1	M11054-1	Nozzle, Siphon	1	18	M16791	Connector, Male	1
2	M10659-1	Washer, Nozzle seal	2	19	ROP12-8	Roll Pin	4
3	M10809-1	Spring, Nozzle seal	1	20	M19112	Body, Burner Head	1
4	M8882	Sleeve	1	(B)	M19114-1	Motor and Pump Assy	1
5	M10837	Plug, Hex hd.	1	21	*FHPF3-8C	Screw, Fil. hd., No. 10-32 x 1 in.	4
6	M10992-1	Screw, Adjusting	1	22	M12430	End cover pump	1
7	M10993-1	Spring, Pressure relief	1	23	*FHPF3-4C	Screw, Fil. hd., No. 10-32 x 1/2 in.	2
8	M8940	Ball	1	24	M8645	Pump Body	1
9	*M12461-54	Screw, Hex hd., No. 10-24 x 7/8 in.	2	25	M11259	Pump Rotor	1
10	M12576	Body Valve	1	26	M11966-5	Spring, Pump Rotor	1
11	M12577	Gasket	1	27	M8643	Blade	1
12	M15241	Output Filter Element	1	28	M17941	Motor	1
13	M16896G1	Spark Plug Assy	1	29	M13372	Seal (O-Ring)	1
14	*M10908-38	Screw, No. 12-24 x 3/8 in., Type S	1	30	*FHF3-20C	Screw, Fil hd., No. 10-32 x 2-1/2 in.	2
15	M13849	Nut, Flared	1				

* Standard hardware - Obtain locally.

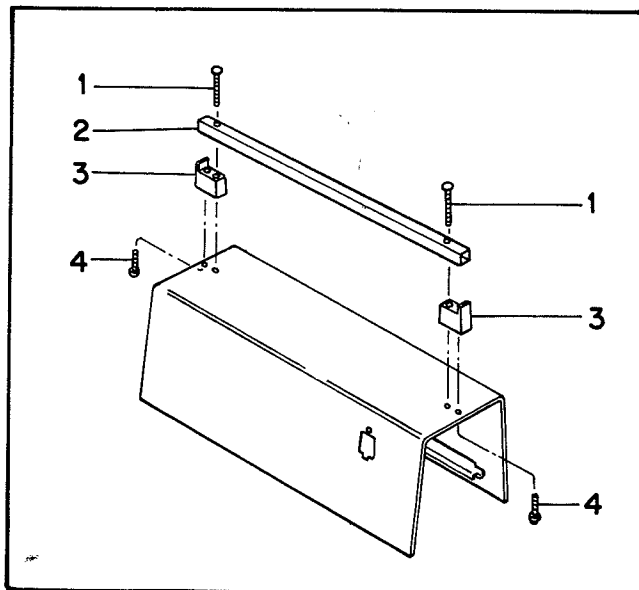


Figure 16. Handle Arrangement

HANDLE ARRANGEMENT

Index No.	Part Number	Part Name	Quan.
1	*RPC4-18C	Screw, Rd. hd., 1/4-20 x 2-1/4	2
2	M12440-2	Handle (Square bar)	1
3	M12439C	Support, Handle	1
4	*M10908-58	Screw, Self-tapping, Hex hd., No. 10-24 x 1-1/2 in., Type "S"	2

* Standard hardware - Obtainable locally.

WARRANTY

We warrant Products sold by us to be in accordance with our published specifications or those specifications agreed to by us in writing at time of sale. Our obligation and liability under this warranty is expressly limited to repairing or replacing, at our option, within one year or as otherwise set forth in our published specifications, any product not meeting the specifications. WE MAKE NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKE NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. Our obligation under this Warranty shall not include any transportation charges or costs of installation or any liability for direct, indirect or consequential damage or delay. If requested by us, Products or parts for which a warranty claim is made are to be returned transportation prepaid to our factory. Any improper use, operation beyond rated capacity, substitution of parts not approved by us, or any alteration or repair by others in such manner as in our judgment affects the Product materially and adversely shall void this Warranty. NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY.

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