



**CV125CG
53380**

PORTABLE DUCT HEATER



Operation ♦ Service

REVISION 20AUG07

WARNING - SAFETY REQUIREMENTS

IMPORTANT

Read and understand this instruction manual before starting or servicing this heater.



WARNING!

FIRE, EXPLOSION, CARBON MONOXIDE POISONING

Improper use of this heater can result in serious bodily injury due to hazards of fire and explosion, carbon monoxide poisoning, burn and electrical shock.



WARNING!

CARBON MONOXIDE POISONING

The heat exchanger must be inspected annually by a qualified service personnel for leaks which could allow dangerous carbon monoxide gas to enter the shelter. Failure to do so, could cause severe injury or death.



WARNING!

FIRE, EXPLOSION, CARBON MONOXIDE POISONING

Improper adjustment of the air pump can over fire the heater and as a result, compromise the heat exchanger which can cause serious bodily injury due to hazards of fire and explosion, carbon monoxide poisoning.



WARNING!

FIRE, EXPLOSION

Use only Kerosene, Diesel or Number 1 Fuel Oil, or JP8 can be used for extreme cold conditions. Never burn gasoline, naphtha, paint thinners, alcohol or other volatile fuels. Fill fuel tank or move heater only when heater is shut off.



WARNING!

FIRE, EXPLOSION

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.



WARNING!
FIRE, EXPLOSION

Fully drain and ventilate fuel tank before transporting. Fuel tank vent must be open during transport and storage.



WARNING!
ROTATING MACHINERY

When used with thermostat, heater may start at any time. Do not open access door while heater is running or plugged in. Remove all power prior to service



WARNING!
SHOCK HAZARD

Use only with electrical voltage and frequency specified on model plate. Do not perform any service with heater plugged in.



WARNING!
HIGH VOLTAGE

The ignition transformer develops 10,000 volts. Serious injury or death may occur if personnel come in contact with high voltage lead.



WARNING!
FIRE, EXPLOSION

Do not operate heater without output duct, P/N CAH-1015, properly installed. Ensure hot air outlet is at least 1.5 meters from combustible materials. Ensure ducts are free from obstructions and sharp bends.



WARNING!
HOT SURFACE

Parts of the heater become very hot when operating and immediately after operating. The exhaust can reach temperatures in excess of 1000 degrees Fahrenheit. Severe burns may occur if the heater is not allowed to cool down properly before servicing.

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CAMFIRE Heater Specifications

MODEL CV125CG MOD D

Input Heat Rating

BTU/Hour 90,000 – 120,000

Output Ratings

Clean-Air Output, BTU/Hour 60,000 - 70,000

Volume, CFM (Approximate) 600

Other Ratings

Current, Running 4.0 Amps

Voltage 120 VAC

Frequency 60 Hz

Air Pump Pressure 5.0 PSI

Fuel Nozzle

Meter Size 0.65 GPH

Spray Angle 80 Degrees

Fuel

Kerosene, DF1, DF2, Fuel Oil, JP8 Only

Tank Capacity

12.0 Gal (45.5 Litres)

Duct

(Refer to Venting Instructions)

Dimensions

W16" L48" H23"

40 x 122 x 58 cm

Weight (Without Fuel)

74 lbs (33 Kg)

Description

The CAMFIRE® Heater, Model CV125CG MOD D, is a portable, clean-air space heater which relies on an external input of 120 volts, 60 Hz, single phase power.

The heart of the heater is a heat exchanger which is supplied with air from a fan driven by a 1/4 horse power motor. Part of the air from the fan enters the combustion chamber where it mixes with the atomized fuel to become a combustible mixture. The exhaust gases circulate within the heat exchanger, warming its inner surfaces, then escape from the heater through a flue pipe adapted to the top of the heater.

The remaining air from the fan passes over and around the combustion chamber and through the heat exchanger where it is heated, and emerges from the heater as a powerful stream of heated clean air.

The fuel system consists of an air pump mounted on one end of the motor shaft which forces air through the nozzle. A fan is mounted at the other end of the shaft. The moving air in the nozzle lifts the fuel from the tank by siphon action and carries it into the combustion chamber.

Filters protect the fuel system at the filler neck and prior to the fuel entering into the spray nozzle. The electrical control system is protected by a push button type circuit breaker.

A Safety Control Unit, connected to a Photoelectric Cell, shuts down the heater if a flame is not detected in the combustion chamber after start up. A "Duct Over-Heat" switch is installed as a safety measure. In the event that the outlet duct becomes blocked, the switch will shut the heater down.

An optional thermostat accessory, which plugs into the electrical system of the heater, may be set to any desired temperature. When the temperature of the surrounding air reaches the pre-set temperature, the thermostat contacts open and cause the heater to shut down. When the air cools, the thermostat contacts close and the heater recycles.

The heater is designed for hard use in rough environments resulting in a minimum of down time for repair and maintenance.

SECTION 1 INTRODUCTION

A. General

The CAMFIRE® Heater, Model CV125CG MOD D, is designed to provide fresh, heated air. Electrical power 120VAC 60 or 50 Hz single phase. See cord size, Section 2.

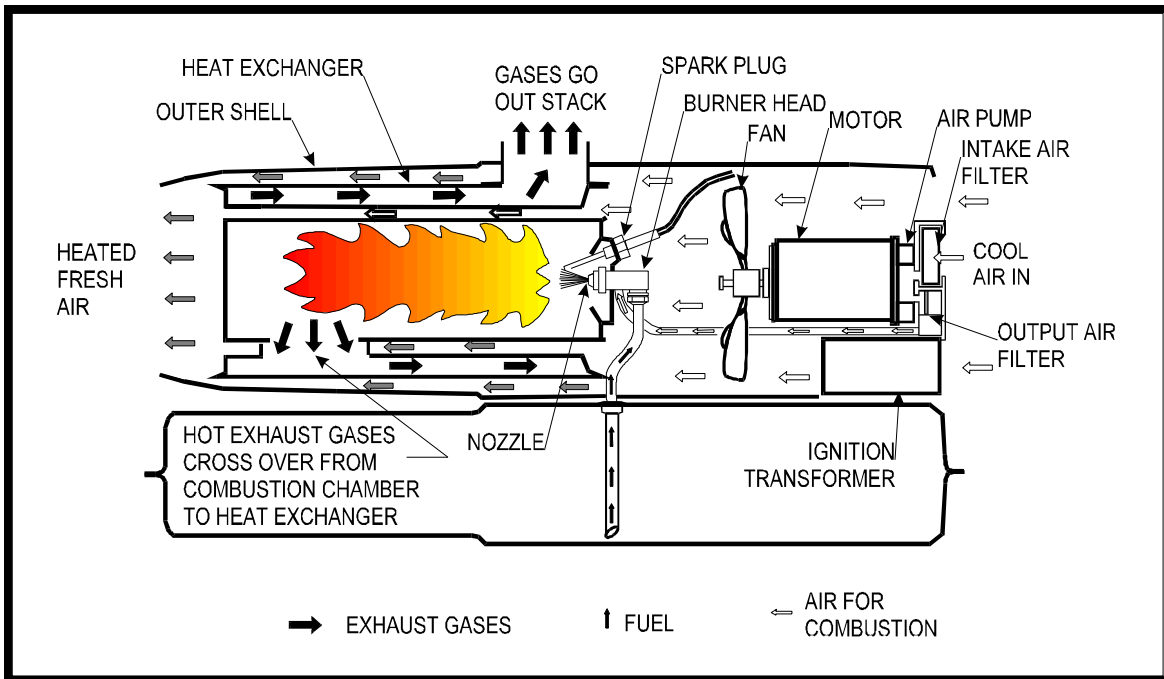


Figure 1 : Schematic of Operations

With Ducts

When using the heater with the thermostat control connected and the optional outlet duct installed, the heater is "duct temperature limited". This means that if the duct temperature reaches a pre-determined temperature before the thermostat has reached its set position, the heater will shut down. Once the heater has shut down it will be necessary to wait 3 to 5 minutes before pressing the reset control.

NOTE : Check for blockage or restriction of outlet duct before re-starting the heater.

B. Principle of Operation

Fuel System

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

Air System

The air system is divided into two parts, both of which are supplied with air from a fan which is attached to the other end of the motor.

Part of the air from the fan enters the combustion chamber where it mixes with the atomized fuel to become a combustible mixture, and also mixes with the burning gases to complete the process of combustion.

The exhaust gases from the combustion chamber circulate within the inner surfaces of the heat exchanger. They are then ducted out of the heater through the stack adapter on its' top and out of the heater space through a flue pipe.

The rest of the air from the fan passes over and around the combustion chamber and through the heat exchanger where it is heated and emerges from the front of the heater as a powerful stream of heated fresh air, without being mixed with the products of combustion.

Ignition System

The ignition system consists of a transformer and spark plug. The transformer increases the input voltage to a very high potential which causes an arc to be drawn between the electrodes of the spark plug. The arc is used to ignite the fuel and air mixture within the combustion chamber.

Control System

The safety control circuit consists of a duct over heat switch, a light sensitive photocell, and a safety control. The safety control will trip if the heater fails to ignite or the flame goes out, thereby causing the heater to shut down.

The photocell is used to sense the presence of light due to the flame inside the combustion chamber. It varies its' electrical resistance in relation to light rays. When under the influence of light, the cell has very low resistance. The resistance is high when little or no light strikes the light sensitive surface. The flame sensor's function is to control the safety control.

A "duct over-heat" switch is located at the outlet end of the heater. This switch will shut down the heater if the duct temperature exceeds approximately 275 deg. F.

A thermostat accessory, Part No. CAH-134, may be incorporated into the electrical circuit of the heater. The thermostat can be set to any desired temperature between 35 deg. F and 95 deg. F. When the temperature of the surrounding air reaches the pre-set temperature, the thermostat contacts open and cause the heater to shut down. When the air cools, the thermostat contacts close and the heater recycles.

SECTION 2

Installation and Operation

A. To Prepare for Operation

1. Remove all protective material which may have been applied to the heater for shipment.
2. Install optional stack extension, P/N CAH-132.
3. Install output duct, P/N CAH-1015.
4. Open vent on fuel tank.

NOTE: Two air ducts, 15 feet in length and 12 inches in diameter, connect to the inlet and outlet ends of the heater and move air from the interior of the shelter, through the heater, and back to the interior of the shelter. In conditions where the outside ambient temperature is above freezing, only the heated air return duct is used. In this way, the heater draws unheated air from the outside. Operating the heater without input ducting in warmer temperatures allows the heater to run cooler, thus preventing safety overheat shutdown. Also follow these guidelines if the heater shuts down on overheat.

B. Electrical Supply

1. Power source 120 volt, 60 or 50 cycle single phase A.C.
2. When using an extension power cord, make sure it is a three wire cord and of adequate size, as listed in the following table.

EXTENSION CORD SIZE	
LENGTH OF CORD	WIRE SIZE (AWG)
100 ft	NO. 14
200 ft	NO. 12
300 ft	NO. 10
400 ft	NO. 8
450 ft	NO. 6

C. Starting the Heater

1. Open fuel filler and check for an adequate fuel supply.
2. Plug the heater power cord into the grounded power supply outlet. There is no on off switch, the heater will start immediately.
3. If a thermostat accessory is being used, set the dial to the desired temperature. The heater will start immediately provided that the surrounding air is cooler than the setting of the dial. The heater will continue to operate until the temperature of the surrounding air reaches the dial setting. It will then shut down and recycle when the temperature drops.

D. Stopping the Heater

1. Unplug heater power cord from grounded power supply outlet.
2. If the heater is equipped with a thermostat accessory, turn the dial to the "No Heat" position.

E. Start up Procedure

1. Set Thermostat to call for heat.
2. Plug the heater power cord into a grounded power supply outlet ; igniter and motor should start immediately.
3. Safety switch lockout will occur if flame is not established during the start up 30 second “trial for ignition” period. To restart, the safety switch must be manually reset.
4. Control will provide a 5 to 10 second ignition overrun time after the “trial ignition period” to prevent lockouts.
5. Burner will turn off when call for heat is satisfied.
6. If flame failure occurs during a run, the motor will immediately shut off. To restart, the safety switch must be manually reset.
7. Power loss during a run will cause the burner to safely shut down.

F. Venting Instructions

NOTE: Ensure the heater is vented properly in order to assure proper combustion, and avoid contamination of the ventilating air with exhaust gases. If a vent is required, use a CAH-132 Stack extension. A vent stack over 12” in length may create back-pressure on the heater, reducing the combustion efficiency.

G. Transportation and Storage



WARNING!
FIRE, EXPLOSION

Fully drain and ventilate fuel tank before transporting. Fuel tank vent must be open during transport and storage.

Drain the fuel tank before long term storage. A commercially available fuel stabilizer may be added to the fuel and run through the heater before draining. If fuel is left in the heater it may gel or turn to varnish causing hard starting or poor performance the next time the heater used.

Always keep the vent on the fuel tank cap open during operation and storage. The vent may only be closed while moving the heater with fuel in the tank to a new location to prevent spillage.

SECTION 3

Maintenance

Maintenance consists of simple operations the user of the heater can perform to keep the heater running and in good condition. If ordinary maintenance fails to return the heater to good operating condition, refer to Section 4, page 14, in this manual for checking and trouble shooting. See Figure 2 for maintenance points.

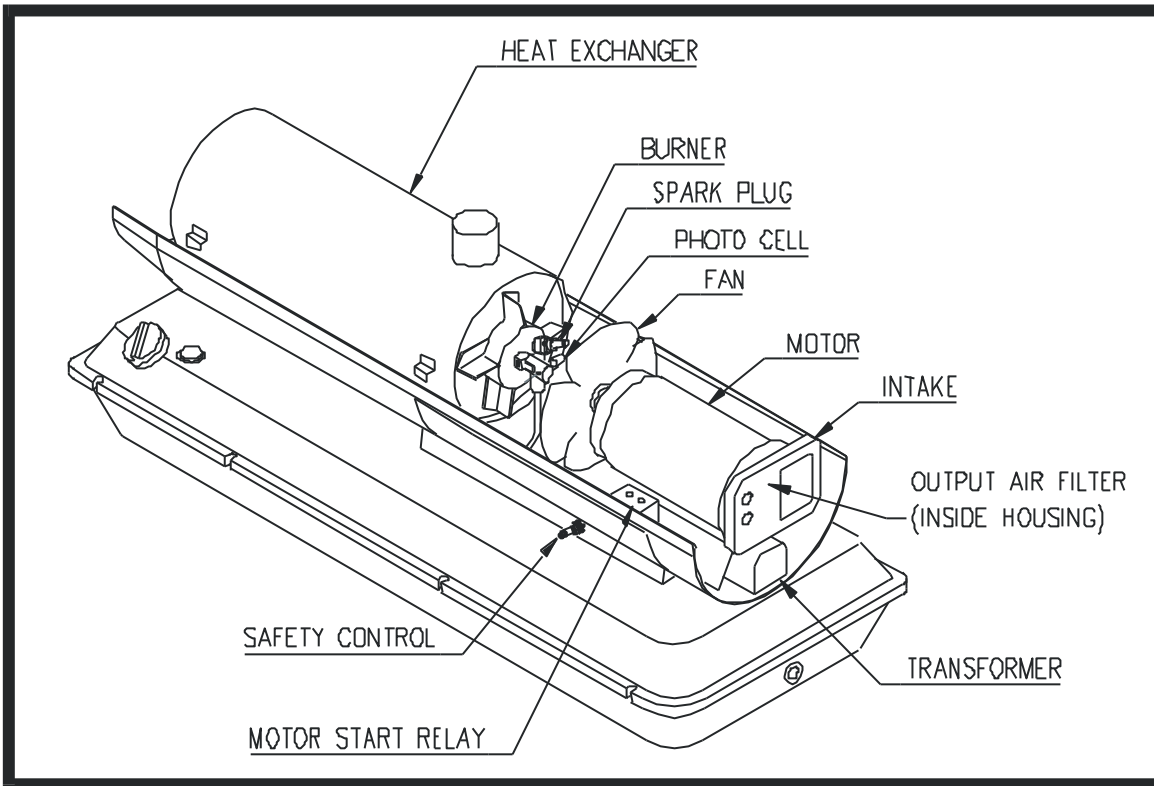


Figure 2 Maintenance Points

A. Fuel Tank Maintenance

1. Drain the fuel tank after every 150 hours of operation and flush it out with clean fuel. Refill with new, clean fuel.

B. Air Filters

1. Check and clean the intake air filter often. The filter needs cleaning more often if the heater is operated in dusty conditions. See Figure 3, page 11.

2. To clean the intake air filter, simply pull it out through the opening of the filter housing end cover (see fig. 3), Wash with mild detergent and hot or cold water, dry thoroughly, and replace in the housing.

CAUTION : Do not oil the filter element

3. Replace the output air filter once each heating season.
4. To reach the output air filter, remove the four screws which attach the filter housing end cover. Lift the output air filter out. See figure 3.

NOTE: Cleaning the output air filter may cause a change in the air pump output pressure. If the heater burns improperly after cleaning, have the air pump pressure checked. See Section. 5, Paragraph N, Page 26.

5. When changing the output air filter, clean the lint filter, remove it from the housing, wash with mild detergent and hot or cold water, and dry thoroughly. Do not oil.

6. Replace the lint filter, the output air filter the filter housing end cover, and the screws and washers.

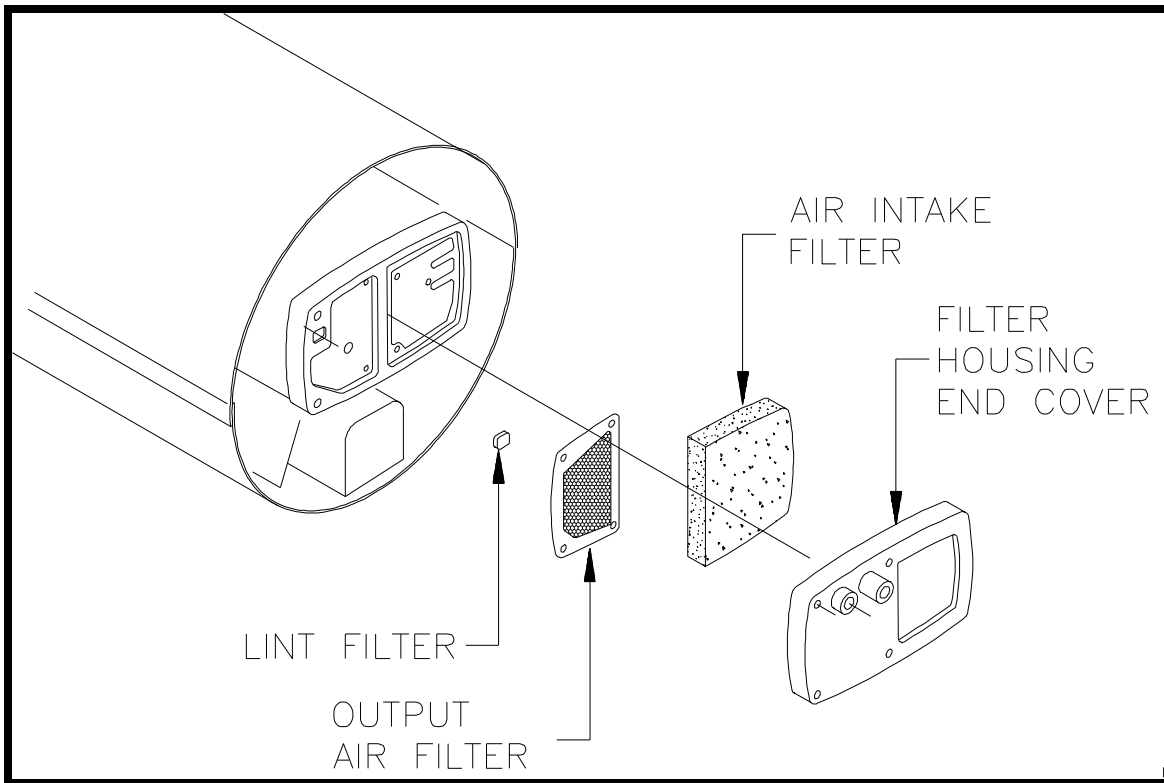


Figure 3 Air Filters

C. Removing Upper Shell

WARNING: When necessary to work on the heater with the upper shell removed, be sure to unplug the power source from the heater. If power is required to perform any maintenance procedure, keep away from the fan and spark plug lead to prevent injury or serious electrical shock.

DO NOT operate the heater for extended periods of time with the upper shell removed. If you do, the combustion chamber may be permanently damaged due to overheating.

1. To remove upper shell of the heater, remove eight screws from split seam of upper and lower shells.

2. To replace the upper shell, align the eight holes located along its lower edge over the eight speed nuts on the lower shell and install the screws.

D. Cleaning the Fan

1. Clean the fan blades after every 500 hours of operation, or whenever you see that they are getting dirty. A build-up of dirt will reduce the air supply and cause faulty operation.
2. To clean, wipe the blades with a cloth moistened with kerosene or solvent. Be careful not to bend the blades. Dry the fan thoroughly.

E. 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 and remove the spark plug.
2. Adjust the gap by bending the outside electrode. See Figure 5.
3. Reinstall the spark plug.

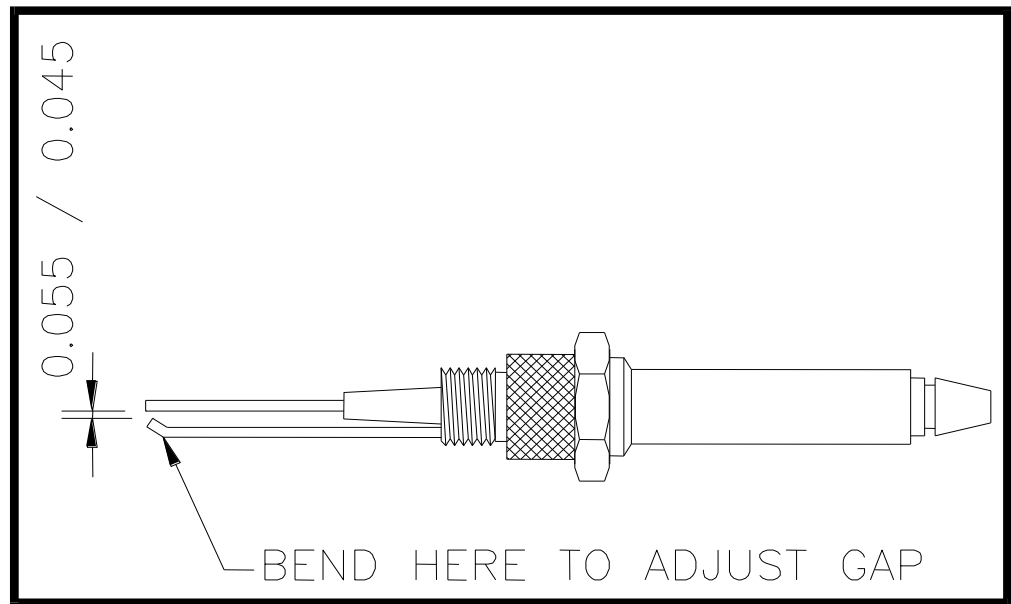


Figure 4 Spark Plug Gapping

F. Cleaning the Fuel Filter

1. The fuel filter is located on the fuel line assembly, which leads up from the fuel tank to the burner. Replace it twice each season, or if the trouble-shooting chart indicates.
2. To remove the fuel filter, gently pull both male ends out of the gas line.
3. Replace dirty filter element with new filter element.
4. When re-installing the filter, moisten the male ends and simply insert into fuel line. Be sure to position filter according to arrow on side.

NOTE: If the burner head is to be removed for maintenance, do not re-install the fuel filter until ready to re-install the burner.

G. Burner Removal, Cleaning & Replacement

1. Be sure the heater is disconnected from the power source, Open the access door in the upper shell, then remove the lead wire from the spark plug. Remove fuel line assembly from burner head. Disconnect the air line from the fitting in the right side of the nozzle adapter.
2. Remove the photocell assembly from its bracket. Then remove the screws that fasten the burner head to the combustion chamber and remove the burner head.
2. Remove the nozzle carefully, using a socket wrench. Hold the nozzle adapter with another wrench while removing the nozzle.

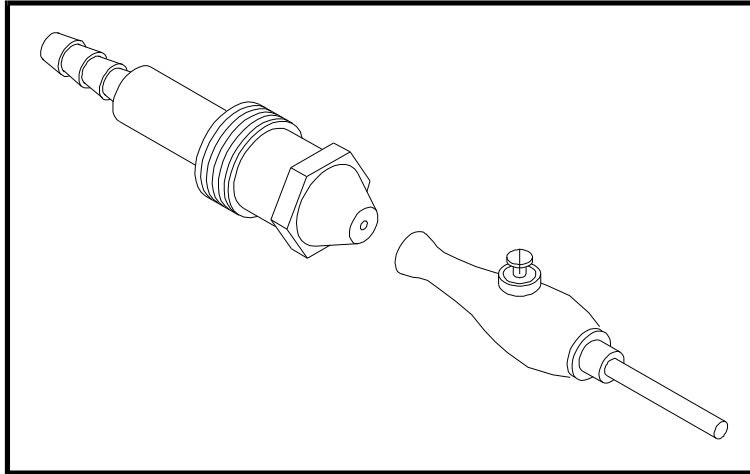


Figure 5 Cleaning Nozzle with Compressed Air

CAUTION: Do not attempt to open the nozzle passage with a steel drill, a wire, or any other tool. Any change in the nozzle opening will alter the flow characteristics which will affect the heater's performance. If solvent and reverse air flow through the nozzle cannot remove the contamination, replace the nozzle. Always protect the nozzle face whenever the burner head is removed from the heater.

4. Soak the remaining parts of the burner head assembly for one hour in non-flammable liquid cleaning agent. (Do not use gasoline, kerosene or fuel oil.) Blow dry through fittings in rear of burner. Blow the nozzle dry through the face (outlet) end only. See Figure 6.
5. When reinstalling the burner, place it on the back of the combustion chamber so the fitting for the fuel filter is down, and the spark plug is just above center, on the right. Install the attaching screws and hardware.
6. Connect the fuel filter assembly and the air line from the filter housing to its' respective fittings on the nozzle adapter.
7. Reinstall the photocell, then install the spark plug and snap the spark plug lead onto the terminal. It must snap, or it may not be tight enough to prevent loosening as the heater is moved.

CAUTION: Do not attempt to repair the nozzle. If the nozzle is defective, replace it.

H. Post Maintenance Assembly

1. Put the heater back together in the reverse order of disassembly. Be sure all parts are in place and all screws and electrical connections are tight before attempting to use the heater.

SECTION 4

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

C. Test-Firing

1. Clean the fuel tank and fill it with at least 2 gal of fuel. A minimum of 1 gal of fuel must be in the tank in order to test-fire the heater.
2. Clean the air intake filter. See Section 3, Part B, Page 10.
3. Check and adjust the air pressure, as described in Section 5, Part N, Page 27, except that fuel must be used for test-firing.

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

4. Allow the heater to run for 15 minutes. Observe its operation during the test-run.
5. After making the pressure check, adjustment, and test-firing, remove the gauge and re-install the plug. Tighten plug until sealed. Use soapy water to check for sealing. Do not over tighten.
6. 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

Should you encounter any problems with the operation of a heater, the chart on the following pages may help. For each problem there is a list of "possible causes". The "remedy" column tells you how to correct the problem or tells you by means of a section and paragraph number where to find detailed instructions for correcting it. In trouble shooting, remember that the air pump is part of the fuel system because the air it supplies lifts 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 – MOTOR STARTS – UNIT WILL NOT IGNITE
NO SPARK OBSERVED**

POSSIBLE CAUSE	TEST PROCEDURE
A. Improper spark plug gap.	1. Adjust spark plug gap (see Section 3, Part E, Page 12).
B. Defective transformer.	<p><u>WARNING:</u> To begin the transformer test, first ensure the heater is not plugged in. Then, when power is required, be EXTREMELY careful when checking the transformer. A transformer in good condition produces VERY HIGH VOLTAGE at the output terminal.</p> <p>1. Connect the transformer lead to a properly gapped spark plug. The gap should be 0.050 inch, plus or minus 0.005 inch.</p> <p>2. Establish a good ground between the spark plug and the heater. Be careful not to let any part of your person become a portion of the grounded circuit.</p> <p>3. Start heater; observe the spark between the plug's electrodes. If the ground is good and spark does not jump between the electrodes, the transformer is defective and must be replaced.</p>
C. Defective or damaged spark plug.	<p>1. Remove spark plug from burner head. Visually inspect spark plug for cracks or worn electrodes.</p> <p>2. Adjust spark plug gap (see Section 3, Part E, Page 12).</p> <p>3. Establish a good ground between the spark plug and the heater. Be careful not to let any part of your person become a portion of the grounded circuit.</p> <p>4. Start heater; observe the spark between the plug's electrodes. If the ground is good and spark does not jump between the electrodes, replace spark plug.</p>

**PROBLEM – MOTOR STARTS – UNIT WILL NOT IGNITE
SPARK OBSERVED SUFFICIENT NT FUEL IN TANK**

A. Low pump output pressure (low motor speed, worn pump, pump out of adjustment).	<p>1. Ensure that no mechanical damage to the fan blades could be causing low motor speed.</p> <p>2. Check and adjust pump output pressure (see Section 5, Part M, Page 26).</p> <p>3. Repair or replace pump if adjustment cannot be made (see Section 5, Parts L to M, Pages 25 to 26).</p>
B. Fuel filter loose	<p>1. Remove and clean fuel filter (see Section 3, Part F, Page 12).</p> <p>2. Replace a blocked filter.</p>
C. Dirty fuel nozzle.	1. Remove and clean the burner head.

Trouble Shooting Chart

POSSIBLE CAUSE

TEST PROCEDURE

2. Remove and clean nozzle (see Section 3, Part G, Page 13).

NEVER USE A DRILL, WIRE OR OTHER TOOL TO OPEN NOZZLE PASSAGE

PROBLEM – MOTOR DOES NOT START OR RUNS AT A LOW SPEED FAN IS DIFFICULT TO ROTATE BY HAND

- | | |
|---|--|
| A. Fan obstructed by mechanical damage or dirt. | <ol style="list-style-type: none">1. Check for bent outer shell, damaged fan, or damaged motor mount.2. Replace a damaged fan. Do not attempt to repair. |
| B. Broken rotor or carbon blades. Pump rotor binding. | <ol style="list-style-type: none">1. Remove pump end cover and pump front cover.2. Visually inspect rotor and blades for breakage.3. Ensure that the rotor and blades are free of any lubricant or debris.4. Check rotor with feeler guage for proper clearance between rotor and pump body (see Section 5, Part M, Page 26). |

PROBLEM – MOTOR DOES NOT START OR RUNS AT A LOW SPEED FAN ROTATES EASILY BY HAND

- | | |
|--|---|
| A. No power or low voltage at heater. | <ol style="list-style-type: none">1. Check that heater is plugged in.2. Ensure voltage at heater is the same as indicated on heater Data Plate located on top cover and as indicated in the Specifications, Page 4.3. Use an extension cord of sufficient guage to carry the electrical load of the heater (see Chart, Page 8). |
| B. Thermostat (if used) improperly set or defective. | <ol style="list-style-type: none">1. Adjust thermostat to a higher setting. If heater still does not start, disconnect thermostat from heater and plug heater directly into power cord. |
| C. Defective photocell. | <ol style="list-style-type: none">1. Open access hatch. Remove photocell from bracket attached to burner head.2. Disconnect blue and white photocell leads.3. Connect ohmmeter test leads to photocell leads.4. Hold open end of photocell towards a light source (a 60 watt light bulb or direct sunlight). The resistance indicated on the ohmmeter should be low.5. Block off light completely by covering the open end of the photocell. Within 10 seconds the resistance indicated should be high.6. Replace photocell if there is no change in resistance during this procedure. |

Trouble Shooting Chart

PROBLEM – HEATER DOES NOT START.

POSSIBLE CAUSE	TEST PROCEDURE
A. Safety control locked out.	1. Push and hold red reset button for 120 seconds.
B. No power or low voltage at heater.	1. Check that heater is plugged in. 2. Ensure voltage at heater is the same as indicated on heater Data Plate located on top cover and as indicated in the Specifications, Page 5. 3. Use an extension cord of sufficient gauge to carry the electrical load of the heater (see Chart, Page 8).
C. Thermostat (if used) improperly set or defective.	1. Adjust thermostat to a higher setting. If heater still does not start, disconnect thermostat from heater and plug heater directly into power cord. .
D. Fan obstructed by mechanical damage or dirt.	1. Check for bent outer shell, damaged fan, or damaged motor mount. 2. Replace a damaged fan. Do not attempt to repair.
E. Defective photocell.	1. Open access hatch. Remove photocell from bracket attached to burner head. 2. Disconnect blue and white photocell leads. 3. Connect ohmmeter test leads to photocell leads. 4. Hold open end of photocell towards a light source (a 60 watt light bulb or direct sunlight). The resistance indicated on the ohmmeter should be low. 5. Block off light completely by covering the open end of the photocell. Within 10 seconds the resistance indicated should be high. 6. Replace photocell if there is no change in resistance during this procedure.
F. Broken air pump rotor or carbon blades. Pump rotor binding.	1. Remove inlet screen. Remove pump end cover and pump front cover. 2. Visually inspect rotor and blades for breakage. 3. Ensure that the rotor and blades are free of any lubricant or debris. 4. Check rotor with feeler gauge for proper clearance between rotor and pump body (see Section 5, Part M, Page 26).

Trouble Shooting Chart

**PROBLEM – HEATER IGNITES BUT SAFETY CONTROL TRIPS OR
SAFETY CONTROL TRIPS WITHIN FIRST MINUTE OF OPERATION**

POSSIBLE CAUSE	TEST PROCEDURE
A. Dirty or defective photocell.	<ol style="list-style-type: none">1. Open access hatch. Remove photocell from bracket attached to burner head.2. Inspect glass face of photocell. If dirty, wipe with clean soft cloth.3. Replace photocell and close access hatch. Start heater. If problem persists, continue with the following steps.4. Disconnect blue and white photocell leads.5. Connect ohmmeter test leads to photocell leads.6. Hold open end of photocell towards a light source (a 60 watt light bulb or direct sunlight). The resistance indicated on the ohmmeter should be low.7. Block off light completely by covering the open end of the photocell. Within 10 seconds the resistance indicated should be high.8. Replace photocell if there is no change in resistance during this procedure.
B. Defective overheat switch.	<ol style="list-style-type: none">1. Remove leads from overheat switch (located at output end of heater).2. Using a test lead with 2 alligator clips, jump overheat leads (white wires).3. Start heater. If heater runs properly, replace overheat switch.
C. Defective safety control.	<ol style="list-style-type: none">1. Ensure unit is unplugged from power source.2. Open fan access hatch.3. Disconnect the blue (photocell) and white (overheat switch) wires from the safety control unit.4. Connect the blue and white wires terminals from the safety control to each other.5. Plug heater into power source. If reset button on the safety control pops out and the unit shuts off, the control is defective and must be replaced.

Trouble Shooting Chart

HEATER IGNITES AND RUNS FOR SOME TIME THEN THE HEATER SHUTS OFF AND THE SAFETY CONTROL POPS OUT

POSSIBLE CAUSE

A. Unit is over heating.

TEST PROCEDURE

1. Check to make sure ducts are not kinked and are as straight as possible
2. Check for blockages in ducts and heater inlet.
3. If using a two duct system, remove the return duct from the shelter so the heaters draws in cool air. You may also remove the duct entirely except in rainy conditions.

SECTION 5

Service and Repair

A. General

This Section covers replacement of parts, repair and rebuilding of heater components and the making of adjustments. Check to be sure the maintenance of the heater has been done before going into the more extensive service operations.

B. Special Tools, Equipment and Supplies

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

1. Air gauge, Part Number CAH-146, or any gauge with a 15 psi pressure range and 1/4 psi divisions, able to indicate 5 psi accurately, plus fittings for installation into a 1/8 inch standard pipe-threaded hole.
2. Oil burner nozzle wrench, or any deep 5/8 inch socket wrench.
3. Clean fuel, either kerosene or No. 1 fuel oil.
4. Non-flammable, non toxic liquid cleaning solvent.

CAUTION: Fumes of most solvents are poisonous. Use solvent in a well ventilated area.

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

C. Thermostat Accessory

If you suspect that the thermostat is preventing the heater from starting when it is set to call for heat, unplug thermostat.

D. Transformer

Check the transformer as follows:

WARNING: To begin the transformer test, first ensure the heater is not plugged in. Then, when power is required, be EXTREMELY careful when checking the transformer. A transformer in good condition produces VERY HIGH VOLTAGE at the output terminals.

1. Open access cover and remove spark plug, place on grounded surface.
2. Connect the transformer lead to a properly gapped spark plug. The gap should be 0.050 inch, plus or minus 0.005 inch.
3. Establish a good ground between the spark plug and the heater. Be careful not to let any part of your person become a portion of the ground circuit.
4. Plug heater into proper power supply; observe the spark between the plug's electrodes. If the ground is good and spark does not jump between the electrodes, the transformer is defective and must be replaced.
5. To replace the transformer, unplug the heater, then take out the two screws which attach it to the motor mounting bracket. Make sure that the new transformer mounting tabs are free of paint, to assure a satisfactory ground.
6. Reinstall the attaching screws, and make wiring connections in accordance with Figure 9.

7. Snap the spark plug lead tightly onto the plug terminal to prevent its coming loose when the heater is moved.

E. Checking the Motor Starting Circuits

1. In case the motor fails to start, when the cord is plugged in or the thermostat is set to call for heat, check the motor and its starting circuit components as described below.

WARNING: UNPLUG THE POWER CORD.

- a. The heaters have $\frac{1}{4}$ horsepower motors and separate starting relays. See the wiring diagram, Figure 7.
NOTE: The starting relay is "position sensitive" and must be tested in the same position as when installed in the heater (with the contacts on the bottom).
- b. Take the relay out of the heater by taking out the screw that holds its bracket to the left side of the motor mounting bracket.

CAUTION: Avoid touching the bare wires or the exposed wire terminals.

- c. Fabricate a wire as shown in Figure 6. Take the black motor wire off its terminal (3) of the starting relay. Touch the test prod to the terminal (2) of the red lead and plug in the heater. The motor should start. As soon as the motor reaches operating speed, remove the test prod from terminal (2). The motor should continue to run.
- d. If the motor starts and continues to run install a new relay. Disconnect the power cord and re-connect the wiring according to the wiring diagram. See Figure 7.
- e. If the motor fails to start and the relay is found not to be the cause of failure, disconnect the power cord and remove the motor. Install a new motor.

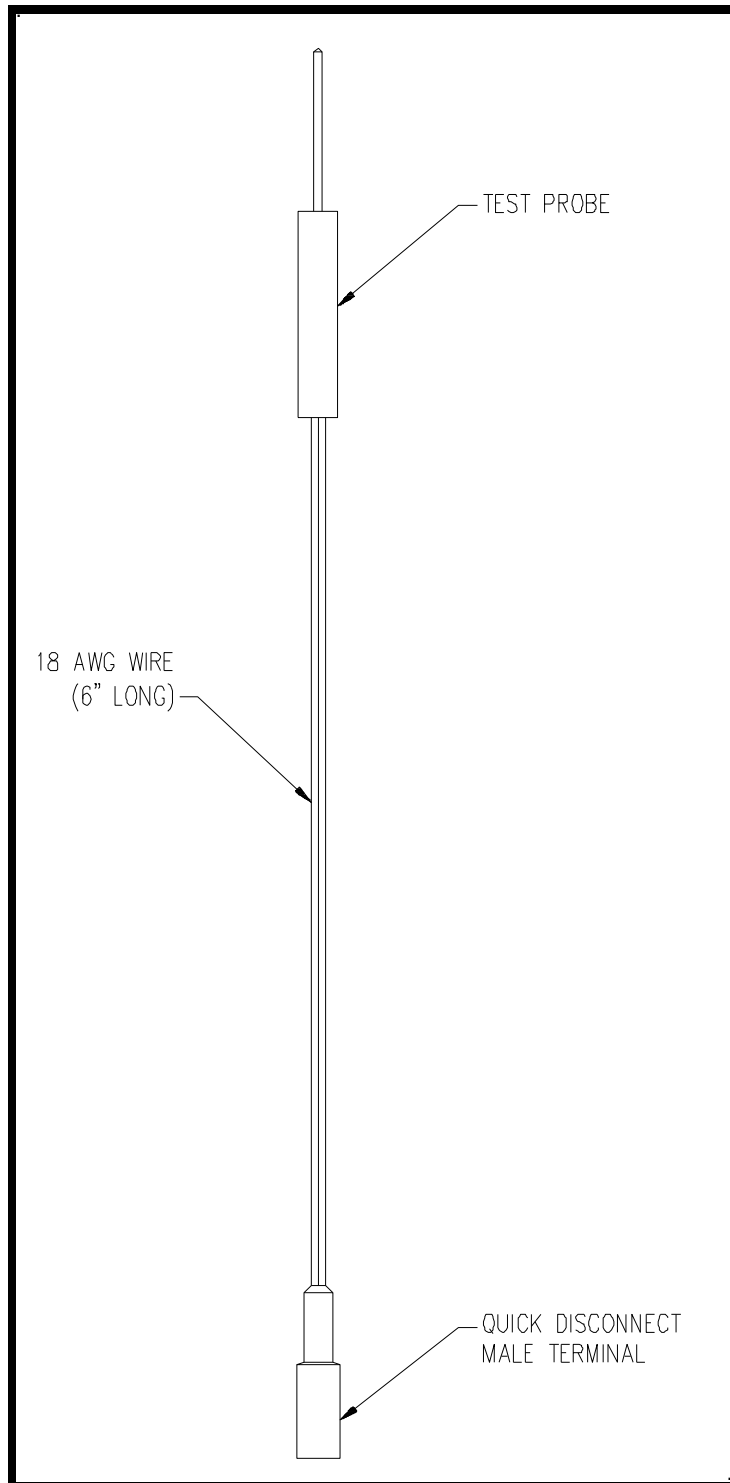
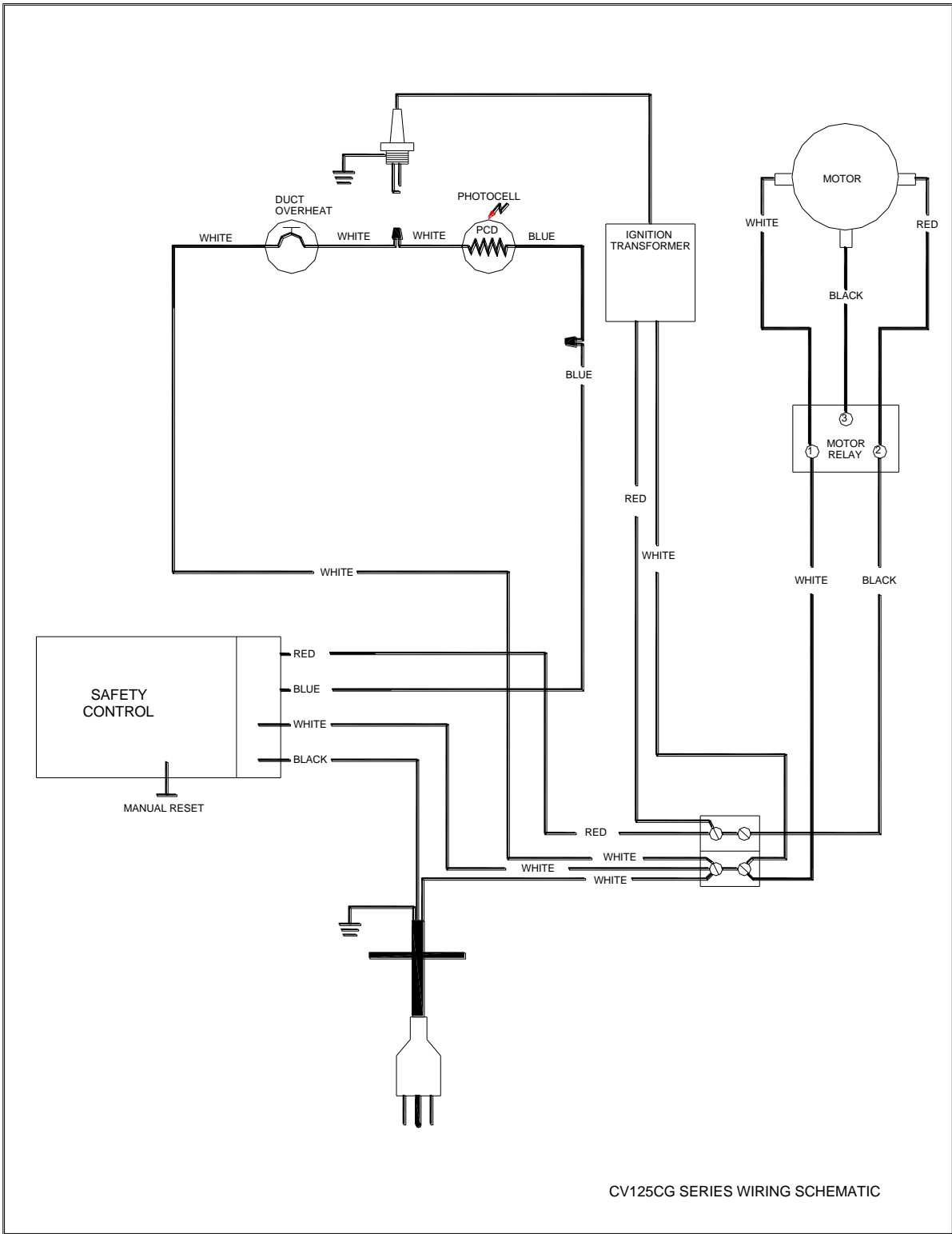


Figure 6 Test Probe



CV125CG SERIES WIRING SCHEMATIC

Figure 7 Wiring Diagram

F. Fan Service

Replace a damaged or bent fan. Do not attempt repair except as a temporary emergency measure. Loosen the two setscrews to remove the fan from the motor shaft. Only use replacement fan P/N CAH-EUR-113. This is important in order to retain the air flow and combustion characteristics of the heater. Check for proper fan location of the motor shaft. Make sure the fan is in the same position and location as before it was removed. See Figure 8.

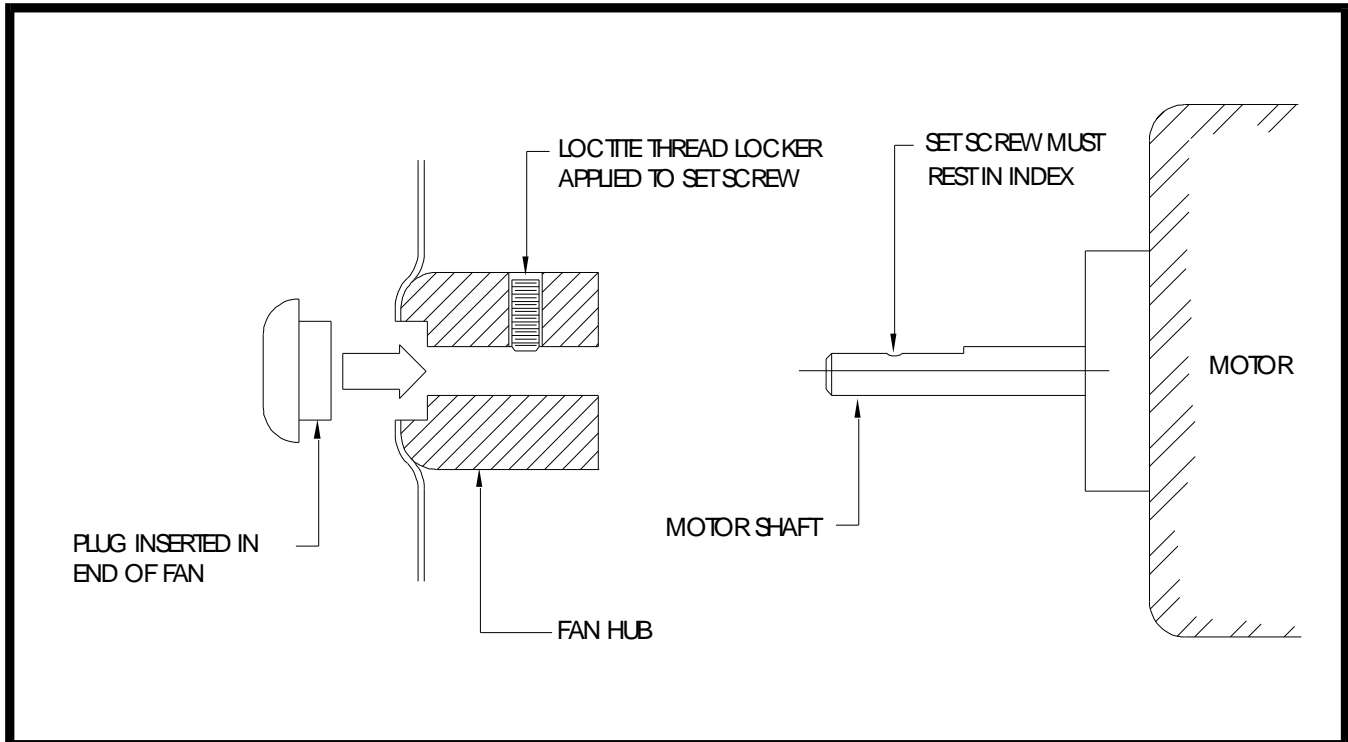


Figure 8: Location of Fan on Shaft

G. Fuel Filter Service

1. Remove the fuel filter from the heater and clean it as described in Section 3, Paragraph G Page 15.
2. Before reinstalling the fuel filter check the rubber bushing where it enters the fuel tank. Be sure the bushing is in good condition, not cut or cracked. Replace a damaged bushing.
3. Reinstall the fuel filter according to Section 3, Paragraph G. Replace with a new filter if the connecting parts are damaged thus preventing a tight connection.

H. Burner Head Service

1. Take out the spark plug and remove the burner head. Clean the entire burner head as described in Section 3, Paragraph H.
2. If there is any sign of damage to the nozzle, or if it is impossible to clean out the nozzle by blowing compressed air into it through the outlet end, replace with a new nozzle. Always blow a nozzle out thoroughly with air, from the outlet end, before installing it into the burner.

CAUTION: Never try to open a nozzle passage with a drill. Any change in the size or shape of the passage will alter the flow characteristics. Protect the passage from damage whenever you work on the burner or nozzle.

I. Air Pump Repair

NOTE: Because of the close tolerance and critical positioning of the parts, we recommend that only skilled technician attempt any repair of the air pump.

The heater air pump consists of a rotor with four carbon blades, rotating inside a pump body. The rotor is directly driven by the motor, and is supported by the ball-bearing end of the motor. One of the pump end plates is the motor's back plate. The other pump end plate is a part of the housing for the air intake and outlet filters.

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

J. Disassembly

CAUTION: Do not take apart the pump any further than you need in order to reach the parts which must be replaced.

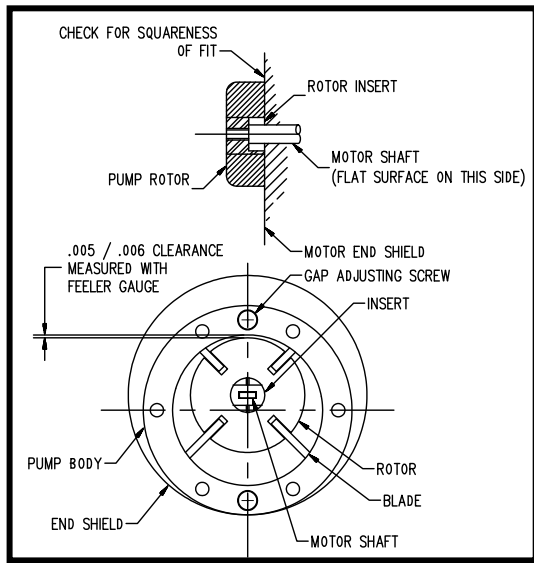
1. Remove the end cover and take out the intake and outlet air filters and the lint filter. Disconnect the air line from the elbow.
2. Hold the clean, dry cloth under the pump and remove the six screws that hold down the end cover to the pump body. Catch the carbon blades in the cloth, as the pump body is removed.
3. Take all four carbon blades out of the rotor and the insert off the motor shaft.

K. Replacing the Carbon Blades

1. Worn out 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 the pump body to replace the carbon blades.)
2. Install the carbon blades into the slots.

L. Replacing the Rotor

1. Use a new rotor only if deep groves or uneven wear appear on the surfaces. Check the insert for wear, and replace if worn or loose.
2. To remove the rotor, first remove the pump body.



reconnect the air line.

M. Reassembly of the Air Pump

1. Install the insert in the pump rotor as shown in fig. 9, then assemble rotor on the motor shaft. when installing the rotor, take care to keep it perpendicular to the motor shaft. Attach the pump body to the motor with the two recessed screws which were removed to take it off.
2. Adjust the pump body to provide 0.005 to 0.006 inch clearance at the point shown in fig. 9. measure the clearance with a feeler gauge. 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 recessed screws are tight after adjusting.
3. Insert Carbon blades as described previously.
4. Install the end cover, using the six screws which were removed.

Figure 9 Checking Clearance of Air Pump Rotor

N. Adjustment of Pump Pressure

WARNING! Do not adjust the pump pressure higher than the recommended amount. Failure to do so can result in higher than normal heat exchanger temperatures, which can cause the heat exchanger to fail allowing dangerous Carbon Monoxide gas to enter the shelter. Failure to follow these instructions could cause serious injury or death.

Note: Adjusting the air pressure higher than the recommended amount will void your warranty.

1. Remove the plug from the air filter housing, and install the pressure gauge (A) into the hole.
2. Start the heater. (You do not need to have fuel in the tank for this pressure check and adjustment.)
3. Pump pressure must be 5 PSI plus or minus 1/4 pound for most efficient performance. If the pressure is not within this range, adjust the pressure relief valve. For maximum output an adjustment of 6 PSI can be used but is not as efficient.
4. To adjust pump pressure, loosen the lock nut (B) and screw the valve stem (C) in to raise the pressure; out to lower.
5. Remove the gauge and replace the plug.

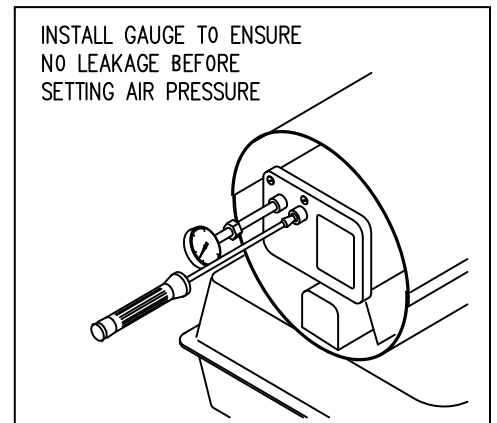


Figure 10 Air pump Pressure Adjustment

O. Reassembly of Heater

1. Put the heater back together in the reverse order of disassembly.
2. Check all wiring to be sure it agrees with the wiring diagram. Be sure all electrical connections are tight.
3. Tighten the connections at both ends of the air line, and tighten the connection where the fuel filter is assembled to the burner head.
4. Make sure the electrode lead is snapped on to the spark plug and the transformer output terminal.
6. Be sure all parts are in place and the screws are tight before attempting to use the heater

P. Heat Exchanger Service

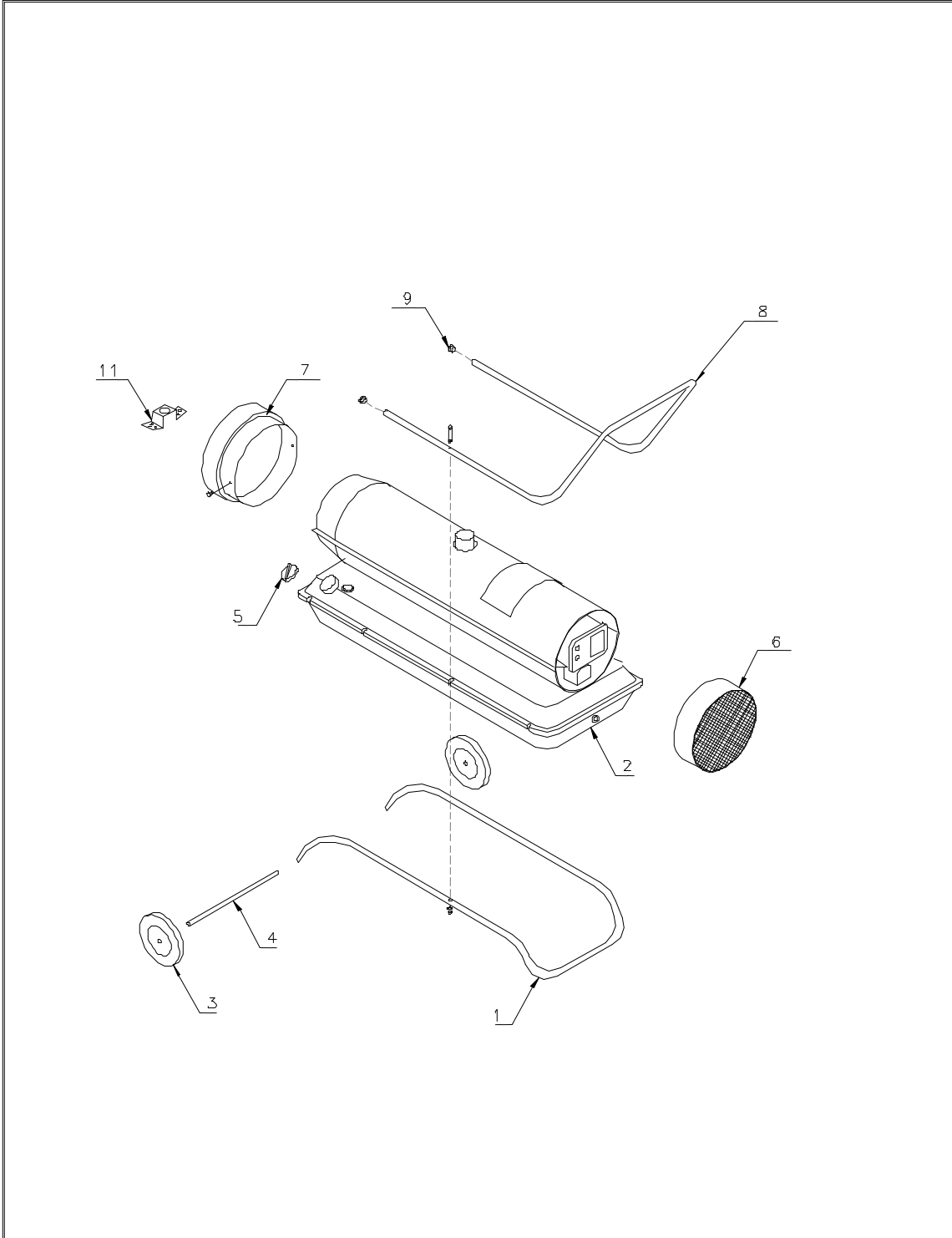
WARNING! CARBON MONOXIDE POISONING

The heat exchanger must be inspected annually by qualified service personnel for leaks which could allow dangerous carbon monoxide gas to enter the shelter. Failure to do so, could cause severe injury or death.

1. Inspect the heated air out end of the heat exchanger using a good quality light source. Look in the areas where the heat exchanger has turned dark due to the intense heat. Look for cracks or pin holes. If heat exchanger has cracks or pin holes replace immediately.

SECTION 6
Illustrated Parts List

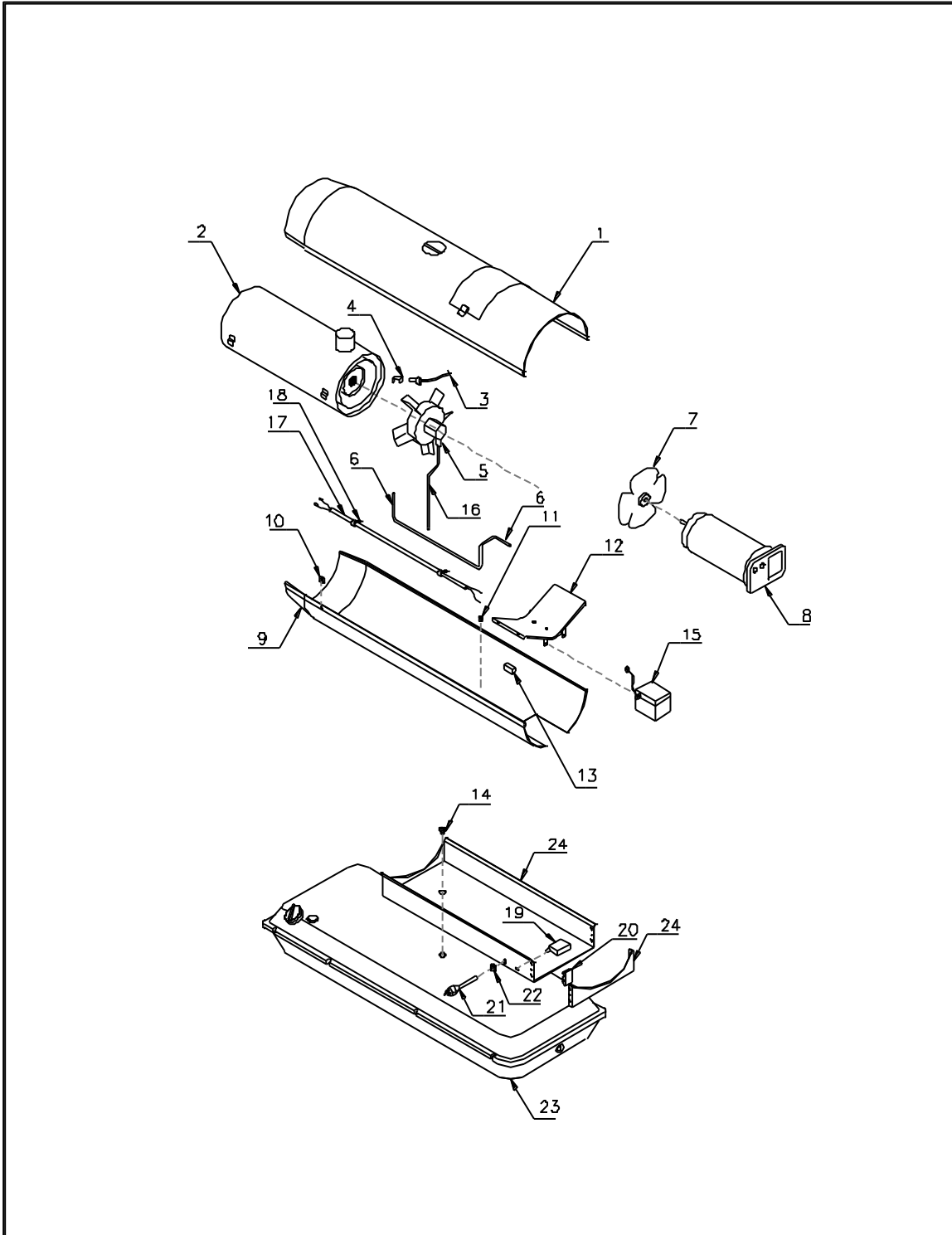
HEATER ASSEMBLY



HEATER ASSEMBLY

Index	P/N	Description	Quantity
1.	CV-100 (D)	Lower Frame	1
2.	CV-102 (E)	Fuel Tank	1
3.	WLK-CV-101	Wheel	2
4.	WLK-CV-102	Axle	1
	WLK-CV-102	Axle Caps	2
5.	CAH-128	Gas Cap	1
6.	CV-125-1	Inlet Screen Adapter	1
	CAH-142	Screw	2
7.	CV-123	Adapter, Output	1
	CAH-142	Screw	2
8.	CV-127 (D)	Handle	1
9.	CAH-103-2	Plug, Handle	2
10.	CV-124-5	Overheat Switch Assembly	1

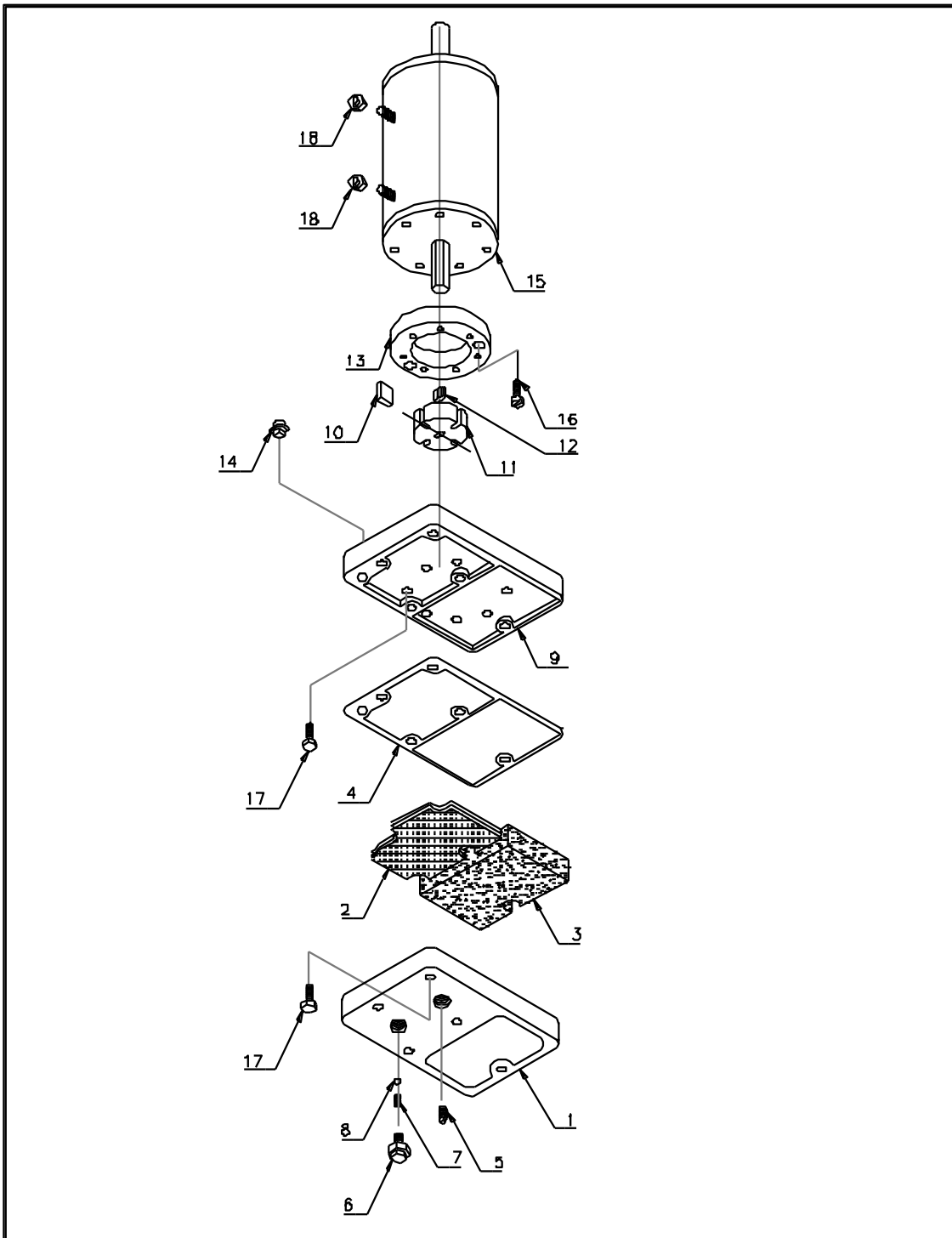
HEATER INTERNAL EXPLODED VIEW



HEATER INTERNAL EXPLODED VIEW

Index	P/N	Description	Quantity
1.	CAH-115 (D)	Upper Shell	1
2.	CAH-111	Combustion Chamber	1
3.	CAH-112-2	Photo Cell	1
4.	CAH-112-1 (B)	Bracket, Photo Cell	1
	CAH-141	Screw	2
5.	B-200	Burner Head Assembly	1
6.	CAH-110	Air Line	1
7.	CAH-113	Fan	1
8.	M-100 (D)	Motor and Pump Assembly	1
9.	CAH-104 (D)	Lower Shell	1
10.	CAH-104-1	Nut Clip	14
11.	CAH-105	Grommet (Small)	2
12.	CV-106 (D)	Bracket, Motor	1
13.	CAH-114 (D)	Relay	1
14.	CAH-102-2 (B)	Bushing	1
15.	CAH-107-1	Transformer Assembly	1
	CAH-142	Screw	2
16.	CAH-108-1 (E)	Fuel Line Assembly	1
17.	CAH-109-3	Electrical Conduit Assembly	1
18.	CAH-109-1	Clamp, Conduit	2
19.	CV-118-1	Safety Control Assembly	1
20.	CV-119-1	Distribution Bar	1
21.	CV-133-1	Power Cord Assembly	1
22.	CV-133-2	Strain Relief Bushing	1
23.	CV-102 (E)	Fuel Tank	1
24.	CV-102-1	Fuel Tank Bracket	1

MOTOR AND PUMP ASSEMBLY

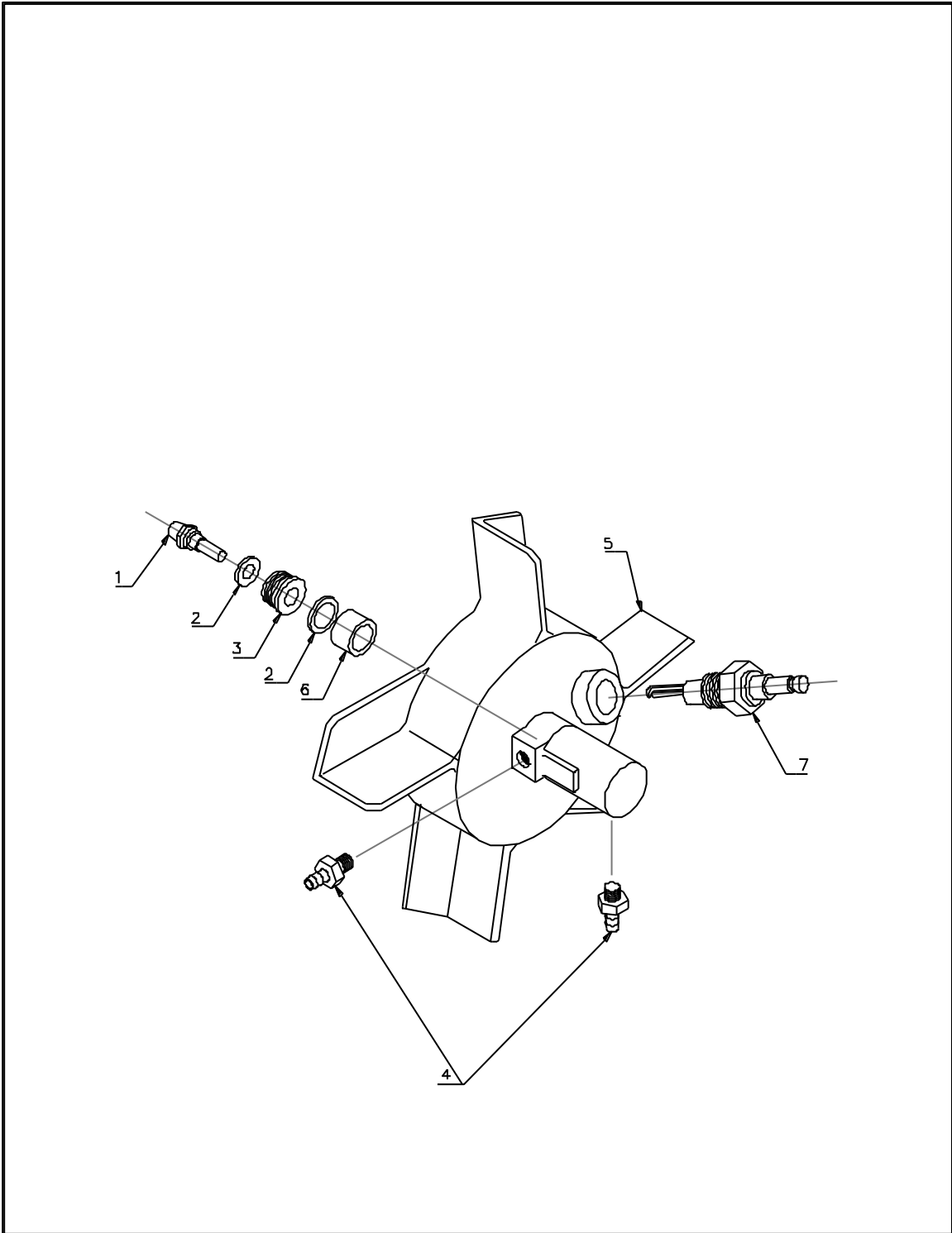


MOTOR AND PUMP ASSEMBLY

M-115

Index	P/N	Description	Quantity
1.	M-102 (D)	End Cover, Plastic	1
2.	M-103 (D)	Output Filter	1
3.	M-104 (D)	Intake Air Filter	1
4.	M-102-1 (D)	Pump Gasket	1
5.	M-105 (D)	Plug	1
6.	M-106 (D)	Screw, Pressure Adjust	1
7.	M-107 (D)	Spring, Compression	1
8.	M-108 (D)	Ball, 1/4" Diameter	1
9.	M-109 (D)	Front Cover, Pump	1
10.	M-110 (D)	Blade, Pump	4
11.	M-111 (D)	Rotor, Pump	1
12.	M-112 (D)	Insert, Rotor	1
13.	M-113 (D)	Pump Body	1
14.	M-114-1	90 Degree Fitting, Barb Hose	1
15.	M-115 (D)	Motor	1
16.	M-116 (D)	Screw	2
17.	M-117 (D)	Screw	11
18.	M-115-2 (D)	Nut	2

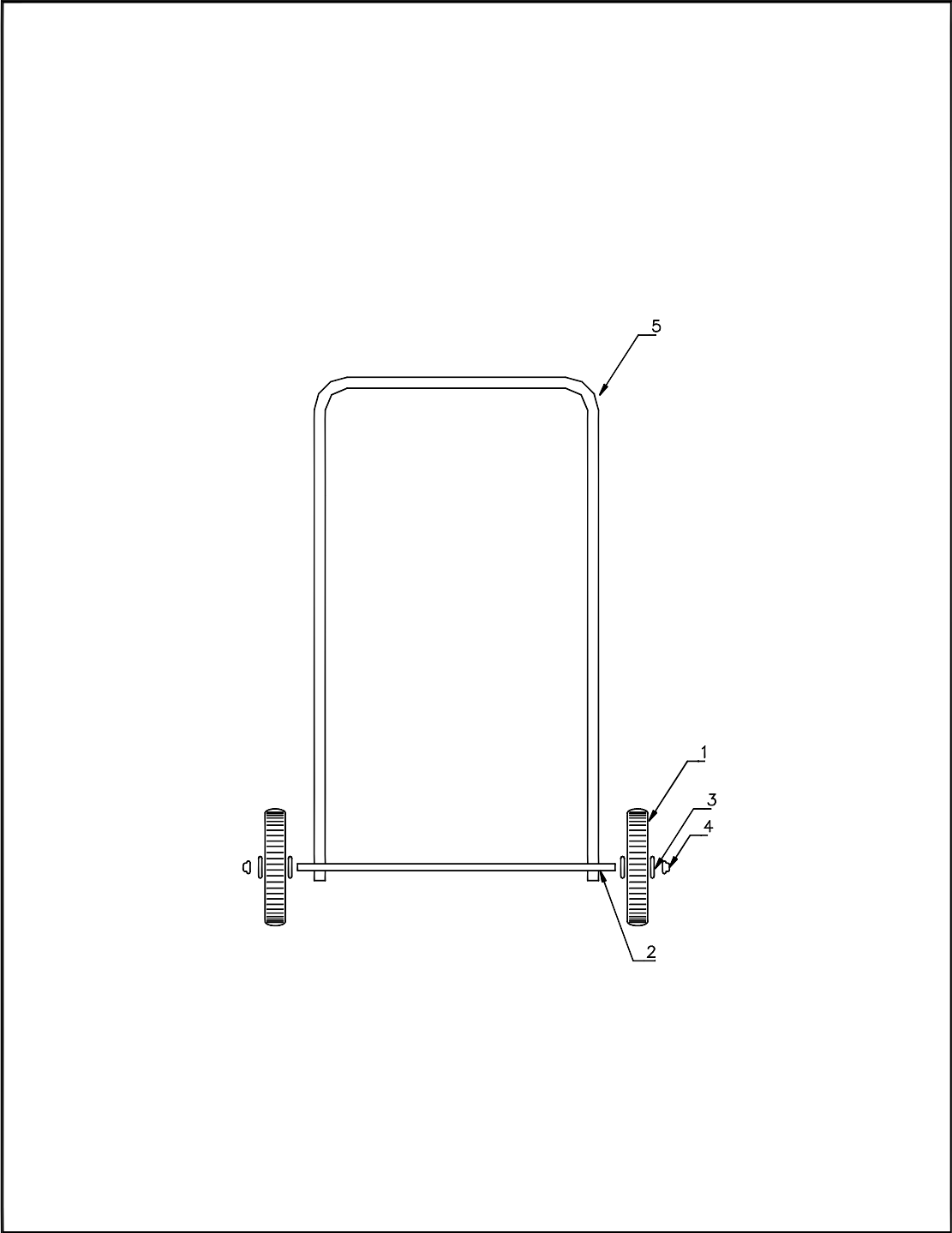
BURNER HEAD ASSEMBLY



BURNER HEAD ASSEMBLY
B-200

Index	P/N	Description	Quantity
1.	B-201	Nozzle	1
2.	B-202	Washer, Nozzle Seal	2
3.	B-203	Spring, Nozzle Seal	1
4.	M-114	Fitting, Barb Hose	2
5.	B-205	Body, Burner Head	1
6.	B-206	Sleeve, Nozzle Seal	1
7.	B-207	Spark Plug	1

WHEEL KIT



WHEEL KIT

CV-100

Index	P/N	Description	Quantity
1.	WLK-CV-101	Wheel	2
2.	WLK-CV-102	Axle	1
3.	WLK-CV-103	Washer	2
4.	WLK-CV-104	Cap, Axle	2
5.	CV-100	Lower Frame	1

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