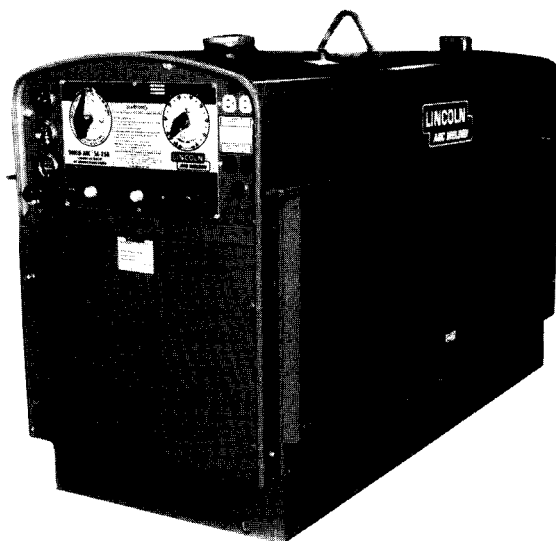


# OPERATING MANUAL

## Shield-Arc<sup>®</sup> SA-250-F163 DC Arc Welding Power Source with CONTINENTAL F163 ENGINE



Type K1305-3KSB

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and the availability of optional features may have changed.

### DAMAGE CLAIMS

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

### SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON PAGES ii, iii, AND iv.** And, most importantly, think before you act and be careful.

# ARC WELDING SAFETY PRECAUTIONS



**WARNING: PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH.**



## **ELECTRIC SHOCK can kill.**

1. a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- b. Insulate yourself from workpiece and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage Welder
  - DC Manual (Stick) Welder.
  - AC Welder with Reduced Voltage Control.
- c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
  - d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
  - e. Ground the work or metal to be welded to a good electrical (earth) ground.
  - f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
  - g. Never dip the electrode in water for cooling.
  - h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
  - i. When working above floor level, protect yourself from a fall should you get a shock.
  - j. Also see Items 4c and 6.



## **ARC RAYS can burn.**

2. a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

- b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



## **FUMES AND GASES can be dangerous.**

3. a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
- b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.
- e. Also see item 7b.



## **WELDING SPARKS can cause fire or explosion.**

4. a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have a fire extinguisher readily available.
- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure

that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).

- e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- h. Also see item 7c.



## CYLINDER may explode if damaged.

- 5. a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- c. Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
- e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- f. Valve protection caps should always be in place and handtight except when the cylinder is in use or connected for use.
- g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY powered equipment.

- 6. a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



## FOR ENGINE powered equipment.

- 7. a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



- b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



- c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.



- d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

- e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

- f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

- g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



- h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

**HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed by qualified people.**

For more detailed information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting — ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974.

## **PROPER GROUNDING DURING INSTALLATION**

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

Some State, local or other codes or unusual operating circumstances may require the machine frame to be grounded. It is recommended that you determine the extent to which such requirements may apply to your particular situation and follow them explicitly.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

## **INSTALLATION, CONNECTION, AND MAINTENANCE OF BATTERY**

To prevent EXPLOSION when:

- a) Installing a new battery — disconnect the negative cable from the old battery first and connect the negative cable to the new battery last.
- b) Connecting a battery charger — remove the battery from the welder by disconnecting the negative cable first, then the positive cable and battery clamp. When reinstalling, connect the negative cable last.
- c) Using a booster — connect the positive lead to the battery first then connect the negative lead to the copper strap on the engine foot.

To prevent ELECTRICAL DAMAGE when:

- a) Installing a new battery.
- b) Using a booster.

Use correct polarity — Negative Ground.

To prevent BATTERY DISCHARGE, if you have an ignition switch, turn it off when the engine is not running.

To prevent BATTERY BUCKLING, tighten nuts on battery clamp only until snug.

(S-17851)

## **OPERATION OF ENGINE WELDERS**

**WARNING:** Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

## **OPERATION OF ALL WELDERS**

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

## **MAINTENANCE AND TROUBLESHOOTING WARNINGS**

**WARNING:** Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

## **ATTENTION OWNERS OF ENGINE WELDERS**

**WARNING:** Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

## **CAUTION WHEN INSPECTING THE COMMUTATOR AND BRUSHES**

**WARNING:** Uncovered rotating equipment can be dangerous. Use care so your hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

## **NAMEPLATES**

Whenever routine maintenance is performed on this machine — or at least yearly — inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

## ENGINE OPERATION

See the engine manufacturer's operating manual supplied with the welder for detailed engine operating and maintenance instructions, parts lists and safety precautions.

**WARNING:** Operate internal combustion engines in open, well-ventilated areas or vent engine exhaust fumes outdoors.

### EXHAUST SPARK ARRESTER

Some federal, state or local laws may require that gasoline engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard. This welder is not originally shipped with a spark arrester nor does the optional muffler qualify as a spark arrester. When required by local regulations, suitable spark arresters must be installed and properly maintained. **CAUTION:** An incorrect arrester may lead to damage of the engine or its performance. Contact the engine manufacturer for specific recommendations.

### CONTROL PANEL

Both the engine and welder controls are located on one recessed panel at the exciter end of the machine. The engine controls consist of the "Start Button", "Idler Control Switch" and "Ignition Switch". On this panel is also mounted a battery charging ammeter, an oil pressure light and the receptacles and fuses for the auxiliary power.

### BATTERIES

These machines are furnished with wet batteries. **WARNING:** When servicing batteries use caution — the electrolyte is a strong acid that can burn skin and damage eyes.

### COOLING SYSTEM

The SA-250-F163 is equipped with a pressure radiator. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passage and overheating the engine. When anti-freeze is needed, always use the permanent type. Cooling system capacity is 10½ quarts.

### CARBURETOR DE-ICER

This welder is provided with an anti-frosting device. Frosting generally occurs when the humidity is high and the temperature is between 26 and 40°F. To connect the de-icer, remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive preheated air to the carburetor.

Disconnect this hose for warm weather operation.

### ENGINE CHECKLIST

Fill the crankcase to the "Full" mark on the bayonet gauge with the recommended weight oil (see ENGINE MANUAL). Fill the radiator, gasoline tank and air filter oil bath. Open the carburetor feed valve on the sediment bowl by turning the handle.

### ROUTINE ENGINE OPERATION\*

Put the 'Idler Control' switch in the 'High Idle' position, the ignition switch in the "ON" position and start the engine. Allow it to run at high idle speed for several minutes to warm the engine. Cold engines tend to run at a speed too slow to supply the voltage required for proper idler operation.

Running the engine with proper oil pressure lights a green light on the control panel. If this light flickers or goes off, stop the engine immediately. Locate and correct the cause of low oil pressure before re-starting the engine. Run the engine for five minutes to check for proper operation. Stop the engine and check the oil level. If the oil level is down, fill to the "Full" mark again.

Operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

At the end of each day's welding, refill the gasoline tank to minimize moisture condensation in the tank. Also, running out of gas tends to draw dirt into the fuel system. Check the crankcase oil and radiator water level.

When hauling the welder between job sites, close the fuel feed valve on the sediment bowl by turning the handle from left to right. Failure to turn the fuel off when traveling can cause carburetor flooding and difficult starting at the new job site.

The fan belt tends to loosen after about 40 hours of operation. Check and tighten, if necessary. Check and tighten all internal and external connections as needed.

\* Refer to the Continental Engine Manual for specific engine adjustments.

## IDLER OPERATION

Start the engine with the "Idler Control" switch in the "High Idle" position. Allow it to run at high idle speed for several minutes to warm the engine.

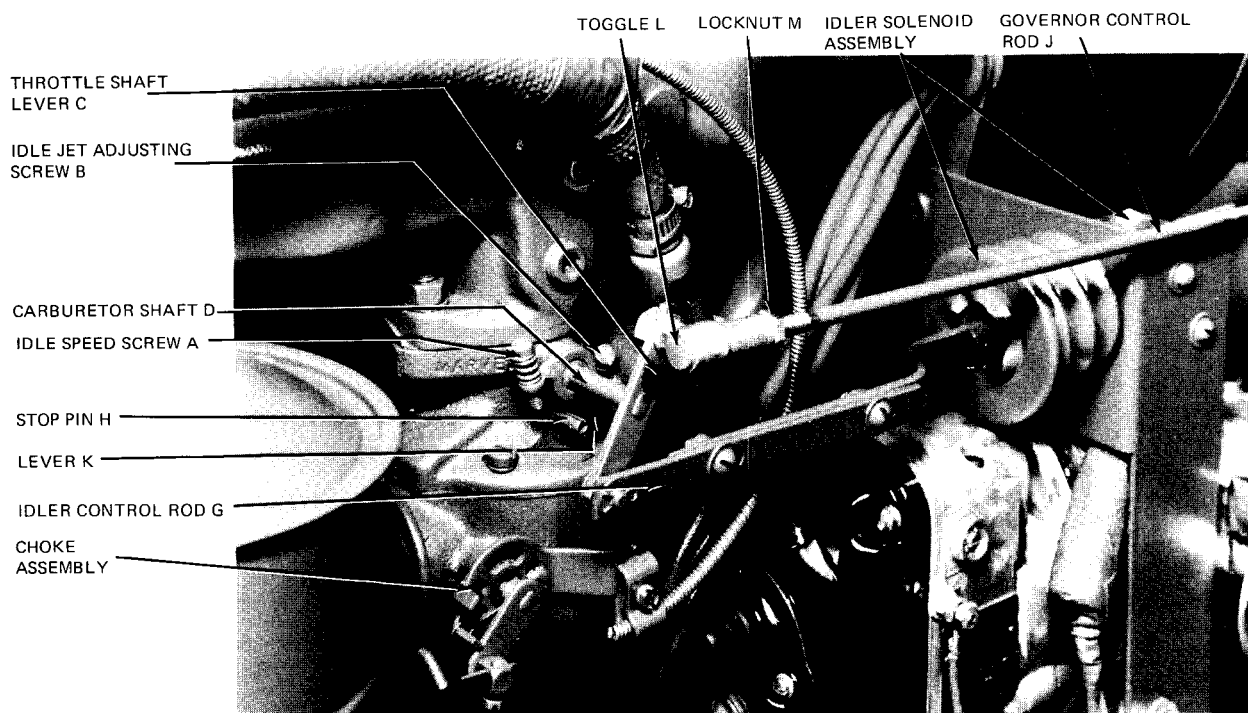
Operating Speeds	
Full Load	1700 rpm
High Idle	1800 rpm
Low Idle	1350 rpm

The idler is controlled by an "Idle Control" toggle switch on the welder control panel. The switch has two positions as follows:

1. In the "High Idle" position, the idler is off and the engine runs at the high speed controlled by the governor.
2. In the "Automatic Idle" position, the idler operates as follows:
  - a. When welding or drawing power for lights or tools (approximately 100 – 150 watts minimum) from the receptacles, the engine operates at full speed.
  - b. When welding ceases or the power load is turned off a preset time delay of about 15 seconds starts. This time delay cannot be adjusted.
  - c. If the welding or power load is not re-started before the end of the time delay, the idler reduces the engine to low idle speed.

## Low Idle Speed (See Figure 3)

Instructions for adjusting the low idle speed are as follows:



1. Stop the warmed engine. Loosen the two screws which hold the two halves of the idler control rod (G) together so the two halves slide freely with respect to each other.
2. Start the engine. Set the 'Idler Control' switch into the 'Automatic Idle' position.
3. Rotate the carburetor shaft (D) until the idle speed screw (A) is against the stop pin (H). While holding the screw against the stop pin, adjust the screw for a speed of 1325 to 1375 RPM.
4. Then with the idler plunger fully seated, pull the *slotted* half of the idler control rod (G) until the idle speed screw is against the stop pin and tighten the two screws to fix the idler control rod at this setting.
5. Idle speed should be 1325 to 1375 RPM. Readjust if necessary.

## WELDER OPERATING INSTRUCTIONS

### DUTY CYCLE

The NEMA output rating of the SA-250 is 250 amperes at 30\* arc volts, on a 60% duty cycle. Duty cycle is based on a 10 minute period; thus, the welder can be loaded at rated output for 6 minutes out of every 10 minute period.

\* Lincoln's "Plus Rating" at 60% duty cycle is 250 amps at 40 volts.

### POLARITY CONTROL AND CABLE SIZES

With the engine off, connect the electrode and work cables of the appropriate size (see the following table) to the studs located on the fuel tank mounting rail. For Positive polarity, connect the electrode cable to the terminal marked "Positive". For Negative polarity, connect the electrode cable to the "Negative" stud. These connections should be checked periodically and tightened if necessary.

When welding at a considerable distance from the welder, be sure you use ample size welding cables.

Machine Size in Amperes	Duty Cycle	Copper Cable Sizes for Combined Lengths of Electrode and work Cables	
		Up to 200 ft.	200 to 250 ft.
250	60%	1	1/0

### CONTROL OF WELDING CURRENT

The welder controls consist of a "Current Range Selector" switch and a "Fine Current Adjustment" rheostat. The "Current Range Selector" provides five current ranges. The "Fine Current Adjustment" adjusts the current from minimum to maximum within each range. Open circuit voltage is also controlled by the "Fine Current Adjustment" permitting control of the arc characteristics.

DO NOT TURN THE "CURRENT RANGE SELECTOR" WHILE WELDING because the current may arc between the contacts and damage the switch.

A guide for setting the welding controls is as follows:

A high open circuit voltage setting provides the soft "buttering" arc with best resistance to pop-outs preferred for most welding. To get this characteristic, set the "Current Range Selector" to the *lowest* setting that still provides the current needed and set the "Fine Current Adjustment" near maximum. For example: To obtain 175 amps and a soft steady arc, set the "Current Range Selector" to the 190-120 position and then adjust the "Fine Current Adjustment" to get 175 amps.

When a forceful "digging" arc is required, usually for vertical and overhead welding, use a higher "Current Range Selector" setting and a lower open circuit voltage. For example: To obtain 175 amps and a forceful arc, set the "Current Range Selector" to the 240-160 position and the "Fine Current Adjustment" setting to get 175 amps.

Some arc instability may be experienced with EXX10 electrodes when trying to operate with long arc techniques using settings at the lower end of the OCV range.

DO NOT attempt to set the "Current Range Selector" between the five points designated on the nameplate.

These switches have a spring loaded cam which almost eliminates the possibility of setting this switch between the designated points.

### AUXILIARY POWER

The AC auxiliary power, supplied as a standard, has a continuous rating of 3.0 KVA of 115/230 VAC (60 Hertz). Set the "Fine Current Adjustment" on "100" for maximum auxiliary power.

With the 3.0 KVA, 115/230 VAC auxiliary power, one duplex 115V grounding type receptacle (NEMA configuration 5-20R) is provided. For the 230 VAC power, one grounding type duplex receptacle is provided (NEMA configuration 6-15R). The circuit is protected with fuses.

If auxiliary power is used simultaneously with welding, the current which can be used while maintaining voltage regulation within 10% is as follows:			
Welding Current Amps (@ NEMA Arc Volts)	Using Only 115V Circuit, Amps	Using Only 230V Circuit, Amps	Total Aux. KVA
0	26	13	3.0
100	16	8	1.8
150	15	7.5	1.7
200	15	7.5	1.7
250	14	7	1.6

The rating of 3.0 KVA permits a maximum continuous current of 13 amps to be drawn from the 230 volt duplex receptacle. Or, a total of 26 amps can be drawn from the 115 volt duplex receptacle. The 115 volt duplex receptacle has a configuration which permits 20 amps to be drawn from either half. Therefore, on this machine up to 20 amps continuous can be drawn from one half and the balance of 6 amps from the other half. The total combined load of all receptacles is not to exceed 3.0 KVA.

## POWER PLUG

An optional power plug kit is available. When this kit is specified, the customer is supplied with a plug for each receptacle. In this case, he will receive two 20 amp, 115 volt plugs (NEMA configuration 5-20P) and two 15 amp, 230 volt plugs (NEMA configuration 6-15P).

Power tools should always be grounded to the welder frame unless they are protected by an approved system of double insulation.

## PIPE THAWING

**WARNING:** Although not specifically designed for the work, the output of arc welding machines is sometimes used to thaw frozen water pipes by electrical resistance

heating of the pipe metal. Pipe thawing, if not done properly, can result in fire, explosion, damage to wiring which may make it unsafe, damage to pipes, burning up the welder, or other hazards. Do not use a welder to thaw pipe before reviewing Lincoln bulletin E695.1 (dated December '76 or later).

For protection of the welder from overloads, use of a device called the Linc-Thaw™, as described in bulletin E695.1, is recommended.

## UNDERCARRIAGE (K-769)

The recommended undercarriage for use with this equipment for in-plant and yard towing by a vehicle is Lincoln's two-wheeled K-769. If the user adapts a non-Lincoln undercarriage, he must assume responsibility that the method of attachment and usage does not result in a safety hazard nor damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of undercarriage vs. weight of Lincoln equipment and likely additional attachments.
2. Proper support of, and attachment to, the base of the welding equipment so there will be no undue stress to the framework.
3. Proper placement of the equipment on the undercarriage to ensure stability side to side and front to back when being moved and when standing by itself while being operated or serviced.
4. Typical conditions of use, i.e., travel speed, roughness of surface on which the undercarriage will be operated, environmental conditions, likely maintenance.
5. Conformance with federal, state and local laws.\*

\* Consult applicable federal, state and local laws regarding specific requirements for use on public highways.

## MAINTENANCE

**WARNING:** Have qualified personnel do the maintenance and troubleshooting work. Turn the engine off before working inside the welder.

### ROUTINE SERVICE

1. Blow dirt out of the welder and controls with an air hose at least once every two months — once every week in dirty locations. Use low air pressure to avoid driving dirt into the insulation.
2. 'Current Range Selector' contacts should not be greased. To keep the contacts clean, rotate the current control through its entire range frequently. Good practice is to turn the 'Current Range Selector' handle from maximum to minimum setting twice each morning before starting to weld.
3. Change the crankcase oil at regular intervals using the proper grade of oil as recommended in the engine operating manual.
4. Change the oil filter in accordance with the instructions in the engine operator's manual. When the filter is changed add a quart of oil to the crankcase to replace the oil held in the filter during operation.
5. When necessary, remove the sediment bowl from beneath the gas tank and clean out any accumulated dirt and water. Replace the fuel filter at the carburetor as needed. In an emergency, the fuel filter can be



back-flushed for continued use until a replacement can be obtained.

6. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
7. Inspect air filter (oil bath type) daily — more often under dusty conditions. Clean and fill with oil to bead. The oil cup should never be removed while the engine is running.
8. Put a drop of oil on the 'Current Range Selector' shaft at least once every month.
9. Fan belts tend to loosen after the first 30 or 40 hours of operation. Check and tighten if necessary. **DO NOT OVERTIGHTEN.**
10. See the engine manufacturer's manual supplied with the welder for more complete engine maintenance information.

## COMMUTATOR AND BRUSHES

The generator brushes are properly adjusted when the welder is shipped. They require no particular attention. **DO NOT SHIFT THE BRUSHES** or adjust the rocker setting.

Periodically inspect the commutators and brushes by removing the commutator covers. **DO NOT** remove or replace these covers while the machine is running.

Commutators and slip rings require little attention. However, if they are black or appear uneven, have them cleaned by an experienced maintenance man using fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

Replace brushes when they wear within  $\frac{1}{4}$ " of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have an experienced maintenance man seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low pressure air.

To seat slip ring brushes, position the brushes in place. Then slide one end of a piece of fine sandpaper between slip rings and brushes with the coarse side against the brushes. With slight additional finger pressure on top of the brushes, pull the sandpaper around the circumference of the rings — in direction of rotation only — until brushes seat properly. In addition, stone slip ring with a fine stone. Brushes must be seated 100%.

**WARNING:** Uncovered rotating equipment can be dangerous. Use care so hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

Arcing or excessive exciter brush wear indicates a possible misaligned shaft. Have an authorized Field Service Shop check and realign the shaft.

## BEARINGS

This welder is equipped with a double-shielded ball bearing have sufficient grease to last indefinitely under normal service. Where the welder is used constantly or in excessively dirty locations, it may be necessary to add one-half ounce of grease per year. A pad of grease one inch wide, one inch long and one inch high weighs approximately one-half ounce. Over-greasing is far worse than insufficient greasing.

When greasing the bearings, keep all dirt out of the area. Wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

## IDLER MAINTENANCE

1. The solenoid plunger must work freely because binding can cause engine surging. If surging occurs, be sure the plunger is properly lined up with the carburetor lever. Dust the plunger about once a year with a graphite powder.
2. When any service is done, reassemble the rubber bellows on the solenoid plunger with the vent hole on the lower side.
3. Proper operation of the idler requires good grounding of the printed circuit board (through its mounting), reed switch and battery.
4. If desired, the welder can be used without automatic idling by setting the 'Idler Control' switch to the 'High Idle' position.
5. **CAUTION:** Before doing electrical work on the idler printed circuit board, disconnect the battery. When installing a new battery or using a jumper battery to start the engine, be sure the battery polarity is connected properly. The correct polarity is *negative* ground. Damage to the engine alternator *and* the printed circuit board can result from incorrect connection.

# TROUBLESHOOTING

**WARNING:** Have qualified personnel do the maintenance and troubleshooting work. Turn the engine off before working inside the welder.

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator Brushes may be worn down to limit. Brush springs may be broken. Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire. Electrode lead or work lead connection may be poor. Wrong grade of brushes may have been installed on generator. Field rheostat may be making poor contact and overheating.	Commutator should be trued or cleaned. Replace brushes. Replace brush springs. Check field current with ammeter to discover varying current. This applies to both the main generator and exciter. Tighten all connections. Use Lincoln brushes. Inspect and clean the rheostat.
Welder starts but fails to generate current.	Generator or exciter brushes may be loose or missing. Exciter may not be operating. Field circuit of generator or exciter may be open. Exciter may have lost excitation. Series field and armature circuit may be open-circuited.	Be sure that all brushes bear on the commutator or slip rings and have proper spring tension. Check exciter output voltage with voltmeter or lamp. Check for open circuits in rheostat, field leads, and field coils. Flash exciter fields.† Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high. Polarity may be wrong.	Check setting and current output with ammeter. Check polarity. Try reversing polarity or try an electrode of the opposite polarity.
Welding current too great or too small compared to indication on the dial.	Exciter output low causing low output compared to dial indication. Operating speed too low or high.	Check exciter field circuit. Adjust speed screw on governor for 1800 rpm operating speed for welding.*
Arc continuously pops out.	Current Range Selector switch may be set at an intermediate position.	Set the switch at the center of the current range desired.
Engine fails to start.	Out of fuel. Clogged fuel system. Choke not closing tightly. Distributor or Magneto points are pitted and fused. Ignition switch shorted or open. Moisture or carbon on spark plugs.	Fill with at least 75 octane gasoline. Check all lines to carburetor. Loosen choke cable screw and slack off choke wire. Dress or replace points and adjust to 0.020". Replace. Remove plugs, clean and adjust gap to 0.025".
Low oil pressure. Light not lit when engine running.	Oil too light. Oil too low. Defective oil pressure switch or light.	Drain, refill with proper grade. Fill to "Full" mark on bayonet gage. Do not overfill. Replace.
Lack of power.	Carbon deposits, causing pre-ignition. Incorrect timing.	Run engine under full load for a short time. Time ignition.*
Overheating.	No water in radiator or clogged cooling system. Late timing. Improper valve clearance. Fan belt too loose.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump. Time ignition.* Adjust valve tappets (cold settings) Adjust for 3/4" to 1" deflection.

Intake	Exhaust
.012	.021

## TROUBLESHOOTING (Continued)

TROUBLE	CAUSES	WHAT TO DO
Knocking.	Poor grade of gasoline. Spark advanced too far.	Use at least 75 octane gasoline. Retime Ignition.*
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking. Dirty air filter. Governor spring adjusting screw misadjusted. Governor control rod wrong length.	Clean and lubricate. Replace toggles if worn.  Remove and clean according to instruction on unit. Adjust screw just enough to eliminate surge.*  Adjust length of control rod so that there is from $\frac{1}{32}$ " to $\frac{1}{16}$ " clearance between the stop pin and the stop when the engine is shut off and the regulator expanded.*
Low output.	Operating speed is set too low.	Adjust speed screw on governor for 1800 rpm high idle operating speed.*
Large decrease in speed.	Misadjusted governor spring adjusting screw.	Adjust screw until speed does not drop more than 100 rpm $\pm$ 25 rpm when arc is struck. If surge occurs, eliminate it with the control rod. If high idle speed changes readjust the high idle speed screw.*
Unable to strike an arc.	Idle speed screw is misadjusted.	Idle speed is set too low so idler fails to operate when arc is struck. Adjust low idle speed screw for 1325 – 1375 rpm.*
Engine runs irregularly.	Carburetor set too lean.	Adjust carburetor adjusting screw so engine will run smoothly at idle speed.*
Engine fails to pick up speed when arc is struck.		Check the idler.

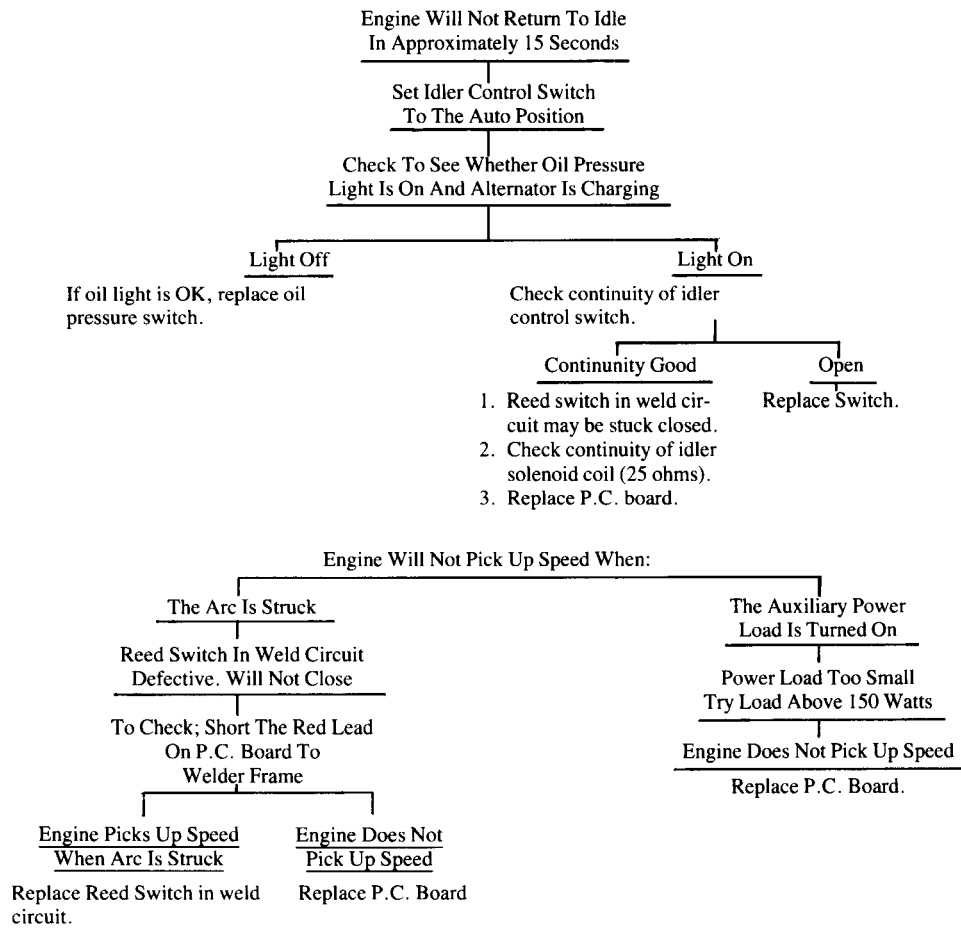
\* See engine manual.

### † FLASHING THE FIELDS

AC Auxiliary Power:

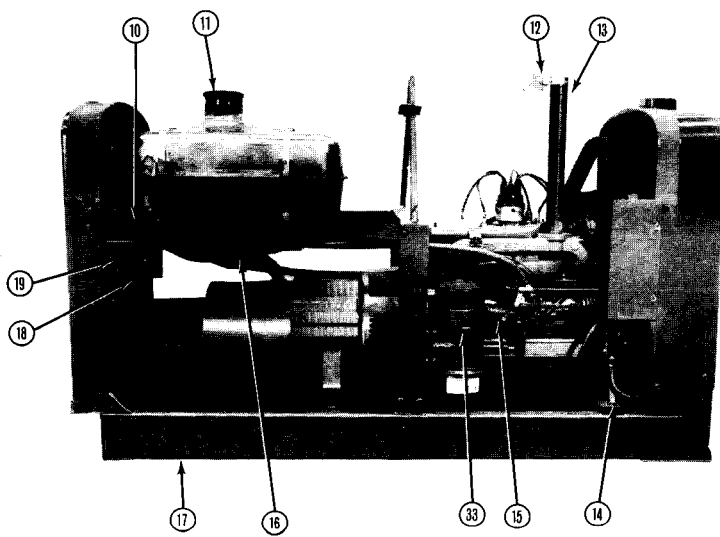
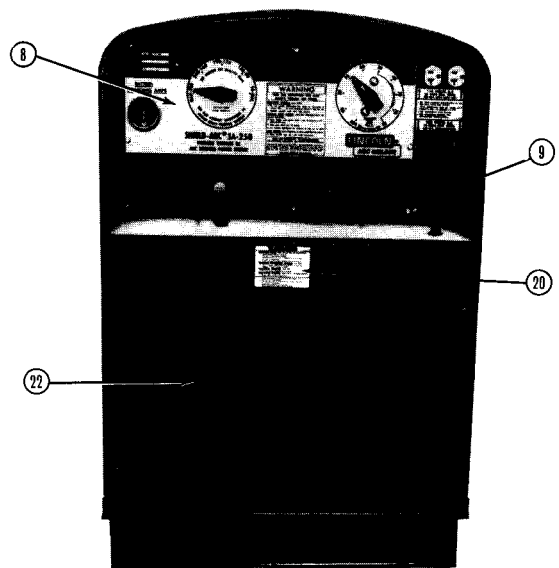
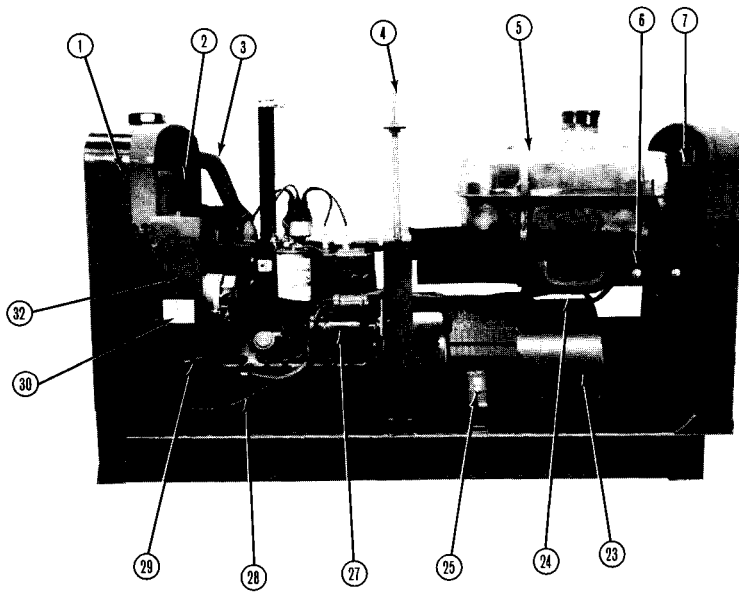
1. Stop the engine welder and remove the cover from the exciter.
2. Turn the "Fine Adjustment Control" (rheostat) to "100" on the dial.
3. Using a 12 volt automotive battery, connect its negative terminal to the negative brushholder. The negative brushholder is the one nearest to the rotor lamination. See the wiring diagram. With the engine NOT running, touch the positive battery terminal to the positive brushholder. Remove the battery from the circuit.
4. Replace exciter cover. Start the welder and the generator voltage should build up.

# ELECTRONIC IDLER TROUBLESHOOTING GUIDE





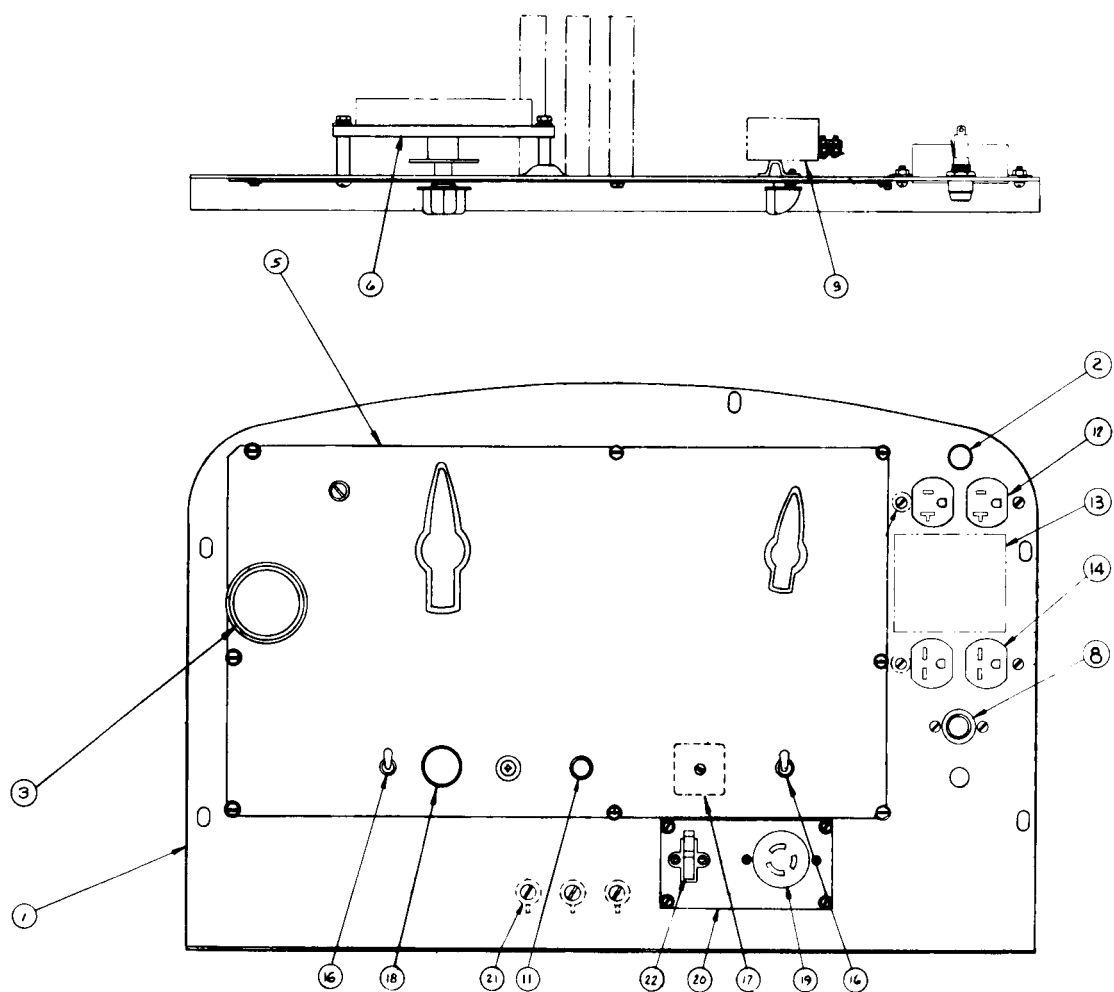
# GENERAL ASSEMBLY



# Parts List P-150-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Radiator Shell and Screen Assembly See P-124-D	1
2	Fan	1
3	Top Radiator Hose	1
	Hose Clamps	2
4	Lift Bail	1
	Hex Head Screw	4
	Lock Washer	4
	Hex Nut	4
5	Fuel Tank See P-150-F	1
6	Rail and Output Panel, Includes:	2
	Molded Output Stud	2
	Output Stud Nut	As Req
	Hex Head Cap Screw	4
	Self Tapping Screw	1
	Meter Shunt	1
7	Idle Reed Switch Assembly	1
8	Control Panel Assembly See P-150-D	1
9	Choke Control See P-150-F	1
10	Current Transformer	1
11	Fuel Tank Cap and Gasket See P-150-F	1
12	Rail Cap	1
13	Exhaust Pipe	1
13	Optional Muffler Kit, Includes:	1
	Muffler	1
	Exhaust Pipe	1
	Pipe Nipple	1
	Rain Cap	1
14	Battery Negative Lead and Ground Strap See P-150-G	1
15	Hose and Clamps (Air Filter to Carb.) See P-150-F	1
16	Fuel Strainer See P-150-F	1
17	Base Assembly	1
18	Idle P.C. Board Mounting Bracket	1
19	Idle P.C. Board	1
20	Warning Decal	1
21	Rear Roof Support	1
22	Lower Rear Panel	1
23	Generator Assembly See P-150-H	1
24	Air Heater Hose See P-150-F	1
25	Ground Decal	1
26	Starter Motor See P-150-G	1
28	Battery Positive Lead See P-150-G	1
29	Bottom Radiator Hose	1
	Hose Clamps	2
30	Alternator Polarity Decal	1
32	Fan Guard	2
33	Air Filter See P-150-F	1
	Items Not Illustrated:	
	Roof	1
	Lift Bail Seal	1
	Roof Mounting Angle (Front)	2
	Roof Mounting Angle (Rear)	2
	Door	2
	Door Decal	2
	Lincoln Logo Decal	2
	Engine Mountings to Base	2
	Generator Mountings to Base	2
	Fan Belt	1
	Hose - Thermostat Bypass	1
	Hose Clamp - Thermostat Bypass	2
	Voltammeter (Optional)	1
	Hour Meter (Optional)	1

# CONTROL PANEL



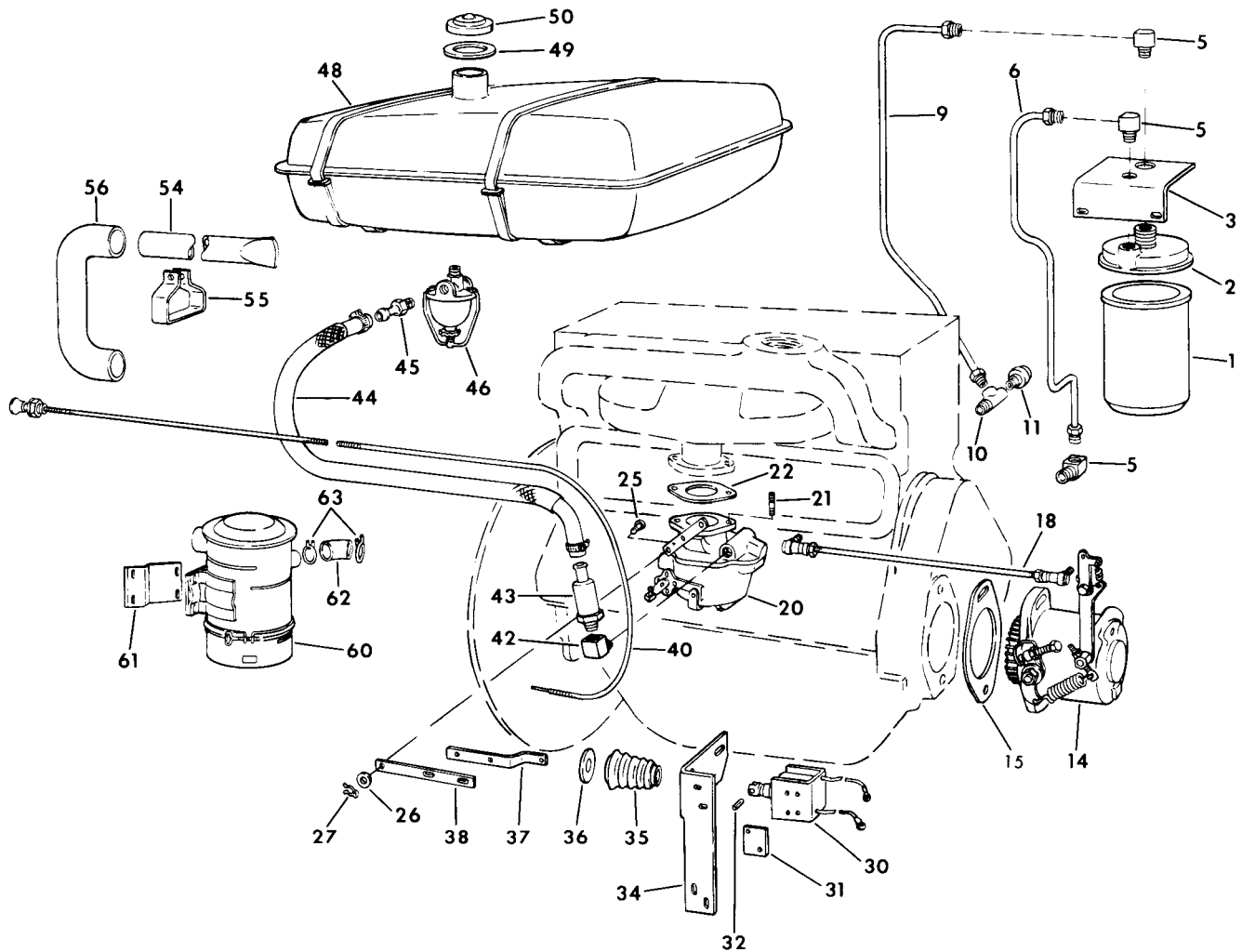
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# Parts List P-150-D

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Control Panel Assembly, Includes:	1
1	Control Panel w/o Remote Control	1
2	Fuse	1
	Fuse Holder	1
3	Ammeter	1
5	Nameplate	1
	Self Tapping Screws	8
6	Selector Switch	1
	Handle	1
8	Fuse	1
	Fuse Holder	1
9	Rheostat	1
	Rheostat Handle	1
11	Pilot Light	1
12	Receptacle	1
13	Receptacle Decal	1
14	Receptacle	1
16	Idler Switch	1
17	Full Wave Bridge	1
18	Start Button	1
19	Receptacle - Remote Control Only	1
20	Nameplate - Remote Control	1
	Self Tapping Screw	4
21	Resistor - Remote Control Only	1
	Round Head Screw	3
	Insulating Washer	6
	Plain Washer	3
	Lockwasher	3
	Hex Nut	3
22	Switch - Remote Control Only	1

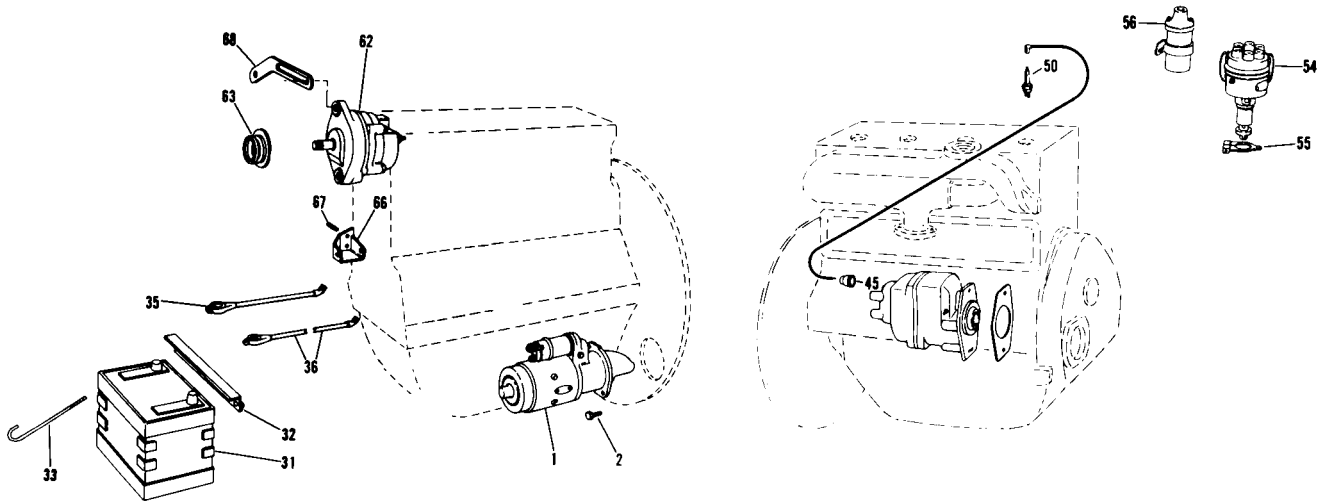
# ENGINE FUEL SYSTEM, IDLER AND OIL FILTER



**Parts List P-150-F**

<b>ITEM</b>	<b>PART NAME AND DESCRIPTION</b>	<b>NO. REQ'D.</b>
1	Oil Filter	1
2 & 3	Filter Bracket Assembly	1
5	Tube Elbow	3
6	Inlet Oil Line	1
9	Outlet Oil Line	1
10	Tee Connector	1
11	Oil Pressure Switch	1
14	Governor	1
15	Flange Gasket	1
18	Governor to Carburetor Control Rod	1
20	Carburetor	1
21	Stud	2
22	Carburetor Gasket	1
25	Pivot Pin	1
26	Plain Washer	1
27	Spring Clip	1
30	Idler Solenoid	1
31	Mounting Spacer	1
32	Roll Pin	1
34	Mounting Bracket	1
35	Boot	1
36	Gasket	1
37	Idler Control Rod	1
38	Idler Control Rod Slide	1
40	Choke Control	1
42	Street Elbow	1
43	Fuel Filter	1
44	Fuel Hose Assembly	1
45	Hose Connector	1
46	Fuel Strainer	1
48	Gas Tank	1
49	Gas Tank Gasket	1
50	Filler Neck Cap	1
54	Heater Tube	1
55	Heater Tube Clamp	1
56	Heater Hose	1
60	Air Filter	1
61	Filter Mounting Bracket	1
62	Hose, Filter to Carburetor	1
63	Hose Clamp	2

# ENGINE ELECTRICAL SYSTEM



LEFT SIDE

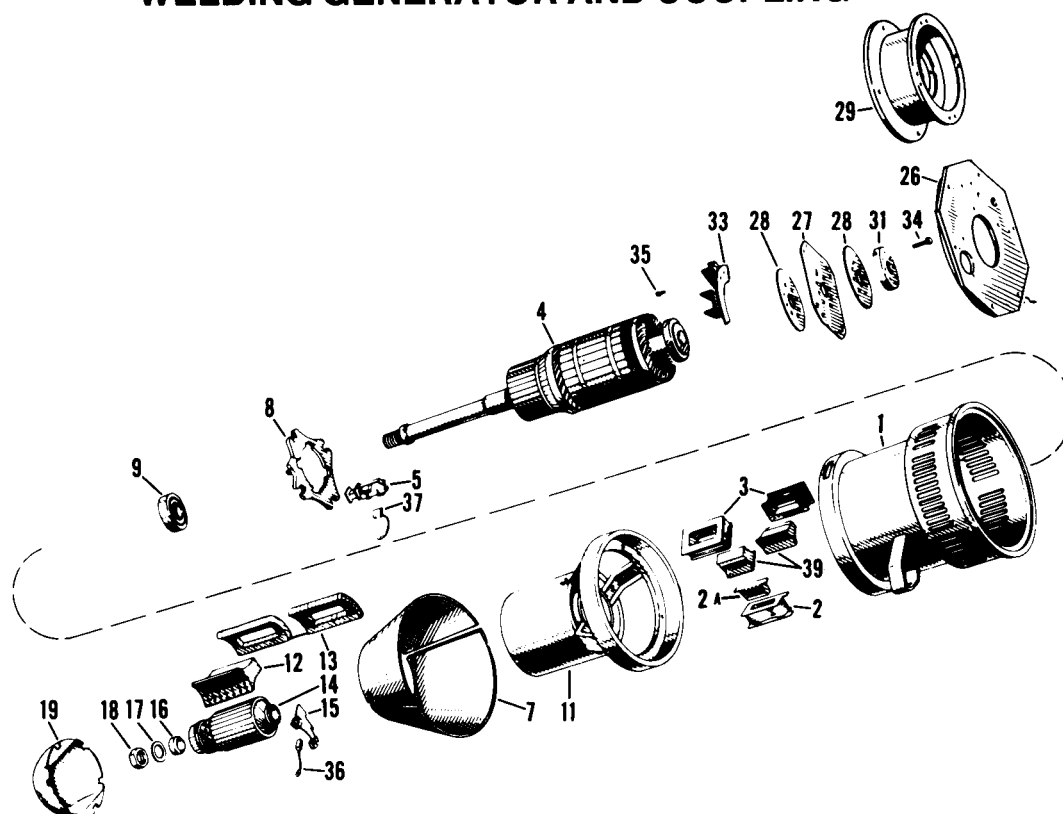
RIGHT SIDE

1-19-83

Parts List P-150-G

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Starting Motor	1
2	Hex Head Screw (Starter Mounting)	2
31	Battery	1
32	Battery Mounting Bracket	1
33	Battery Clamp Hook	2
35	Battery Cover Plate	1
36	Ground Lead	1
45	Battery Lead to Starter	1
45	Nipple	6
50	Spark Plug	4
54	Distributor	1
55	Drive Shaft Assembly	1
55	Stud	1
55	Clamp Arm	1
56	Ignition Coil	1
62	Alternator & Voltage Regulator Assembly, Includes:	1
62	Alternator & Voltage Regulator (Includes Fan)	1
63	Pulley	1
66	Alternator Mounting Brackets	1 ea
67	Stud-Mounts Alternator Brackets	2
68	Adjusting Strap	1

# WELDING GENERATOR AND COUPLING

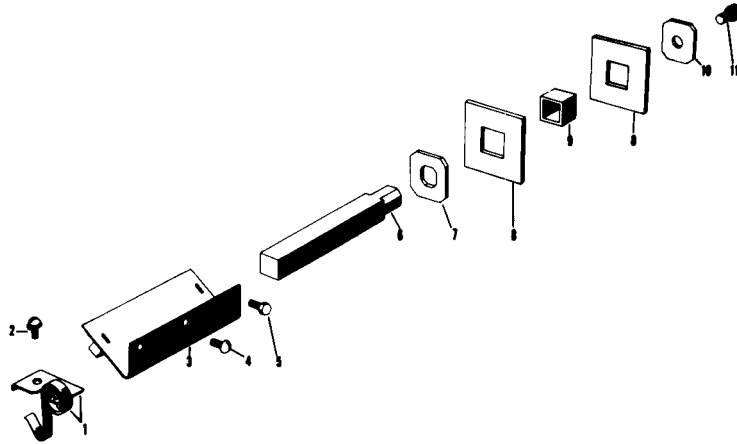


1-19-83

Parts List P-150-H

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Frame	1
	Interpole Coil & Pole (Set of 2-3 & 6 o'clock)	1
	Includes:	
	Interpole Coil & Pole (Set of 2-9 & 12 o'clock)	1
	Includes:	
2	Interpole Coil (Set of 2-3 & 6 o'clock)	1
2	Interpole Coil (Set of 2-9 & 12 o'clock)	1
2A	Interpole Pole Piece	4
3	Shunt & Series Field Coils	As Req'd
4	Armature	1
5	Brushholder	4
	Brushholder Parts	See P-25-L
7	Bracket Cover	1
8	Rocker	1
9	Bearing	1
Items 11 thru 19	Alternator Parts	See P-124-G
26	Housing Plate	1
	Dowel-Housing Plate to Engine	2
	Hex Head Screws (Housing Plate to Engine)	3
	Hex Head Screws (Housing Plate to Engine thru Dowels)	2
27	Coupling Disc	1
28	Disc Backing Plate	2
29	Engine Coupling	1
31	Coupling Ring (Outside-Closest to Engine)	1
31	Coupling Ring (Inside)	1
33	Blower Segments	4
34	Hex Head Screws (Coupling Rings to Armature Hub)	8
35	Hex Head Screws (Blower Segments to Engine)	8
	Coupling	See P-124-G
36	Alternator Part	8
37	Generator Brush	8
39	Main Poles	4
	Alternator Diode & Heat Sink Assembly, (Not Illustrated)	1

# GENERATOR BRUSHHOLDER

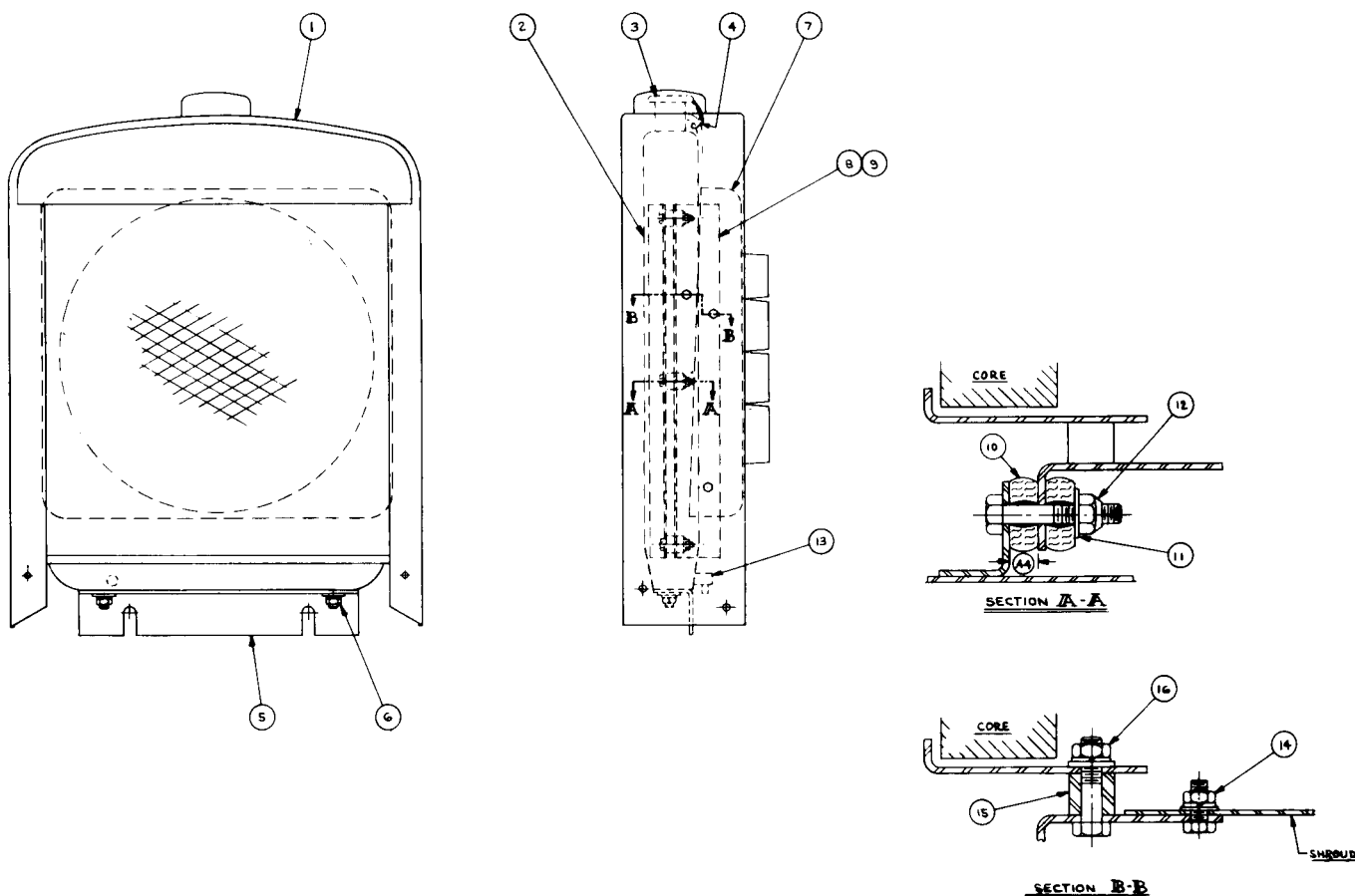


**Parts List P-25-L**

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Brushholder Assembly Includes: Spring and Clip Assembly	4 2
2	Round Head Cap Screw	2
3	Plate and Retainer Assembly	1
4	Round Head Cap Screw	2
5	Hex Head Cap Screw	1
6	Stud	1
7	Clamping Washer	1
8	Insulating Washer	1
9	Insulating Tube	1
10	Clamping Washer	1
11	Hex Head Cap Screw, Sems Kantlink	1

**WHEN ORDERING GIVE:** Item No., Part Name, Parts List No., and Welder Code.

# RADIATOR SHELL AND SCREEN ASSEMBLY



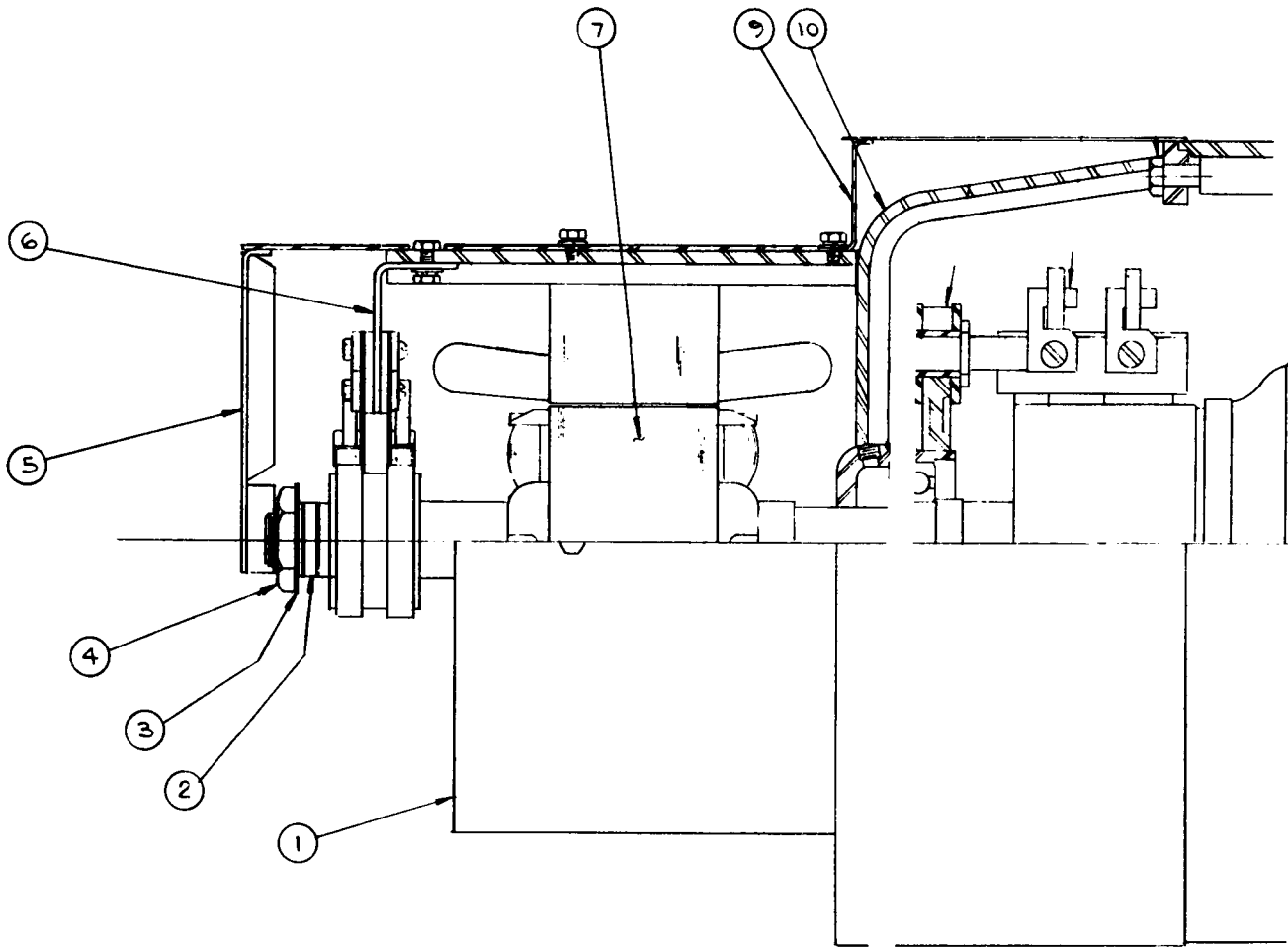
When Ordering Give: Item Number, Part Name,  
Parts List Number and Welder Code

Parts List P-124-D

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Radiator Shell and Screen Assembly, Includes: Radiator Shell Assembly	1
2	Radiator	1
3	Radiator Cap and Chain	1
4	Pig Ring Clamp	1
5	Mounting Bracket	1
6	Hex Nut	2
7	Radiator Shroud	1
8	Mounting Bracket-Left Side From Radiator End of Machine	1
9	Mounting Bracket-Right Side From Radiator End of Machine	1
10	Rubber Washer	12
11	Plain Washer	6

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
12	Lock Nut	6
13	Drain Cock	1
14	Hex Head Screw	4
	Plain Washer	4
	Lock Washer	4
	Hex Nut	4
15	Spacer	2
16	Hex Head Screw	2
	Plain Washer	2
	Lock Washer	2
	Hex Nut	2

## 3 KVA AND 3.5 KVA ALTERNATOR



**Parts List P-124-G**

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Bottom Exciter Cover	1
2	Armature Sleeve Collar	1
3	Locking Collar	1
4	Exciter Lock Nut	1
5	Top Exciter Cover	1
6	Brushholder Assembly, Includes: Brushholder Parts	1
	Alternator Brush - Not part of Brushholder Assy.	2
7	Rotor Assembly, 3.5 KVA Alternator	1
7	Rotor Assembly, 3.0 KVA Alternator	1
9	Baffle	1
10	3.5 KVA Alternator Bracket	1
10	3.0 KVA Alternator Bracket	1









## LIMITED WARRANTY

### STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

### WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

#### Three Years:

Transformer Welders  
Motor-generator Welders  
Semiautomatic Wire Feeders  
Plasma-cutting Power Source  
Engine Driven Welders (except engine and engine accessories) with operating speed under 2,000 RPM

#### Two Years:

Engine Driven Welders (except engine and engine accessories) with operating speed over 2,000 RPM

All engine and engine accessories are warranted by the engine or engine accessory manufacturer and are not covered by this warranty.

Equipment not listed above such as guns and cable assemblies, automatic wire feeders and field-installed optional equipment is warranted for one year.

### TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service Center or Field Service Shop of any defect within the warranty period. Written notification is recommended.

### WARRANTY REPAIR:

If Lincoln's inspection of the equipment confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

### WARRANTY COSTS:

You must bear the cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

### IMPORTANT WARRANTY LIMITATIONS:

- Lincoln will not accept responsibility for repairs made without its authorization.
- Lincoln shall not be liable for consequential damages (such as loss of business, etc.) caused by the defect or reasonable delay in correcting the defect.
- Lincoln's liability under this warranty shall not exceed the cost of correcting the defect.
- This written warranty is the **only** express warranty provided by Lincoln with respect to its products. Warranties implied by law such as the Warranty of Merchantability are limited to the duration of this limited warranty for the equipment involved.



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