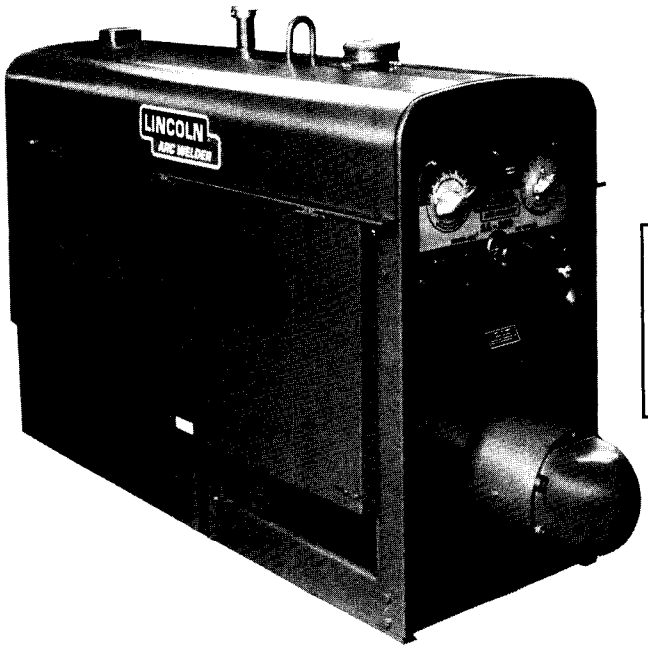
LINCOLN WELDERS®

IM-276-B

IM276
Shield-Arc SA-200 F163 Continental
July, 1993
7276; 7302; 7307; 7693; 7699; 7789; 8017; 8023; 8244; 8245; 8348; 8583; 8638; 8676; 8677; 8790; 8791; 8915; 8916; 9052; 9053; 9324; 9325; 9442; 9443; 9527; 9530

OPERATING MANUAL

Shield-Arc®
SA-200-F163
DC Arc Welding Power Source with CONTINENTAL F163 ENGINE



Type: K-6090-SB
Model: SA-200-F163
(Code 8023 up)

Type: K-6090-SM
(Codes 7276 to 8017)

(For Codes below 7276 see IM-208-A)

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and the availablility of optional features may have changed.

DAMAGE CLAIMS

When Lincoln 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 time 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 THE INSIDE FRONT COVER. And, most importantly, think before you act and be careful.

LINCOLN ELECTRIC
THE LINCOLN ELECTRIC COMPANY
World's Largest Manufacturer of Arc Welding Products
Cleveland, Ohio 44117 U.S.A.

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. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

   c. Insulate yourself from work and ground using dry insulation. When welding in damp locations, on metal framework such as floors, gratings or scaffolds, and when in positions such as sitting or lying, make certain the insulation is large enough to cover your full area of physical contact with work and ground.

   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 National Electrical Code, all local codes and the manufacturer's recommendations.

c. Ground the equipment in accordance with the 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.

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.

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 explicity.

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.)

ENGINE OPERATION

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

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. **WARNING:** An incorrect arrester may lead to damage of the engine or its performance. Contact the engine manufacturer for specific recommendations.

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

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.**

Fill the crank case to the "Full" mark on the bayonet gage 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 from right to left. Put the ignition switch in the "ON" position and start the engine. If the green oil pressure light does not light when the engine starts, stop the engine and locate the cause of low oil pressure. Run the engine for 5 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.

Routine Engine 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. 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 (see Page 5) before re-starting the engine.

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, radiator and battery water levels.

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.

Idler Operation

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 receptacle located below the welder nameplate, 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.

Cooling System

The SA-200-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 antifreeze 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.

WELDER OPERATING INSTRUCTIONS

POLARITY CONTROL

With the engine off, connect the electrode and work cables of the appropriate size (see the following table) to the studs located on the gas 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.

Machine Size in Amperes	Duty Cycle	Copper Cable Sizes for Combined Lengths of Electrode and Ground Cables		
		0 to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	60%	2	1	1/0

CONTROL OF WELDING CURRENT

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

The 'Current Range Selector' provides five overlapping 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.

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 you need and set the 'Fine Current Adjustment' near maximum. For example: to obtain 175 amps and a soft arc, set the 'Current Range Selector' to the 190-120 position and then adjust the 'Fine Current Adjustment' to get 175 amps.

- Some arc instability may be experienced with E6010 and other EXX10 type electrodes when trying to operate with long arc techniques at settings, at the lower end of the OCV range. The above technique for obtaining a higher open circuit voltage will minimize this.

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.

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.

POWER PLUG

A 115 volt DC power receptacle is located on the control panel. This is a 3-prong receptacle with the grounding terminal grounded to the welder frame. The current available is 15 amperes. This will furnish 1.75 KW of power to operate power tools and lights. (Welders prior to Code 7789 were equipped with 1 KW, 9 ampere receptacles.)

WARNING: This current goes through a coil on the idler printed circuit board. The coil has reserve current carrying capacity approximately equivalent to the exciter armature. However, excessive loading of the power receptacle can damage the coil and the armature. **DO NOT exceed the 15 amp rating of the auxiliary power receptacle.**

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

DUTY CYCLE

This welder is NEMA rated 200 Amperes at 28 Arc Volts on a 60% Duty Cycle (it also has the added capacity to be rated 200 amps at 40 volts). 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.

PIPE THAWING

WARNING: 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 E-695.1 (dated December '76 or later).

For protection of the welder from overloads when thawing pipe, use of a device called the "Linc-Thaw" is recommended. A description of the "Linc-Thaw" is in bulletin E-695.1.

MAINTENANCE

WARNING: Have qualified personnel do the maintenance and trouble shooting work. Turn the engine 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.

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. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Drain and change the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when the filter is changed.
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. Periodically service the battery and check the water level per instructions shipped with the welder. When reconnecting the battery be certain the cables are clear of the fan, pulley and belt.
9. 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 require little attention. However, if they are black or appear uneven, clean while running with fine sandpaper or a commutator stone. Never use emery cloth or emery 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. 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.

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 having 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.

TROUBLE SHOOTING

WARNING: Have qualified personnel do the maintenance and trouble shooting work. Turn the engine 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.

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator.	Commutator should be trued or cleaned.
	Brushes may be worn down to limit.	Replace brushes.
	Brush springs may be broken.	Replace brush springs.
	Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire.	Check field current with ammeter to discover varying current. This applies to both the main generator and exciter.
	Electrode lead or work lead connection may be poor.	Tighten all connections.
	Wrong grade of brushes may have been installed on generator.	Use Lincoln brushes.
	Field rheostat may be making poor contact and overheating.	Inspect and clean the rheostat.
Welder starts but fails to generate current.	Generator or exciter brushes may be loose or missing.	Be sure that all brushes bear on the commutator and have proper spring tension.
	Exciter may not be operating.	Check exciter output voltage with voltmeter or lamp.
	Field circuit of generator or exciter may be open.	Check for open circuits in rheostat, field leads, and field coils.
	Exciter may have lost excitation.	Flash exciter fields.†
	Series field and armature circuit may be open-circuited.	Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high.	Check setting and current output with ammeter.
	Polarity may be wrong.	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.	Check exciter field circuit.
	Operating speed too low or high.	Adjust speed screw on governor for 1550 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.	Fill with at least 75 octane gasoline.
	Clogged fuel system.	Check all lines to carburetor.
	Choke not closing tightly.	Loosen choke cable screw and slack off choke wire.
	Lead attched to stud on outside of magneto is grounded.	Check for ground and insulate lead.
	Distributor or Magneto points are pitted and fused.	Dress or replace points and adjust to 0.020".
	Ignition switch shorted or open.	Replace.
	Moisture or carbon on spark plugs.	Remove plugs, clean and adjust gap to 0.025".
Low oil pressure. Light not lit when engine running.	Oil too light.	Drain, refill with proper grade.
	Oil too low.	Fill to "Full" mark on bayonet gage. Do not overfill.
	Defective oil pressure switch or light.	Replace.
Lack of power.	Carbon deposits, causing pre-ignition.	Run engine under full load for a short time.
	Incorrect timing.	Time ignition.*

TROUBLE SHOOTING (Continued)

TROUBLE	CAUSES	WHAT TO DO
Overheating.	No water in radiator or clogged cooling system.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump.
	Late timing.	Time ignition.*
	Improper valve clearance.	Adjust valve tappets (cold settings)
	Fan belt too loose.	Adjust for ¾" to 1" deflection.
Knocking.	Poor grade of gasoline.	Use at least 75 octane gasoline.
	Spark advanced too far.	Retime Ignition.*
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking.	Clean and lubricate. Replace toggles if worn.
	Dirty air filter.	Remove and clean according to instruction on unit.
	Governor spring adjusting screw misadjusted.	Adjust screw just enough to eliminate surge.*
	Governor control rod wrong length.	Adjust length of control rod so that there is from 1/32" to 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 1550 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 ±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 1000-1050 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.*

Intake	Exhaust
.012	.021

* See "Gasoline Engine Adjustment: Timing, Carburetor, Governor & Idler," Instruction Manual IM-277-A.

† Flashing the exciter fields consists of passing current through the fields using an external source of 6 to 125 volts of DC power from a storage battery or DC generator. If using a DC generator, keep the generator turned off except when actually applying the flashing current. To flash the fields:

1. Turn the welder off. Raise one exciter brush off the commutator.
2. On Lincoln welders, attach the positive lead from the external DC source to the right hand brushholder.
3. Carefully holding an insulated section of the negative lead from the DC source, touch its lug or clamp to the left hand brushholder for 5 seconds. Pull it away quickly to minimize arcing.

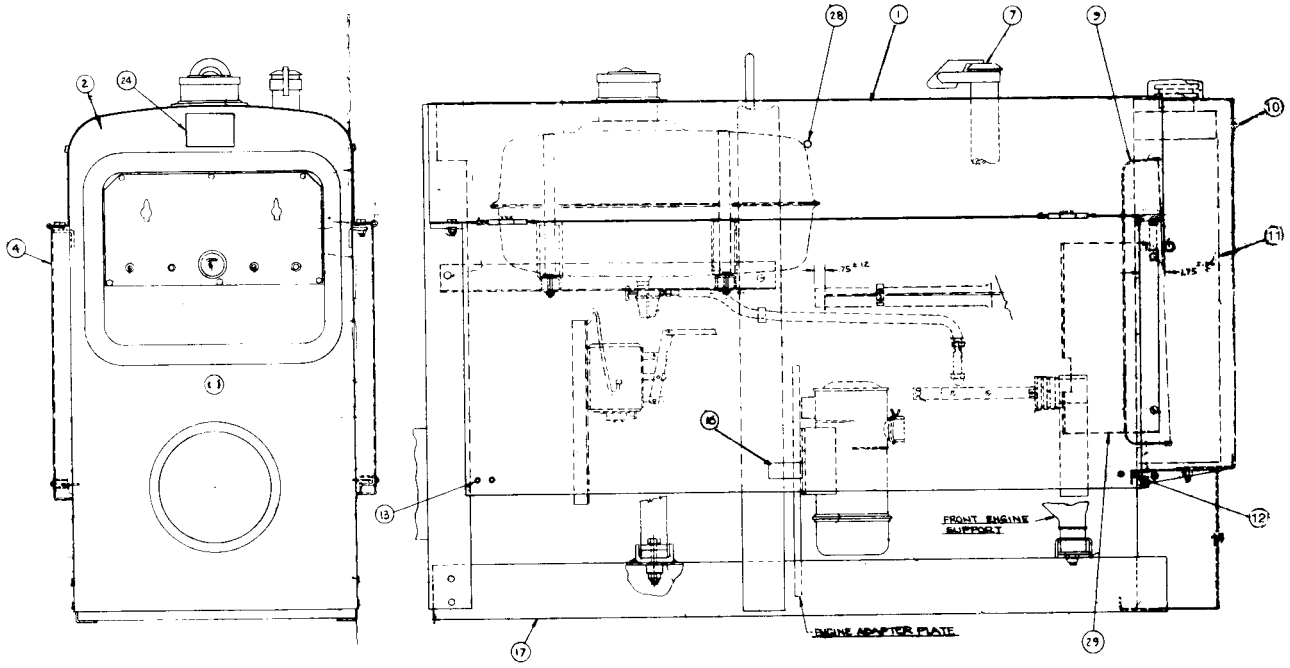
Remove the lead from the right hand brushholder, replace the brush on the commutator, start the welder and the generator voltage should build up.

REMANUFACTURING

After your welder has provided many years of service, it can be returned to the factory for a remanufacturing service called Linconditioning™. It will be completely disassembled and all electrical and mechanical parts will be refurbished or replaced as needed. The machine will be returned to you in "new Welder" condition. A new welder guarantee is issued with each remanufactured machine.

"Linconditioning" lets you plan the overhaul of your equipment during slack periods so it is ready for dependable performance when needed for full scale production. Contact your nearest Lincoln office for details.

GENERAL ASSEMBLY



G-1337
2-24-84

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

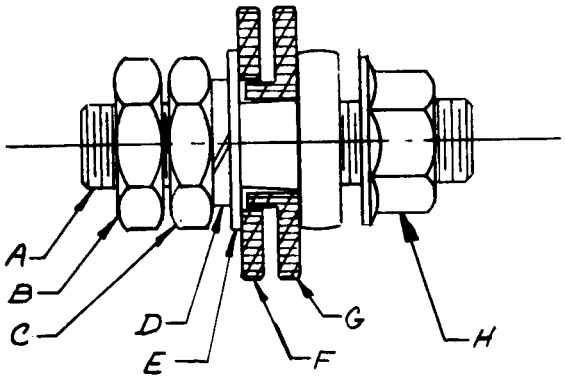
Parts List P-111-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Roof	1
	Roof Mounting Angle	2
	Roof Mounting Angle	2
	Square Head Bolt, Roof Mounting	4
	Hug Locknut, Roof Mounting	4
2	Control Panel and Output Studs See P-111-D	
4	Door	2
7	Exhaust Pipe	1
	Rain Cap	1
8	Radiator Shell and Screen Assembly	1
	Thread Cutting Screw, Shell Mounting	4
9	Radiator Shroud	1
10	Door Decal	2
11	Radiator See P-23-E	
12	Door Hook	2
	Thread Cutting Screw	4

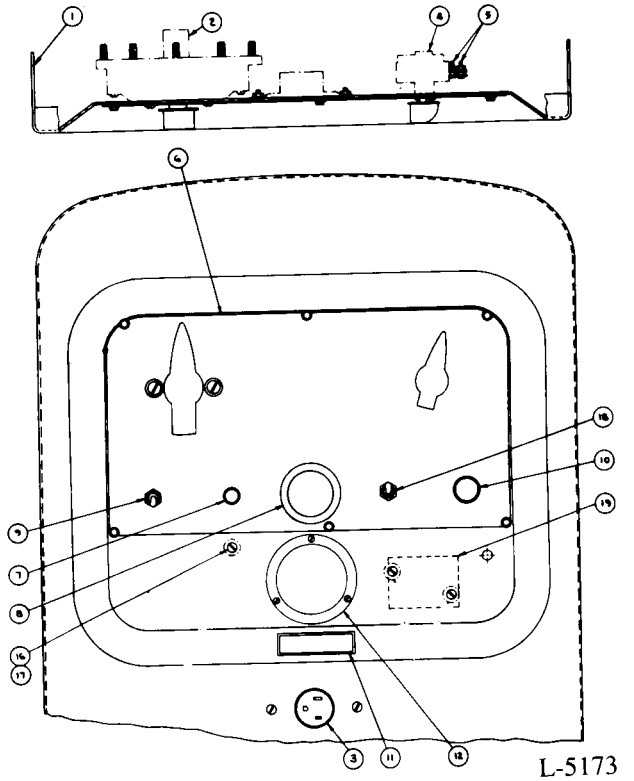
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
13	Door Hook	2
	Thread Cutting Screw	4
17	Base	1
	Stud, Front Engine Mounting	1
	Washer, Front Engine Mounting	2
	Engine Mount, Front Engine Mounting	1
	Rubber Washer, Front Engine Mounting	1
	Huglock Nut, Front Engine Mounting	1
23	Idler Solenoid Assembly	1
24	Decal	1
28	Door Bumper	2
29	Fan Guard (Side Shown)	1
29	Fan Guard (Opposite To Side Shown)	1
	Items Not Illustrated:	
	Engine Hour Meter (Optional)	1
	Hour Meter Shock Mounting	1
	Ground Stud Decal	1

CONTROL PANEL AND OUTPUT STUDS

Old Style Output Stud



S-11125
12-9-60A



L-5173
7-1-83D

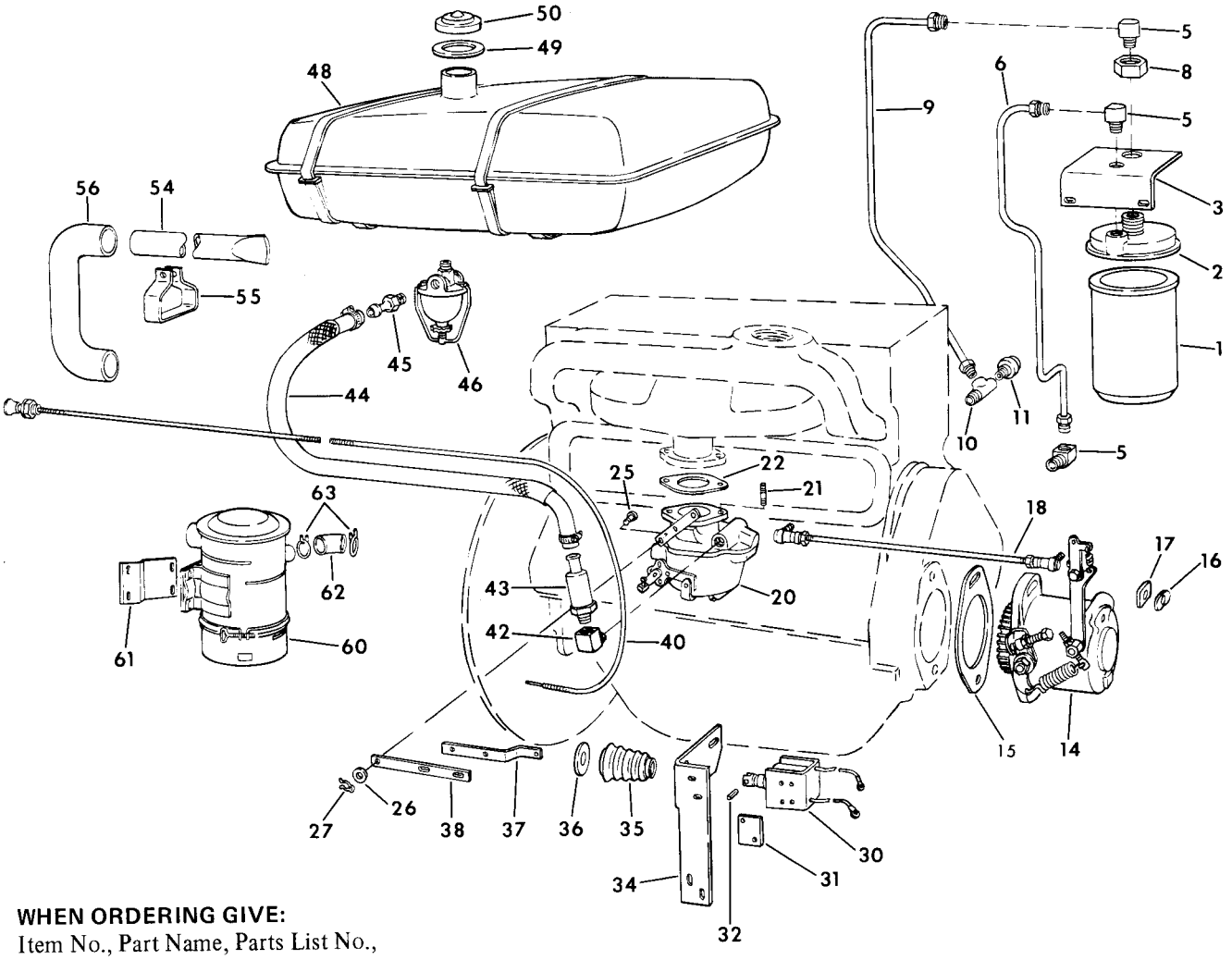
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-111-D

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Control Panel (Without Volt Ammeter)	1
1	Control Panel (With Volt Ammeter)	1
2	Selector Switch	1
	Idler Reed Switch	1
	Thread Cutting Screw, Switch Mounting	2
	Switch Handle	1
3	Receptacle	1
4	Rheostat	1
	Rheostat Handle	1
6	Nameplate	1
	Self-Tapping Screw, Nameplate Mounting	6
7	Pilot Light	1
8	Ammeter	1
9	Ignition and Idler Control Switches	2
10	Start Button	1
11	Instruction Decal	1
12	Volt Ammeter (Optional)	1
18	Ignition Switch	1
19	Idler P.C. Board	1
	Round Head Screw, Board Mounting	2
	Spacer, Board Mounting	2
	Lockwasher, Board Mounting	2
	Hex Nut, Board Mounting	2

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Old Style Output Stud Assembly, Includes Items A thru H (Codes Below 8200 Only)	2
A	Output Stud	1
B	Brass Nut	1
C	Hex Jam Nut	1
D	Lockwasher	1
E	Flatwasher	1
F	Insulating Washer	1
G	Insulator	1
H	Output Stud Nut	1
	New Style Output Stud Assembly Includes: (Codes Above 8200 Only), Not Illustrated	
	Molded Output Stud	2
	Output Stud Nut	2
	Hex Head Cap Screw	2
	Self-Tapping Screw	2

ENGINE FUEL SYSTEM AND OIL FILTER

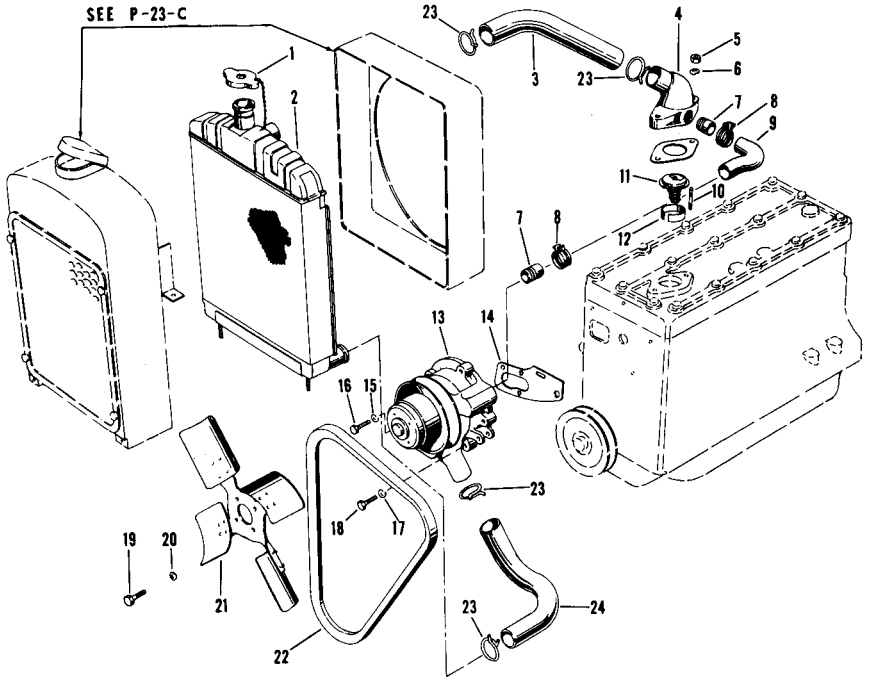


WHEN ORDERING GIVE:
Item No., Part Name, Parts List No., and Welder Code.

Parts List P-111-F

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Oil Filter	1
2	Filter Adapter Base	1
3	Filter Mounting Bracket	1
3	Filter Bracket Assembly	1
5	Tube Elbow	3
6	Inlet Oil Line	1
6	Inlet Oil Line	1
8	Hex Jam Nut	1
9	Outlet Oil Line	1
9	Outlet Oil Line	1
10	Tee Connector	1
11	Oil Pressure Switch	1
14	Governor (Magneto Ignition)	1
14	Governor (Distributor Ignition)	1
15	Flange Gasket	1
16	Cover Plate	1
17	Cover Plate Gasket	1
18	Governor to Carburetor Control Rod	1
20	Carburetor (Magneto Ignition)	1
20	Carburetor (Distributor Ignition)	1
21	Stud	2
22	Carburetor Gasket	1
25	Pivot Pin	1
26	Flatwasher	2
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	L
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

COOLING SYSTEM



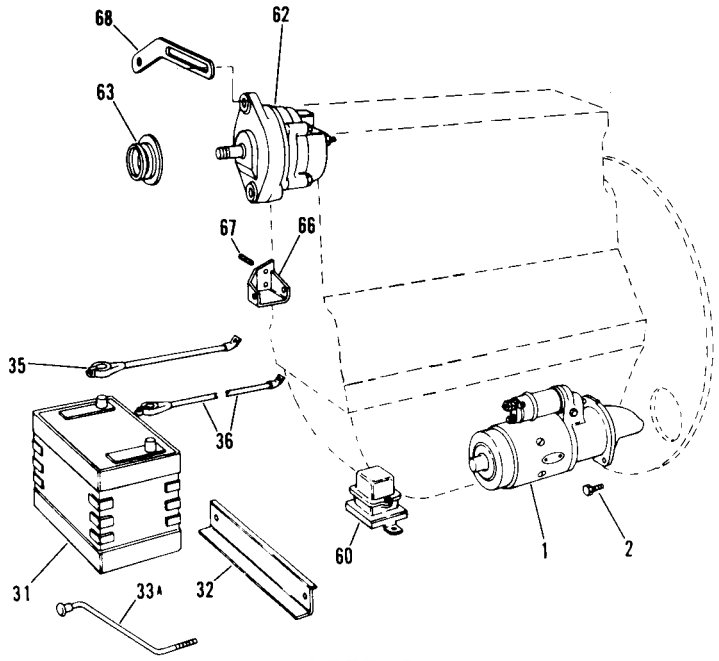
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-E

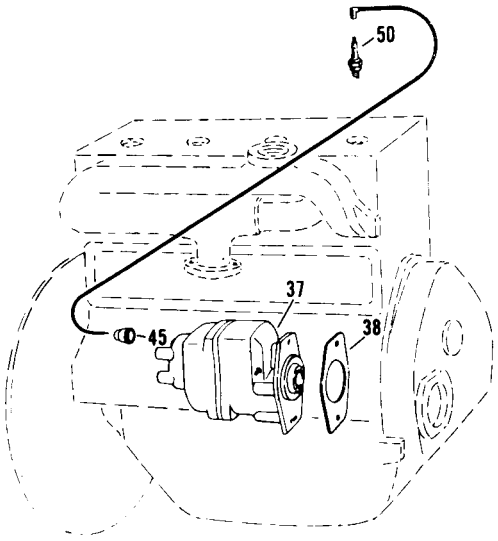
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Radiator Cap	1
2	Radiator	1
	Hex Nut	2
	Washer	2
	Lockwasher	2
3	Radiator Hose - Upper	1
4	Cylinder Water Outlet Elbow	1
5	Nut - Cylinder Water Outlet Elbow to Head	2
6	Lockwasher - Cylinder Water Outlet Elbow to Head	2
7	Nipple - Thermostat Bypass	2
8	Hose Clamp - Thermostat Bypass	2
9	Hose - Thermostat Bypass	1
10	Stud - Cylinder Water Outlet Elbow to Head	2
	Gasket - Cylinder Water Outlet Elbow	1
11	Thermostat	1
12	Thermostat Adapter Ring	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
13	Water Pump Assembly	1
	Water Pump Repair Kit	1
14	Gasket	1
15	Copper Washer	1
16	Screw	1
17	Lockwasher	3
18	Screw	3
19	Hex Head Screw	4
20	Lockwasher	4
21	Fan Blade Assembly	1
22	Fan Belt - No Starter	1
22	Fan Belt - With Starter	1
23	Radiator Hose Clamp	4
24	Radiator Hose - Lower	1

ENGINE ELECTRICAL SYSTEM



LEFT SIDE



RIGHT SIDE

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

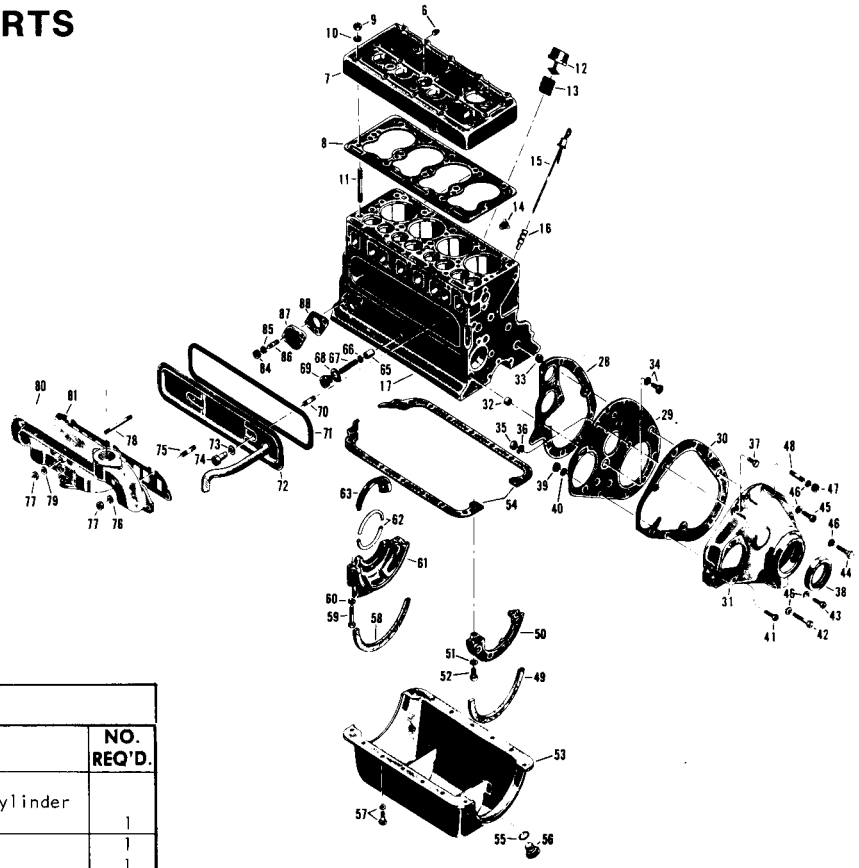
Parts List P-111-H

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
33A	Battery Holder Bolt	2
35	Ground Lead	1
36	Battery Lead to Starter	1
37	Magneto	1
38	Magneto Gasket	1
45	Nipple	4 or 6
50	Spark Plug	4

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
54	Distributor	1
	Drive Shaft Assembly	1
	Stud	1
55	Clamp Arm	1
56	Ignition Coil	1
60	Voltage Regulator	1
	Alternator Assembly Includes	1
62	Alternator (Includes Fan)	1
63	Pulley	1
66	Mounting Bracket	1
67	Stud-Mounts Alternator Bracket	2
68	Adjusting Strap	1

ENGINE EXTERIOR PARTS

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

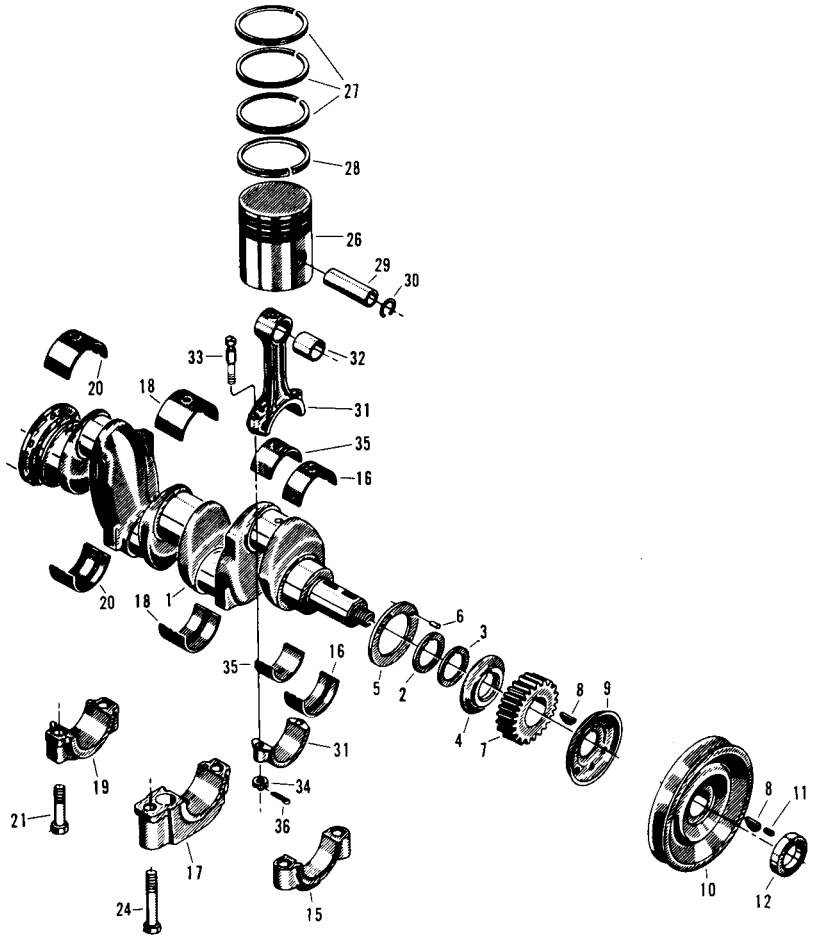


Parts List P-23-J		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
6	Pipe Plug - Temperature Gauge Hole in Cylinder Head	1
7	Cylinder Head	1
8	Cylinder Head Gasket	1
9	Cylinder Head Nut	15
10	Washer - Cylinder Head Nut	15
11	Stud - Cylinder Head to Block	15
12	Oil Filler Cap Assembly	1
13	Oil Filler Tube	1
14	Drain Cock	1
15	Oil Gauge Rod	1
16	Oil Rod Support	1
17	Block	1
	Front End Plate Assembly - Includes:	1
28	Gasket - Front End Plate	1
29	Front End Plate	1
30	Gasket, Gear Cover	1
31	Gear Cover	1
32	Ring Dowel, Front Plate	1
33	Ring Dowel, Gear Cover	1
34	Screw and Lockwasher Assembly	1
35	Nut - Gear Cover to End Plate	1
36	Lockwasher - Gear Cover to End Plate	1
37	Screw, Gear Cover to End Plate	1
38	Oil Seal	1
39	Nut - Gear Cover Dowel Screw	1
40	Lockwasher - Gear Cover Dowel Screw	1
41	Gear Cover Dowel Screw	1
42	Hex Head Screw - Gear Cover to Filler Block	1
43	Hex Head Screw - Gear Cover to Filler Block	3
44	Hex Head Screw - Gear Cover to Block	1
45	Hex Head Screw - Gear Cover to Block (At Ring Dowel)	1
46	Lockwasher - Gear Cover Mounting Screws	8
47	Hex Nut - Gear Cover to Stud	2
48	Stud - Gear Cover to Block (Upper Holes)	2
49	Cork - Oil Pan to Front Filler Block	1
50	Front Filler Block	1
51	Lockwasher - Front Filler Block to Engine Block	2
52	Hex Head Screw - Front Filler Block to Engine Block	2
53	Oil Pan	1
54	Oil Pan Gasket	2
55	Gasket - Oil Pan Drain Plug	1
56	Oil Pan Drain Plug	1
57	Screw and Lockwasher Assembly - Oil Pan to Block	14
58	Cork - Oil Pan to Rear Filler Block	1

For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

Parts List P-23-J		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
59	Hex Head Screw	2
60	Lockwasher	2
61	Rear Filler Block	1
	Rear Bearing Oil Guard Assembly - Includes:	1
62	Seal - Rear Filler Block	2
63	Rear Bearing Oil Guard	1
64	Felt - Rear Bearing Oil Guard	1
65	Oil Pressure Relief Valve	1
66	Washer - Oil Pressure Relief Spring Adjusting As	Req'd
67	Oil Pressure Relief Valve Spring	1
68	Gasket - Oil Pressure Relief Valve	1
69	Plug - Oil Pressure Relief Valve	1
70	Stud - Valve Chamber Cover	2
71	Gasket - Valve Chamber Cover	1
72	Valve Chamber Cover	1
73	Gasket - Valve Chamber Cover Nut	2
74	Hex Nut - Valve Chamber Cover	2
75	Stud - Manifold to Block	6
76	Washer - Manifold to Block - End and Center Studs	3
77	Hex Nut - Manifold to Block	7
78	Stud - Manifold to Block (Center Hole)	1
79	Washer - Manifold to Block	4
80	Manifold	1
81	Manifold Gasket	1
84	Nut - Fuel Pump Hole in Block	2
85	Lockwasher - Fuel Pump Hole in Block	2
86	Stud - Fuel Pump Hole in Block	2
87	Cover - Fuel Pump Hole in Block	1
88	Gasket - Fuel Pump Hole in Block	1

CRANKSHAFT AND PISTON ASSEMBLY



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

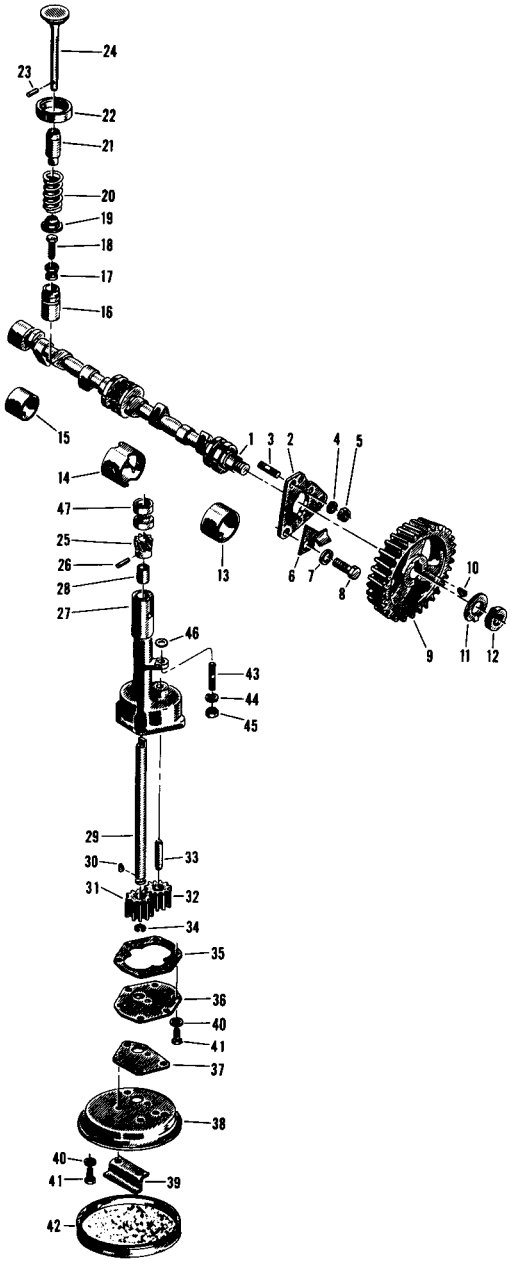
For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

Parts List P-23-K

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Crankshaft Assembly - Includes:	1
	Crankshaft	1
2	Crankshaft Thrust Shim (.002)	8
3	Crankshaft Thrust Shim (.008)	8
4	Crankshaft Thrust Plate	1
5	Thrust Washer	2
6	Pin-Crankshaft Thrust Washer to Crankcase	3
7	Crankshaft Gear	1
8	Key - Crankshaft Gear to Crankshaft	1
9	Oil Thrower	1
10	Pulley	1
11	Cork - Fan Drive Pulley Keyway Plug	1
12	Spacer Collar - Crank Starting Jaw	1
15	Bearing Cap - Front Main	1
16	Bearing Assembly - Front Main (One Bearing Assembly is Two Halves)	1
17	Bearing Cap - Center Main	1
18	Bearing Assembly - Center Main (One Bearing is Two Halves)	1
19	Bearing Cap - Rear Main	1
20	Bearing Assembly - Rear Main (One Bearing Assembly is Two Halves)	1
21	Place Bolt-Front and Rear Main Bearing Cap Mounting	4
24	Place Bolt-Center Main Bearing Cap Mounting	2
26	Piston	4

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
27	Piston Ring - Taper Face (Top 3)	12
28	Piston Ring - Oil Control (Bottom)	4
29	Piston Pin	4
30	Piston Pin Retaining Ring	8
	Connecting Rod and Cap Assembly - (#1 and #3 Cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
	Connecting Rod and Cap Assembly - (#2 and #4 cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
36	Cotter Pin - Connecting Rod Bolts	8
	Piston Ring Kit (For Re-ringing Std. Bore)	1
	Piston Ring Kit (For Re-bored Engines)	1
	Piston Assembly Kit	1

CAMSHAFT AND VALVE ASSEMBLY

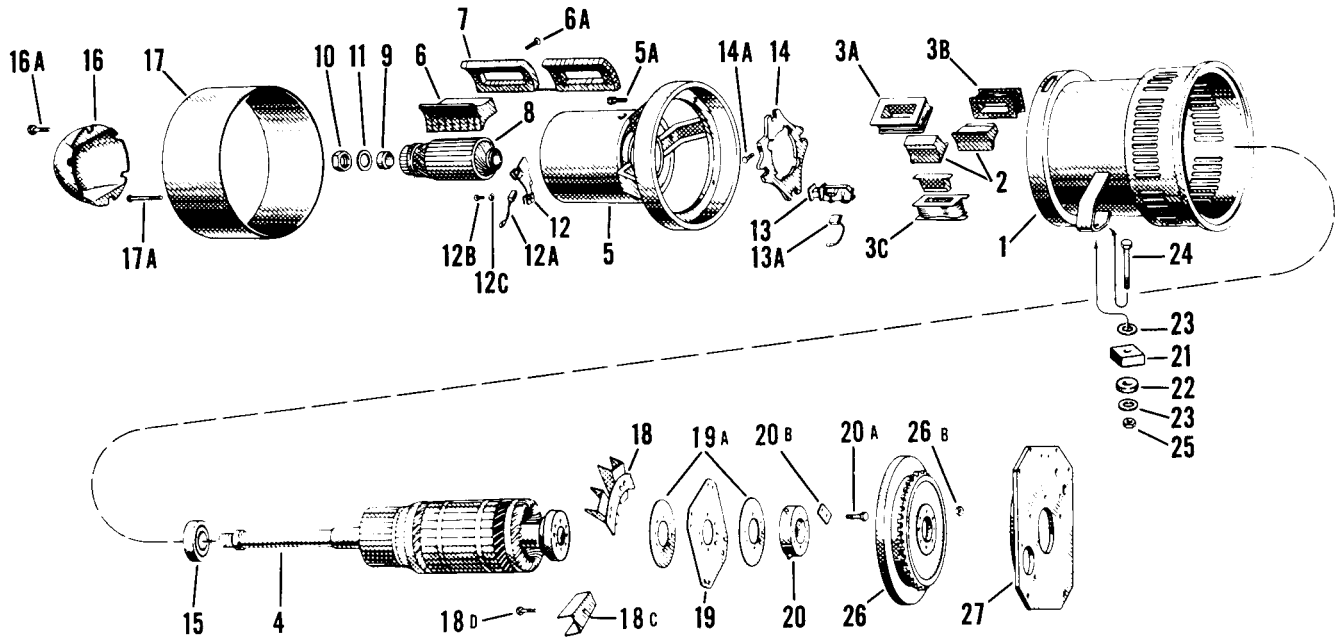


Parts List P-23-L		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Camshaft	1
2	Camshaft Thrust Plate	2
3	Stud - Camshaft Thrust Plate to Block	2
4	Lockwasher - Camshaft Thrust Plate to Block	2
5	Hex Nut - Camshaft Thrust Plate to Block	2
6	Timing Gear Oiler Plate	1
7	Lockwasher - Oiler Plate and Thrust Plate to Block	1
8	Hex Head Bolt - Oiler Plate and Thrust Plate to Block	1
9	Camshaft Gear	1
10	Key - Camshaft Gear to Camshaft	1
11	Washer - To Lock Nut on Camshaft	1
12	Hex Nut - Camshaft Gear to Camshaft	1
13	Bushing - Camshaft Front	1
14	Bushing - Camshaft Center	1
15	Bushing - Camshaft Rear	1
	Valve Tappet Assembly - Includes:	8
16	Valve Tappet	8
17	Valve Tappet Locknut	8
18	Valve Tappet Screw	8
19	Valve Spring Seat	8
20	Valve Spring	8
21	Valve Stem Guide	8
22	Exhaust Valve Seat Insert	4
23	Valve Spring Lock	8
24	Intake Valve	4
24	Exhaust Valve	4
	Oil Pump Assembly - Includes	1
25	Drive Gear - Oil Pump	1
26	Pin - Oil Pump Drive Gear to Shaft	1
27	Body Assembly - Includes:	1
28	Bushing	1
29	Shaft	1
30	Key	1
31	Gear - Oil Pump Driver	1
32	Gear - Oil Pump Driven	1
33	Stud - Oil Pump Idler Gear	1
34	Snap Ring - Oil Pump Drive Shaft	1
35	Gasket - Oil Pump Cover	1
36	Cover - Oil Pump	1
37	Gasket - Strainer Screen	1
38	Strainer Frame	1
39	Strainer Spacer	1
40	Lockwasher	6
41	Hex Head Screw	6
42	Oil Strainer Screen	1
43	Stud - Oil Pump Body to Center Main Bearing Cap	1
44	Lockwasher - Oil Pump Body to Center Main Bearing Cap	1
45	Hex Nut - Oil Pump Body to Center Main Bearing Cap	1
46	Washer - Oil Pump Spacer	1
47	Oil Pump Drive Shaft Sleeve	1

For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

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

WELDING GENERATOR



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

Parts List P-23-M

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Welder Frame	1
2	Main Pole Lamination	4
3A	Shunt Field Coil	2
3B	Series Field Coil	2
3C	Interpole Coil	2
3D	Interpole Pole Piece	2
4+	Armature, Includes:	1
	Armature Coil	1
5	Welder Bracket and Exciter Frame	1
5A	Hex Head Screw, Bracket to Frame	4
6	Exciter Pole	2
6A	Hex Head Screw, Pole to Frame	4
7	Exciter Field Coil	2
8+	Exciter Armature	1
9	Exciter Armature Sleeve Collar	1
10	Exciter Locknut	1
11	Locking Washer	1
12	Exciter Brushholder	2
	Brushholder Parts — See P-25-M	
12A	Exciter Brush	2
12B	Screw, Brushholder to Frame	4
12C	Washer, Brushholder to Frame	4
13	Welder Brushholder	4
	Brushholder Parts — See P-25-L	
13A	Welder Brush	8
14	Rocker	1

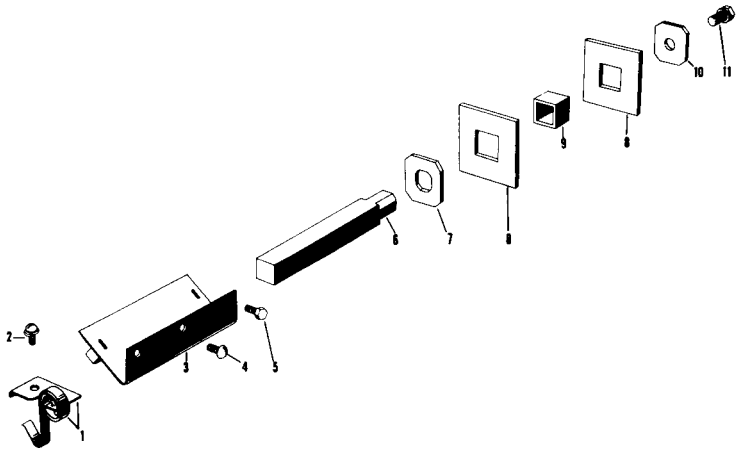
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
14A	Screw, Rocker to Hub	1
15	Ball Bearing	1
16	Exciter End Cover	1
16A	Screw, Mounts End Cover	2
17	Bracket Cover	1
17A	Round Head Screw, Mounts Bracket Cover	2
18	Blower Segments	4
18C	Blower Paddle	8
18D	Lock Screw	8
19	Coupling Disc	1
19A	Backing Plate	2
20	Coupling Ring	1
20A	Screw, Disc to Hub	8
20B	Locking Clip, Disc to Hub	4
21	Welder Foot, Upper Cushion	2
22	Welder Foot, Lower Cushion	2
23	Washer	4
24	Hex Head Screw	2
25	Huglock Nut	2
26	Flywheel	1
26B	Locknut, Flywheel to Crankshaft	6
27	Engine Adapter Plate	1
	+ Available on Exchange Plan	

THE LINCOLN EXCHANGE PLAN gives you fast repairs at modest cost. Here's how:

Factory remanufactured replacements for the major parts indicated by + in this manual are available. These exchange parts are available only through the local authorized Field Service Shops. To get your welder back into operation quickly, replace the faulty parts with a rebuilt part – often from the service shop's stock. The cost is less than a normal rewinding job.

The service shop will ship the removed part to the factory for inspection. If it can be rebuilt, a credit will be issued to the shop. They, in turn, will pass this credit to you, thus further reducing the net cost of the repair. All exchange parts carry the same one year guarantee as new welders. For more information, contact your local Lincoln authorized Field Service Shop.

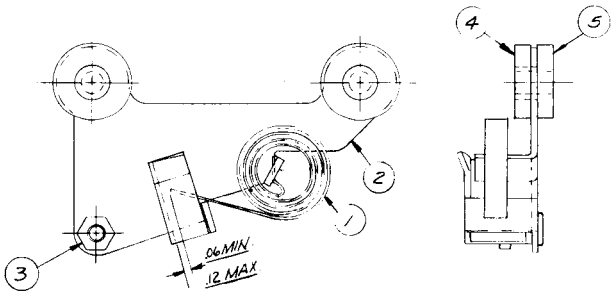
GENERATOR BRUSH HOLDER



Parts List P-25-L		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Brusholder Assembly Includes:	4
1	Spring and Clip Assembly	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.

EXCITER BRUSH HOLDER



ITEMS 4 & 5 ARE NOT PRE-ASSEMBLED

S-6531
6-8-79K

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Exciter Brushholder Assembly Includes:	1
1	Spring	1
2	Brushholder	1
3	Hex Nut	1
4	Insulating Washer	2
5	Bushing	2

Need Welding Training?

The Lincoln Electric Company operates the oldest and most respected Arc Welding School in the United States at its corporate headquarters in Cleveland, Ohio. Over 60,000 students have graduated. Tuition is low and the training is "hands on".

For details write: Lincoln Welding School
22801 St. Clair
Cleveland, Ohio 44117

and ask for bulletin ED-80 or call 216-481-8100 and ask for the Welding School Registrar.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate — machine model, code and serial numbers.
(b) From this manual — complete part name and description, item number, quantity required and the number of the list used to get this information.

Any items indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do ***not*** order the indented parts.

LINCOLN® ELECTRIC

THE LINCOLN ELECTRIC COMPANY
World's Leader in Welding and Cutting Products •
Sales and Service through Subsidiaries and Distributors Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

Eff. July '93

Litho in U.S.A.