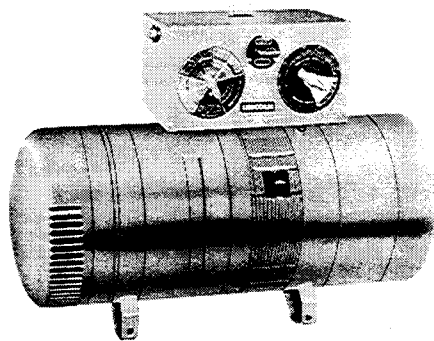
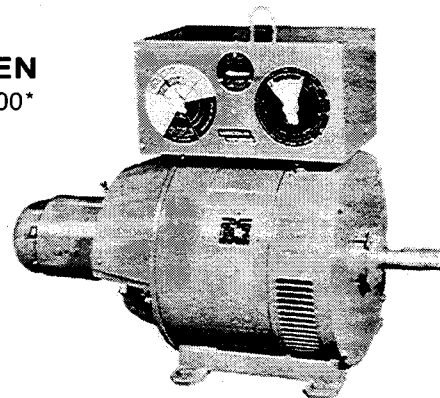
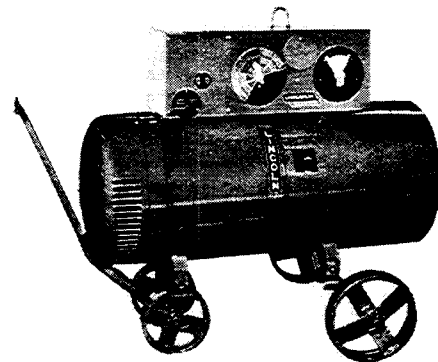


OPERATING MANUAL

Shield-Arc® SAE DC Arc Welding Power Sources Motor and Belt Driven



AC MOTOR DRIVEN
SAE-200*, 300, 400, 600*



BELT DRIVEN
SAE-200*, 300, 400, 600*, 900*-B

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

*Discontinued Models

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 welders are 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.

ARC WELDING SAFETY PRECAUTIONS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

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

2. ELECTRIC SHOCK can kill.

Protect yourself from possible dangerous electrical shock:

- a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Never permit contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- b. Always insulate yourself from the work and ground by using dry insulation. When welding in damp locations, on metal 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.
- c. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
- d. Never dip the electrode holder in water for cooling.
- e. 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.
- f. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.
- g. When working above floor level, protect yourself from a fall should you get a shock.
- h. Ground the work or metal to be welded to a good electrical ground.
- i. Also see Item 7.

3. FUMES AND GASES can be dangerous to your health.

- 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. Also see Item 8b.

4. ARC RAYS can injure eyes and burn skin.

- 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.

5. FIRE OR EXPLOSION can cause death or property damage.

- a. Remove fire hazards well away from the 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 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. Also see Items 6c and 8c.

Additional Safety Precautions

6. For Welding in General.

- a. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with 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 when in a welding area. Use glasses with side shields when near slag chipping operations.
- b. 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.
- c. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance 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.

7. For Electrically Powered Equipment.

- a. Turn off the input power using the disconnect switch at the fuse box before working on the equipment.
- b. Make the electrical installation in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
- c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.

8. For Engine Powered Equipment.

- a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- b. Operate internal combustion 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, if possible, allow it to cool to prevent spilled fuel from igniting on contact with hot engine parts or electrical sparks. 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. 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.
- e. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

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

INPUT CONNECTION: Motor-Generator

Install the welder in a dry location where there is free circulation of air. Place the air intake end of the machine to minimize the amount of smoke and fumes from welding which are drawn into the welder.

Be sure the voltage, phase and frequency of the input power is as specified on the welder nameplate.

On single voltage machines, connections between the control box and motor are made at the factory. Dual voltage machines are shipped with the NVR coil and stator leads not connected. Connect these leads for the available voltage as indicated on the wiring diagram in the control box.

Have a qualified electrician connect power to the input panel or starter, as appropriate, in accordance with the National Electrical Code, all local codes and the wiring diagram glued to the inside of the door on the start button side of the control box.

The welder frame must be grounded. A stud marked with the symbol \equiv located inside the control box is provided for this purpose. See the National Electrical Code for details on proper grounding methods. (If an old machine does not have a grounding stud, connect the grounding wire to an unpainted frame screw or bolt.)

Recommended Input Wire, Ground Wire and Fuse Sizes
Based on National Electrical Code
For 60 Hertz, 3 Phase Welders at 60% Duty Cycle

Welder Size	Input Voltage	Input Ampere Rating	Copper Wire Size Type 75°C in Conduit		Fuse Size (Super Lag)
			3 Input Wires	1 Ground Wire	
AC Motor SAE 200	230	44	8	8	80
	460	22	12	10	40
	575	18	14	10	30
AC Motor SAE 300	230	62	6	8	100
	460	31	10	10	50
	575	25	10	10	40
AC Motor SAE 400	230	78	6	6	125
	460	39	8	8	70
	575	31	10	10	50
AC Motor SAE 600	220	106	3	6	200
	440	53	8	8	100
	550	42.5	8	8	80
DC-DC SAE 400	230	120	3	6	175
	460	60	6	8	90
	575	48	8	8	70

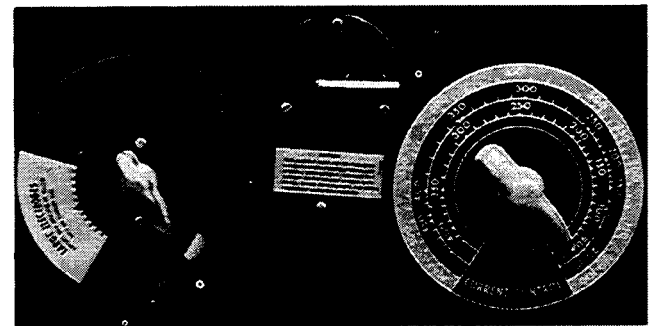
Start the welder and check the direction of rotation. Proper direction is shown by an arrow attached to the welder frame. On 3 phase AC motor driven models, the direction of rotation can be changed by interchanging any two input leads. DC motor driven models rotate in the proper direction but the input leads must be connected as marked on the instruction plate on the starter box so the output studs have the correct polarity.

After the machine has been in operation for some time, check all lead connections and tighten if necessary.

RECOMMENDED OUTPUT CABLE SIZES

Machine Size in Amps	Cable Sizes for Combined Length of Electrode Plus Work Cable (Copper) – 60% Duty Cycle		
	Up to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	2	1	1/0
300	1	1/0	2/0
400	2/0	3/0	4/0
600	3/0	4/0	2-3/0

CONTROL OF WELDING CURRENT



CONTINUOUS CURRENT CONTROL

The Continuous Current Control provides the major adjustment of welding current to suit each particular application. On older machines the Continuous Current Control has a single dial calibrated in amperes and three colored pointers. On the SAE-300, above Code 5006, and the SAE-400, above Code 7638, this control has three separate colored scales. The colored pointers (or scales) correspond

"BELTED" MODELS

These machines consist of the same generator and controls as the motor-generator models but are driven by a PTO, electric motor or an engine.

The appropriate operating and maintenance instructions in this manual apply to the belted welders.

INSTALLATION

The welder frame must be grounded. A stud marked with the symbol \equiv located on the welding generator support frame is provided for this purpose. See the National Electrical Code for details on proper grounding methods. The ground connector must be No. 8 or larger

wire. (If an older welder does not have a grounding stud, connect the ground wire to an unpainted frame screw or bolt.)

Design the driving system to operate the generator at a steady full load speed (1800 or 1500 RPM as indicated on the nameplate). Build a rigid mounting which maintains accurate alignment through the driving system and minimizes vibrations transmitted to the welder. Use a flexible type coupling when connecting the generator shaft directly to the power source shaft. For belt driven installations, prevent excessive bearing wear by using only enough belt tension to avoid slipping.

to the yellow, black and red sections of the Job Selector dial. When the Job Selector is set on the yellow section of its dial, the approximate welding current is indicated by the yellow pointer (or scale) on the Continuous Current Control dial.

DO NOT change the Continuous Current Control setting while welding.

DUTY CYCLE

60 Hertz machines are NEMA rated at a 60% duty cycle. This means they can be operated at rated output for 6 minutes out of every 10 minute period. 50 hertz machines are rated 50% duty cycle.

JOB SELECTOR

The Job Selector is both the fine current adjustment and the voltage control of your welder. With this control you can obtain the exact current you desire. Also, by means of this control, you can vary the open circuit voltage to adjust the arc characteristics to different welding situations.

The Job Selector dial is divided into four sections. The yellow section marked "Large Electrode" provides a high open circuit voltage. The black section marked "Normal Welding Range" gives a medium-high open circuit voltage. The red section marked "Overhead and Vertical" is a medium-low open circuit voltage. The section marked "Special Applications" provides a low open circuit voltage which is used in conjunction with a minimum setting on the Continuous Current Control.

HOW TO SET THE CONTROLS

Example: Assume you want to weld with a 5/32" electrode at about 135 amps using the soft arc (medium-high open circuit voltage) recommended for most applications:

1. Set the Job Selector to the black section of the dial marked "Normal Welding Range."
2. Set the Continuous Current Control to read 135 amperes under the black pointer (or the black dial).
3. Strike the arc.
4. If the arc is too weak, set the Job Selector up (Counter clock-wise) to increase the current. If a still higher current is desired, turn the Continuous Current Control up 10 or 20 amps. In the final adjustment, be certain the Job Selector is still set in the black range to get the smooth arc recommended.

POLARITY SWITCH

Turn the Arc Polarity Switch to Electrode Negative or Electrode Positive as required for the particular application.

To change polarity on DC motor driven models, interchange the welding cables.

AUXILIARY POWER OUTLET (Optional)

AC motor driven models can be furnished with a 1 KW exciter (1 KW standard on belted welders). This exciter provides 120 volt DC power for operating incandescent lights or DC power tools. When using a belted welder as a power source for tools, run the engine at the normal welding speed.

MAINTENANCE AND TROUBLE SHOOTING

WARNING: Have qualified personnel do the maintenance and trouble shooting work. Turn the power off using the disconnect switch at the fuse box before working inside the machine.

GENERAL INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months. In particularly dirty locations this cleaning may be necessary once every week. Use low pressure air to avoid driving dirt into the insulation.
2. Reactor brushes are silver graphite and should not be greased. Keep the contacts clean.
3. Rotate the Current Control through its entire range each morning. This cleans the contacts to lessen the possibility of the contact "freezing". Do not do this while welding.
4. The starter on motor driven models should be inspected every six months. Any accumulated dust should be blown out of the starter.
5. Keep electrode and ground connections tight.

MOTOR PROTECTION (AC Motor Driven Only)

The AC motor is protected by a special device operated by both temperature and current. This device stops the machine if the windings reach the maximum safe operating temperature because of frequent overloads, high room temperature plus overload, or abnormally high or low input voltage. Protection is also assured against excessive currents resulting from single phase or unbalanced line conditions.

The thermostat automatically resets when the temperature reaches a safe operating level. Restart the motor by pushing the start button.

Cooling of the motor can be speeded by holding in the start button and operating the machine idle. **CAUTION:**

Models prior to code 3500 equipped with the optional two voltage switch cannot be cooled in this manner without burning out the NVR coil. If the reason for the disconnection was single phase or unbalanced line conditions, correct the situations before attempting to restart the motor. Serious damage will result if the start button is held in with these conditions present.

BEARINGS

Your welder is equipped with double-shield ball bearings having sufficient grease to last indefinitely under normal conditions. Where the welder is used constantly or in excessively dirty locations, it may be necessary to add one ounce of grease per year.

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

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. **WARNING:** DO NOT remove or replace these covers while the machine is running.

Commutators require little attention. However, if they are black or appear uneven, have an experienced mainte-

nance man clean them with fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

Have an experienced maintenance man replace brushes when they wear within 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 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.

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

Factory remanufactured replacements for the major parts indicated in this manual are available for most models. These exchange parts are available only through the local authorized Field Service Shops. To get your welder back into operation quickly, replace the faulty part 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. And all exchange parts carry the same one year guarantee as new welders. For more information, contact your local Lincoln authorized Field Service Shop.

TROUBLE SHOOTING

WARNING: Have qualified personnel do the trouble shooting work. Turn the input power off using the disconnect switch at the fuse box before working inside the machine.

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 of adjustment or life (1/4 inch from the pigtail)	Replace brushes.
	Brush springs may have lost adjustment or 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 connections 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 rheostat and clean the contact.
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.
	Current control brushholder contact springs may be worn out or bent. Contact surface may be dirty, rough or pitted.	Inspect, replace needed parts, clean internal contact surface of control device. Do not lubricate. Smooth up roughened surface.
Welder starts but fails to generate current.	Current control brushholder support stud and mating contact surfaces may be dirty or pitted and burned.	If brushholder internal contact surface is pitted and burned, replace the brushholder and support stud. If the contact surface is dirty clean off the brushholder stud and internal contact surface. Apply mixture of three parts silicone grease and one part zinc powder (by weight) to stud.
	May be running the wrong way.	Check direction of rotation with direction arrow. On three-phase motors direction of rotation may be changed by interchanging any two input leads.
	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, field coils and resistors. Some machines give less output when fields are open.
	Polarity reversing switch may be in the neutral position.	Put handle in positive or negative position.

TROUBLE SHOOTING

TROUBLE	CAUSES	WHAT TO DO
Welder starts but fails to generate current. (Continued)	Exciter may have lost excitation. Series field or armature circuit may be open-circuited.	Flash the exciter fields.* Check circuit with ringer or voltmeter.
Welding current too great or too small compared to indication on the dial.	Current Control, shaft and handle may have turned slightly in the insulated bushing of the current control brushholder, caused by turning handle too hard against one of the stops. Exciter output low causing low output compared to dial indication. Current Control set to minimum and welder output so great that motor stalls when arc is struck.	See that Current Control Indicator yellow arrow is in the horizontal position when handle is turned against stop in the minimum direction. For the newer SAE-300's and 400's, set the control against the minimum stop and be sure the pointer is at the minimum mark on the dial plate. Field discharge resistor that is wired to the reversing switch may be open-circuited. Check for circuit through it. Motor is probably running backward or series fields connected reversed to make a cumulative series generator. Check rotation.
Motor trips off the line.	Power circuit may be single phase. Thermostat may have tripped. Welding electrode or work leads may be too long or too small in cross-section. Ambient temperature may be too high. Motor input voltage too low (or high) under load. Unbalanced input voltage. Ventilation may be impaired.	Check for one blown fuse or dead line. Check for overload condition. Check terminal voltage while machine is loaded, it should not exceed 40 volts when operating at rated current. Make sure that temperature in motor-generator room or housing does not exceed 100 degrees F. and that there is no interference with normal ventilation of the machine. Motor supply voltages should not fall below 90% of normal voltage. Have power company check transformer and line capacity. The supply leads may be too long or too small. Blow out and clean.
Machine fails to start.	Power circuit may be completely dead. Power circuit may be single phased. Power-line voltage may not be suitable for motor, or may be extremely low; may be accompanied by chattering of the motor starter. Machine may be jammed. Motor starter may be single-phased. Overload protecting device may be tripped or contacts open-circuited.	Look for open disconnect switch, fuses removed from clips, or blown fuses. Look for one blown fuse or one dead line. Check voltage with voltmeter, particularly at the moment of attempted starting. See that armature turns over easily by hand, and look for foreign material in air gaps. Check to see that all fingers on starter make contact simultaneously when closed. If machine has had time to cool after tripping due to over-load, or is cold and starter fails to close – check for circuit through push button, NVR coil and thermostats to find the open-circuited part. See wiring diagram for normally closed and open contacts on the pushbutton.

* 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 of Lincoln Welders:

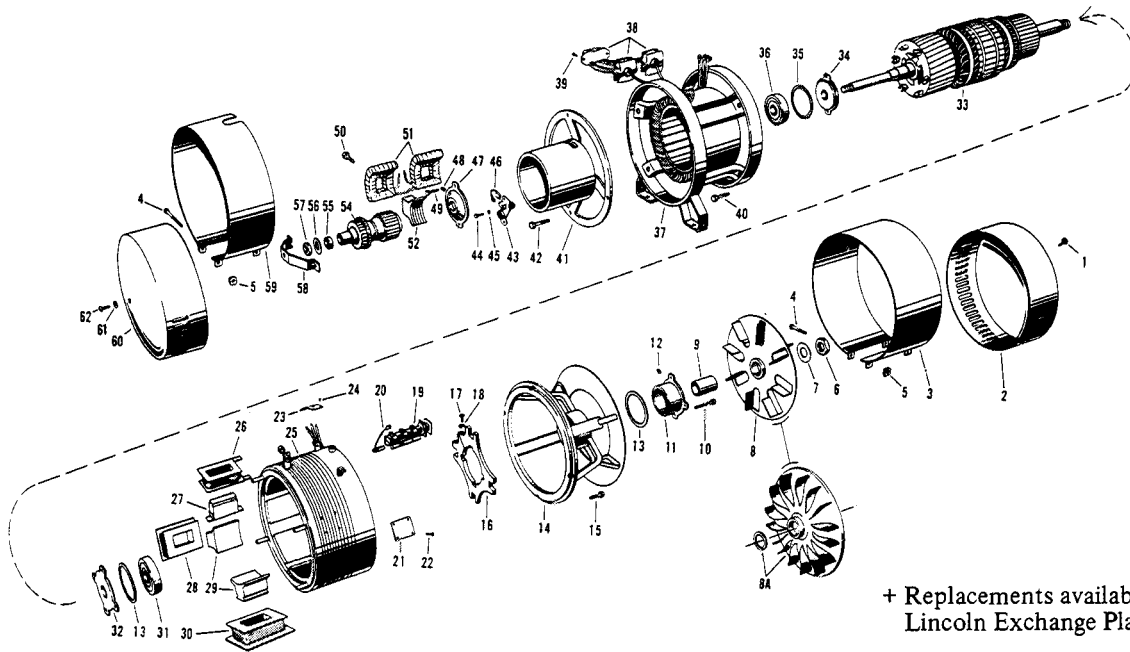
1. Turn the welder off, close the Electrode Polarity switch and raise one exciter brush off the commutator.
2. Attach the positive lead from the DC source to the right hand

- 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 leads from the brushholder, replace the brush on the commutator, start the welder and the generator voltage should build up.

MOTOR GENERATOR – AC MOTOR DRIVEN

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



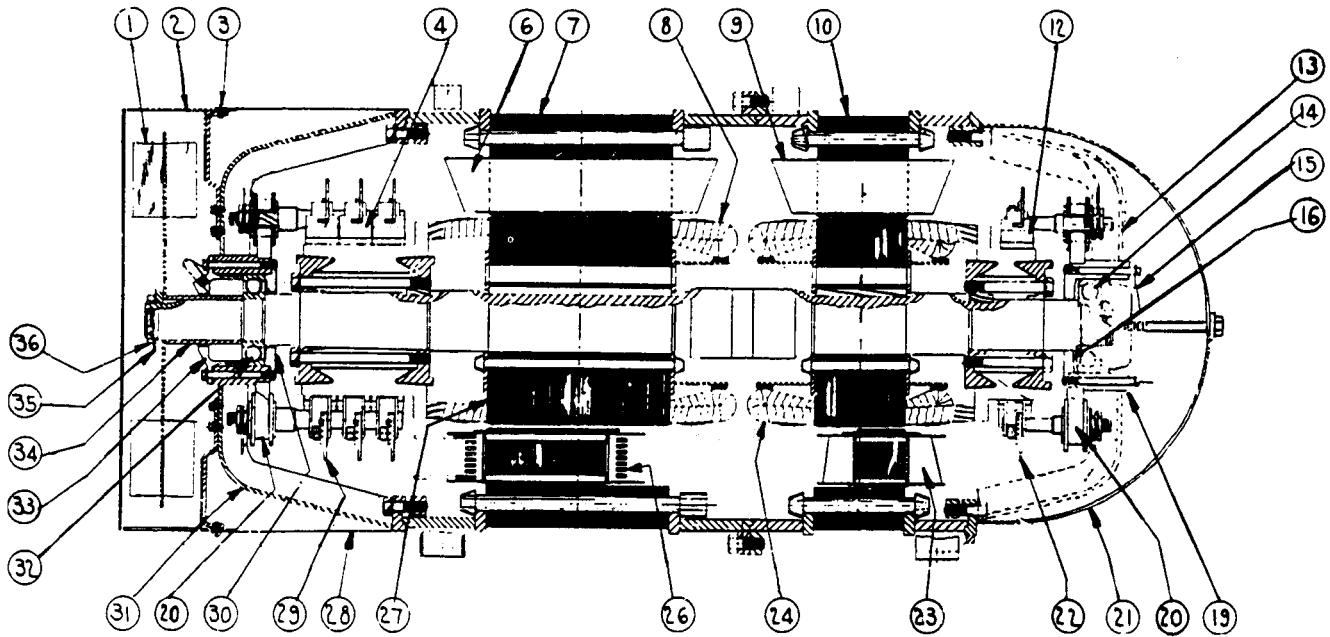
SAE-200 – Parts List P-31-C
SAE-300 – Parts List P-32-C

SAE-400 – Parts List P-33-C
SAE-600 – Parts List P-34-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Screw, Fan Guard	3
2	Fan Guard	1
3	Cover, End Bracket	1
4	Screw, Round Head	4
5	Nut, Square Head	4
6	Nut, Blower	1
7	Washer, Blower	1
8	Blower	1
8A	Blower (Extended Shaft Only)	1
	Retaining Ring	1
9	Tube, Bearing Clamp (Used on Code 2433 and Below)	1
10	Screw, Dust Cap	4
11	Dust Cap, Outer	1
12	Pipe Plug	1
13	Gasket, Dust Cap	2
14	Bracket, Generator End	1
15	Screw, Bracket	4
16	Rocker	1
17	Screw, Round Head	1
18	Lockwasher	1
19	Brush Holder Assembly - Old Style (Prior to Code 275)	4
	Old Style Brush holder Parts	See P-32-E
19	Brush Holder Assembly 0 New-Style	4
	New Style Brush holder Parts	See P-25-I
20	Brush, Generator	8
21	Nameplate	1
22	Drive Screw - Nameplate	2
23	Lead Block	1
24	Drive Screw, Lead Block	4
25	Generator Frame Assembly	1
	Interpole and Coil Assembly, Includes:	4
26	Interpole Coil	4
27	Pole Piece	4
28	Shunt Coil	2
29	Main Pole Piece	4
30	Series Coil	2
31	Bearing	1
32	Dust Cap, Inner	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
33+	Armature Assembly, Includes: Armature Coil	1 1
34	Dust Cap, Inner	1
35	Gasket, Dust Cap	2
36	Bearing	1
37+	Wound Stator, Includes: Stator Coil	1 1
38	Thermostat Assembly	1
39	Screw, Thermo Mounting	2
40	Screw, Frame	4
41	Bracket, Exciter	1
41	Bracket, Exciter (Oversize Exciter Only)	1
42	Screw, Exciter Bracket	4
43	Brush Holder, Exciter	2
	Exciter Brush Holder Parts	See P-25-I
44	Screw, Exciter Brush Holder Mounting	4
45	Washer, Brush Holder Mounting	4
46	Brush, Exciter	2
47	Dust Cap, Outer	1
48	Pipe Plug	1
49	Screw	2
50	Screw, Exciter Pole Piece	4
51	Exciter Field Coil	2
52	Pole Piece	2
52	Pole Piece, Exciter (Oversize Exciter Only)	2
54+	Exciter Armature Coil	1
55	Collar, Spacer	1
56	Washer, Exciter Nut	1
57	Nut, Exciter	1
58	Bracket, Exciter Cover	1
58	Bracket, Exciter Cover (Oversize Exciter Only)	1
59	Cover, Motor Frame	1
60	Cover, Exciter End	1
61	Washer	1
62	Screw	1
64	Key (Blower Hub)	1

MOTOR GENERATOR — DC MOTOR DRIVEN

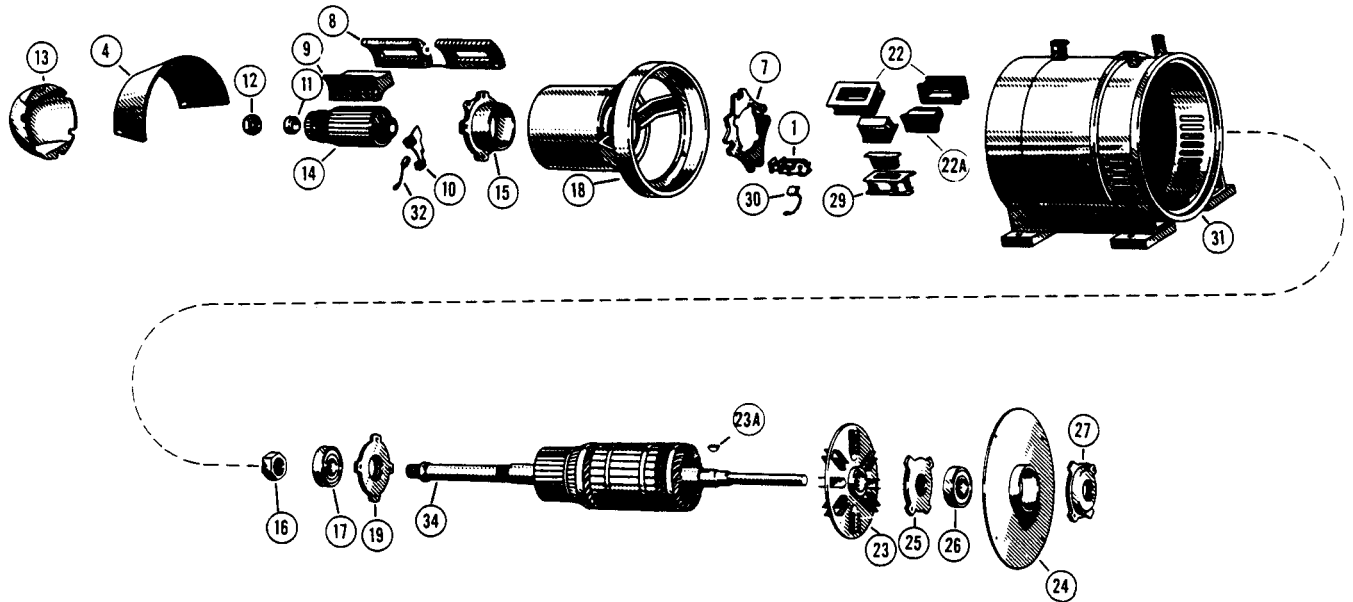


WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-35-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.	ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Blower	1	22M	Brushholder Assembly - Old Style, Prior to Code 322	2
2	Fan Guard Shield	1		Old Style Brushholder Parts	See P-32-E
3	Self-Tapping Screws	4	22M	Brushholder Assembly - New Style	2
4G	Brushes (200 and 300 Amp Models)	3		New Style Brushholder Parts	See P-25-L
4G	Brushes (400 Amp Models)	12	23M	Interpole Coil	4
6G	Series Field Coil	2	24M	Armature Coil	1
6G	Shunt Field Coil	2	26G	Interpole Coil	4
7G	Frame	1	27	Armature - Complete	1
8G	Armature Coil	1	28G	Bracket Cover	1
9M	Shunt and Series Field Coils	4	29G	Brushholder Assembly - Old Style, Prior to Code 322	4
10M	Frame	1		Old Style Brushholder Parts	See P-32-E
12M	Brush	4	29G	Brushholder Assembly - New Style	4
13M	Bracket	1		New Style Brushholder Parts	See P-25-L
14	Ball Bearing	1	30G	Inner Dust Cap	1
15M	Outer Dust Cap	1	31G	Bracket	1
16M	Inner Dust Cap	1	32G	Ball Bearing	1
19	Dust Cap Gasket	4	33G	Outer Dust Cap	1
20	Rockers	2	34	Bearing Clamp Tube	1
21	End Shell	1	35	Lockwasher	1
			36	Bearing Nut	1
				M- Indicates Motor End G- Indicates Welder End	
				Not Illustrated: Warning Label (Mounts on Frame Ring)	1

WELDING GENERATOR – BELT DRIVEN



+ Replacement available through the Lincoln Exchange Plan. See Page 10.

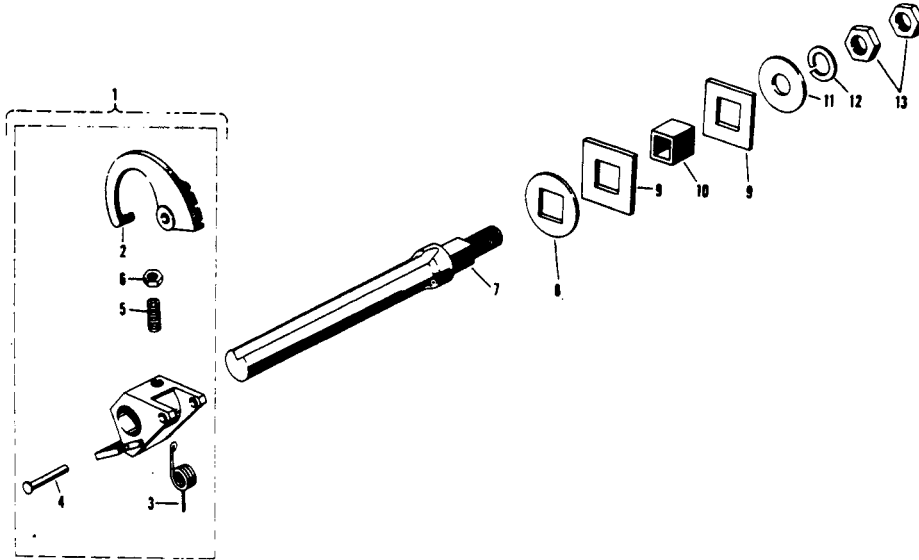
SAE-200-B – Parts List P-36-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Brushholder Assembly - Old Style, Prior to Code 340	4
1	Brushholder Assembly - New Style	4
4	Cover	1
7	Rocker Includes: Clamp Screw	1
8	Exciter Field Coils	2
9	Exciter Field Poles	2
10	Exciter Brushholder	2
	Exciter Brushholder Parts	See P-25-M
11	Exciter Sleeve Collar	1
12	Exciter Sleeve Lock Nut	1
13	Exciter End Shield	1
14+	Exciter Armature	1
15	Outer Dust Cap - Commutator End	1
16	Bearing Lock Nut	1

SAE-300-B to 900-B – Parts List P-36-D

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
17	Bearing	1
18	End Bracket - Exciter End	1
19	Inner Dust Cap	1
20	Commutator	1
21	Armature Coils	1
22	Series Coils	2
22	Shunt Coils	2
22A	Pole Piece	4
23	Blower Assembly	1
24	End Bracket - Pulley End	1
25	Inner Dust Cap	1
26	Bearing	1
27	Outer Dust Cap	1
29	Interpole Field Coil	2
30	Brushes	1
31	Frame	1
32	Exciter Brushes	2
34+	Armature Assembly	1

GENERATOR BRUSH HOLDER — OLD STYLE



**All Models prior to Code 275
Parts List P-32-E**

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Brush Holder Assembly Includes:	
1	Brush holder - includes:	1 per brush
2	Finger	1
3	Finger Spring	1
4	Finger Stud	1
5	Socket Head Screw, Cup Point	1
6	Nut	1
7	Stud	1
8	Washer	1
9	Insulating Washer	2
10	Insulating Tube	1
11	Washer	1
12	Lockwasher	1
13	Hex Head Nut	2

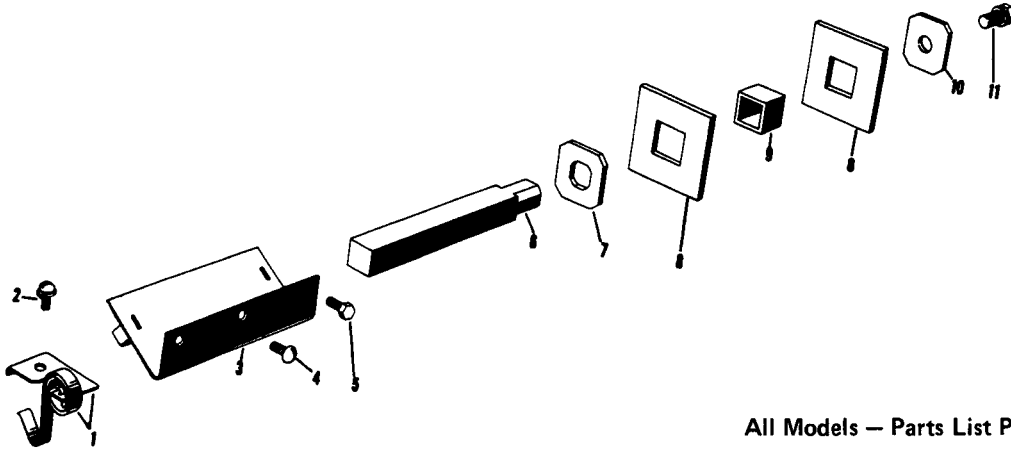
THE LINCOLN EXCHANGE PLAN gives you fast repairs at modest cost. Here's how:

Factory remanufactured replacements for the major parts indicated in this manual are available for most models. These exchange parts are available only through the local authorized Field Service Shops. To get your welder back into operation quickly, replace the faulty part 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. And all exchange parts carry the same one year guarantee as new welders. For more information, contact your local Lincoln authorized Field Service Shop.

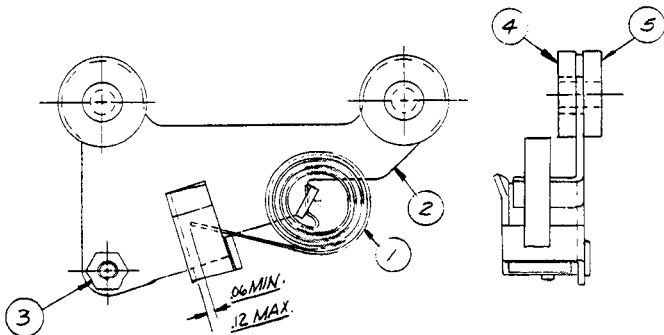
GENERATOR BRUSH HOLDER — NEW STYLE



All Models — Parts List P-25-L

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Brush Holder Assembly Includes:	
1	Spring and Clip Assembly	4
2	Round Head Cap Screw	4
3	Plate and Retainer Assembly	1
4	Round Head Cap Screw	4
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	1
11	Lockwasher	1

EXCITER BRUSH HOLDER



All Models — Parts List P-25-M

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

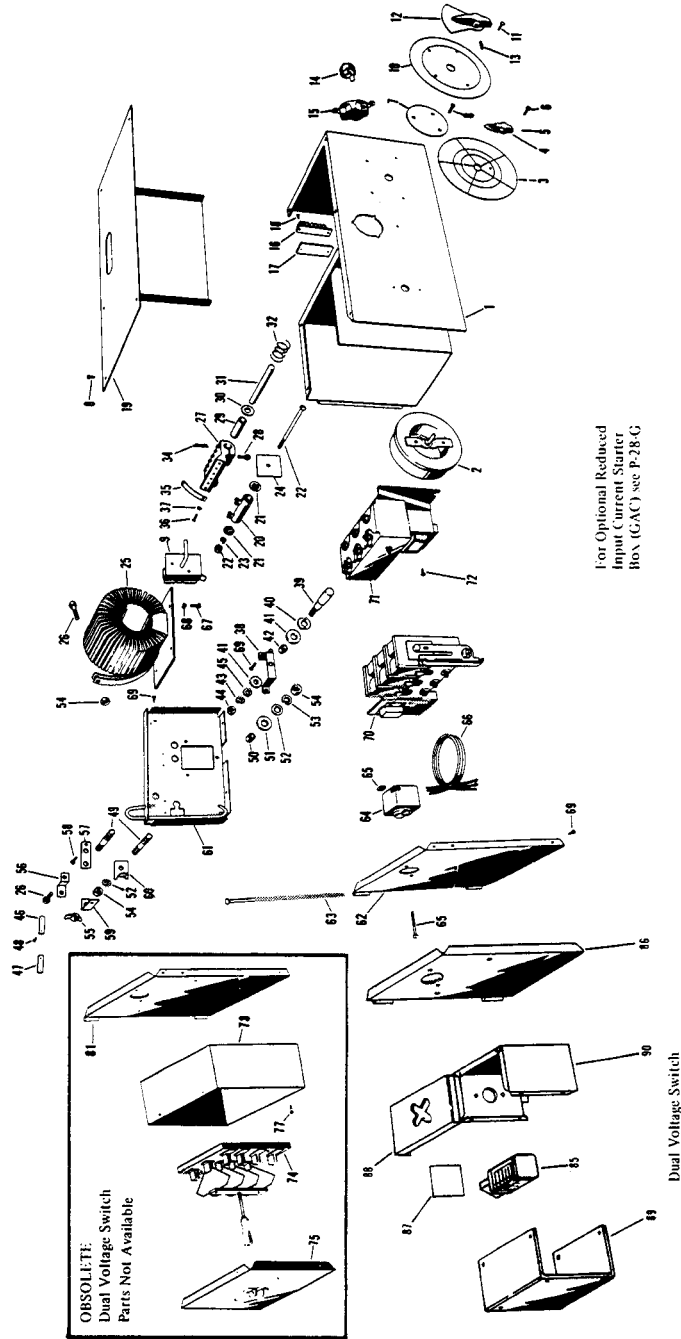
BASIC CONTROL BOX

REMANUFACTURING

(Linconditioning™)

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.



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

SAE-200 AC-Motor Parts List P-31-D
 SAE-300 AC-Motor Parts List P-32-D
 SAE-400 AC-Motor Parts List P-33-D

SAE-600 AC-Motor Parts List P-34-D
 SAE DC-Motor Parts List P-35-D
 SAE Belted Parts List P-36-E

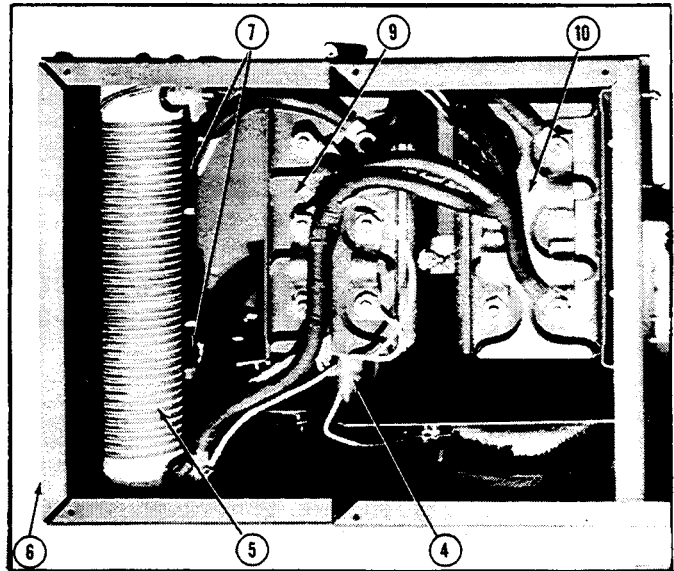
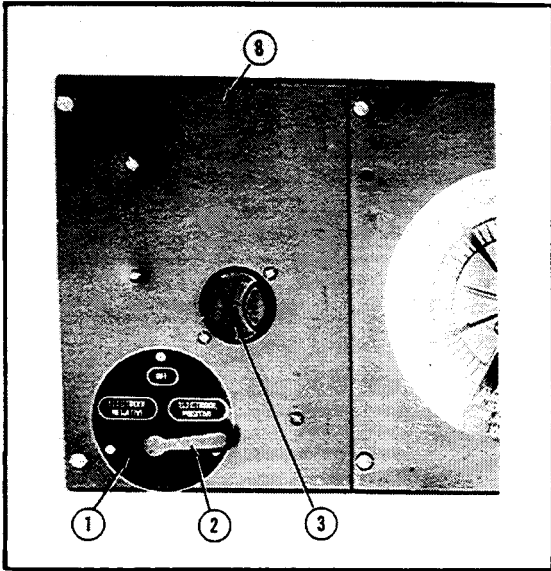
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Case Assembly	1
2	Rheostat	1
3	Voltage Dial Plate	1
4	Rheostat Handle	1
5	Headless Set Screw, Cup Point	1
6	Screw, Rheostat Mounting	2
	Volt - Ammeter (Optional)	1
7#	Reversing Switch Plate	1
8	Screw	9
9#	Reversing Switch	1
10	Current Dial Plate	1
11	Rivets, Dial Plate Mounting	4
12	Reactor Handle	1
13	Set Screw, Hollow, Half Dog Point	1
14	Plug, Oversize Exciter Only	1
15	Receptacle, Oversize Exciters Only	1
16	Terminal Strip, SAE-600 Only	1
17	Terminal Strip Number Plate, SAE-600 Only	1
18	Self Tapping Screw, SAE-600 Only	2
19	Cover Assembly	1
20#	Resistance Tube - 500 OHMS Standard	1
20#	Resistance Tube - 200 OHMS Automatic Duty	1
22#	Stove Bolt	1
23#	Lockwasher	1
24#	Insulation, Resistance Tube	1
25+	Reactor	1
26	Hex Head Cap Screw	1
	Reactor Brush Holder Assembly Includes:	1
27	Brush Holder	1
28	Hex Head Cap Screw	2
29	Insulation Tube	1
31	Shaft	1
34	Finger Spring	4
35	Contact Finger	4
36	Round Head Screw	4
37	Lockwasher	4
30	Washer	2
32	Spring	1
33	Reactor Spring Clip	1
	Stud and Bracket Assembly Includes:	1
38	Bracket	1
39	Stud	1
40	Copper Washer	1
41	Insulating Washer	2
42	Insulating Bushing	1
43	Lockwasher	1
44	Hex Head Brass Nut	1
45	Plain Washer	1
	Sub Panel Assembly Includes: (Without Meter)	1
	Sub Panel Assembly Includes: (With Meter)	1
46	"Electrode" Marker	1
46	"Positive" Marker (DC Motor Over 200V Input)	1
47	"To Work" Marker	1
47	"Negative" Marker (DC Motor Over 300V Input)	1
48	Hollow Rivet	4

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Output Stud Assembly Includes:	2
49	Stud	2
50	Insulating Bushing	2
51	Insulating Washer	4
52	Plain Washer	4
53	Lock Washer	2
54	Hex Jam Nut	4
55	Hex Flanged Weld Nut	2
56	Connection Strap	1
57	Connection Strap Insulation	1
58	Self Tapping Screw	1
59	Connection Strap (Without Meter)	1
59	Shunt (With Meter Only)	1
60	Insulation	1
61	Sub Panel	1
62	End Cover (Without Two Voltage Switch)	1
63*#	Hinge Pin	1
64*#	Push Button Assembly	1
65*#	Screw and Nut	2
66*#	Harness, Push Button	1
67	Screw Reactor Mounting	6
68	Lock Washer, Reactor Mounting	6
69	Screw	8
70*#	GXL Starter Assembly (Less NVR Coil)	1
	GXL Starter Parts	See P-28-F
71*#	S-45 Starter (600 Amp AC Motor) (Less NVR Coil)	1
	S-45 Starter Parts	See P-28-E
*#	GAC Starter Box	See P-28-G
*#	Dual Voltage Switch Assembly, Includes:	1
85*#	Dual Voltage Switch	1
86*#	End Cover	1
87*#	Nameplate	1
88*#	Locking Cover	1
89*#	Case Cover	1
90*#	Case	1
*#	Condensers, Optional (Not Illustrated)	3

+ Replacements available through the Lincoln Exchange Plan. See Page 10.

GDC STARTER BOX

(Obsolete)



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

SAE DC-Motor

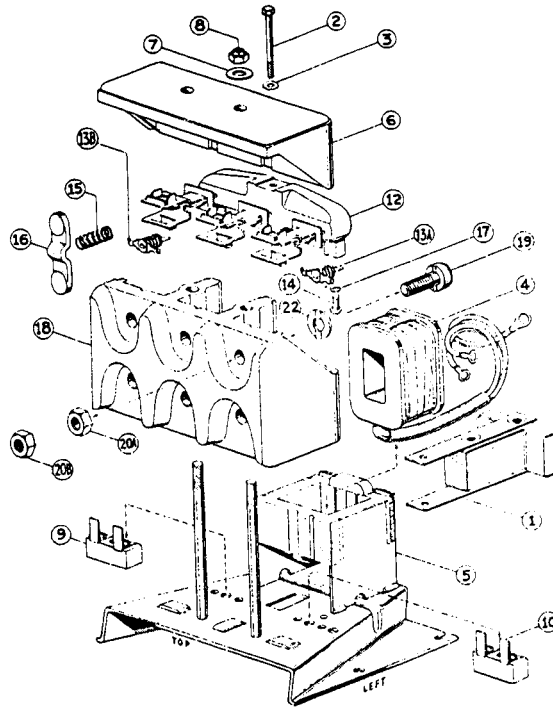
Parts List P-35-E

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Polarity Switch (Less than 300 Volt Input Only)	1
	Round Head Screw, Switch Mounting	2
	Hex Nut	2
	Polarity Switch Flat Spring	1
1	Switch Hole Cover Plate (Over 300 Volt Input)	1
1	Polarity Switch Plate	1
2	Polarity Switch Handle	1
	Switch Lever and Shaft Assembly	1
3	Groove Pin - Handle to Shaft	1
	Push Button	1
	Push Button Harness	1
4	Resistance Tube - Polarity Switch Discharge Tube	1
	Tube Insulation (Glastic)	2
	Tube Insulation (Duro)	1
	Insulating Washer	1
	Stove Bolt, Tube Mounting	1
	Hex Nut, Tube Mounting	1
5	Resistor, Specify Welder Input Voltage	1
6	End Cover	1
7	Resistance Tubes, Specify Welder Input Voltage	2
	Fiber Washers	2
	Tube Insulation (Duro)	2
	Tube Insulation (Glastic)	4
	Stove Bolt, Tube Mounting	2
	Hex Nut, Tube Mounting	2
8	Case	1
	Nameplate, Input Leads	1
	Self Tapping Screw, Nameplate Mounting	2

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Input Lead Clamp	1
	Round Head Screw, Clamp Mounting	1
	Hex Nut, Clamp Mounting	1
9	#1 S-45 Starter (Used on Codes Below 6400)	1
	S-45 Starter Parts	See P-28-E
9	#1 S-67 Starter (Used on Codes Above 6400)	1
	S-67 Starter Parts	See P-28-H
9	#1 GDC* Starter, Prior to Code 2148	1
10	GDC* Starter Parts	See P-28-F
	#2 S-45 Starter (Used on Codes Below 6400)	1
	S-45 Starter Parts	See P-28-E
10	#2 S-67 Starter (Used on Codes Above 6400)	1
	S-67 Starter Parts	See P-28-H
10	#2 GDC* Starter, Prior to Code 2148	1
	GDC* Starter Parts	See P-28-F
	#1 GDC* Starter Interlock Parts - Not Illustrated	1
	Interlock Assembly	1
	Interlock Block	1
	Plunger	1
	Insulation	1
	Coil Spring	1
	Insulation	1
	Support Plate	1
	Time Delay Relay, Mount on #1 S-45	1
	Bracket and Rocker Arm, Relay Mounting	1
	#1 GDC* Starter Mercury Switch Parts - Not Illustrated	1
	Mercury Switch	1
	Trunion	1
	Delay Arm	1

*This GDC Starter, used on machines prior to Code 2148, is basically a GXL Starter. Spare parts are listed on the GXL Starter parts list.

S-45, S-67 OR S-78 STARTER

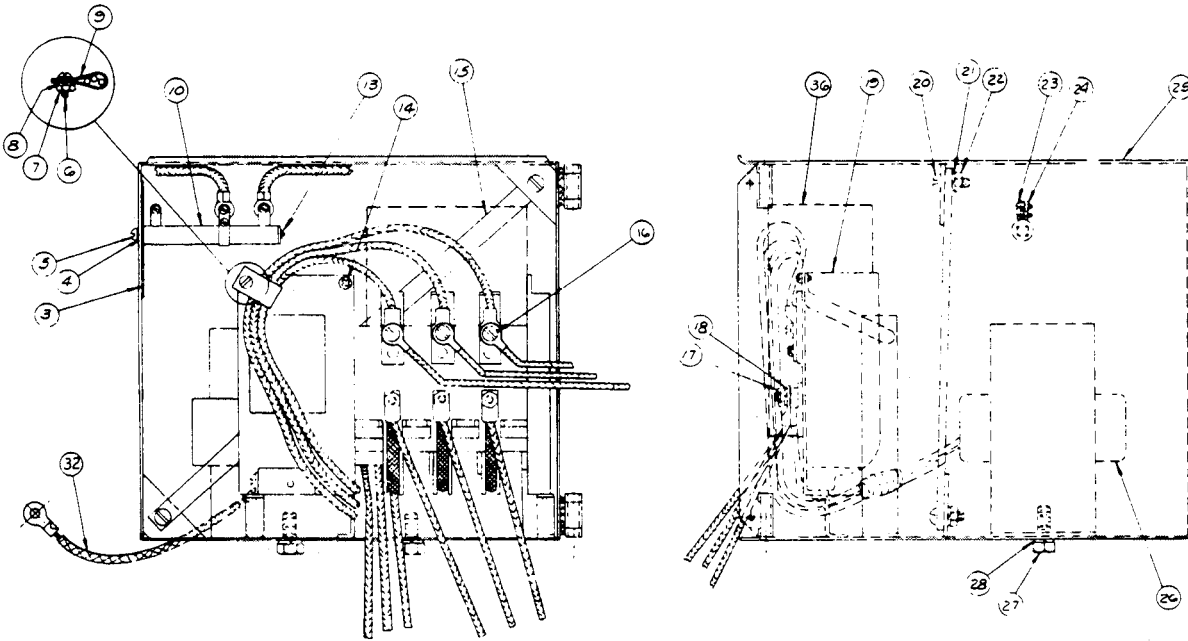


SAE-600 AC-Motor and SAE DC-Motor
S-45 Parts List P-28-E
S-67 Parts List P-28-H
S-78 Parts List P-28-J

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	S-45, S-67 or S-78 Starter Assy., Includes: (Less NVR Coil)	1
1	Moving Lamination Assy.	1
2	Screw - Lamination Mounting	1
3	Lockwasher	1
4	*	1
5	Lamination & Panel Assy. (Specify Input Cycles) Plastic Guide	1 1
6	Contact Block Cover	1
7	Plain Washer	2
8	Washer	2
9	Stationary Interlock Contact Assy.	1
10	Stationary Interlock Contact Assy. Screw - Lead Connections	1 4
11	Screw - Interlock Block Mounting	2
12	Contactory Assy., Includes: Moving Contactory Block	1 1
13A	Moving Interlock Contact Assy.	1
13B	Moving Interlock Contact Assy.	1
14	Round Head Screw	1
15	Spring - Main Contact	2
16	Moving Contact	2
17	Lockwasher	1
18	Main Contact Block Assy., Includes: Main Contact Block	1 1
19	Main Stationary Contact	4
20A	Hex Jam Nut	As Needed
20B	Hex Jam Nut	As Needed
21	Terminals	2
22	Spacer Washer (Not Used On S-78)	4
*	NVR Coil (Specify Input Voltage)	

GAC STARTER BOX

(Obsolete)



SAE AC-Motor

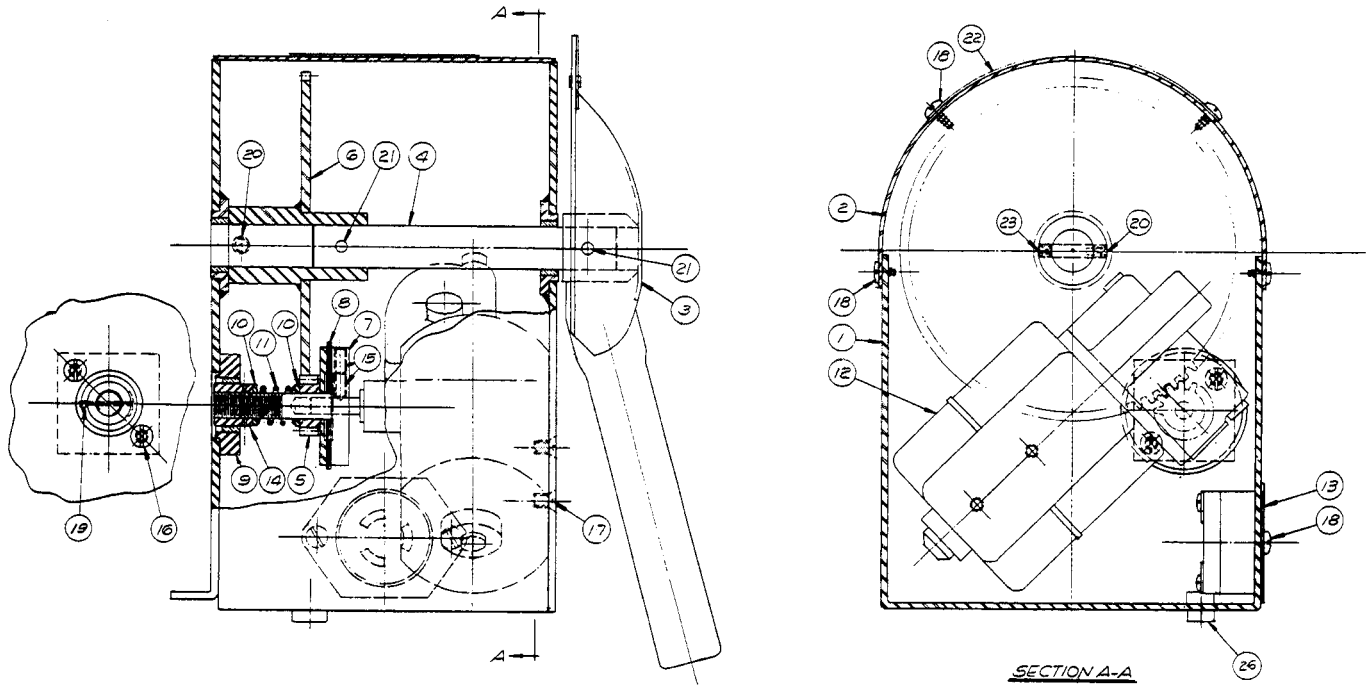
Parts List P-28-G

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	GAC Starter, Includes:	1
3	Insulation	1
4	Lockwasher	1
5	Round Head Screw	1
6	Round Head Screw	1
7	Hex Nut	1
8	Lockwasher	1
9	Lead Clip	1
10	Resistor	1
13	Square Nut	1
14	Self-Tapping Screw	1
15	Cross Brace	1
16	Round Head Screw	3

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
17	Hex Nut	3
18	Lockwasher	3
19	GXL Starter	1
	GXL Starter Parts	See P-28-F
20	Round Head Screw	2
21	Lockwasher	2
22	Hex Nut	2
23	Round Head Screw	2
24	Hex Nut	4
25	Case	1
26	Reactance Coil With Lamination	1
27	Hex Head Screw	2
28	Lockwasher	2
36	Barrier	1

LINCOLN CURRENTROL™

Optional Remote Current Control



Parts List P-32-F

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Case Assembly	1
2	Case Cover Plate	1
3	Handle Assembly	1
4	Handle Shaft	1
5	Pinion Gear Assembly	1
6	Spun Gear Assembly	1
7	Clutch and Pinion Shaft	1
8	Clutch Disc.	1
9	Pinion support Bushing Assembly	1
10	Thrust Washer	2
11	Spring	1
12	Motor	1
13	Receptacle	1
14	Support Bushing	1
15	Set Screw	2
16	Flat Head Screw	2
17	Flat Head Screw	2
18	Self Tapping Screw	10
19	Gotter Pin	1
20	Set Screw	1
21	Groove Pin	2
22	Nameplate	1
23	Set Screw	1
26	Grommet	1

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.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment or electrode or flux within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defect at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without

written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth. There are no guarantees or warranties with respect to engines, accessories, equipment, electrodes, or flux, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

WARRANTY SUPERSEDED



THE LINCOLN ELECTRIC COMPANY

World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors
Cleveland, Ohio 44117 U.S.A.

Branch Offices, Field Service Shops and Distributing Agencies in All Principal Cities

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LINCOLN ELECTRIC CO., of Canada, Ltd., Toronto M4G 2B9, Canada
LINCOLN ELECTRIC CO., (Europe) S.A., Rouen 76120, France

Export Representatives

ARMCO INTERNATIONAL — DIV. OF ARMCO STEEL CORP., Middletown, Ohio, U.S.A.

Ram
Eff. June '83