LINCOLN WELDERS

IM-236-A

OPERATING MANUAL

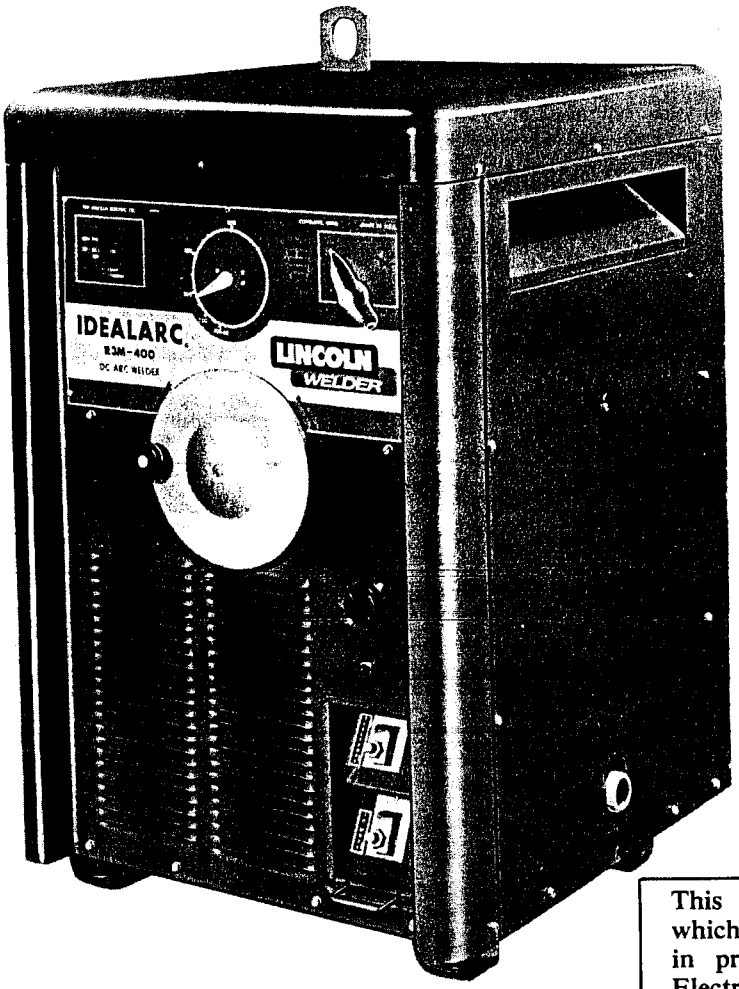
July, 1985
Idealarc R3M
4339; 4347; 4349; 4357; 4358; 4359; 4360; 4361; 4366; 4380; 4394; 4416; 4423; 4425; 4426; 4427; 4428; 4429; 4432; 4435; 4441; 4447; 4451; 4453; 4456; 4517; 4524; 4525; 4526; 4528; 4529; 4531; 4538; 4541; 4548; 4584; 4585; 4589; 4592; 4597; 5239; 5261; 5283; 5295; 5418; 5423; 5441; 5503; 5585; 5721; 5752; 5794; 5807; 5808; 5899; 5900; 5985; 5986; 5987; 5988; 5989; 6067; 6071; 6118; 6141; 6176; 6190; 6207; 6208; 6262; 6290; 6332; 6333; 6394; 6395; 6412; 6524; 6525; 6526; 6554; 6559; 6570; 6571; 6572; 6589; 6602; 6619; 6624; 6654; 6669; 6716; 6718; 6741; 6784; 6795; 6796; 6854; 6875; 6914; 6915; 6978; 6979; 6980; 7001; 7063; 7144; 7156; 7165; 7191; 7194; 7248; 7280; 7301; 7332; 7420

IDEALARC® R3M

300, 400, 500 and 650 AMPS

3 Phase Rectifier DC Welders

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and the availability of optional features may have changed.

LINCOLN ELECTRIC

THE LINCOLN ELECTRIC COMPANY
World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors
Sales and Service Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

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.

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 UPON YOU

Lincoln welders are designed and built with safety in mind. However, your overall safety can be increased by thoughtful operation on your part. Observe the common machine operating and welding safety precautions as outlined on the back of this manual. And, most importantly, think before you act and be careful.

INSTALLATION

Install the welder in a dry location where there is free circulation of air through the louvers in the back, front and sides of the case. A location which minimizes the amount of smoke and dirt drawn into the louvers reduces the chance of dirt accumulation that can block air passages and cause overheating.

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

Dual input voltage models (such as 230/460) are shipped connected for the higher voltage. To change connection, see the wiring diagram pasted to the inside of the right side panel.

Before applying power to the machine have a qualified electrician remove the side panel and connect three phase AC power to the input connection panel in accordance with The National Electric Code, all local codes, and the wiring diagram located inside the machine. Ground the welder frame by connecting a ground wire between a solid earth ground and the stud marked with the symbol ⏚ located on the input connection panel.

Recommended Input Wire, Ground Wire and Fuse Sizes Based on National Electric Code.

For 60 Hertz, 3 Phase Welders at 60% Duty Cycle

Welder	Input Volts	Amps Input	Copper Wire Size Type 75° in Conduit		Super Lag Fuse Size in Amps
			3 Input Wires	1 Ground Wire	
300	230 460	56 28	8 10	8 10	80 40
400	230 460	75 37.5	6 10	6 10	125 60
500	230 460	94 47	4 8	6 8	150 70
650	230 460	118 59	3 8	6 8	175 90

RECOMMENDED CABLE SIZES

With the input power off, connect the output cables to the proper studs on the output panel. The cables should be led through the strain relief loop below the studs to prevent damage to the studs if the cables are pulled excessively. Cable size may be selected according to the following table.

CABLE SIZES FOR COMBINED LENGTHS OF ELECTRODE AND GROUND CABLE

Machine Size	Lengths up to 50 ft.	50 to 100 ft.	100 to 150 ft.	150 to 200 ft.	200 to 250 ft.
300	1/0	1/0	1/0	2/0	3/0
400	2/0	2/0	2/0	3/0	4/0
500	2/0	2/0	3/0	3/0	4/0
650	3/0	3/0	4/0	2-2/0	2-3/0

CONTINUOUS CURRENT CONTROL

Start the welder. A pilot light on the front panel indicates when the output studs are energized. Rotate the continuous current control hand wheel to raise and lower the output current. Adjust for the exact current desired. Turning the control handle also drives the output dial pointer indicating the welding current at all settings. Do not attempt to turn this pointer directly.

Caution: Do not operate the welder without the cover and side panels in place.

POLARITY SWITCH

Turn the arc polarity switch located in the upper right corner to DC negative, or DC positive as required for the particular application. DO NOT CHANGE THE POLARITY SWITCH WHILE WELDING. Doing this will cause the current to arc across the contacts seriously damaging the switch.

DUTY CYCLE

This welder is rated for 60% duty cycle. Duty cycle is based on a ten minute period. Therefore, the welder can be operated at nameplate rated output for 6 minutes out of every 10 minute period.

OVERLOAD PROTECTION

All Idealarc R3M's have built-in protective thermostats operated by both temperature and current. These devices stop the machine if the rectifier or transformer reaches the maximum safe operating temperature because of frequent overload, high room temperature plus overload or abnormally high input voltage. The thermostats automatically reset when the temperature reaches a safe operating level.

RECTIFIER FAILURES

NOTE: Since proper material and correct assembly procedures are critical, field disassembly of the rectifier stack can do more harm than good. Contact the nearest authorized Field Service Shop if disassembly is required.

When a rectifier fails by shorting, the welder is immediately overloaded and the thermostat cuts it off the line. However, if the welder stops while welding, it can also indicate other troubles. See the "Trouble Shooting" table before testing the rectifier bridge for a short.

If the welder trips off when under no load or if it starts but again cuts off a few seconds after setting for sufficient time to allow the thermostat to cool, test for a shorted rectifier as follows:

1. Refer to the wiring diagram and rectifier test instructions pasted to the inside of the welder right side panel. Connect an ohmeter between the rectifier bridge positive (red) output terminal and the right hand rectifier input terminal (AC 1). Note the ohmeter reading using the 10 or 100 scale.
2. Reverse the ohmeter leads. Note the reading.
3. The reading taken in Step 1 should be different from the reading taken in Step. 2. If, however, the two readings are the same, and near zero, the rectifier bridge has shorted.
4. Repeat Steps 1 and 2 with the ohmeter connected between the rectifier bridge negative (black) output terminal and the right hand rectifier input terminal (AC 1). Again, if the two readings are the same, the rectifier bridge has shorted.

It is possible to have a bridge failure caused by an open rectifier. Such a failure will not usually cause the welder to stop. However, it will cause a change in the welder output. Bridge failures caused by an open rectifier will not be indicated by the above test.

AUXILIARY POWER

115 volt AC current can be obtained from the transformer coil used to energize the fan motor. Extra current available is about 10 amps. To obtain this power connect leads to transformer coil terminals to which the fan motor is connected.

REMOTE CONTROL POLARITY SWITCH (Optional)

The remote control polarity switch permits the operator to change the polarity without returning to the machine. It is connected to operate between DC negative and DC positive. The remote toggle switch is a double pole, center off, momentary contact switch. The polarity switch at the welder can be turned by hand when the remote switch is connected. DO NOT turn the switch when welding.

REMOTE CURRENT CONTROL (Optional)

The remote current control permits the operator to adjust the current required for different electrodes sizes without returning to the welder. It consists of a motor-gear box unit coupled to the control shaft by a chain drive. Push the remote control toggle switch in the proper direction to raise or lower the welding current.

TIG WELDING

When using these welders with a high frequency unit for TIG welding or high frequency starting when automatic welding a R.F. by-pass condenser should be installed for protection of the Idealarc R3M circuit. Order Kit T-12246. Instructions are in the kit.

MAINTENANCE

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

1. Periodically check the helical and bevel gears of the current control mechanism. If needed, lubricate with molysulfide grease. Any substitute lubricant must have a melting point no lower than 200°F.
2. Current machines have rubber boots to keep dirt off of the control screw (Item 328A of Parts List P-63-D). Additional lubricant is not needed except during disassembly for major repairs. On machines built before April 1969, periodically check the control screw for an accumulation of dirt. If needed, lubricate with Lubriplate #107. A dust shield kit L-4839 can be purchased to protect these control screws.
3. The fan motor has sealed bearings which require no service.
4. All exposed bearings are made of nylon or graphite impregnated bronze. No lubrication is normally required.
5. In extremely dusty locations dirt may clog the air channels causing the welder to run hot. Blow out the welder if needed. Avoid blowing dirt on the current control mechanism. Check and lubricate per paragraphs 1 and 2 above after blowing out the machine.

TROUBLESHOOTING

TROUBLE	CAUSES	WHAT TO DO
Starter chatters.	Check-Low Line Volts.	Check with Power Company
	Faulty starter.	Repair or replace.
Welder will not start. (Starter not operating.)	Supply line fuse blown.	Replace. (Look for reason for blown fuse first.)
	Power Circuit dead.	Check voltage.
	Broken power lead.	Repair.
	Wrong voltage.	Check voltage against instructions.
	Thermostat tripped. (Welder overheated)	Make sure that fan is operating and that there are no obstructions to free flow of air. Operate at normal current and duty cycle.
	Starter switch jammed.	Remove obstruction.
	NVR coil open.	Replace.
Welder will not weld. (Starter operating.)	Electrode or work lead loose or broken.	Tighten and repair connections.
	Open transformer circuit	Send to repair shop to have coils replaced.
	Polarity switch not centered on arrows.	Center switch.
Welder welds but soon stops welding. (Thermostat tripped.)	Proper ventilation hindered.	Make sure all case openings are free for proper circulation of air.
	Loaded beyond rating.	Operate at normal current and duty cycle.
	Fan inoperative.	Check leads and motor bearings. Fan can be tested on 115 volt line; with welder on, voltage across fan should be 115 volts.
Welder trips off when under no load.	Rectifier stack may be shorted.	Test as described on page 3.
Variable or sluggish welding arc.	Poor ground or electrode connection.	Check and clean all connections.
	Current too low.	Check recommended currents for rod type and size.
	Low line voltage.	Check with Power Company.
	Welding leads too small.	SEE TABLE ON PAGE 3.
	Open rectifier.	Check each diode.
Welder won't shut off.	Starter contacts frozen.	Check for approximately 3/16" to 1/4" over travel with a GXL starter.
Polarity switch won't turn.	Arced by turning under load.	Replace switch.
Binding in current control cranking handle	Dry spots on gears.	Lubricate.
	Gear misalignment front-to-back.	Check for dislocated snap rings on control shaft and replace.
Objectionable noise.	Loosened cap and locking ring on moving core tubes.	Tighten end cap using channel-lock pliers and secure locking rings.

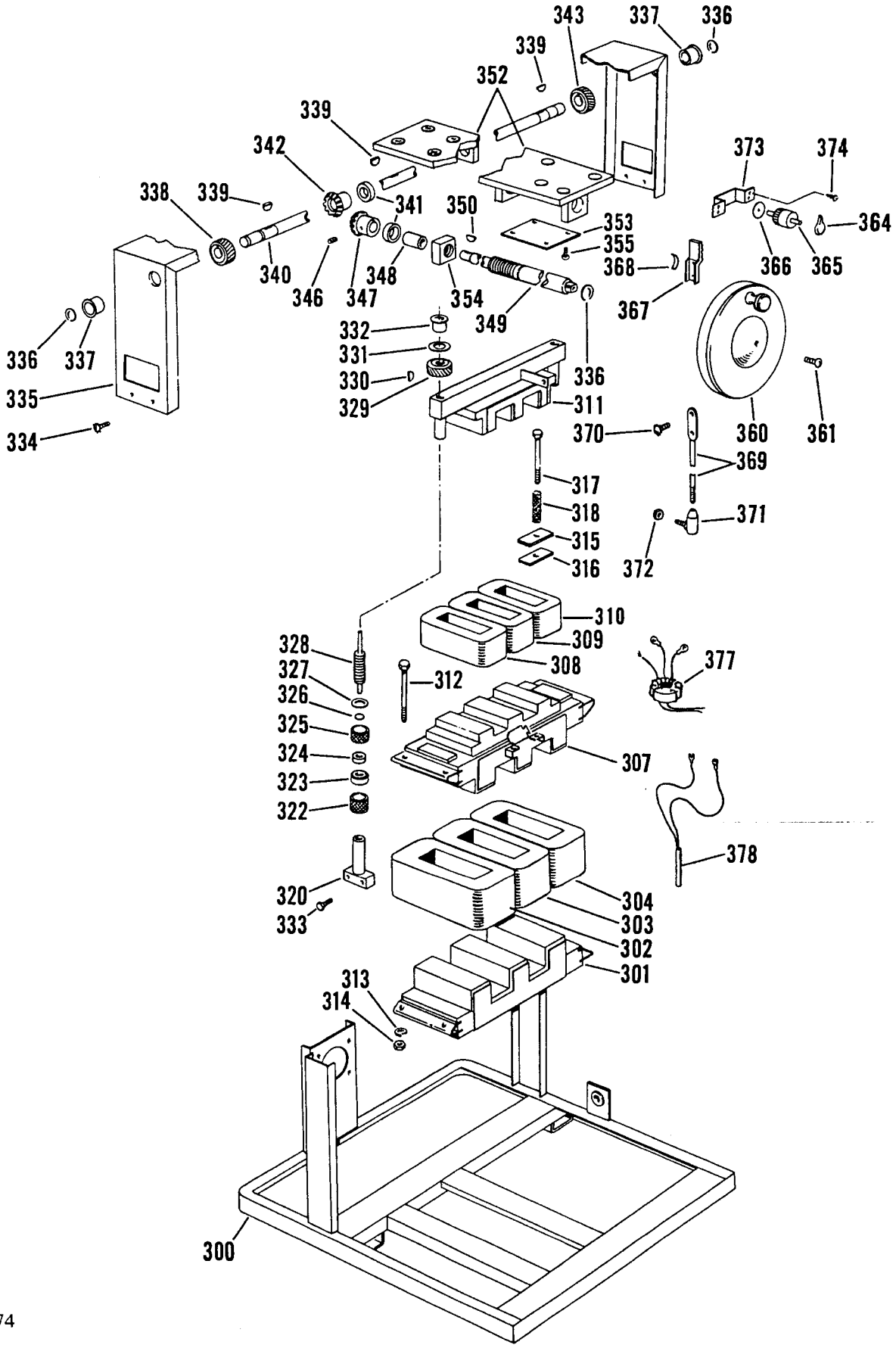
INDEX OF PARTS LISTS

See the back cover for instructions on how to order parts.

Always give the machine code number when ordering parts.

TRANSFORMER AND CURRENT CONTROLS

Parts List P-63-D

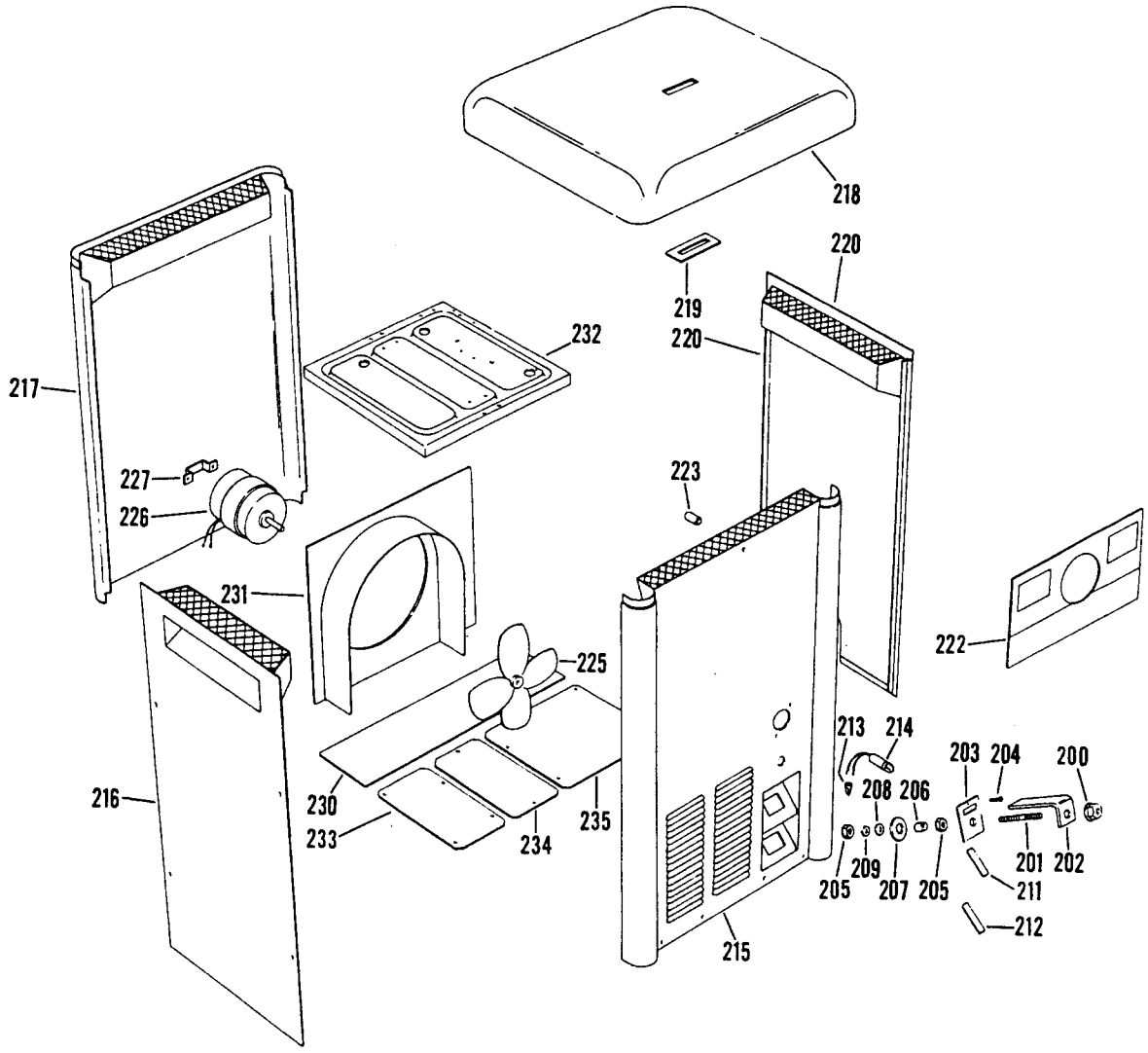


March 1974

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
300	Base	1
301	Trans. Lower Lamination 300 Amp	1
302	Trans. Coil Left	1
303	Trans. Coil Center	1
304	Trans. Coil Right	1
307	Trans. Upper & Reac. Lower Lamin. Asbly.	1
308	Left Reactor Coil	1
309	Center Reactor Coil	1
310	Right Reactor Coil	1
311	Reactor Upper Lamination Asbly.	1
312	Hex Hd. Bolt	4
313	Lockwasher	4
314	Square Nut	4
315	Clamp	4
316	Clamp Insulation	4
317	Hex Hd. Bolt	4
318	Screw Insulation	4
320	Reactor Control Pin	2
322	Locking Cap	2
323	Control Sleeve	2
324	Nylon Insert	2
325	Locking Ring	2
326	Spacer	2
327	"O" Ring	2
328	Reactor Control Screw (Left Hand)	1
328	Reactor Control Screw (Right Hand)	1
328A	Screw Protective Boots - Above Code 6550 (Not Illustrated)	2
329	Helical Gear (Left Hand)	1
329	Helical Gear (Right Hand)	1
330	Woodruff Key	2
331	Spacer	6
332	Bearing	2
334	Sems Screw	4
335	Cross Shaft Support	1
336	Snap Ring	7
337	Bearing	2
338	Helical Gear (Left Hand)	1
339	Woodruff Key	3
340	Cross Shaft	1
341	Thrust Bearing	2
342	Bevel Gear	1
343	Helical Gear (Right Hand)	1
346	Set Screw	1
347	Bevel Gear	1
348	Spacer Collar	1
349	Control Shaft	1
350	Woodruff Key	1
352	Control Shaft Support	1
353	Crank Stop Nut Slide	1
354	Crank Stop Nut	1
355	Self Tapping Screw	4
360	Control Handle	1
361	Oval Head Screw	1
364	Pointer	1
365	Pointer Drive Gear	1
366	Pointer Vibration Damper	1
367	Pointer Rack	1
368	Rack Spring	1
369	Support Arm	1
370	Sems Screw	2
368	Rack Spring	1
369	Support Arm	1
370	Sems Screw	2
371	Ball Joint	1
372	Hex Nut	2
373	Pointer Mounting Bracket	1
374	Self Tapping Screw	4
377	Transformer and Klixon Thermostat Assembly	2
378	Thermostat (Edge Wound Coils Only)	1

CASE, BAFFLES, FAN, STUDS, ETC.

Parts List P-63-C



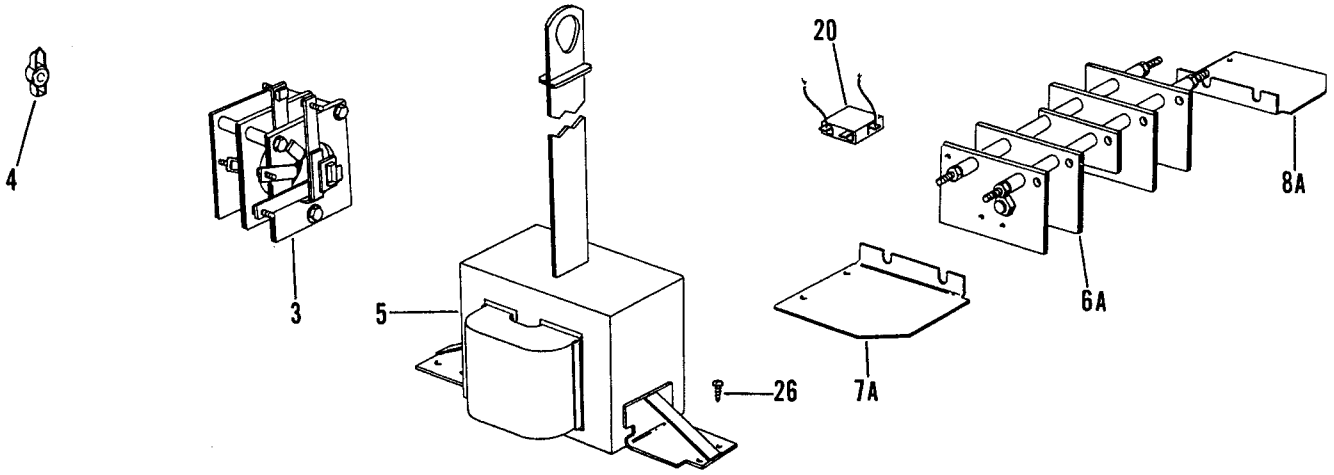
April 1962

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
200	Flanged Nut	2
201	Stud	2
202	Connection Strap	2
203	Stud Insulation	2
204	Self Tapping Screw	2
205	Hex Jam Nut	4
206	Insulating Tube	2
207	Insulating Washer	2
208	Flat Washer	4
209	Lockwasher	2
211	Decal (Electrode)	1
212	Decal (To Work)	1
213	Wire Nut	2
214	Pilot Light	1
215	Case Front Panel	1
216	Left Side Panel	1
217	Back Panel	1

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
218	Top	1
219	Cover Seal	1
220	Right Side Panel	1
222	Nameplate	1
223	Spacer	1
225	Fan	1
226	Fan Motor	1
227	Fan Bracket Support	1
230	Rear Base Baffle	1
231	Fan Baffle	1
232	Horizontal Baffle	1
233	Right Base Baffle	1
234	Center Base Baffle	1
235	Left Base Baffle	1

DC UNIT ASSEMBLY

Parts List P-63-E



ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
3	Arc Polarity Switch	1
	Arc Polarity Switch Parts See	P-61-H
4	Polarity Switch Handle	1
5	Choke Assembly, Includes:	1
	Choke Coil	1
	Thermostat	1
6A	Rectifier Assembly	1
7A	Rectifier Bracket, Right	1
8A	Rectifier Bracket, Left	1
	Thread Cutting Screw, Brackets to Horizontal Baffle	6
20	Supressor Condenser	1
26	Self Tapping Screw	8

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 a period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defect or defects 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 flux or 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 or flux 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, trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

SPECIAL GUARANTEE ON RECTIFIER STACKS

The Lincoln Electric Company guarantees the main power rectifiers on transformer-rectifier type welders against defects in material or workmanship for a period of five years from date of welder shipment. When an individual diode or diode assembly is replaced, the original diode or diode assembly must be returned to Cleveland for examination and credit if judged defective. If a replacement diode or diode assembly is installed by an Authorized Field Service Shop within twelve months of the date of shipment of the original part, the labor expense will be paid by The Lincoln Electric Company. After 12 months any labor expense will be the owner's responsibility.

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