LINCOLN® WELDERS

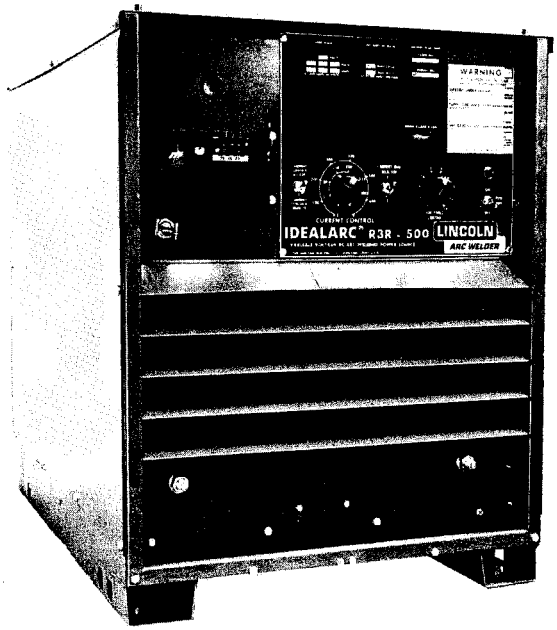
IM-319

OPERATING MANUAL

IDEALARC R3R-300, R3R-400 and R3R-500

3 Phase Rectifier Type
Constant Current DC Arc Welding Power Source
For Manual Electrode Welding
Codes 8587 to 9500

IM319
Idealarc R3R-300, R3R-400,
R3R-500
8587; 8588; 8589; 8590; 8591; 8592; 8625; 8633; 8635; 8636; 8637; 8643; 8654; 8659; 8660; 8662; 8667; 8681; 8682; 8683; 8684; 8686; 8690; 8701; 8720; 8723; 8733; 8747; 8778; 8792; 8793; 8794; 8802; 8806; 8912; 8925; 8935; 8937; 8951; 8952; 8953; 8958; 8967; 8968; 8969; 8972; 8973; 8977; 8985; 9017; 9037; 9042; 9043; 9044; 9045; 9046; 9047; 9056; 9066; 9067; 9091; 9153; 9163; 9283; 9314; 9335; 9348; 9349; 9369; 9370; 9371; 9455; 9476; 9488



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

Date of Purchase:_____
Serial Number:_____
Code Number:_____
Model:_____
Where Purchased:_____

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.

PRODUCT PURPOSE

The Idealarc R3R welder is a 3 phase transformer rectifier constant current power source for DC manual welding. It is a solid-state SCR-type welder with a simple rheostat current control.

SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON PAGES 2, 3 AND 4. And, most importantly, think before you act and be careful.

LINCOLN® ELECTRIC

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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

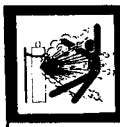
Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).

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

c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

FOR ENGINE powered equipment.

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

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

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

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

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

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

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

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

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

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

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:
   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vètements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique, ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.
3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:
   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protèger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.
6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.
7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un èchauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.
11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

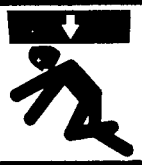
PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

INSTALLATION

LOCATION AND STACKING

⚠ WARNING



FALLING EQUIPMENT can cause injury.

- Do not lift this machine using lift bail if it is equipped with a heavy accessory such as trailer or gas cylinder.
- Lift only with equipment of adequate lifting capacity.
- Be sure machine is stable when lifting.

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

The Idealarc R3R welders can be stacked three high when the following precautions are observed:

1. Be sure the bottom machine is on a firm, level surface suitable for the total weight [up to 1340 pounds (608 Kg)] of the stacked machines.
2. Stack the machines with the fronts flush. Be certain the pins on the top front corners of the lower machines fit through the holes in the base rails of the upper machines.
3. No unit heavier than the bottom unit should be stacked on top of it. For example, an R3R-500 shall not be stacked on top of an R3R-400, but an R3R-400 may be stacked on top of an R3R-500.

INPUT WIRING

⚠ WARNING

ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment.
- Turn the input power off at the fuse box before working on equipment.
- Do not touch electrically hot parts.

Dual or triple voltage (eg; 230/460, 220/440/380, etc.) models are shipped connected for highest voltage. To change the connection, see the wiring or connection diagram pasted to the inside of the access panel in the case back.

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

Have a qualified electrician remove the access panel in the case back and connect the three phase AC power to terminals L_1, L_2, L_3 of the input contactor in accordance with the U.S. National Electrical Code, all local codes, and the wiring diagram located inside the machine.

The welder frame must be grounded. A stud marked with the symbol ⏚ located on the floor of the input box is provided for this purpose. See the U.S. National Electrical Code for details on proper grounding methods.

Recommended Input Wire, Ground Wire and Fuse Sizes Based on U.S. National Electrical Code. For 60 hertz, 3 phase Welders at 60% Duty Cycle.

Welder	Input Volts	Amps Input	Copper Wire Size Type 75°C in Conduit		Super Lag Fuse Size In Amps
			3 Input Wires	1 Ground Wire	
300	230	56.0	8	8	80
	460	28.0	10	10	40
400	230	74.0	6	6	125
	460	37.0	10	10	60
500	230	88.0	4	6	150
	460	44.0	8	8	70

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 without overheating.

OUTPUT CONNECTIONS

A. Output Studs

With the machine off, run electrode and work cables of the appropriate sizes (see the following table) up through the rectangular holes in the machine base located below the output studs. Connect the cable lugs to the output terminals marked (+) and (–) or, if the welder comes equipped with the polarity switch option "electrode" and "to work". Tighten the holding nuts with a wrench.

Cable Sizes for Combined Length of Electrode and Work Cable (Copper) at 60% Duty Cycle

Machine Size	Up to 100 ft (30 m)	100 to 150 ft (30 to 46 m)	150 to 200 ft (46 to 61 m)	200 to 250 ft (61 to 76 m)
300	1/0 (54 mm²)	1/0 (54 mm²)	2/0 (68 mm²)	3/0 (86 mm²)
400	2/0 (68 mm²)	2/0 (68 mm²)	3/0 (86 mm²)	4/0 (108 mm²)
500	2/0 (68 mm²)	3/0 (86 mm²)	3/0 (86 mm²)	4/0 (108 mm²)

B. Connection of Optional Remote Control — K775

Turn the machine off. The K775 consists of a control box with 28 feet (8.5 m) of four conductor cable. This connects to terminals 75, 76, 77 on the terminal strip and the case ground screw so marked with the symbol ⏚ on the machine. These terminals are made available by opening the terminal access cover on the left side of the case front. This control will give the same control as the current control on the machine depending on the position of the current dial selector switch. (Current dial selector switch not required on the R3R-300.)

If the K775 Remote Control option, or the K798 Amptrol Adapter Kit, is used on a welder equipped with

the Pocket Amptrol, it is recommended that leads 75, 76 and 77 to the Pocket Amptrol P.C. board be disconnected from the terminal strip and taped individually. This is desirable to provide a reasonably linear control with the K775.

⚠ CAUTION

Extreme care must be observed when installing or extending the wiring of a remote control. The Remote Control cord can be lengthened to any length by splicing four wires to the standard 28 ft (8.5 m) cord before connecting to the R3R terminal strip. Only the green lead can and should be grounded to the machine case.

When extending the standard remote control make sure the leads are the same and the splice is waterproof. Don't let the lugs touch against the case.

C. Optional Amptrol™ Adapter Cable — K798

A 3-wire cable, 12" (305 mm) long, is available to connect a standard K771 (Hand) or K772 (Foot) Amptrol in place of the K775 Remote Current Control. In this application the Amptrol arc start switch is non-functional. Install per instructions (T14234) shipped with the K798.

TIG Welding

The R3R is shipped with proper R.F. by-pass circuitry installed to protect the control circuit when TIG welding with a Hi-Freq™ unit. To provide protection, the welder frame grounding stud must be connected to ground (see Page 4).

OPERATING INSTRUCTIONS

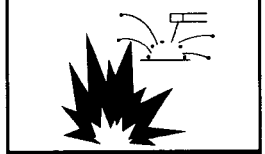
⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground.**

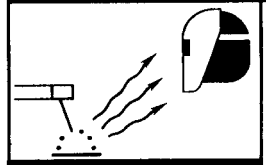
FUMES AND GASES can be dangerous.

- **Keep your head out of fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**



WELDING SPARKS can cause fire or explosion.

- **Keep flammable material away.**



ARC RAYS can burn.

- **Wear eye, ear and body protection.**

NOTE: The P.C. board is protected by a moisture resistant coating. When the welder is operated, this coating will "bake off" of certain power resistors that normally operate at high temperatures, emitting some smoke and odor for a short time. These resistors and the P.C. board beneath them may become blackened. This is a normal occurrence and does not damage the component or affect the machine performance.

1. To Start the Welder

   Move the "Power Switch" to "On". This starts the welder and lights the red pilot light on the machine control panel (this light indicates that the line contactor is energized).

2. Setting Welding Current

   a. The "Current Control" dial on the front of the machine indicates the output current at the NEMA arc voltage.

   On the R3R-300, one dial covers the complete range. On the R3R-400 and -500, *two* dials are used. The "A" range controls the current over about 1/2 of the range of the "B" range. A toggle switch on the control panel allows selection of the desired range. The output control can be adjusted while welding.

   b. Provisions for remote control are standard on each power source. A current control switch on the machine control panel labeled "Current Control at R3R" or "Current Control Remote" is provided for selecting the desired mode of operation, either at the machine or remote. Be certain the machine remote switch is in the machine position, unless a remote control is connected, or the R3R is equipped with optional pocket amptrol.

   c. The "Arc Force Control", located on the right side of the front control panel, is calibrated from one to ten. Lower settings will provide less short circuit current and a softer arc. A setting that is too low may cause the electrode to stick in the puddle. Higher settings will provide a higher short circuit current, a more forceful arc, and possibly more spatter. For most welding, the dial should be set at approximately mid-range (5 – 6). Adjustment up or down can then be made depending on the electrode, procedures, and operator preference. For most TIG welding applications adjust this control to minimum for best operating characteristics.

3. Pocket Amptrol (Optional)

The Pocket Amptrol option provides a remote current control for the R3R welders. This "wireless" control requires no control cable connection to the welder.

a. On the R3R-400 and R3R-500 the welder "Current Control" switch must be in the "Remote" position and the "Current Dial Selector" switch in the "B" range. The R3R-300 has only one dial and no selection switch. The R3R-300 does not have a "Current Dial Selector" switch. With the "Current Control" switch in the "Remote" position, the current control potentiometer on the welder is removed from the circuit and its setting has no effect on the output. With the "Current Dial Selector" switch in the "B" range position, the Pocket Amptrol provides total control from NEMA min. to NEMA max. output of the welder.

b. Turn the welder power switch on.

c. Insert one end of the probe into the electrode holder and hold the other end on the work for approximately five seconds.

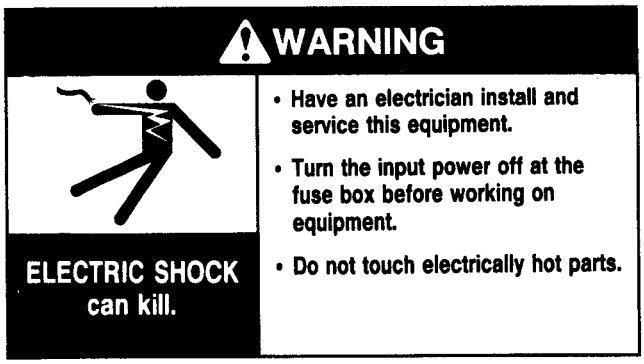
d. To change current, change the probe dial setting and repeat the five-second procedure of placing the probe between electrode and work.

The solid-state circuitry within the welder senses this change in probe setting and automatically resets the welding current to the new level. Each time the welder is turned off, the output goes to minimum and must be reset when the welder is turned on again.

OPTIONAL EQUIPMENT

1. Remote Current Control (K775). See "Operation".
2. Amptrol Adapter Cable (K843). See "Operation".
3. Polarity Switch (factory installed only). Permits changing polarity at the machine output terminals. (See also "Output Connections".)
4. Meters — Ammeter and Voltmeter (factory installed only).
5. Pocket Amptrol — (factory installed only). See "Operation".
6. Undercarriage — (K817, K817R) includes a spring loaded handle for hand towing and a choice of wheels.

MAINTENANCE



GENERAL MAINTENANCE

1. The fan motor has sealed bearings which require no service.
2. In extremely dusty locations, dirt may clog the air channels causing the welder to run hot. Blow out the welder at regular intervals. The side panels can be removed even when the machines are stacked.
3. In extremely dusty locations dirt may accumulate on the remote control terminal strip. Wipe or blow this terminal strip off at regular intervals.

"POCKET AMPTROL" MAINTENANCE

Routine cleaning should be the only maintenance required. The probe tip should be kept in condition to provide sharp edges at the ends to assure penetration of heavy oxide coatings on the work piece. A blunted tip could result in giving different welding currents for a given dial setting.

POWER RECTIFIER REPLACEMENT

Refer to the troubleshooting section "Power Rectifier Bridge Assembly Checking Procedure" if a rectifier failure is suspected.

NOTE: Since proper material and correct assembly procedures are critical, field disassembly of the power rectifier bridge sections can do more harm than good. Return a defective rectifier bridge section (or the entire bridge) to the factory for repairs.

GENERAL TROUBLESHOOTING

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

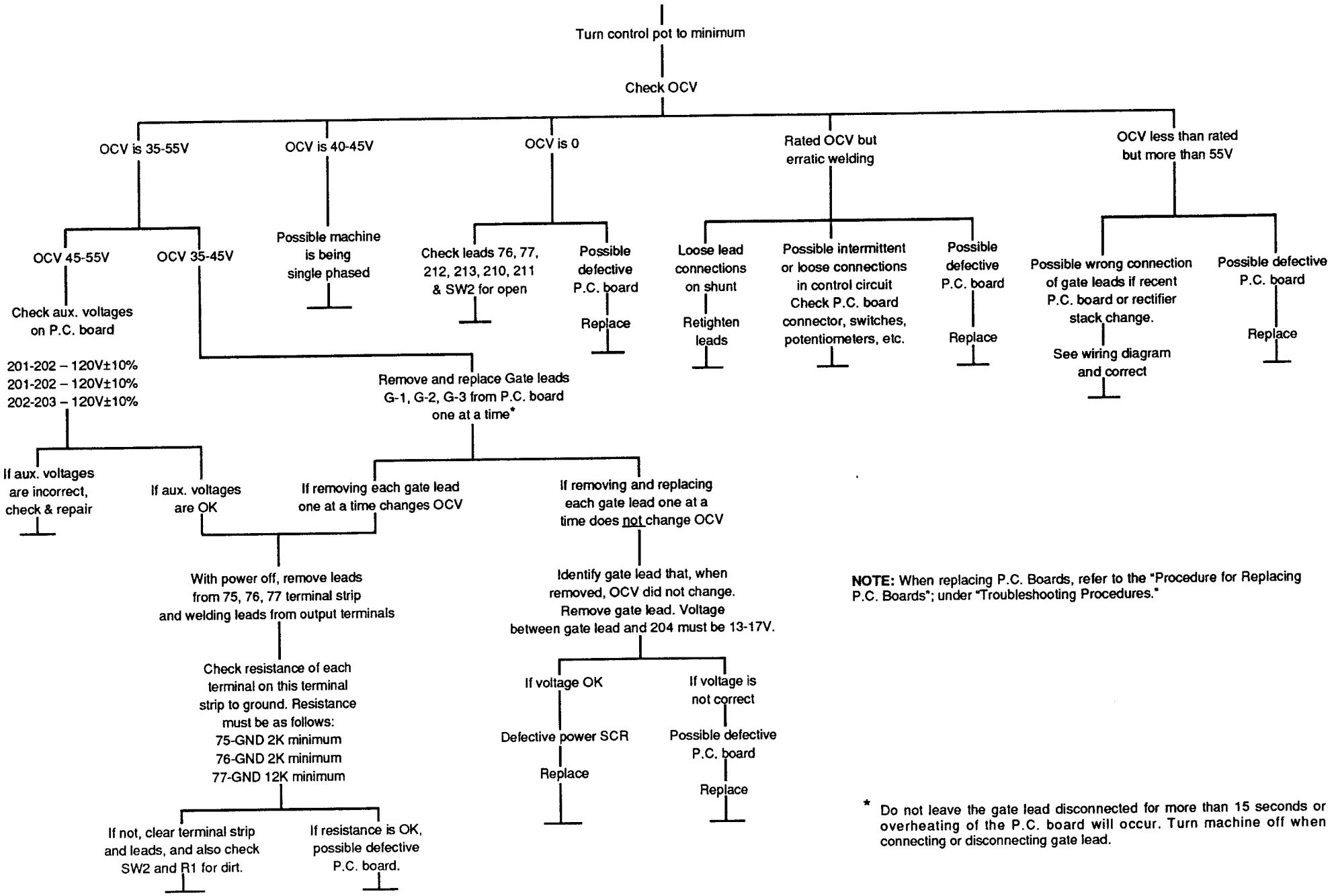
WARNING: Have a qualified personnel do the maintenance and troubleshooting work. Turn the power off before working inside the machine. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring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

TROUBLE	CAUSE	WHAT TO DO
A. Input contactor chatters.	1. Faulty input contactor. 2. Low line voltage.	1. Repair or replace. 2. Check with Power Company.
B. Machine input contactor does not operate.	1. Supply line fuse blown. 2. Power circuit dead. 3. Broken or loose power lead. 4. Wrong voltage. 5. Thermostats tripped (welder overheated). 6. Input contactor coil open. 7. Open winding on 115V control transformer. 8. Power ON-OFF switch not closing. 9. Lead broken or loose connection in 115V starter circuit. 10. Thermostat defective.	1. Replace (look for reason for blown fuse first). 2. Check voltage. 3. Repair. 4. Check voltage against instructions. 5. a. Make sure the fan is operating and that there are no obstructions to free flow of air. b. Operate at normal current and duty cycle. 6. Replace. 7. Replace. 8. Replace. 9. Replace. 10. Turn input power off (115V circuit is hot when input power is connected). Check thermostats with continuity meter – should read short circuit when machine is cool. Replace if defective. There are two thermostats; one on the secondary level and one on the choke.
C. Machine input contactor closes but has no or low output. Open circuit voltage should be 67 to 71 volts.	1. Electrode or work lead loose or broken. 2. Open transformer primary or secondary circuit. 3. Supply line fuse blown. 4. Input line grounded, causing single phase input. 5. Input leads not connected to contactor. 6. Latching resistor, R3, open. 7. Control circuit problems.	1. Repair connections. 2. Repair. 3. Replace blown fuse – check fuse size. 4. Repair input to machine. 5. Connect input lead. 6. a. Replace. b. Check leads to the resistor and repair if defective. 7. See control circuit troubleshooting chart.
D. Machine has maximum output but no control.	1. Possible defective power SCR. 2. Possible defective control board.	1. Remove all gate leads G1, G2 and G3 at P.C. board. If welder has any open circuit voltage, power SCR is defective. See Troubleshooting Procedures, Sec. H. 2. See P.C. Board Troubleshooting Procedures.
E. Machine does not have maximum output (67 to 71 volts).	1. Input fuse blown. Machine is single phased. 2. One phase of main transformer windings open. 3. Defective power bridge.	1. Replace fuse or repair input line. Check reason for fault. 2. Repair. 3. Check bridge per Troubleshooting Procedures Sec. H and check snubber per Sec. D.

GENERAL TROUBLESHOOTING (Continued)

TROUBLE	CAUSE	WHAT TO DO
F. Thermostats shut machine off. (Pilot light is on but contactor and fan are not operating.)	1. Improper ventilation. 2. Loaded beyond rating. 3. Fan inoperative. 4. Shorted diode or SCR in power rectifier bridge.	1. Make sure all case openings are free for proper circulation of air. 2. Operate at rated current and duty cycle. 3. Check leads and motor bearings. Fan can be tested on 15 volt AC line. 4. Refer to Troubleshooting Procedures.
G. Machine comes on but reduces to low output under load and remains there until the load is broken and arc re-started. See Overload Protection, Troubleshooting Procedures, Sec. C.	1. Excessive load causing the overload protection on control board to operate. 2. Machine output shorted causing overload protection on control board to operate. 3. Control circuit defective.	1. Reduce load. 2. Turn machine off and remove short. 3. See P.C. board Troubleshooting Procedures.
H. Machine trips off when under no load or makes excessive noise like it is loaded.	1. Power bridge rectifier may have a shorted diode or SCR. 2. Short in the transformer. 3. Fan hitting vertical baffle.	1. See Troubleshooting Procedures. 2. Repair. 3. Clear the fan.
I. Variable or sluggish welding arc.	1. Poor work or electrode cable connection. 2. Current too low. 3. Welding leads too small. 4. Open SCR or diode in power rectifier bridge. 5. Control circuit problems.	1. Check and clean cable connections. 2. Check recommended currents for rod type and size. 3. See recommended cable sizes. 4. See Troubleshooting Procedures. 5. See Control Circuit Troubleshooting Chart.
J. Welder won't shut off.	1. Input contactor contacts frozen.	1. Replace input contactor.
K. Current control on machine not functioning.	1. Current control switch in wrong position. 2. Current control switch defective. 3. Current control potentiometer defective. 4. Lead or connection in control circuit open. 5. Defective control or circuit boards.	1. Place switch in "Output Control at R3R" position. 2. See Troubleshooting Procedures. 3. See Troubleshooting Procedures. 4. Repair or connect. 5. See Control Circuit Troubleshooting Chart.
L. Optional remote current control not functioning. See Sec. C, Troubleshooting Procedures, before connecting.	1. Current control switch in the wrong position. 2. Leads 75, 76 and 77 not connected to correct numbers on terminal strip. 3. Remote control leads broken. 4. Remote control potentiometer open. 5. Lead or connection in current control circuit open. 6. Control P.C. board plug disconnected or loose. 7. Control circuit problems.	1. Place switch in "Output Control Remote" position. 2. Correct connection. 3. Repair broken leads. 4. See Troubleshooting Procedures. 5. Connect to repair. 6. Connect plug. 7. See Control Circuit Troubleshooting Chart.

CONTROL CIRCUIT TROUBLESHOOTING CHART



NOTE: When replacing P.C. Boards, refer to the "Procedure for Replacing P.C. Boards"; under "Troubleshooting Procedures."

* Do not leave the gate lead disconnected for more than 15 seconds or overheating of the P.C. board will occur. Turn machine off when connecting or disconnecting gate lead.

TROUBLESHOOTING PROCEDURES

A. Procedure For Replacing P.C. Board

(The P.C. board is located behind the front control panel. Remove the nameplate screws to loosen the control panel.)

When the P.C. board is to be replaced, follow this procedure:

Visually inspect P.C. board in question. Are any of the components damaged? Is a conductor on the back side of the board damaged?

1. If there is no damage to the P.C. board, insert a new one and see if this remedies the problem. If the problem is remedied, re-insert the old P.C. board and see if the problem still exists with the old P.C. board.
   a. If the problem does not exist with the old board, check the harness plug and P.C. board plug for corrosion, contamination, or oversize.
   b. Check leads in the harness for loose connections.
2. If there is damage to the P.C. board, refer to the Troubleshooting Guide.

B. Output Voltage

The open circuit voltage of the machine should be 67 to 71 volts and should not vary when the rheostat is varied unless the machine is welding. If any other condition exists, refer to the Troubleshooting Guide.

C. Overload Protection

All Idealarc R3R's have built-in protective thermostats. If the rectifier or transformer reaches the maximum safe operating temperature because of frequent overload or high room temperature plus overload, the line contactor drops out stopping the welder. The thermostats automatically reset and the line contactor pulls in when the temperature reaches a safe operating level.

The power rectifier bridge is also protected against short term, high current overloads generally caused by poor operating techniques. For example, if an arc gouging carbon or the electrode is allowed to touch — or almost touch — the work for a couple of seconds or more, the overload protection P.C. board automatically reduces the output to minimum and keeps it there until the overload is removed or the machine is turned off.

D. Checking Snubber Circuit

In case of an SCR malfunction or failure, the snubber assembly should be checked. Turn the machine off and disconnect one lead of the snubber assembly. (Either 221, 222 or 223 depending on the SCR in question. See wiring diagram.) The sides of the machine have to be removed to do this. (See parts list for the exact location.)

1. Visually inspect the snubber assembly for overheated components.
2. Using a V.O.M. meter on the X10 scale connect the positive lead to the lead removed. Touch the negative lead to the shunt. The indicating needle on the meter will move quickly to the right (low resistance value) and then slowly return to the left (high resistance value). This indicates that the capacitor in the snubber circuit is taking a charge.
3. If the needle stays to the right, the capacitor is shorted and the assembly is defective.
4. If the needle does not move, the capacitor or resistor on the snubber assembly is open and the assembly is defective.

E. Checking Current Control Rheostat on Machine

Turn machine off.

Remove the control panel screws and open the front cover.

Turn the current control switch to remote.

Disconnect the harness plug from the control board.

Put current range switch to B range.

With an ohmmeter on X1K, connect it to lead 210 and 211 on SW #2.

Rotate the current control rheostat. The resistance reading should be from around zero to 10KΩ. Check the resistance reading between 75 on the terminal strip and 211 on SW #2. The reading must be 10KΩ. No reading will indicate an open rheostat and a low reading will indicate a shorted or partially shorted rheostat; in either case, replace.

F. Toggle Switch Check

1. Turn off the machine power input. SW #1 has 115 volts across it when the input power is connected.
2. Isolate the switch to be tested by removing all connecting leads.
3. Check to make sure the switch is making connections with a V.O.M. meter. The meter should read zero resistance.
4. Put the ohmmeter on X1K scale and measure the resistance between the terminal and the case of the machine (touch a self-tapping screw). Reading should be infinite.
5. If either step (3) or step (4) fails, replace the switch.

G. Remote Control Check

Disconnect the remote field control and connect an ohmmeter across 75 and 76 and rotate the rheostat in the remote control. The resistance reading should go from zero to 10K Ω. Repeat with ohmmeter across 77 and 76 with same results. Connect ohmmeter across 75 and 77. The reading should be 10K Ω. A lower reading will indicate a shorted or partially shorted rheostat. A very high reading will indicate an open rheostat. In either of

the last two cases, replace rheostat. Check cable for any physical damage.

H. Checking Power Rectifier Bridge Assembly

⚠ CAUTION

Precise evaluation of diodes or SCR's require laboratory equipment. If a bridge problem still exists after test, please call a Lincoln Field Service Shop.

Equipment Needed:

1. V.O.M. or ohmmeter for diodes
2. Circuit Diagram 1 for SCR's

1. **Device Isolation** (see the instruction manual Parts List for the exact location)

   Disconnect the following leads from the bridge, shown in Diagram 2:

   a. Wiring harness gate leads (G1, G2, G3) from the gate lead terminals on the control P.C. board.
   b. AC leads X1, X2 and X3 from the anodes of the SCR's and cathodes of the diodes.
   c. One lead from each snubber assembly.
   d. The flex lead 220 on the DC(–) common heat sink. This lead connects to the latching resistor (R3).
   e. The pigtail of the freewheeling diode from the diode heat sink.

2. **Power Diode Test**

   a. Establish the polarity of the ohmmeter leads and set to the X10 or scale.
   b. Connect the ohmmeter positive lead to anode and negative lead to the cathode.
   c. Reverse the leads of the ohmmeter from Step b.
   d. A shorted diode will indicate zero or an equally low resistance in both directions. An open diode will have an infinite or high resistance in both directions; and a good diode will have a low resistance in Step b and a much higher resistance in Step c.

I. Power Silicon Controlled Rectifier Test

The SCR must be mounted in the heat sink when making this test.

a. Connect the ohmmeter (set to the X10 scale) leads to the anode and cathode.
b. Reverse the leads of the ohmmeter from Step a.
c. A shorted SCR will indicate zero or an equally low resistance in one or both directions.
d. Establish the polarity of the ohmmeter. Connect the positive lead to the gate and the negative lead to the cathode.
e. An open gate circuit will have an infinite or high resistance. A good gate circuit will read a low resistance, but not zero ohms.

J. Battery Test

Check the batteries by shorting leads (A) and (C), then close switch SW-1. Replace batteries if voltage is less than 3 volts.

K. SCR Test

1. Isolate SCR to be tested by disconnecting gate leads from the terminals on the P.C. board. (Do not remove SCR from the heat sink.)
2. Connect SCR into the test circuit as shown (A) lead to anode (C) lead to cathode and (G) lead to the gate.
3. Close switch SW #1 (switch SW #2 should be open); voltmeter should read zero. If the voltmeter reads higher than zero, the SCR is shorted.
4. With switch SW #1 closed, close switch SW #2 for two seconds and release. The voltmeter should read 2 to 2.5 volts before and after switch SW #2 is released. If the voltmeter does not read, or reads only while SW #2 is depressed, the SCR is open or batteries are defective (repeat Battery Test Procedure).
5. Open switch SW #1, disconnect the gate lead (G) and reverse the (A) and (C) leads on the SCR. Close switch SW #1. The voltmeter should read zero. If the voltage is higher than zero, the SCR is shorted.

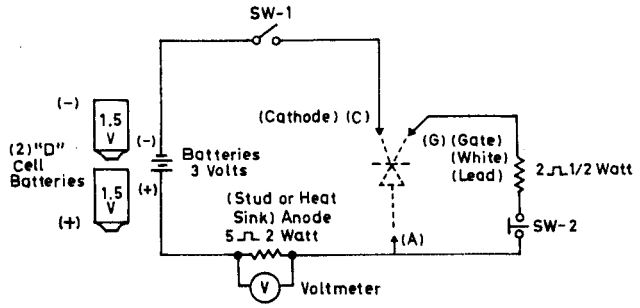
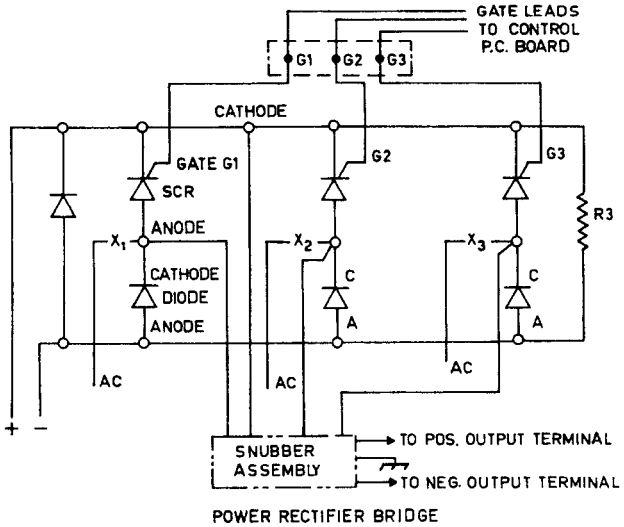


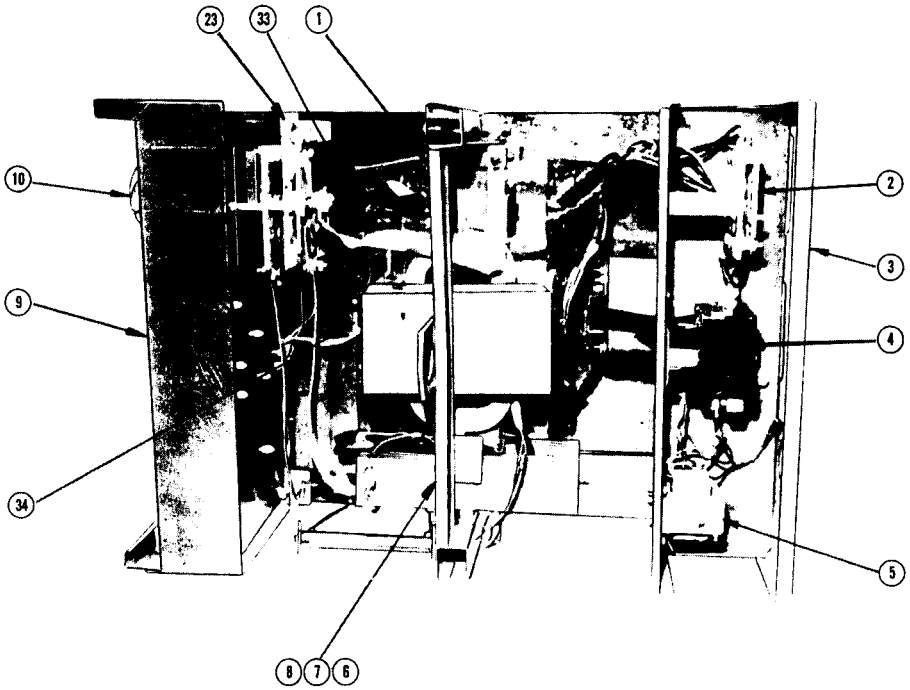
DIAGRAM 1

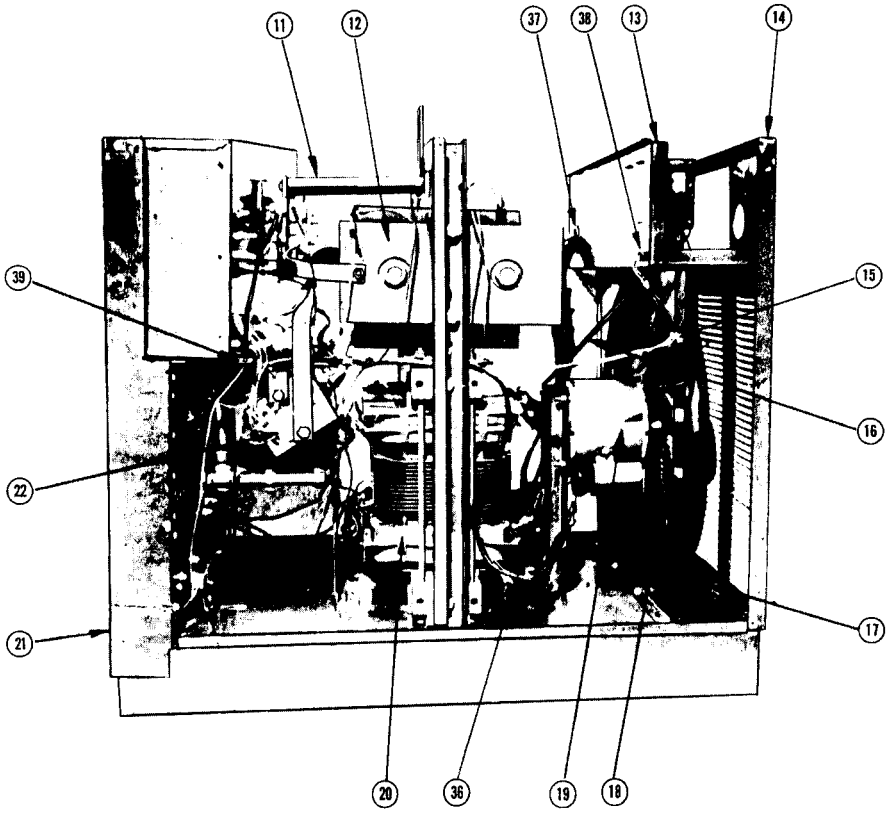


POWER RECTIFIER BRIDGE

DIAGRAM 2

GENERAL ASSEMBLY





G1584

9-4-87Q

Parts List P-144-C.1

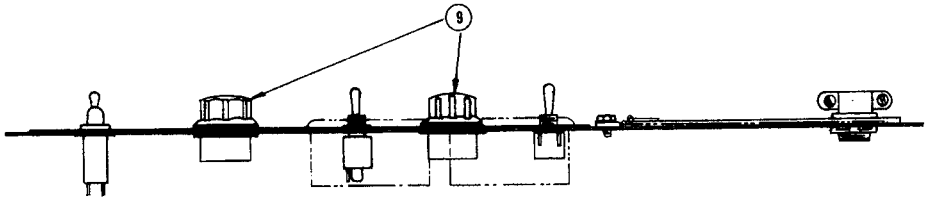
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Baffle	1
	Thread Cutting Screw	3
2	Input Reconnect Panel	1
3	Input Access Panel	1
	Self Tapping Screw	3
4	Contactor	1
	Self Tapping Screw	3
5	115 Volt Control Transformer	1
	Self Tapping Screw	3
6	Baffle — Right	1
	Thread Cutting Screw	2
7	Baffle — Bottom Right	1
	Baffle Mounting Bracket	1
	Self Tapping Screw	4
8	Baffle — Top Right	1
	Thread Cutting Screw	2
9	Control Box Cover Assembly	1
10	Selector Switch Handle	1
11	Resistor (R3)	1
	Insulating Washer	2
	Plain Washer	1
	Lock Washer	1
	Round Head Screw	1
	Hex Nut	1
12	Diode Heatsink Assembly	1
	Hex Head Screw	2
	Insulating Tube	2
	Plain Washer	2
	Lock Washer	2
13	Input Box Assembly	1
	Self Tapping Screw	3
14	Rear Panel	1
	Self Tapping Screw	8
15	Lead Clamp	4
16	Fan Motor Bracket Stiffener	1
	Self Tapping Screw	2
17	Fan Baffle	1
	Self Tapping Screw	4

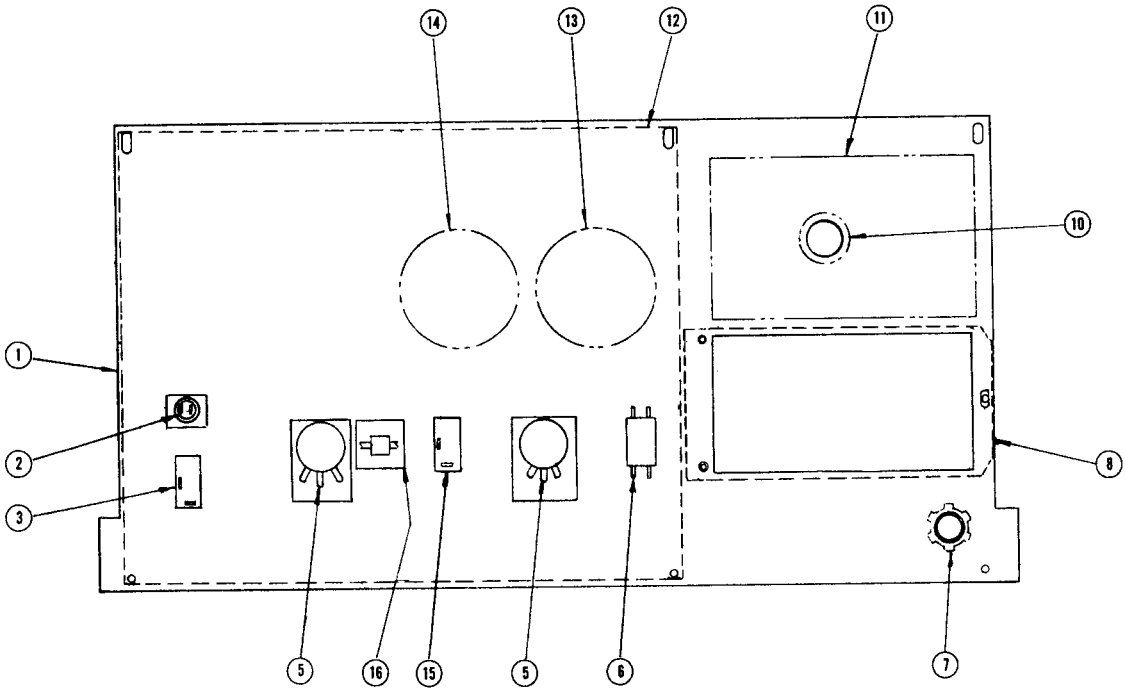
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
18	Fan	1
19	Fan Motor	1
	Plain Washer	4
	Lock Washer	4
	Hex Nut	4
20	Transformer, Base, Lift Bail & Rectifier Assembly See P-144-E	1
21	Case Front Assembly See P-144-E	1
	Self Tapping Screw	6
22	Shunt	1
	Hex Head Screw	1
	Plain Washer	1
	Lock Washer	1
	Round Head Screw	2
23	Lead Insulating Panel	1
	Self Tapping Screw	2
33	Air Deflector (R3R-300 Only)	1
	Self Tapping Screw	2
34	Grommet Strip (R3R-300 Only)	1
36	Bushing	1
37	Bushing	1
38	Bushing	1
39	Lead Insulating Panel	1
	Self Tapping Screw	2
	Items Not Illustrated:	
	Roof	1
	Side Panel	2
	Pocket Remote Assembly (Part of Pocket Amptrol Option)	1
	Roof Cover Seal	1
	Pocket Amptrol Decal	1
	Ground Decal	1
	Warning Decal	1
	Caution Decal (Rectifier)	1
	Identification Sticker (1CR)	1

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

9-16-83

CONTROL BOX COVER ASSEMBLY





L6500
9-25-87R

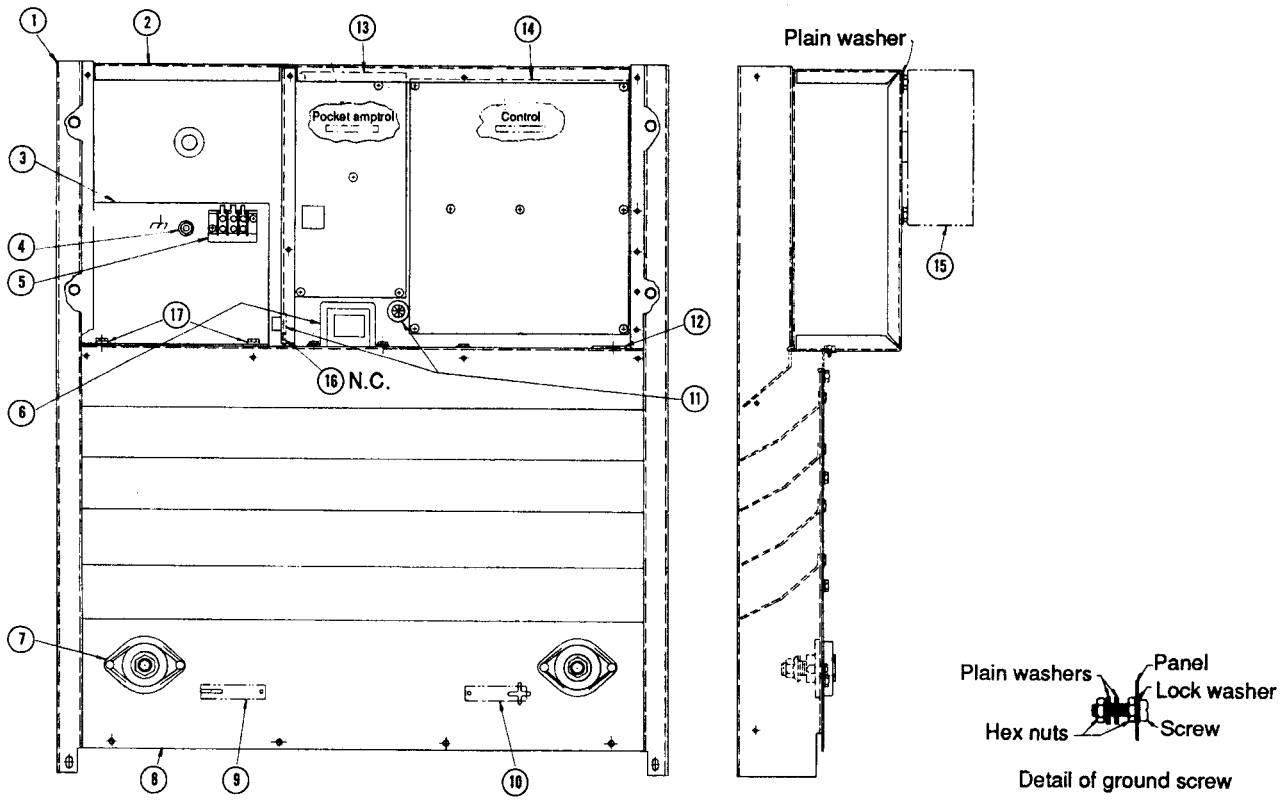
Parts List P-144-D

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Control Box Cover	1
2	Pilot Light	1
3	Power Switch (SW1)	1
	Potentiometer	2
5	Insulation	2
6	Remote Switch (SW2)	1
7	Box Connector	1
8	Access Door	1
	Self Tapping Screw	2
9	Knob	2
10	Plug Button	1
11	Polarity Switch Nameplate	1
12	Nameplate	1
13	Voltmeter (Optional)	1
14	Ammeter (Optional)	1
15	Current Range Switch (SW3) R3R-400 & -500 Only	1
16	Cable Tie Mount	1
	Cable Tie	1

9-25-87R

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

CASE FRONT ASSEMBLY



L6545
9-25-87E

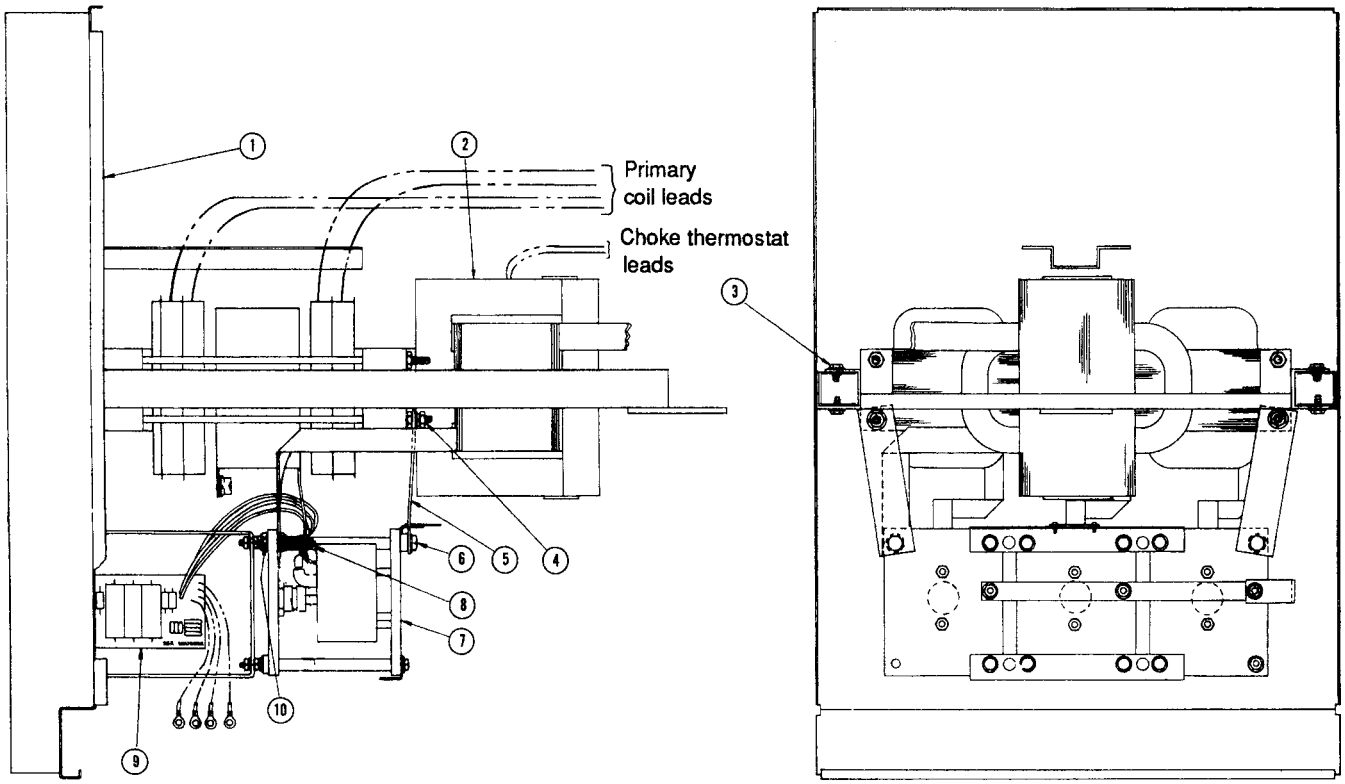
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-144-E

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Front Support and Baffle Assembly	1
2	Control Box Welded Assembly	1
3	Self Tapping Screw	6
	Terminal Strip Bracket	1
	Self Tapping Screw	2
4	Thread Cutting Screw	1
	Lock Washer	1
	Plain Washer	2
5	Hex Nut	2
	Terminal Strip	1
	Number Plate	1
6	Self Tapping Screw	2
	Receptacle, Transformer and Lead Assembly (Pocket Amptrol Only)	1
7	Transformer	1
	Self Tapping Screw	4
	Output Terminal	2
8	Self Tapping Screw	4
	Output Stud Nut	2
	Output Panel	1
9	Self Tapping Screw	8
	Marker "To Work" With Polarity Switch Only	1
10	Self Tapping Screw	2
	Marker "Electrode" With Polarity Switch Only	1
11	Self Tapping Screw	2
	Bushing	2
12	Bushing	1
13	Pocket Amptrol Printed Circuit Board	1
	Expansion Nut	5
	Self Tapping Screw	5
14	Control Printed Circuit Board	1
	Expansion Nut	7
	Self Tapping Screw	7
15	Polarity Switch (Optional)	1
	Polarity Switch Parts See P-61-H	
	Plain Washer	3
	Lock Washer	3
	Hex Nut	3
	Shaft Extension	1
16	Set Screw	1
	Adhesive Backed Rubber Insulation	1
17	Shakeproof Lock Washer	2

9-25-87E

TRANSFORMER, BASE, LIFT BAIL AND RECTIFIER ASSEMBLY



G1628
1-22-82

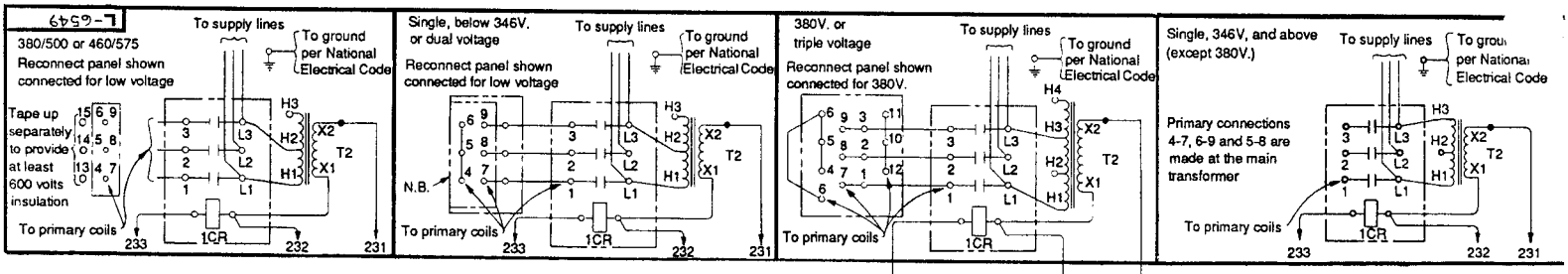
Parts List P-144-F

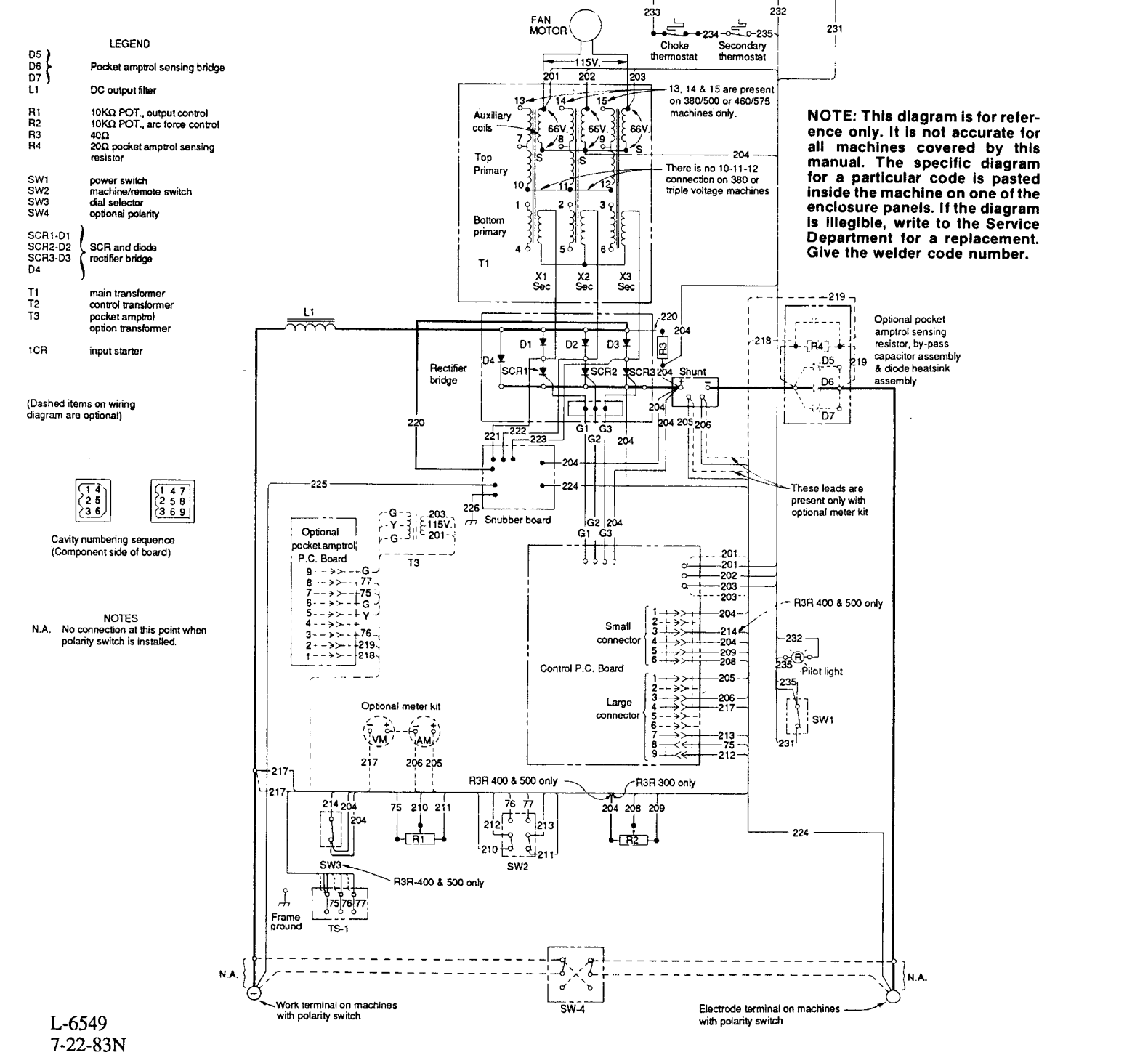
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Base Assembly	1
2	Transformer, Choke & Lift Bail,	
	Includes:	
	Transformer Primary Coils	12
	Transformer Primary Coils	3
	Transformer Auxiliary Coils	3
	Choke Coil	1
	Lift Bail Assembly	1
3	Hex Head Screw	4
	Lock Washer	4
	Plain Washer	4
4	Plain Washer	2
	Lock Washer	2
	Hex Nut	2
5	Brace	2
6	Thread Cutting Screw	2
	Spacer	2
7	Rectifier Assembly, Includes:	1
	Stud Diodes	4
	SCR Heat Sink Assembly	3
	Lock Washer	4
	Hex Nut	4
8	Plain Washer	3
	Lock Washer	3
	Hex Nut	3
9	Snubber Printed Circuit Board	1
10	Hex Head Screw	1
	Plain Washer	2
	Lock Washer	1
	Hex Nut	1

2-2-90

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

R3R-300, -400 and -500

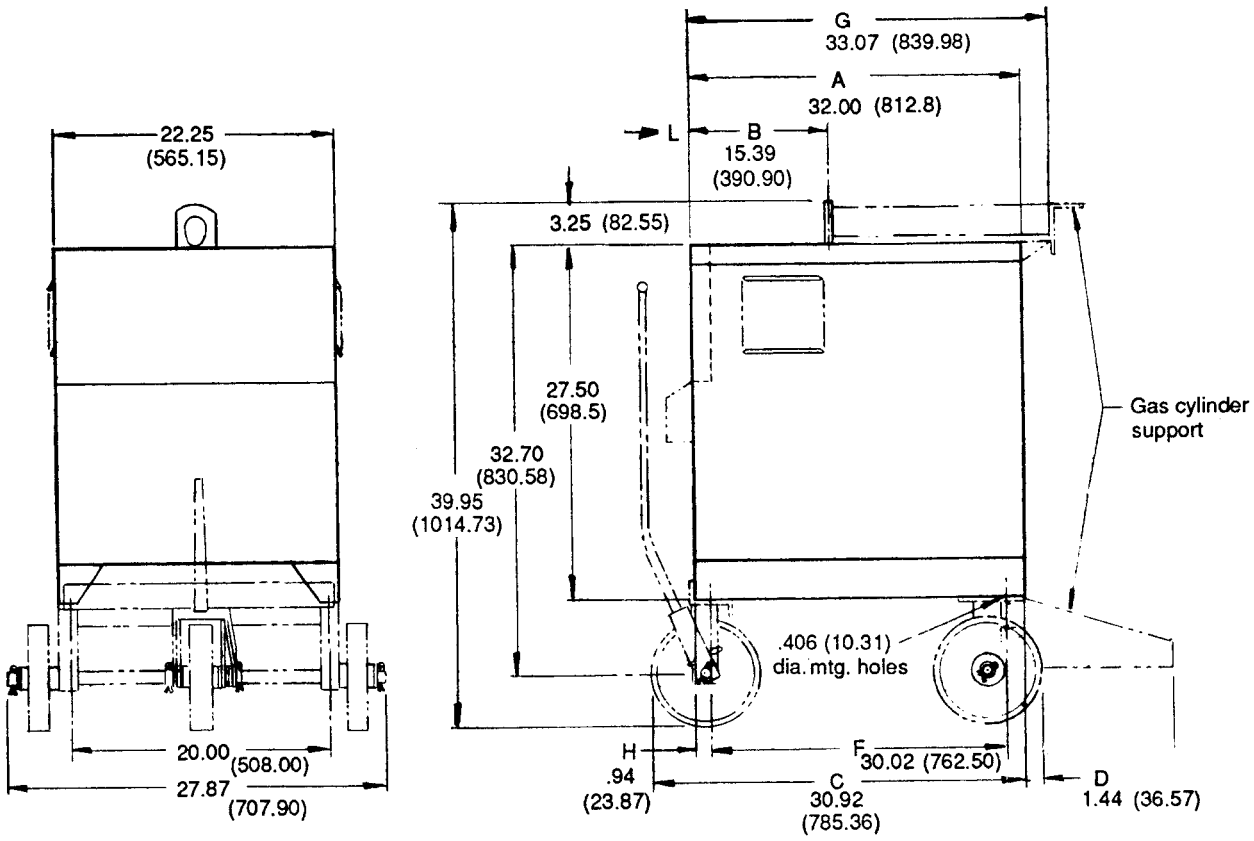




L-6549
7-22-83N

R3R-300, -400 and -500

K817 or K817R (K841 not shown)



All dimensions in inches and (mm).

M-12244-7
Dimension Print
1-20-89A

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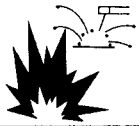
The Lincoln Electric Company operates the oldest and most respected Arc Welding School in the United States at its corporate headquarters in Cleveland, Ohio. Over 60,000 students have graduated. Tuition is low and the training is "hands on".

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.

			
WARNING	• Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground.	• Keep flammable materials away.	• Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	• No toque las partes o los electrodos bajo carga con la piel o ropa mojada. • Aislese del trabajo y de la tierra.	• Mantenga el material combustible fuera del área de trabajo.	• Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	• Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. • Isolez-vous du travail et de la terre.	• Gardez à l'écart de tout matériel inflammable.	• Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	• Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! • Isolieren Sie sich von den Elektroden und dem Erdboden!	• Entfernen Sie brennbarres Material!	• Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	• Não toque partes elétricas e electrodos com a pele ou roupa molhada. • Isole-se da peça e terra.	• Mantenha inflamáveis bem guardados.	• Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	• 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 • 施工物やアースから身体が絶縁されている様にして下さい。	• 燃えやすいものの側での溶接作業は絶対にしてはなりません。	• 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	• 皮肤或濕衣物切勿接觸帶電部件及銲條。 • 使你自己與地面和工件絶緣。	• 把一切易燃物品移離工作場所。	• 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	• 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. • 모재와 접지를 접촉치 마십시요.	• 인화성 물질을 접근 시키지 마시요.	• 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	• لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. • ضع عازلا على جسمك خلال العمل.	• ضع المواد القابلة للاشتعال في مكان بعيد.	• ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

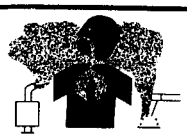
READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCT ION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

NOTES

			⚠
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración. para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。	● 維修前切斷電源。	● 儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استع تعليمات الوقاية لصاحب العمل.

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