

OPERATING MANUAL

IDEALARC® DC-400 (CODE 9200 AND ABOVE*)

IM363

June, 1992

Idealarc DC-400

9200; 9203; 9204; 9205; 9206; 9207;
9208; 9209; 9210; 9211; 9212; 9213;
9214; 9215; 9216; 9313; 9347; 9372;
9373; 9374; 9375; 9388; 9389; 9390;
9391; 9392; 9393; 9394; 9395; 9396;
9397; 9398; 9399; 9400; 9454; 9532;
9563; 9587; 9588; 9589; 9590; 9591;
9592; 9593; 9594; 9595; 9596; 9597;
9616; 9617; 9749



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

*See IM-316 for Codes below 9200.

DAMAGE CLAIMS

When this equipment is purchased, 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 equipment 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 PAGES 2, 3, AND 4.** And, most importantly, think before you act and be careful.

ARC WELDING SAFETY PRECAUTIONS



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



ELECTRIC SHOCK can kill.

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

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

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



ARC RAYS can burn.

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

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



FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion.

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

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

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



CYLINDER may explode if damaged.

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



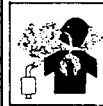
FOR ELECTRICALLY powered equipment.

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



FOR ENGINE powered equipment.

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



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



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



- d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



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

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

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

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
 - a. Les circuits à l'électrode et à la pièce 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 vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
 - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique, ou des grilles métalliques, 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'appliquent 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 où 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 soleil, 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 protéger 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 latéraux 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 accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes 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 fumées 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 phosgène (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 conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce 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 faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

IMPORTANT SAFETY NOTE: EMF CONSIDERATIONS

Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines. EMF fields may interfere with some pacemakers, and **welders having a pacemaker should consult their physician before welding.** Exposure to EMF fields in welding may have other health effects which are now not known.

All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Route the electrode and work cables together. Secure them with tape when possible.
2. Never coil the electrode lead around your body.
3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
4. Connect the work cable to the workpiece as close as possible to the area being welded.
5. Do not work next to welding power source.

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SPECIFICATIONS

Model	DC-400	
Type	K1308-(1)	K1309-(1)
Standard Input Voltages(1)	230/460/3/60	220/380/440/3/50
Input Amps	76 (230/60)	42 (380/50)
Output Rating @ Plus Rating 100% 60% 50%	400 amps/40 volt 450 amps/38 volt 500 amps/40 volt	
Current Range	60-500 (12-40 volts)	
Dimensions(2) H x W x D	27.5 x 22.08 x 33.07 inches (698 x 561 x 840mm)	
Four .406" (10.33mm) Dia. Mounting Holes – Width x Depth	20.00 x 30.02 inches (508 x 762.5mm)	
Net Weight	486 lbs. (220.4kg)	

(1) Several standard input voltages and option packages are available. They are specified by type number. See price book or your local Lincoln distributor.

(2) Overall height including lift bail — 30.75" (781mm).

PRODUCT DESCRIPTION


The DC-400 is an SCR controlled three phase DC power source. It is designed with a single range potentiometer control.

The DC-400 model is designed for all open arc processes including Innershield and all solid wire and gas procedures within the capacity of the machine, plus the capability of stick and TIG welding and air carbon arc gouging up to 5/16" (8mm) diameter. A mode switch selects CV (FCAW, GMAW), CV Submerged Arc, or CC (Stick/TIG). Stick welding performance approaches that of the R3R-500.

The DC-400 is designed to be used with the LN-7, LN-8, LN-9, LN-9 GMA, LN-22, LN-23P or LN-25 semiautomatic wire feeders, the NA-3, NA-5 and NA-5R automatics, and the LT-56 and LT-7 tractors, within the 400 ampere capacity of the machine. The K826 DC-400 Diode Kit option is required to utilize the cold start and cold electrode sensing features of the NA-3, NA-5 and NA-5R.


There are no provisions on the DC-400 for paralleling.

INSTALLATION



WARNING

- 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.



ELECTRIC SHOCK
can kill.

The machine should be located in a clean dry place where there is free circulation of clean air such that air movement in through the front and out through the back will not be restricted. Dirt and dust that can be drawn into the machine should be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown of the machine.

Input Power Connections

By removing the rear access panel the three phase input power can be connected to the three line terminals on the input contactor, and the earth grounding lead to the grounding terminal on the input box floor marked with the \perp symbol. Install the reconnect panel for the proper input voltage per the diagram pasted inside the access panel cover. See table below.

Recommended Input Wire, Grounding Wire and Fuse Sizes
Based on National Electrical Code
3 Phase Welders at 100% Duty Cycle
Ambient Temperature 30°C or Less

60 Hertz		50 Hertz		Copper Wire Size Type 75°C in Conduit		Super Lag Fuse Size in Amps
Input Volts	Input Amps	Input Volts	Input Amps	3 Input Wires	1 Grounding Wire	
230	76	220	73	4 (21mm ²)	6 (13mm ²)	125
460	38	440	37	8 (8.4mm ²)	10 (5.3mm ²)	60
—	—	380	42	8 (8.4mm ²)	10 (5.3mm ²)	60

Output Connections

The output leads are connected to the output terminals marked “+” and “-”. They are located at the lower right and lower left corners of the front panel. Strain relief for the electrode and work cables is provided by routing the leads through the rectangular holes in the base before connecting them to the output terminals. See table which follows.

**Cable Sizes for Combined Lengths of Electrode and
Work Cable (Copper) at 100% Duty Cycle**

Machine Size	Lengths up to 150 ft. (46m)	150 to 200 ft. (46-61m)	200 to 250 ft. (61-76m)
400	2/0 (67mm ²)	3/0 (85mm ²)	4/0 (107mm ²)

Control Cable Connections (excluding the LN-22)

The control cable from the automatic wire feeding equipment is connected to the terminal strips behind the hinged door on the front of the power source. A strain relief box connector is provided for access into the terminal strip section. A chassis ground screw is also provided below the terminal strip marked with the symbol \nearrow for connecting the automatic equipment grounding wire. See the appropriate connection diagram for the exact instructions for the wire feeder being used. A spare hole is provided for an additional box connector if required.

Connection of DC-400 to LN-22

1. Turn off all power.
2. Select “welding terminals always on.”
3. Connect the electrode cable to the output terminal of polarity required by electrode. Connect the work lead to the other terminal.
4. Place the Output Control Switch “at DC-400” position unless a K775 Remote Control is connected to 75, 76, 77 on the DC-400 terminal strip.
5. Place Mode Switch in CV.

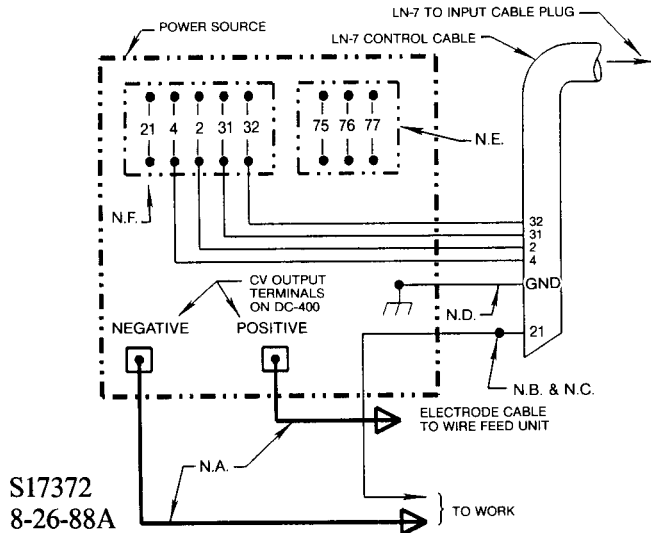
NOTE: The output terminals are energized at all times.

Stick, TIG or Air/Carbon Arc*

1. Turn off all power.
2. Disconnect all wire feed unit control, electrode, and work leads.
3. Place mode switch in the CC position for stick or TIG and CV (FCAW/GMAW) for air carbon arc.
4. For stick, TIG or air carbon arc, select “welding terminals always on.” With the DC-400 connected for stick, TIG or air carbon arc welding, the output terminals will be energized at all times.



*NOTE: If stick welding, TIG welding or air carbon arc cutting is to be done on the DC-400 along with semiautomatic/automatic welding, a K804 Multiprocess Switch is required. If the Multiprocess Switch is not used, all control, electrode, and work leads to wire feed equipment **must** be disconnected from the DC-400 **before** connecting the DC-400 for stick or air carbon arc cutting.


Connection of LN-7 to DC-400



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and position the switch on power source and wire feeder (if equipped) to proper polarity. Also refer to note N.F.

WARNING: TURN INPUT POWER TO POWER SOURCE OFF BEFORE CONNECTING WIRE FEEDER.

- N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications. See LN-7 Operating Manual for proper sizes.
- N.B. If LN-7 is equipped with a meter kit, extend LN-7 control cable lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead may be ordered for this purpose. Connect it directly to the work piece independent of the welding work cable connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of welding work cable is short, less than 25 feet (7.6m), and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the LN-7 voltmeter reading.)
- N.C. Tape up bolted connection if lead #21 is extended.
- N.D. Connect the control cable ground lead to the frame terminal marked  near the power source terminal strip. The power source grounding terminal (marked  and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.
- N.E. If an optional remote voltage control is used, connect it to this terminal strip.
- N.F. If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed. (Does not apply to DC-400 below code 9200 with polarity switch.)

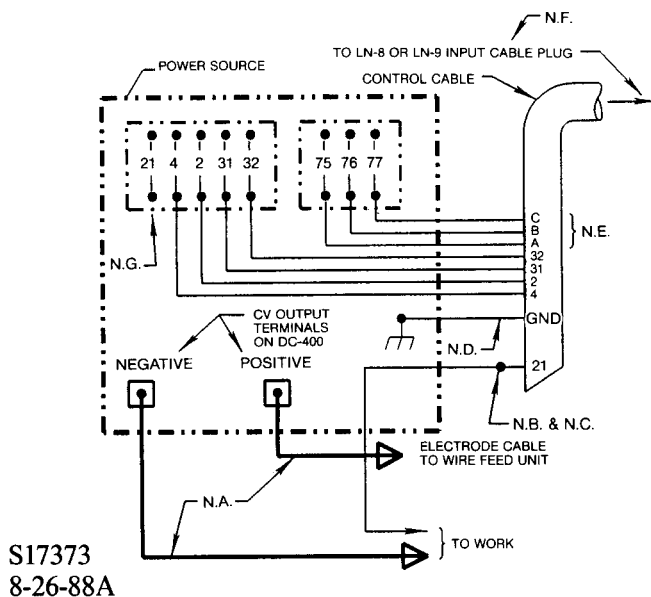


WARNING

ELECTRIC SHOCK can kill.



- Do not operate with covers removed.
- Disconnect power source before servicing.
- Do not touch electrically live parts.
- Only qualified persons should install, use or service this machine.

Connection of LN-8 or LN-9 to DC-400

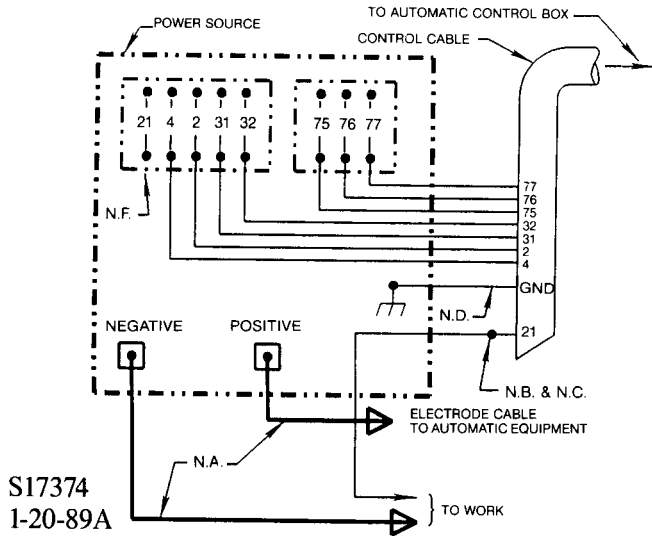


Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and position the switch on power source and wire feeder (if equipped) to proper polarity. Also refer to note N.G.

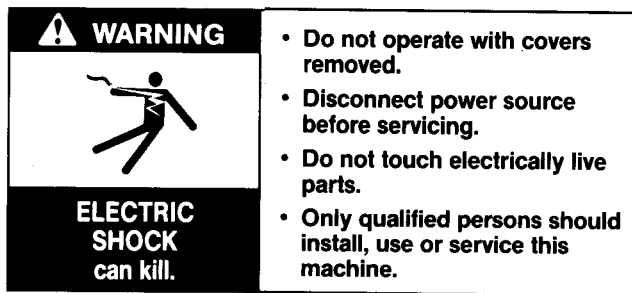
WARNING: TURN INPUT POWER TO POWER SOURCE OFF BEFORE CONNECTING WIRE FEEDER.

- N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.
- N.B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it electrically separate from the welding work lead circuit and connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the wire feeder voltmeter reading.)
- N.C. Tape up bolted connection if lead #21 is extended.
- N.D. Connect the control cable ground lead to the frame terminal marked  near the power source terminal strip. The power source grounding terminal (marked  and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.
- N.E. If using an older LN-8 control cable: connect lead #75 to #75 on terminal strip, connect lead #76 to #76 on terminal strip, connect lead #77 to #77 on the terminal strip.
- N.F. The LN-9 voltage control jumpers must be connected as follows (refer to LN-9 Operating Manual):
White jumper on voltage board to pin 'S':
Blue jumper on voltage board (later units only), or on start board (earlier units), to pin 'B'.
- N.G. If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed. (Does not apply to DC-400 below code 9200 with polarity switch.)

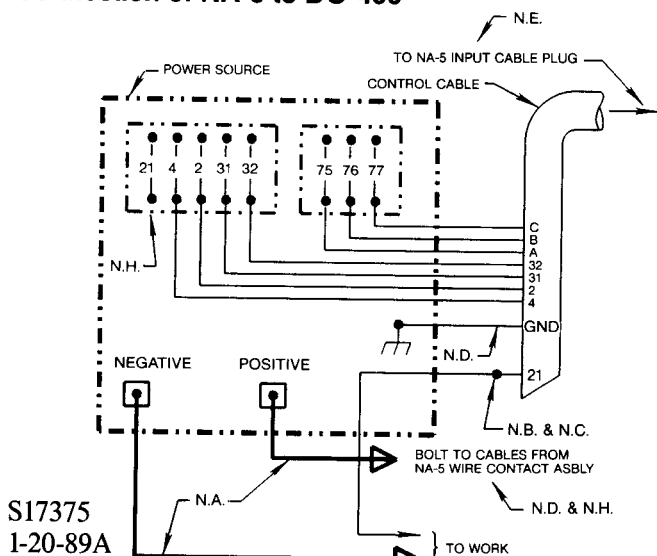
Connection of NA-3, LT-5, or LT-7 to DC-400



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and position the switch on power source (if equipped) to proper polarity. Reverse the leads on the back of the ammeter and voltmeter in the automatic control box. Also refer to note N.F.





Connection of NA-5 to DC-400





Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and position the switch on power source (if equipped) to proper polarity. Refer to NA-5 Operating Manual for required NA-5 control box polarity connections. Also refer to note N.H.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL.



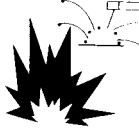

WARNING: TURN INPUT POWER TO POWER SOURCE OFF BEFORE CONNECTING WIRE FEEDER.

- N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.
- N.B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it electrically separate from the welding work lead circuit and connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the wire feeder voltmeter reading.)
- N.C. Tape up bolted connection.
- N.D. Connect the control cable ground lead to the frame terminal marked  near the power source terminal strip. The power source grounding terminal (marked  and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.
- N.E. If a variable voltage board is present in the automatic controls and the DC-400 diode kit or CV-400 or CVI-500 diode option is not used, the jumper lead on the VV board must be connected to pin 'L' to permit the inch down button to operate. This jumper, however, will disable the cold starting/autostop feature of the automatic controls, permitting only hot starting techniques to be used.
- N.F. If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed. (Does not apply to DC-400 below code 9200 with polarity switch.)

WARNING: TURN INPUT POWER TO POWER SOURCE OFF BEFORE CONNECTING WIRE FEEDER.

- N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.
- N.B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it electrically separate from the welding work lead circuit and connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the NA-5 voltmeter reading.)
- N.C. Tape up bolted connection.
- N.D. Connect the control cable ground lead to the frame terminal marked  near the power source terminal strip. The power source grounding terminal (marked ) and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.
- N.E. The jumpers on the NA-5 voltage board must be connected as follows:
Connect red jumper to pin 'S'.
Connect white jumper to pin 'B'.
- When using NA-5 controls above Code 8300 without the optional DC-400 diode kit or CV-400, CVI-500 diode option:** The NA-5 Inch Down button will not operate unless a jumper is connected between the two tab terminals, labeled 'AUTO', located above the transformer on the NA-5 Voltage P.C. board. This jumper, however, will disable the Cold Starting/Auto-Stop feature of the NA-5, permitting only Hot Starting techniques to be used.
- N.G. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 control box.
- N.H. If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed. (Does not apply to DC-400 below code 9200 with polarity switch.)

OPERATION

⚠ WARNING	
	<ul style="list-style-type: none"> • Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground. • Always wear dry insulating gloves.
ELECTRIC SHOCK can kill.	
	<ul style="list-style-type: none"> • Keep your head out of fumes. • Use ventilation or exhaust to remove fumes from breathing zone.
FUMES AND GASES can be dangerous.	
	<ul style="list-style-type: none"> • Keep flammable material away. • Do not weld upon containers which have held combustibles.
WELDING SPARKS can cause fire or explosion.	
	<ul style="list-style-type: none"> • Wear eye, ear and body protection.
ARC RAYS can burn.	

IMPORTANT SAFETY NOTE: This DC Constant Voltage welding power source provides “COLD” electrode when gun trigger is released. This feature and DC Constant Voltage output provide an added margin of safety when welding must be performed under electrically hazardous conditions such as:

- damp locations
- while wearing wet clothing
- on metal structures, or,
- in cramped positions (sitting, kneeling or lying) if there is a high risk of unavoidable or accidental contact with the workpiece or ground.

IMPORTANT SAFETY NOTE: Applies to DC-400's without the Capacitor Discharge Option (K828).

When using a DC-400 power source in CV mode, there will be a small spark if the electrode contacts the work or ground within several seconds after releasing the trigger.

When used with some wire feeders with the electrical trigger interlock in the ON position, the arc can restart if the electrode touches the work or ground during these several seconds.

Be sure to select “welding terminals remotely controlled” for operation with wire feeders that have leads numbered 2 and 4.

Starting the Machine

1. The toggle switch at the extreme right side of the control panel energizes and closes the three phase input contactor from a 115 volt auxiliary transformer. This in turn energizes the main power transformer.
2. The red light below the stop-start toggle switch indicates when the input contactor is energized.
3. Output Control — The output control to the right of the center of the control panel is a continuous control of the machine output. The control may be rotated from minimum to maximum while under load to adjust the machine output.

The machine is equipped with line voltage compensation as a standard feature. This will hold the output constant except at maximum output of the machine, through a fluctuation of $\pm 10\%$ input line voltage.

4. Output Control at DC-400 or Output Control Remote — Switch

The toggle switch on the control panel labeled “Output Control at DC-400” — “Output Control Remote” gives the operator the option of controlling the output at the machine control panel or at a remote station. For remote control, the toggle switch is set in the “Output Control Remote” position and controlled at the wire feed unit control or by connecting a K775 Remote Output Control to terminals 75, 76, and 77 on the terminal strip at the front of the machine. For control at the machine control panel, the toggle switch is set in the “Output Control at DC-400”

(Exception: When used with an LN-9 or NA-5 wire feeder models, the toggle switch must be in the “Output Control Remote” position or automatic shutdown of the LN-9 or NA-5 may occur.)

5. Polarity Selection

Polarity selection is made by appropriately connecting the electrode and work welding cables to either the “positive” stud or to the “negative” stud. Work polarity terminals (+21 and -21) are provided for appropriate connection of the #21 work sensing lead of automatic or semiautomatic equipment.

6. AC 8-Amp Fuse

The AC 8-amp fuse on the control panel is in the 115 volt AC auxiliary power circuit to protect it from excessive overloads or short circuits. This auxiliary power is available at terminals 31 and 32 on the terminal strip on the front of the machine.

7. Mode Switch

The large mode switch on the left side of the machine, labeled “Constant Voltage (Submerged Arc), Constant Voltage (FCAW/GMAW) and Constant Current (Stick/TIG),” is used to select the proper welder characteristics for the process being used.

The CV (FCAW/GMAW) Mode permits the DC-400 to produce essentially a flat output characteristic that can be varied from approximately 12 to 40 volts. In this position, the dynamic characteristics of the machine under welding conditions provides optimum welding characteristics for Innershield welding, other open arc processes including short arc MIG welding, and air carbon arc. Most submerged arc welding can also be done in this mode.

The CV Submerged Arc Mode also produces an essentially flat output characteristic that can be varied from approximately 12 to 40 volts. The dynamic characteristics of the CV Submerged Arc Mode make possible improved submerged arc welding over that possible using the Constant Voltage Innershield Electrode Mode. That improvement is most noticeable on high deposition, slow travel speed welds.

There are no means provided to switch between any of the modes remotely.

Do not change the position of the mode switch if output voltage or current is present as this may damage the switch.

The CC Mode permits the DC-400 to produce a constant current output characteristic through the range of 60 to 500 amps with an open circuit voltage of approximately 57 volts (54V on 50 Hz). Stick welding and TIG are done with this position of the Mode Switch.

8. Arc Force Selector (Effective only in CC mode)

The arc force control is calibrated from one to ten. For most welding, the dial should be set at approximately midrange, 5-6. Adjustments up or down can then be made depending on the electrode, procedures,


and operator preference. 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 and a more forceful arc. Excessive spatter may result if the control setting is too high. For most TIG welding applications adjust this control to minimum for best operating characteristics.

9. Arc Control (effective only in CV FCAW/GMAW mode)

The Arc Control is a tapped switch numbered from 1 to 5 and changes the pinch effect of the arc. This control is most useful in processes that utilize a “shorting” metal transfer and controls the spatter, fluidity, and bead shape. The pinch effect is increased by turning the control clockwise.

For all applications, a good starting point for the arc control is a midrange dial setting of 3. The control can be increased or decreased as desired.

OPTIONAL EQUIPMENT

Remote Output Control (K775) — The K775 consists of a control box with 28 feet (8.5m) of four conductor cable. This connects to terminals 75, 76, 77 on the terminal strip and the case grounding 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 output control on the machine.

Undercarriages (K817, K817R, K841) — For easy moving of the machine, optional undercarriages are available with either steel (K817) or rubber tired (K817R) wheels, or a platform undercarriage (K841) with mountings for two gas cylinders at rear of welder.

Amptrol Adapter Cable (K843) — A 12” (.30m) long cable is available for easy connection of standard K812 Hand Amptrol or K870 Foot Amptrol. The Amptrol will control the same range of output as the current control on the welder. (If a smaller range of control is desired for finer adjustment, a K775 Remote may be used in conjunction with the Amptrol Adapter Cable Kit. Connection information is included with the Amptrol Adapter Cable Kit.)

Multi-Process Switch (K804) — Factory or field installed kit that mounts on the front of the DC-400. The switch has three positions: Positive semiautomatic/automatic, negative semiautomatic/automatic, and stick/air carbon arc. Required when using the DC-400 for both semiautomatic/automatic and stick/air carbon arc. Factory installed unit also includes ammeter and voltmeter. For details on the Multiprocess Switch, see page 12.

Capacitor Discharge Circuit (K828) — Field installed circuit that mounts inside the DC-400. Recommended when:

1. DC-400 is used in conjunction with any LN-23P or older LN-8 or LN-9 semiautomatic wire feeder. Eliminates possible arc flash at start or restart of weld when trigger interlock is used. Not required with current LN-8 (above Code 8700), or LN-9's with serial numbers above 115187 (manufactured after 12/83), or any LN-9 having an L-6043-1 Power PC Board.
2. DC-400 is used with an LN-22 equipped with an older K279 Contactor-Voltage Control Option. Eliminates electrode overrun when gun trigger is released. Not required when current K279 (above Code 8800) is used.
3. DC-400 is used with any semiautomatic wire feeder and possible small spark with rapid restriking is objectionable.

Hi-Freq™ (K799) — Field installed kit that supplies the high frequency plus gas valve for DC TIG welding. The DC-400 is shipped with proper R.F. bypass circuitry installed to protect the control circuit when welding with a HI-FREQ unit.

Water Valve Option Kit (K844) — For use with K799 when TIG welding with water-cooled torches.

Diode Kit (K826) — This field installed option mounts to the front of the DC-400. It allows the use of the cold start and cold electrode sensing features of the NA-3, NA-5 or NA-5R. The Diode Kit is connected to the positive output terminal of the DC-400. Consult the Diode Kit nameplate for work and electrode lead connections. Connect the wire feeder voltage sensing lead (#21) directly to the workpiece when using the Diode Kit.

MULTIPROCESS SWITCH

Description

A multiprocess switch has been designed for use with the DC-400 or DC-600. With this switch installed on the DC-400, it permits easy changing of the polarity of the wire feed unit connected and also provides separate terminals for connection of stick or air carbon arc. The Multiprocess Switch is available as either a factory installed or field installed option.

NOTE: IF THE DC-400 IS TO BE USED FOR BOTH SEMIAUTOMATIC/AUTOMATIC AND STICK/AIR CARBON ARC, THEN A MULTIPROCESS SWITCH IS REQUIRED.

Design

The Multiprocess Switch consists of a 3-position switch assembly that is mounted in a sheet metal enclosure that has two output terminals on each end of the box. The two terminals on the left side of the box are for connection of wire feed electrode and work leads. The two terminals on the right side of the box are for connection of work and electrode for stick or air carbon arc.

The switch mounts to the front of the DC-400 by means of a bracket that fastens to the case sides. Two 4/0 (107mm²) leads connect the switch assembly to each output stud.

Connections

1. Connect wire feed unit electrode and work cables through the rectangular strain relief holes in the base of the DC-400 to the output studs on the left side of the box.
2. Connect wire feeder control cable and make other terminal strip connections as specified on the connection diagram for the Lincoln wire feeder being used. "Electrode" and "Work" are connected to the left side of the Multiprocess Switch.
3. Connect stick or air carbon arc electrode and work cables through the rectangular strain relief holes in the base of the DC-400 to the output studs on the right side of the box.
4. Select "Welding Terminals Remotely Controlled".

Operation

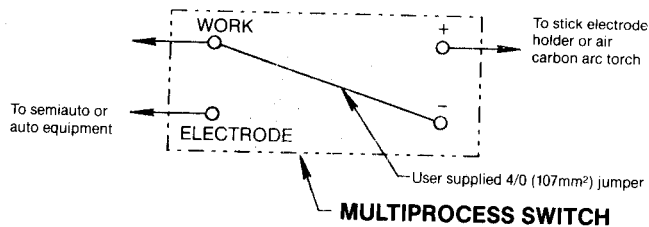
The operation of the switch is as follows:

A semiautomatic or automatic wire feed unit electrode and work cables are connected to the terminals on the left side of the box. Stick or air carbon arc electrode and work leads are connected to the terminals on the right side of the box. There are three positions on the switch. With the switch in the left position, the wire feed terminals are electrode negative. In the center position, the wire feeder terminals are electrode positive. In both the left and center switch position, the right side stick terminals are disconnected. In the right switch position, the wire feed terminals are disconnected from the DC-400 and the stick terminals are connected. The polarity of the stick terminals is as marked on the end of the box. To change polarity, the electrode and work leads must be interchanged. In the stick position, the stick terminals are energized at all times.

IMPORTANT: When switching from *VV* to *CV*, change the multi-process switch first then change the DC-400 mode switch. When switching from *CV* to *VV* change the DC-400 mode switch to *VV* first, then change the multi-process switch. Failure to follow these procedures will result in damage to the DC-400 mode switch.

Connections (for those applications where it is not necessary to have separate work cables for stick and semiautomatic welding)

If both stick and semiautomatic welding is done on the same workpiece, only one work lead is required. To do this, connect a 4/0 (107mm²) jumper from the work terminal on the semiautomatic side to the terminal to be used for work on the stick side. The work lead from the semiautomatic side then serves as the work lead for both semiautomatic and stick welding.



To change stick polarity, reverse the leads at the (+) and (-) terminals on the right side of the Multiprocess Switch.

NOTE: When a DC-400 equipped with Multiprocess Switch is mounted on an undercarriage, the undercarriage handle in the resting position can hit the case of the Multiprocess Switch. This does no harm, but if the user desires, a 1/4" or 3/8" bolt and nut may be placed in the hole

in the undercarriage tow bar to limit the travel of the undercarriage handle.

SAFETY PRECAUTIONS: The units may be stacked three high by observing the following safety precautions.

- A. Make sure the first or bottom unit is sitting on a level, well supported surface.
- B. The units must be stacked with their fronts flush, making sure the two holes in the base rails of the unit being stacked on top are over the two pins located on the top front corners of the unit it is being stacked on.

MAINTENANCE

WARNING

- 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.

ELECTRIC SHOCK
can kill.

Routine 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 machine at regular intervals.
3. In extremely dusty locations, dirt may accumulate on the remote control terminal strip. Wipe or blow this terminal strip off at regular intervals. This is particularly important in damp locations.

TROUBLESHOOTING CHART

Trouble	Cause	What To Do
Input contactor (CR1) chatters.	Faulty input contactor (CR1). Low line voltage.	Repair or replace. Check input power.
Machine input contactor does not operate.	Supply line fuse blown. Contactor power circuit dead. Broken power lead. Wrong input voltage. Primary or secondary thermostats open.	Replace if blown — look for reason first. Check pilot transformer T2 and associated leads. Check input voltage at contactor. Check voltage against instructions. Check for overheating; make sure fan is operating and there is no obstruction to free air flow. Replace faulty thermostats.
	Open input contactor coil.	Replace coil.
	Power "on/off" switch (S1) not closing.	Replace switch.

TROUBLESHOOTING CHART *(continued)*

Trouble	Cause	What To Do
Machine input contactor operates, but no output when trying to weld.	Electrode or work lead loose or broken.	Repair connection.
	Open main transformer (T1) primary or secondary circuit.	Repair.
	Defective Control PC Board.	Replace. See Procedure for Replacing PC Boards.
Machine has minimum output and no control.	Terminals 75, 76, or 77 grounded to positive output.	Check 75, 76, or 77 for ground to positive output circuit. Nearly zero ohms to ground indicates a grounded circuit. A value greater than a few thousand ohms is normal. Self-restoring fuses on PC board automatically reset within a few seconds after ground is cleared.
Machine has high output or pulsing output and no control.	Terminals 75, 76, or 77 grounded to negative output.	Check 75, 76, or 77 for ground to negative output circuit. Nearly zero ohms to ground indicates a grounded circuit. A value greater than a few thousand ohms is normal. Self-restoring fuses on PC board automatically reset within a few seconds after ground is cleared.
Machine has low output and no control.	Output control Machine/Remote switch (S4) in wrong position.	Check position of switch.
	Output control switch faulty.	Check switch and replace if faulty.
	Open in feedback circuitry.	Check wiring and control PC board connections.
	Faulty Control PC Board.	Replace. See Procedure for Replacing PC Boards.
Machine does not have maximum output.	Output control potentiometer circuit open (lead 75).	Check and replace potentiometer if faulty. Check wiring of lead #75.
	One input fuse blown.	Check and replace if blown after checking for reason for blown fuse.
	One phase of main transformer open.	Check for open and repair.
	Faulty Control PC Board.	Replace. See Procedure for Replacing PC Boards.
Machine will not shut off.	Output control potentiometer defective.	Check and replace if faulty.
	Output control potentiometer leads 210, 211, or 75 open.	Check and repair broken leads.
	Input contactor contacts frozen.	Check and replace if necessary.
	Defective On/Off switch, S-1	Replace.
Variable or sluggish welding arc.	Poor work or electrode connection.	Check and clean all connections.
	Welding leads too small.	Check table in instruction manual.
	Welding current or voltage too low.	Check procedures for recommended settings.
	Defective main SCR bridge.	Check and replace if defective.
	Microswitch S4D or S4D actuator defective.	Check and replace if defective. (If S4D actuator is found defective, replace mode switch cam also.)

TROUBLESHOOTING CHART *(continued)*

Trouble	Cause	What To Do
Output control not functioning on the machine.	Output control switch in wrong position.	Place switch in "Output Control at DC-400"
	Faulty output control switch.	Check and replace if found faulty.
	Faulty output control potentiometer.	Check and replace if found faulty.
	Leads or connections open in control circuit.	Check lead continuity and connections for an open and repair if necessary.
	Faulty Control PC Board.	Replace. See Procedure for Replacing PC Boards.
Output control not functioning on remote control.	Output control switch in wrong position.	Place switch in "Output Control Remote."
	Faulty output control switch.	Check and replace if found faulty.
	Faulty remote control potentiometer.	Check and replace if found faulty.
	Leads or connections open in control circuit.	Check all leads and connections, internal or remote, for continuity; repair if necessary.
	Faulty Control PC Board.	Replace. See Procedure for Replacing PC Boards.
Poor arc striking with semi-automatic or automatic wire feeders.	Defective start circuit.	Check start board and reed switch CR3.
	Poor work connection.	Work connection must be adequate for application.
	Improper procedures.	Adjust procedures for improved starting.
	Defective Control PC Board.	Replace. See Procedures for Replacing PC Boards.
Poor arc characteristics.	Start circuit energized at all times (reed switch not closing).	Short reed switch leads together. If welding improves, replace reed switch.
	Start board defective.	If problem is still present with reed switch shorted, unplug start board. If problem disappears, replace start board.
	Defective Control PC Board.	Replace. See Procedure for Replacing PC Boards.
	Capacitor(s) in output circuit failed. A failure is indicated if the small vent plug on top of a capacitor is raised or blown out.	Replace entire bank of capacitors. Do not replace individual capacitors. WARNING: The fluid in these capacitors is toxic. Avoid contact with any portion of your body. Clean up vented fluid using rubber gloves and a water dampened cloth. Any fluid which gets on skin, clean with soap and water.
Arc Control has no effect in CV (FCAW/GMAW) mode with short circuit transfer processes.	Defective R1, L1, S4D, S4D actuator or S5.	Check and replace if found defective. (If S4D actuator is found defective, replace mode switch cam also.

TROUBLESHOOTING PROCEDURES

Procedure for Replacing PC Boards

When a PC board is suspected of being defective, the following procedure must be followed:

1. Visually inspect the PC board. If the board has fuses, check to see if any are blown. Are any of the components damaged? Is a conductor on the back side of the board damaged? If electrical damage is visible on the PC board, inspect the machine wiring for grounds or shorts to avoid damaging a new PC board. Install a new PC board only after a visual inspection of the PC board and machine wiring is satisfactory.
2. If the problem is remedied by a new PC board, install the old PC board and see if the problem still exists. If the problem does not return with the old board:
 - a. Check the PC board harness plug and PC board plug for contamination, corrosion or oversize.
 - b. Check leads in the harness for loose connections.

Connecting the Remote Control to the Machine.

Extreme caution must be observed when installing or extending the wiring of a remote control. Improper connection of this unit can lead to failure of the output control rheostat or the control circuit. 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. Be very careful not to ground the cable when in use and don't let the lugs touch against the case.

Output Voltage

The open circuit voltage of the machine should be adjustable from 10 to 42 volts in CV. In the CC mode, the open circuit voltage should be approximately 57 volts (54 volts on 50 Hz) except at near minimum settings of the output control where it may be lower. If any other condition exists, refer to the Troubleshooting Guide.

Fault Protection Operation

The overload protection circuit, in the Control Board, will limit the welding current (heat) to 550 amps if a short or overload is applied to the machine.

Recommended Cable Sizes

Cable Sizes for Combined Lengths of Electrode and Ground Cable					
Machine Size	Lengths up to 50 ft. (15m)	50-100 ft. (15-30m)	100-150 ft. (30-46m)	150-200 ft. (46-61m)	200-250 ft. (61-76m)
400	2/0 (67mm ²)	2/0 (67mm ²)	2/0 (67mm ²)	3/0 (85mm ²)	4/0 (107mm ²)

Checking Snubber Circuit

In case of an SCR malfunction or failure, the snubber assembly should be checked. Turn the machine off and remove the sides of the machine. (See the Parts List at the back of this manual for the exact location.)

Visually inspect the snubber assembly for overheated components or damaged components.

Checking Output Control Rheostat on Machine

Turn machine off. Remove the arc control switch knob.

Remove the control panel and screws and open the front cover. (If machine has a mode switch, the switch knob must also be removed.)

Turn the output control switch to remote.

Disconnect the harness plug from the Control Board.

With an ohmmeter on X1K, connect it to lead 210 and 75 on R4.

Exercise caution to avoid damaging POT taps.

Rotate the output control rheostat. The resistance reading should be from around zero to 10K ohms. Check the resistance reading between 77 and 75 on the terminal strip. The reading must be 10K ohms. No reading will indicate an open rheostat and a low reading will indicate a shorted or partially shorted rheostat; in either case, replace.

Input Contactor Toggle Switch Check

1. Turn off the machine power input. S-1 has 110 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.

Remote Control Check

Disconnect the remote output 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 ohms. Repeat with ohmmeter across 77 and 76 with same results. Connect ohmmeter across 75 and 77. The reading should be 10K ohms. 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.

Power Rectifier Bridge Assembly Checking Procedure

CAUTION: The rectifier bridge tests outlined below will identify the most common defects found in power diodes or power silicon controlled rectifiers. If a bridge problem still exists after test, please call a Lincoln Field Service Shop. Further evaluation of diodes or silicon controlled rectifiers may require laboratory equipment.

1. Bridge and Device Isolation (See Parts List at the back of this manual for the exact location.)

Disconnect the following leads from the bridge, shown in Diagram 1:

- a. Unplug P3 (G1, G2, G3, and 204) from the Control PC Board.
- b. Unplug P5 from the Snubber PC Board.
- c. Secondary leads X1, X2, and X3 from the anodes of the SCR's and cathodes of the diodes.
- d. Disconnect positive bridge lead from shunt and positive capacitor bank lead and from shunt and positive capacitor bank lead and from lug with triple 204 leads.
- e. Perform following steps 2 and 3. If diodes and SCR's are not shorted, bridge test is completed. If any device appears shorted, disconnect the cathode lead of each diode (4 total) and repeat steps 2 and 3.

2. Power Diode Test

- a. Establish the polarity of the ohmmeter leads and set to X10 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.

3. 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. If gate circuit reads zero ohms, check gate harness for shorts between gate leads and 204 before replacing SCR.

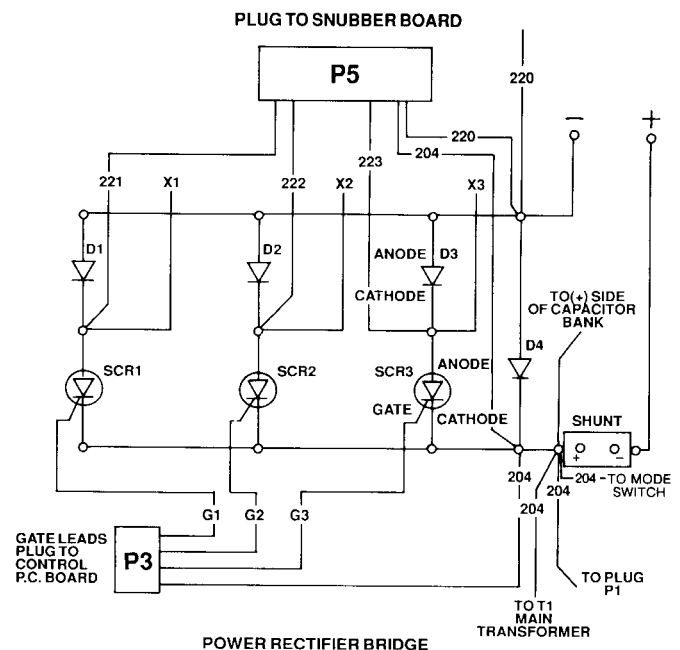
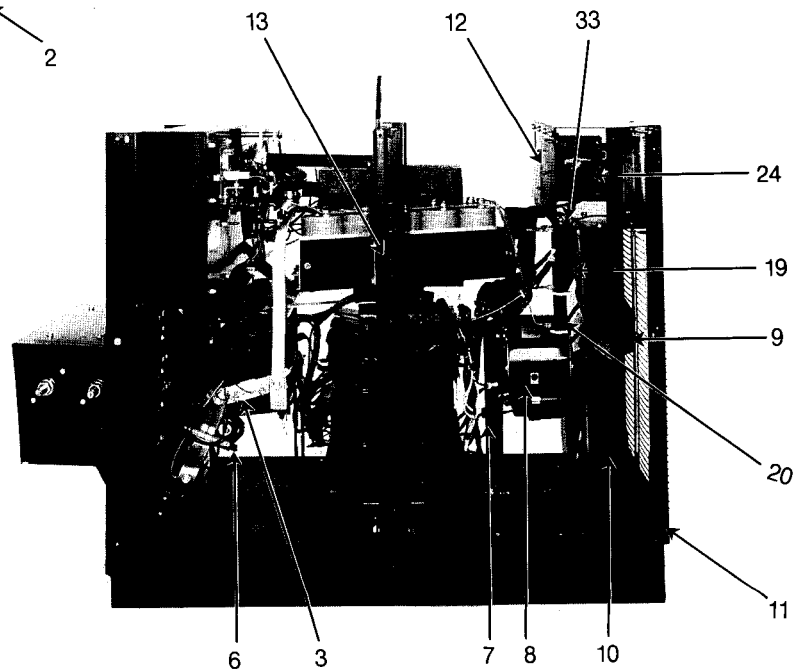
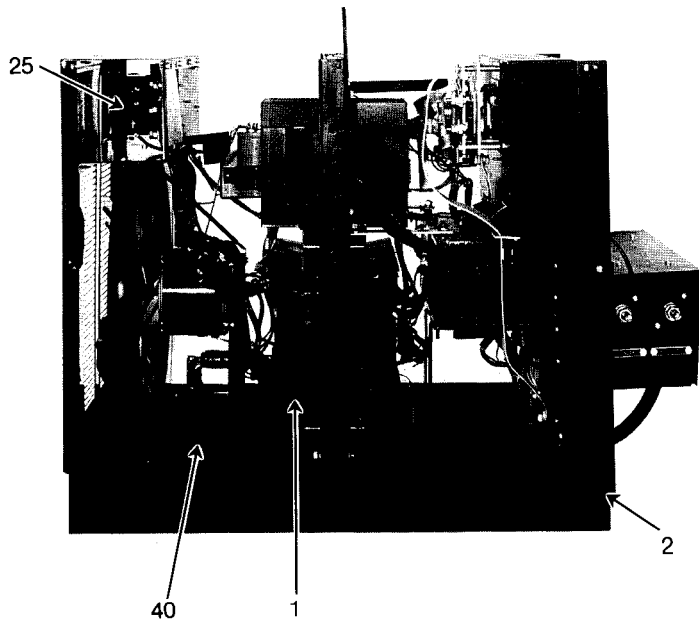
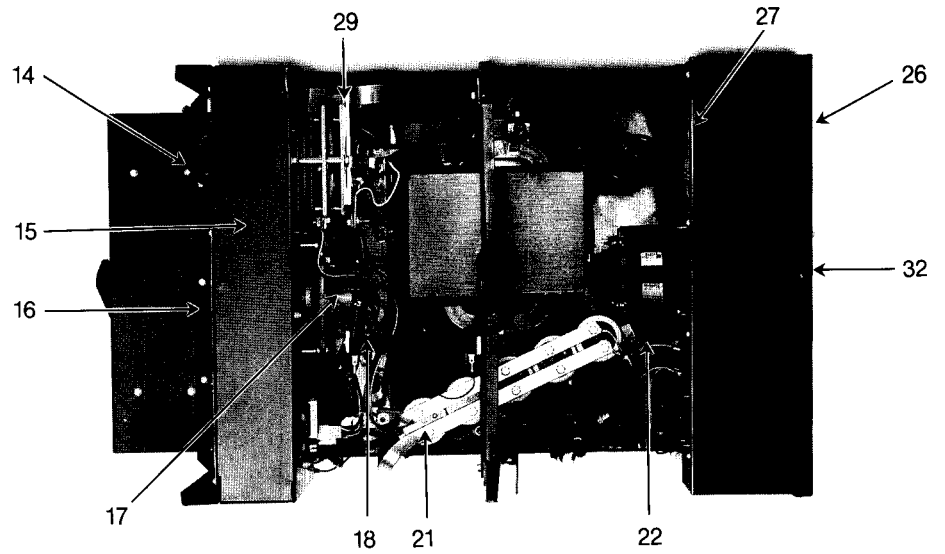


DIAGRAM 1

GENERAL ASSEMBLY



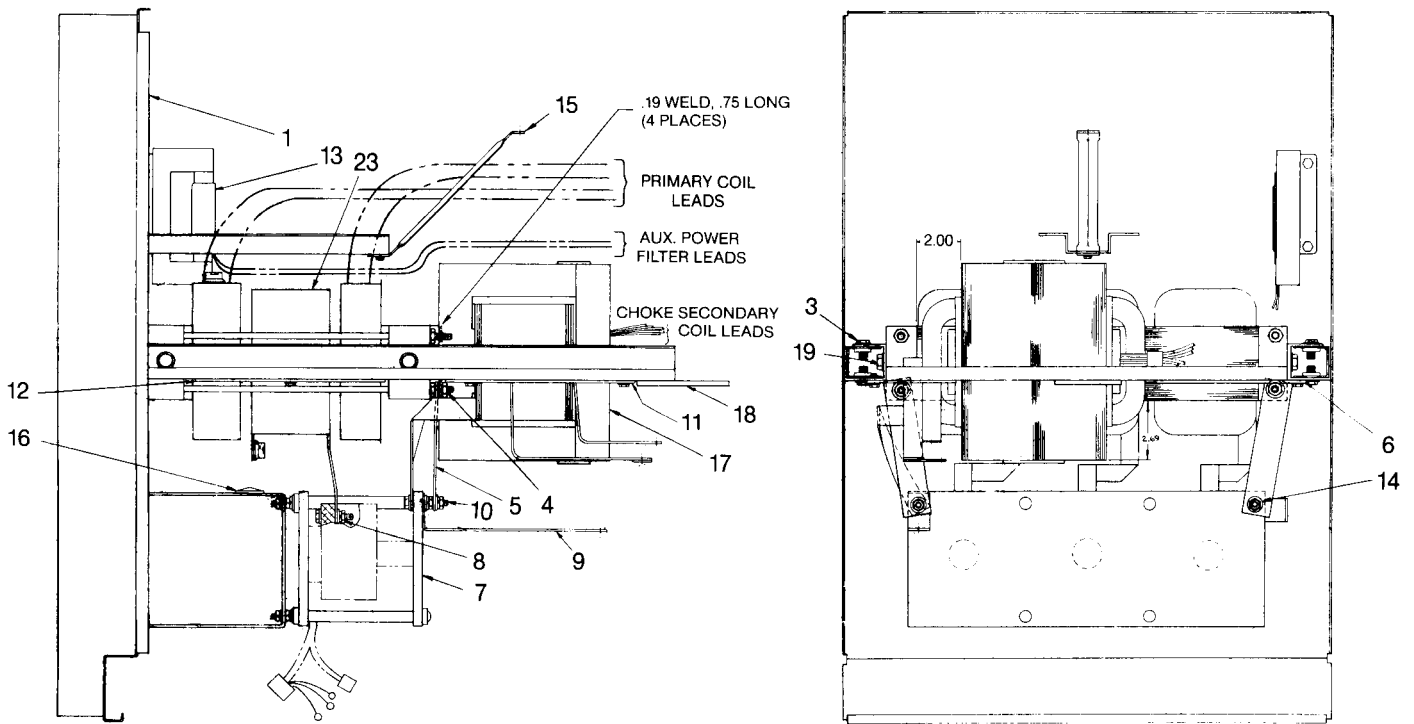
G1827
10-2-87F

Parts List P-179-C

ITEM	PART NAME & DESCRIPTION	NO. REQ'D	ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Main Transformer Assembly	1	22	Capacitor Brace	1
2	Case Front Assembly	1	24	Control Transformer	1
3	Shunt	1	25	Contact	1
6	Reed Switch Assembly, Includes:	1	26	Input Access Door	
7	Reed Switch	1	27	Reconnect Panel (All Single Voltages Below 400V except 380V & all Dual Voltage	
8	Bushing	1		Machines except 380/500 & 460/575V	1
9	Fan Motor	1		Reconnect Panel (380/440/560 & 380V	1
10	Fan Blade	1		Machines)	
11	Fan Baffle	1	27	Reconnect Panel (230/460/575V Machines)	1
12	Rear Panel	1		Panel Connecting Links (2 Holes) (All	As Req'd
13	Input Box	1		Machines)	
14	Capacitor Mounting Bracket	1		Panel Connecting Links (3 Holes) (Triple &	As Req'd
15	Mode Switch Handle (Optional)	1	29	380V Machines Only)	1
16	Control Box Cover Assembly	1		Lead Insulating Panel	1
17	Control Handle	1	32	Ground Decal	1
	Shaft Extension	1	33	Bushing	1
	Arc Control Switch	1	40	Capacitor Discharge Ass'y (Optional), Includes:	1
	Switch Spacers	2		Resistor (R6 & R7)	2
18	Resistor (R1)	1		Round Head Screw	2
	Round Head Screw	1		Insulating Washer	4
	Insulating Washer	2		Plain Washer	2
	Lock Washer	1		Lock Washer	2
	Plain Washer	1		Hex Nut	2
	Hex Nut	1		Relay (CR4)	1
19	Resistor (R2)	1		Fuse Holder	1
	Round Head Screw	1		Fuse	1
	Insulating Washer	2	41	Optional Multi-Process Switch Ass'y (K804)	1
	Lock Washer	1		Parts Orders ref. P-126-F	
	Plain Washer	1		Multi-Process Switch Brackets	2
	Hex Nut	1			
20	Resistor (R3)	1		Parts Not Illustrated	
	Round Head Screw	1		Roof	1
	Insulating Washer	2		Side Panel	2
	Lock Washer	1		Lift Bail Cover Seal	1
	Plain Washer	1		Ground Warning Decal	1
	Hex Nut	1		Caution Decal — Back of Control Box Above	
21	Capacitor Bank, Includes:	1		Rectifier	1
	Capacitors	5			
	Insulation	1			

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

MAIN TRANSFORMER ASSEMBLY



G1826
7-24-87

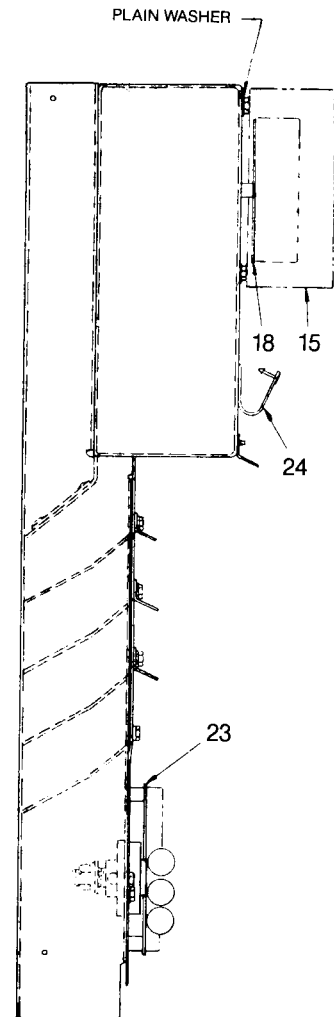
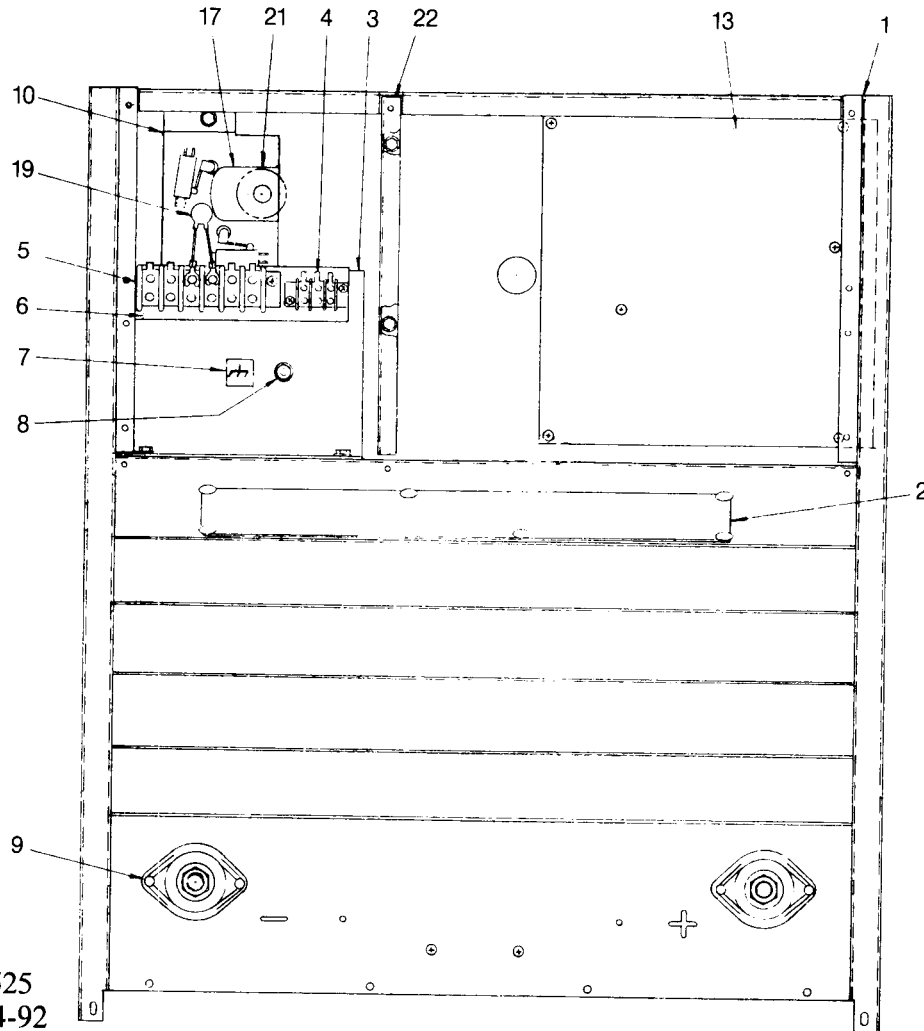
Parts List P-179-D

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Base Assembly	1
2	Joint Compound	.003 oz.
3	Hex Head Cap Screw	4
4	Lock Washer	4
	Plain Washer	4
	Plain Washer	2
5	Lock Washer	2
	Hex Nut	2
	Brace	2
6	Capacitor Baffle	1
	Thread Forming Screw	1
7	Three Phase Bridge Assembly	1
8	Lock Washer	4
	Hex Nut	4
	Plain Washer	3
9	Lock Washer	3
	Hex Nut	3
	Lead-Bridge Neg. to Mode Switch	1
10	Hex Head Cap Screw	1
	Plain Washer	3
	Lockwasher	2

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
11	Hex Nut	2
	Choke Baffle	1
	Thread Forming Screw	2
12	Insulation (Baffle)	2
	Thread Forming Screw	2
13	Auxiliary Power Filter	1
14	Thread Forming Screw	2
	Plain Washer	1
	Lock Washer	1
15	Hex Nut	1
	Fan Motor Bracket Stiffener	1
	Self Tapping Screw	1
16	Cable Tie Mount	2
17	Welded Choke Assembly	1
18	Lift Bail Assembly	1
19	Thread Forming Screw	4
20	Power Harness	1
21	.750 Wide Tape	6 ft.
22	.375 Wide Tape	1.6 ft.
23	Transformer Assembly	1

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

CASE FRONT ASSEMBLY



L7525
1-24-92

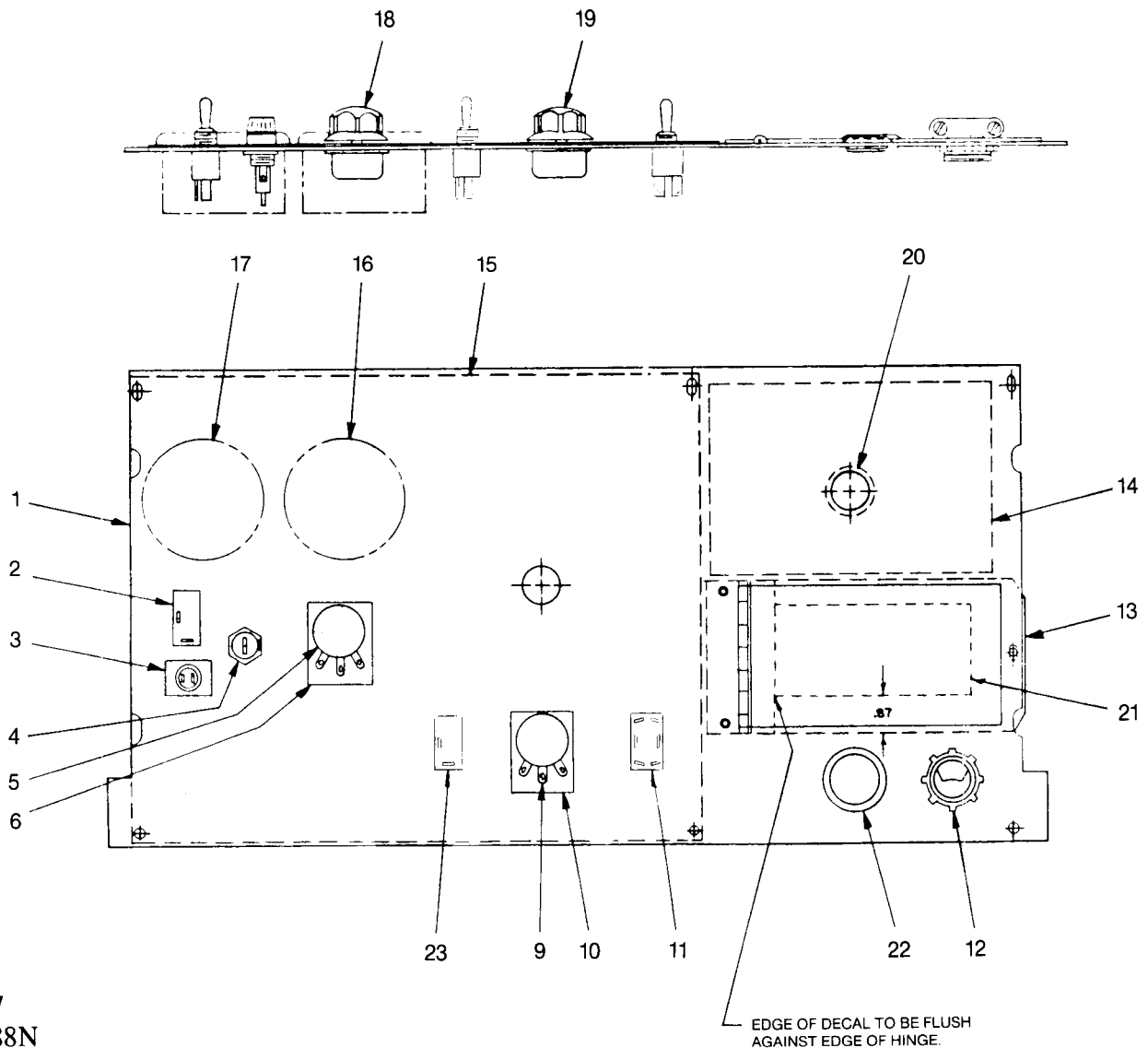
Parts List P-179-E

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Case Front Support, Louvers & Control Box	1
2	Warning Plate	1
	Fastener Button	6
3	Terminal Strip Bracket	1
	Lock Washer	2
	Self Tapping Screw	2
4	Terminal Strip	1
5	Self Tapping Screw	2
	Terminal Strip	1
6	Self Tapping Screw	2
7	Number Plate	1
	Decal (Chassis Ground)	1
8	Thread Forming Screw	1
	Lock Washer	1
	Plain Washer	2
9	Hex Nut	2
	Output Terminal Assembly	2
	Self Tapping Screw	4
10	Micro Switch Assembly	1
	Self Tapping Screw	2

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
13	P. C. Board (Control)	1
	Expansion Nut	6
	Self Tapping Screw	6
15	Mode Switch	1
	Plain Washer	3
	Lock Washer	3
17	Hex Nut	3
	Cam	1
	Set Screw	1
18	P. C. Board (Starting)	1
	Expansion Nut	2
	Self Tapping Screw	2
19	Capacitor Assembly (C6)	1
21	Plug Button	1
22	Control Box Divider	1
23	Self Tapping Screw	2
	P. C. Board (Snubber)	1
	Self Tapping Screw	4
24	Cable Hanger	3
25	Cable Tie	1

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

CONTROL BOX COVER ASSEMBLY



L7527
2-12-88N

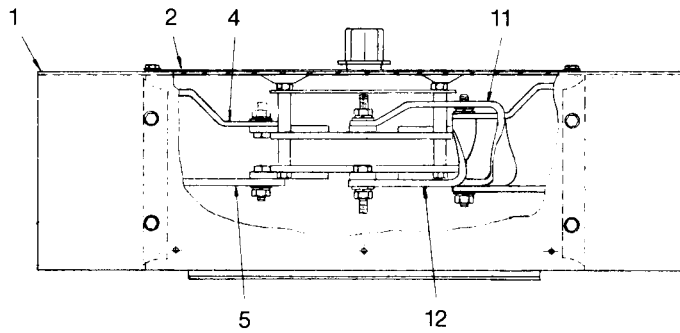
Parts List P-179-F

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Control Box Cover	1
2	Power Switch (S1)	1
3	Pilot Light	1
4	Fuse Holder	1
5	Fuse (F1)	1
6	Potentiometer (R4)	1
9	Potentiometer (R5)	1
10	Insulation	1
11	Output Control Switch (S2)	1
12	Box Connector	1
13	Access Door Assembly	1
14	Self Tapping Screw	2
15	Mode Switch Nameplate	1
15	Nameplate	1

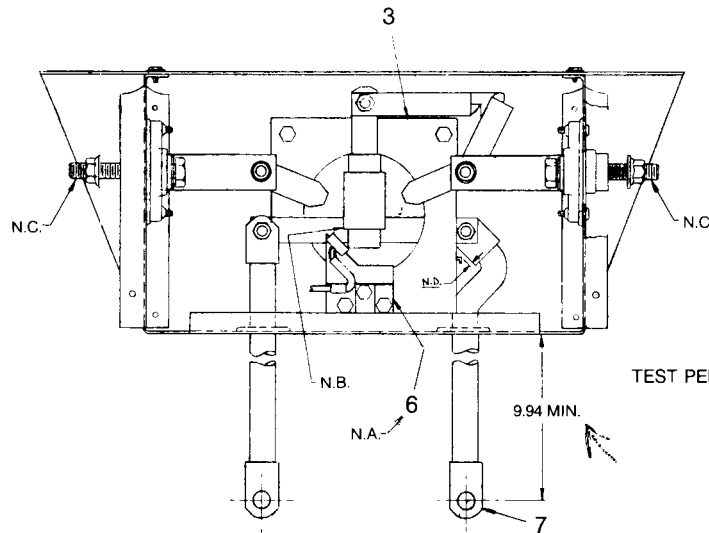
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
16	Ammeter	1
17	Plain Washer	4
17	Voltmeter	1
18	Plain Washer	4
18	Knob	1
19	Knob	1
20	Button Plug	1
21	Warning Decal	1
22	Button Plug	1
23	Welding Terminals Switch (S3)	1
24	Control Harness*	1
25	Meter Harness*	1
*These items not shown		

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

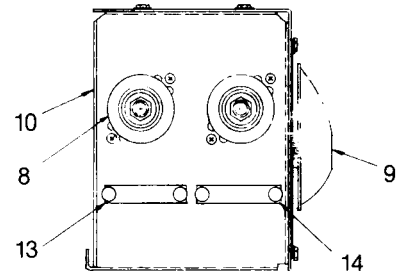
K804 MULTI-PROCESS SWITCH



NOTE: Micro-Switch should not be actuated when multi-process switch is in either the semi-automatic electrode positive or electrode negative position or any point in between.



TEST PER E2465



- N.A. ITEM 6 TO BE ADJUSTED FOR ACTUATION WHEN SWITCH IS APPROXIMATELY 80-90% OF ITS FULL STICK POSITION.
- N.B. PERMISSIBLE TO FILE CORNER IF REQUIRED FOR PROPER OPERATION.
- N.C. AT FINAL ASSEMBLY COAT OUTPUT STUDS AND NUTS WITH A LIGHT FILM OF E-1893 RUST PREVENTATIVE SOLVENT.
- N.D. POSITION ITEM 7 TO OBTAIN .125 MIN. CLEARANCE TO LEAF SPRING OF ITEM 3. PUSH LEAF SPRING TO EXTREME POSITION TO PRODUCE THE MIN. POSSIBLE CLEARANCE WHEN MAKING MEASUREMENT.

L6203
11-30-89A

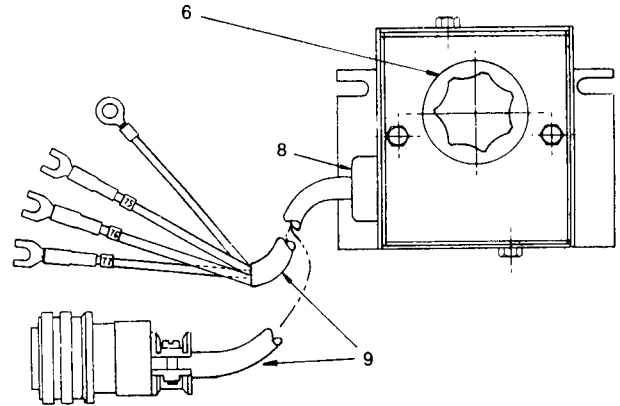
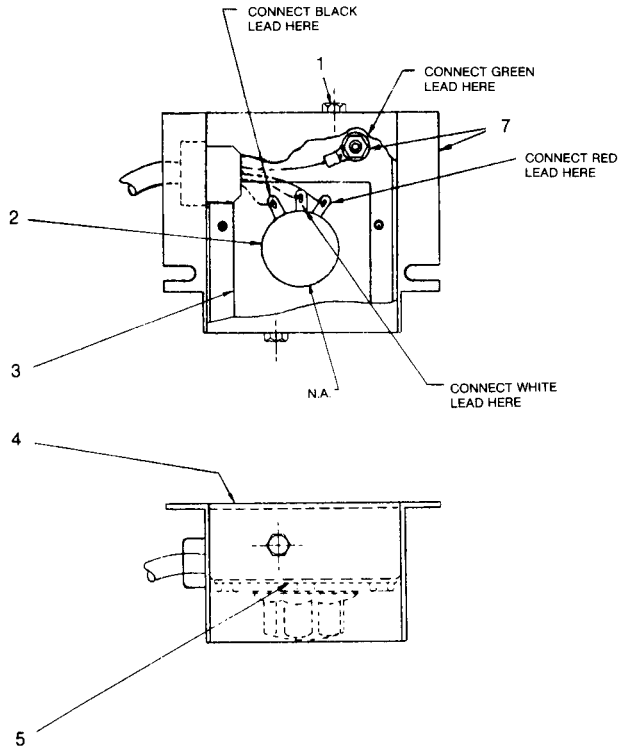
Parts List P-126-F

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Front & Top Cover	1
2	Self Tapping Screw	10
	Nameplate	1
3	Process Switch	1
	Lock Washer	3
	Hex Nut	3
4	Hex Nut	8
	Negative Lead Strap	2
	Hex Head Screw	2
	Plain Washer	2
	Lock Washer	2
	Plain Washer	2
5	Lock Washer	2
	Positive Lead Strap	2
	Hex Head Screw	2
	Plain Washer	2
	Lock Washer	2
	Plain Washer	2
	Lock Washer	2

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
6	Micro Switch Assembly	1
	Hex Head Screw	2
	Lock Washer	2
7	Hex Nut	2
	Lead	2
8	Output Terminal	4
	Thread Cutting Screw	8
9	Output Stud Nut	4
	Switch Handle	1
10	Box	1
11	Jumper	1
	Plain Washer	1
12	Lock Washer	1
	Jumper	1
	Plain Washer	1
13	Lock Washer	1
	Marker "TO WORK"	1
	Fastener Button	2
14	Marker "ELECTRODE"	1
	Fastener Button	2

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

REMOTE CONTROL



NOTES

- N.A. Solder all lead connections with E-584.
- N.B. Ground test at 1,000 volts for one second between lead #75 and case.
- N.C. Check resistance between leads 75 and 77. It should be $10K \pm 10\%$. Check resistance 75 to 76 as pot is rotated clockwise. Resistance must increase as pot is rotated its full range. Operation must be smooth.
- N.D. Ground test at 1,000 volts for one second, pin C to case.
- N.E. Check resistance between pins C and A. It must be $10K \text{ ohms} \pm 10\%$. Check resistance pins "B" to "C". Resistance must increase as pot is rotated its full range. Operation must be smooth.

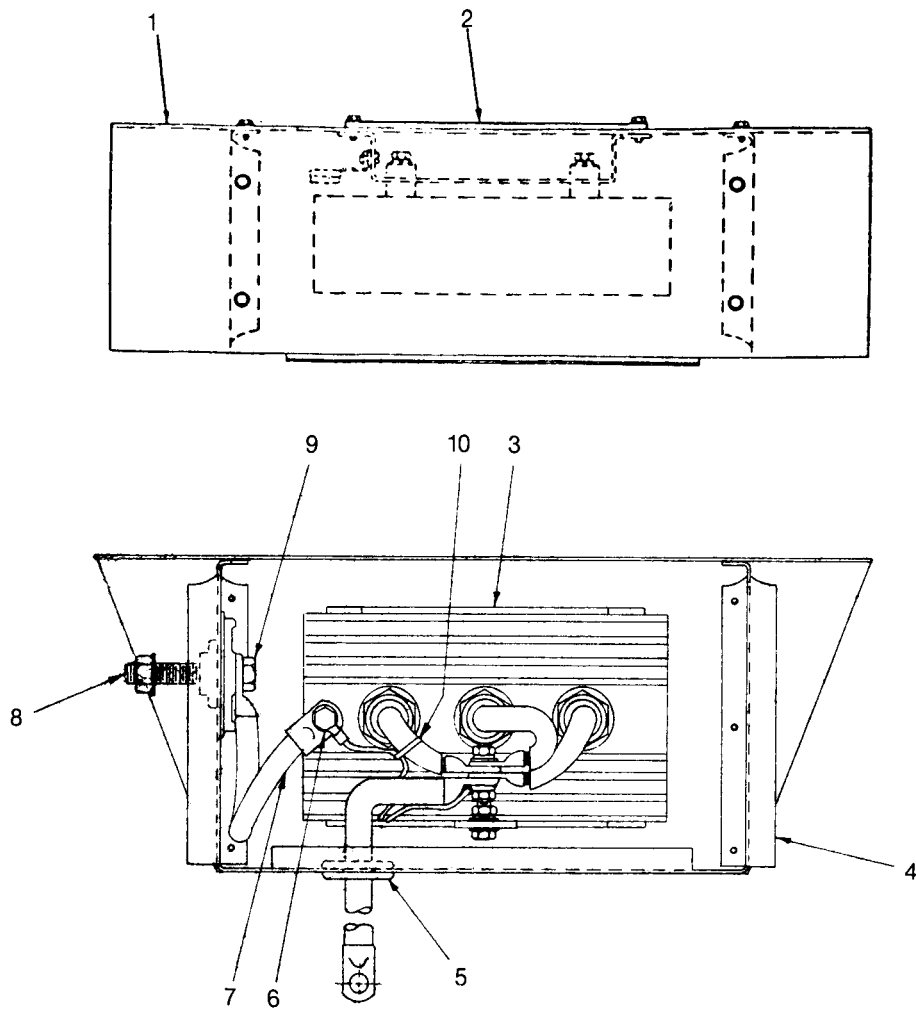
L4829
4-3-92

Parts List P-84-J

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Self-Tapping Screw	4
2	Potentiometer	1
3	Insulation	1
4	Wraparound	1
5	Nameplate	1
6	Knob	1
7	Control Assembly	1
	#10-24 Hex Nut	1
	Plain Washer	1
8	Lead Grommet	1
9	Lead Cable	1

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

DIODE KIT



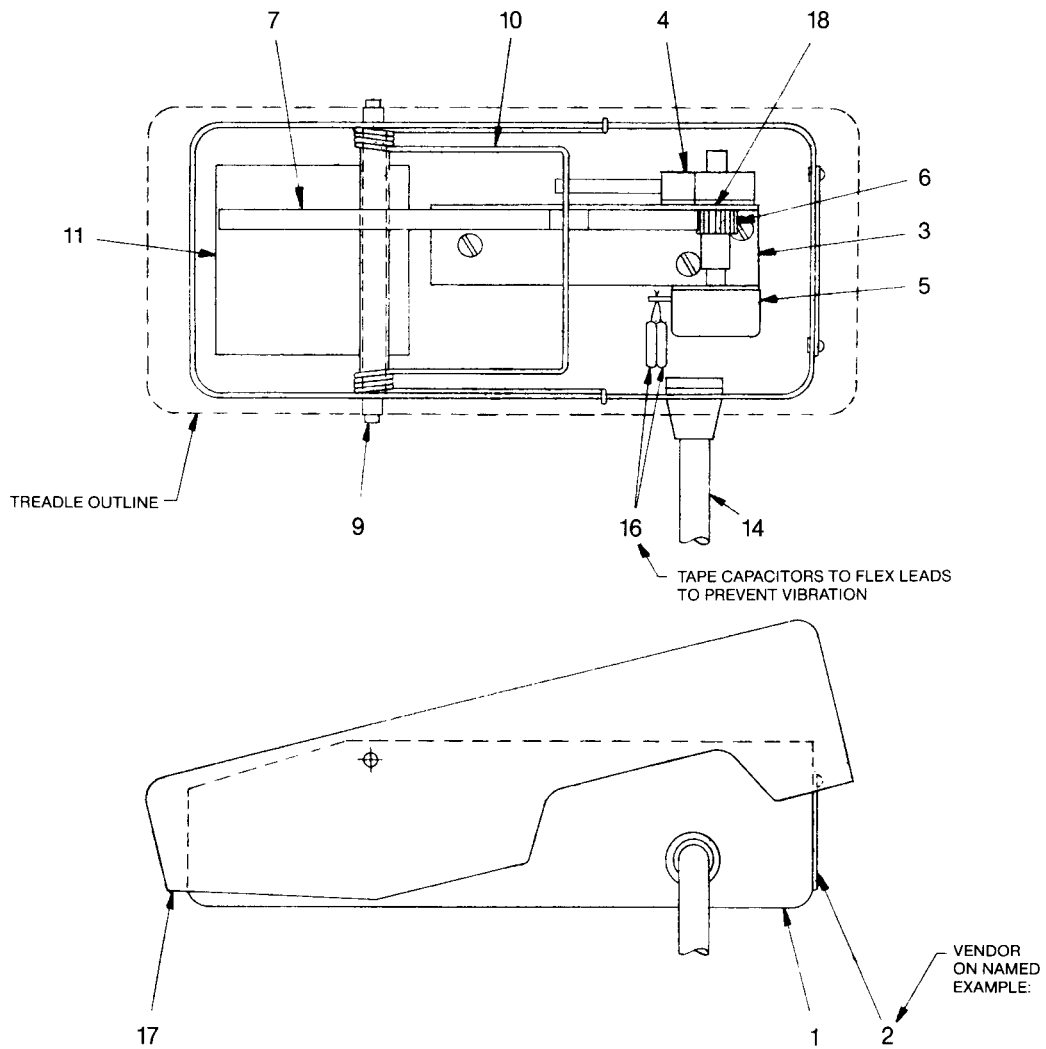
L6973
8-31-84P

Parts List P-151-G

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Front and Top Cover	1
2	Self Tapping Screw	10
	Nameplate	1
3	Self Tapping Screw	4
	Diode Heat Sink Assembly	1
4	Box	1
5	Grommet	1
6	Hex Head Screw	1
	Plain Washer	1
	Lock Washer	1
	Hex Nut	1
7	Lead	1
8	Output Terminal Assembly	1
	Output Stud Nut	1
	Thread Cutting Screw	2
9	Hex Head Screw	1
10	Cable Tie	1

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

FOOT AMPTROL



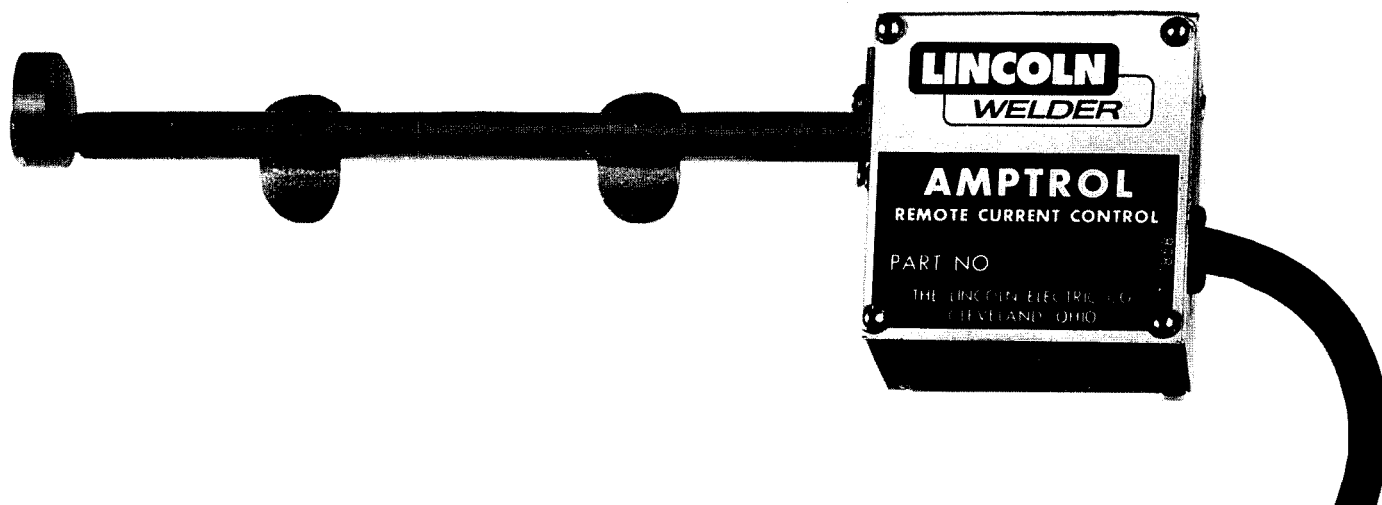
L7306
4-19-91A

Parts List P-66-J.4

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Base (Black Painted with Non-Slip Pad)	1
2	Nameplate (Riveted to Base)	1
3	Bracket	1
4	Microswitch	1
5	Control Potentiometer	1
6	Pinion Gear	1
7	Rack	1
9	Pivot Pin Assembly	1
10	Spring	1
11	Connection Diagram	1
14	Cable Assembly (Including Strain Relief)	1
16	Capacitors	1
17	Treadle (Black Painted with Non-Slip Surface)	1
18	Pinion Gear Bushing	1

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

HAND AMPTROL



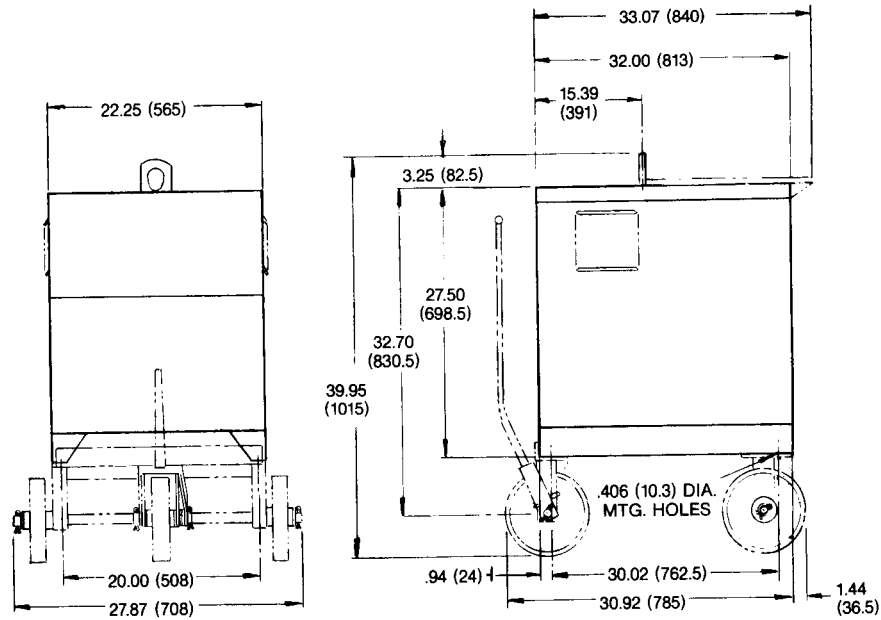
Parts List P-66-K

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Hand Amptrol, Includes:	1
	Actuator Arm Assembly	1
	Nameplate	1
	Control Unit, Includes:	1
	Rheostat	1
	By-Pass Capacitor	2
	Micro Switch	1
	Cable	1
	Bottom Cover Plate	1

11-7-86

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

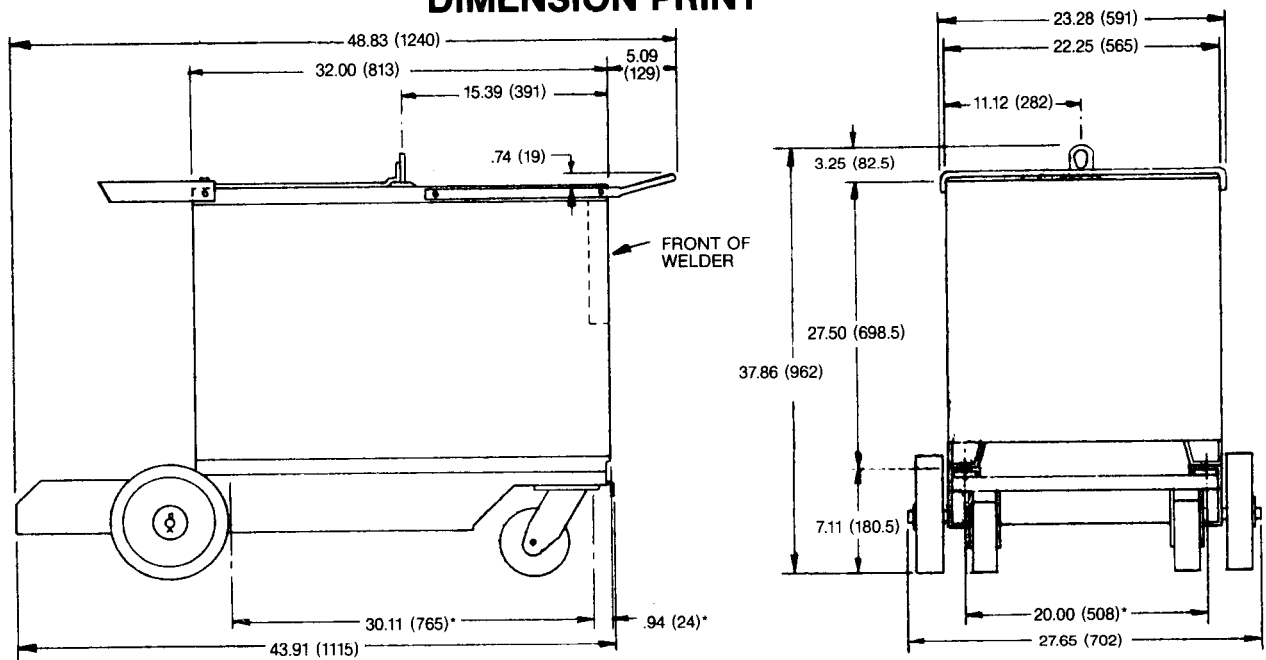
DC-400 WITH K817/K817R UNDERCARRIAGE DIMENSION PRINT



M12244-7
1-20-89A

All dimensions in inches and (millimeters).

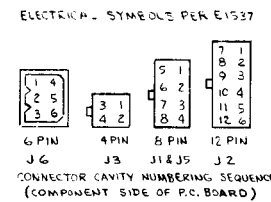
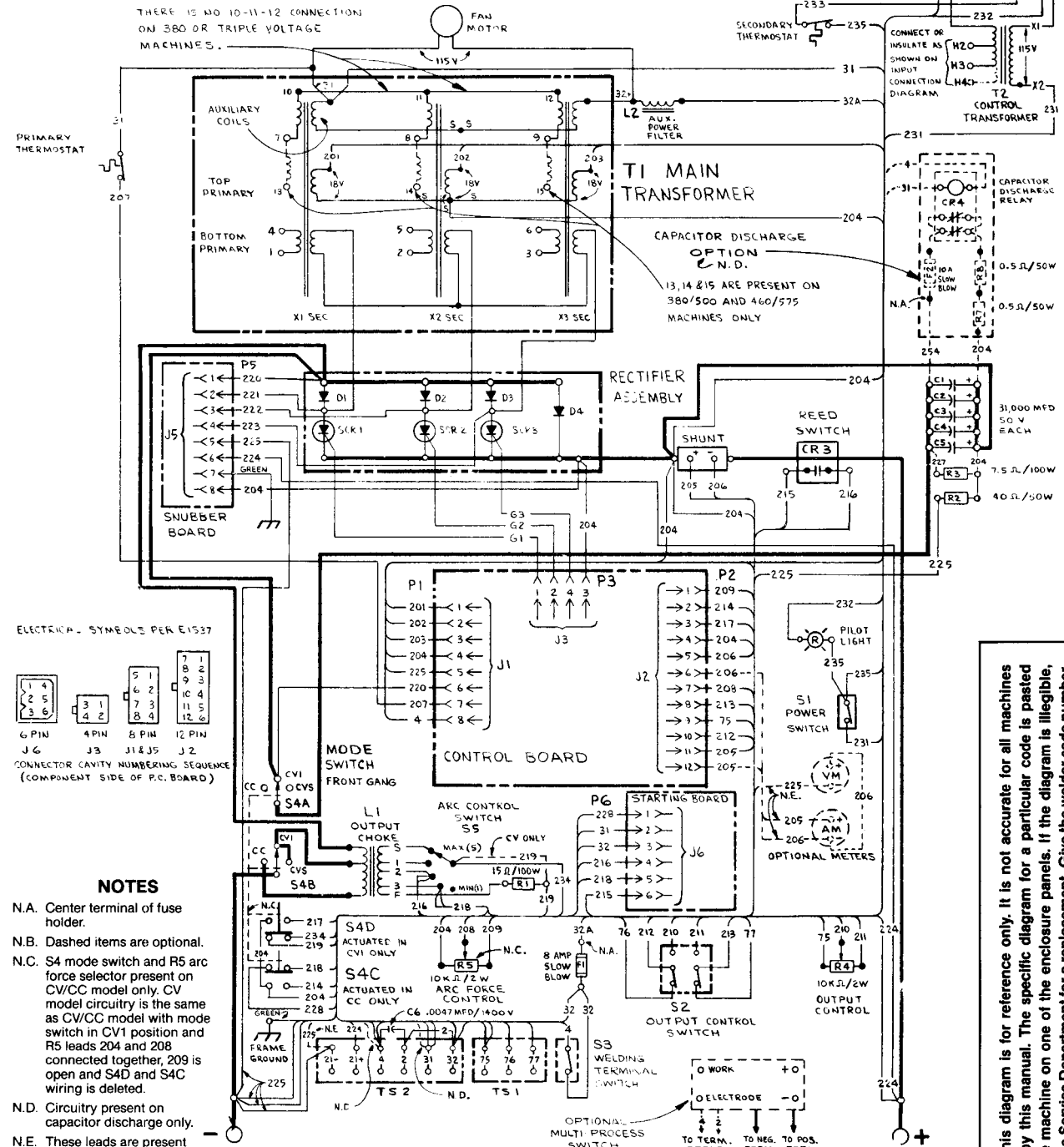
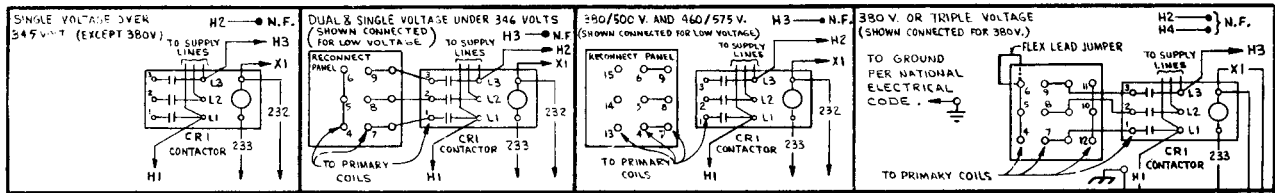
DC-400 WITH K841 UNDERCARRIAGE DIMENSION PRINT



M15200-1
8-26-88B

*Location of .406 (10.3) diameter mounting holes.
All dimensions in inches and (millimeters).

DC-400 WIRING DIAGRAM



- NOTES**
- N.A. Center terminal of fuse holder.
 - N.B. Dashed items are optional.
 - N.C. S4 mode switch and R5 arc force selector present on CV/CC model only. CV model circuitry is the same as CV/CC model with mode switch in CV1 position and R5 leads 204 and 208 connected together, 209 is open and S4D and S4C wiring is deleted.
 - N.D. Circuitry present on capacitor discharge only.
 - N.E. These leads are present with meter option only.
 - N.F. Tape up separately to provide at least 600 V insulation.

L7526
930-88B

NOTE: This diagram is for reference only. It is not accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.

WARNING	<ul style="list-style-type: none"> Do not touch electrically live parts or electrode with skin or wet clothing. Insulate yourself from work and ground. 	<ul style="list-style-type: none"> Keep flammable materials away. 	<ul style="list-style-type: none"> Wear eye, ear and body protection.
Spanish AVISO DE PRECAUCION	<ul style="list-style-type: none"> No toque las partes o los electrodos bajo carga con la piel o ropa mojada. Aislese del trabajo y de la tierra. 	<ul style="list-style-type: none"> Mantenga el material combustible fuera del área de trabajo. 	<ul style="list-style-type: none"> Protéjase los ojos, los oídos y el cuerpo.
French ATTENTION	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Gardez à l'écart de tout matériel inflammable. 	<ul style="list-style-type: none"> Protégez vos yeux, vos oreilles et votre corps.
German WARNUNG	<ul style="list-style-type: none"> Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! Isolieren Sie sich von den Elektroden und dem Erdboden! 	<ul style="list-style-type: none"> Entfernen Sie brennbares Material! 	<ul style="list-style-type: none"> Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese ATENÇÃO	<ul style="list-style-type: none"> Não toque partes elétricas e electrodos com a pele ou roupa molhada. Isol-se da peça e terra. 	<ul style="list-style-type: none"> Mantenha inflamáveis bem guardados. 	<ul style="list-style-type: none"> Use protecção para a vista, ouvido e corpo.
Japanese 注意事項	<ul style="list-style-type: none"> 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。 	<ul style="list-style-type: none"> 燃えやすいものの側での溶接作業は絶対にはなりません。 	<ul style="list-style-type: none"> 目、耳及び身体に保護具をして下さい。
Chinese 警告	<ul style="list-style-type: none"> 皮肤或湿衣物切勿接觸帶電部件及鉗條。 使你自己與地面和工件絕緣。 	<ul style="list-style-type: none"> 把一切易燃物品移離工作場所。 	<ul style="list-style-type: none"> 佩戴眼、耳及身體勞動保護用具。
Korean 위험	<ul style="list-style-type: none"> 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> 인화성 물질을 접근 시키지 마시오. 	<ul style="list-style-type: none"> 눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	<ul style="list-style-type: none"> لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الإلكترود بجلد الجسم أو بالملابس المبللة بالماء. ضع عازلا على جسمك خلال العمل. 	<ul style="list-style-type: none"> ضع المواد القابلة للاشتعال في مكان بعيد. 	<ul style="list-style-type: none"> ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.
READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.		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.	
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.		LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.	

			
<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● 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。 	<ul style="list-style-type: none"> ● 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して下さい。 	<ul style="list-style-type: none"> ● パネルやカバーを取り外したまま機械操作をしないで下さい。 	Japanese 注意事項
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 儀表板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 패널이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابتعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● قطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغل هذا الجهاز إذا 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擇材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

LIMITED WARRANTY

STATEMENT OF WARRANTY:

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

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

WARRANTY PERIOD:

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

Three Years:

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

Two Years:

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

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

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

TO OBTAIN WARRANTY COVERAGE:

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

WARRANTY REPAIR:

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

WARRANTY COSTS:

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

IMPORTANT WARRANTY LIMITATIONS:

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

PERFORMANCE
PLUS PROTECTION

3 YEAR
WARRANTY
PARTS &
LABOR

LINCOLN
ELECTRIC



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