INVERTEC™ V250-S

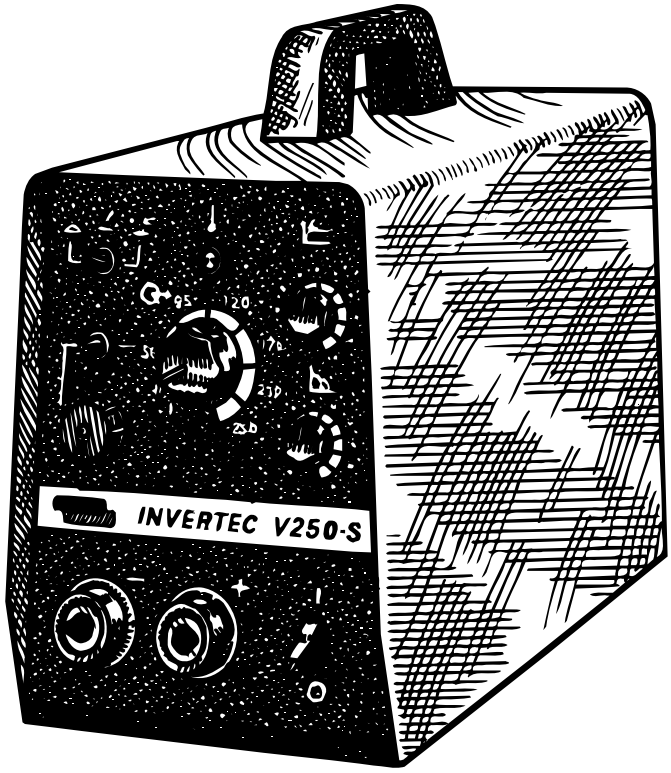
IM589

May, 1997

For use with machine Code Number 10467

Safety Depends on You

Lincoln arc welding and cutting 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 MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

OPERATOR'S MANUAL

World's Leader in Welding and Cutting Products

LINCOLN® ELECTRIC

Premier Manufacturer of Industrial Motors

Sales and Service through Subsidiaries and Distributors Worldwide

22801 St. Clair Ave. Cleveland, Ohio 44117-1199 U.S.A. Tel. (216) 481-8100

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety 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. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

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

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

1.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.

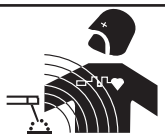
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.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.

1.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.

1.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.

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



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

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

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.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.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Mar '95

ELECTRIC SHOCK can kill.

3.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.

3.b. Insulate yourself from work 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 (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

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

3.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.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.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.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.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. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.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.

5.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 with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

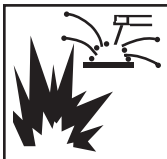
5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.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.

5.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. MSDS forms are available from your welding distributor or from the manufacturer.

5.e. Also see item 1.b.

Mar '95



WELDING SPARKS can cause fire or explosion.

6.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. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.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.

6.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.

6.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 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.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.

6.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.

6.h. Also see item 1.c.

CYLINDER may explode if damaged.

7.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.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.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.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “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.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

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

Mar ‘95

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 vétements 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 defonctionnement.
   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 precautions 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 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 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 échauffement 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 particuliérement 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.

Thank You ——— for selecting a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product ••• as much pride as we have in bringing this product to you!

Please Examine Carton and Equipment For Damage Immediately

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.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Name & Number _____

Code & Serial Number _____

Date of Purchase _____

Whenever you request replacement parts for or information on this equipment always supply the information you have recorded above.

Read this Operators Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

⚠ WARNING

This statement appears where the information **must** be followed **exactly** to avoid **serious personal injury** or **loss of life**.

⚠ CAUTION

This statement appears where the information **must** be followed to avoid **minor personal injury** or **damage to this equipment**.

TABLE OF CONTENTS

Technical Specifications - Invertec V250-S (380-415 VAC Model)

INPUT

THREE PHASE

Standard Voltage	Input Current at Rated Output	Model
380-415	20-18	50/60 Hz

RATED OUTPUT

THREE PHASE

Duty Cycle[1]	Amps	Volts at Rated Amps	Model
35% Duty Cycle	250	30	50/60Hz
60% Duty Cycle	200	28	50/60Hz
100% Duty Cycle	165	26	50/60Hz

OUTPUT

THREE PHASE

Welding Current Range	Constant Open Circuit Voltage
1-250 Amps	60-75 VDC

RECOMMENDED INPUT WIRE AND FUSE SIZES

THREE PHASE

Input Voltage Frequency[2]	Fuse (Superlag) or Breaker Size	Input Ampere Rating on Nameplate	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
380-415/50/60	35	20-18	12 (4mm^2)	12 (4mm^2)

PHYSICAL DIMENSIONS

Height	Width	Depth	Weight
15.0 in.	9.1 in.	19.7 in.	36.5 lbs.
381 mm	231 mm	500 mm	16.6 Kg

(1) Based on a 10 min. period.

(2) Input voltage must be within ±10% of rated value.

Read this entire installation section before you start installation.

SAFETY PRECAUTIONS

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.
- Be sure to discharge capacitors with the procedure outlined in the Maintenance Section of this manual before working in that area of the equipment.

SELECT SUITABLE LOCATION

The Invertec V250-S will operate in harsh environments. Even so, it is important that simple preventative measures are followed in order to assure long life and reliable operation.

- The machine must be located where there is free circulation of clean air such that air movement in the back and out the front 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.
- Keep machine dry. Shelter from rain and snow. Do not place on wet ground or in puddles.

STACKING

V250-S's cannot be stacked.

TILTING

Place the machine directly on a secure, level surface or on a recommended undercarriage. The machine may topple over if this procedure is not followed.

HIGH FREQUENCY PRECAUTIONS

If possible locate the V250-S away from radio controlled machinery. The normal operation of the V250-S may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

INPUT CONNECTIONS

The Invertec V250-S should be connected only by a qualified electrician. Installation should be made in accordance with all local and national electric codes and the information detailed below.

GROUND CONNECTION

For 50/60Hz machines connect the ground terminal marked ⏚ located in the machine on the lower right side of the base of the welder to earth ground.

INPUT SUPPLY CONNECTIONS

Be sure the voltage, phase and frequency of the input power is as specified on the rating plate, located on the rear of the machine.

Supply line entry provision is in the case rear panel.

POWER INPUT CONNECTION FOR 50/60 HZ MACHINES

1. Connect terminal marked ⏚ to earth ground per National Electric Code.
2. Connect the supply lines to the line switch. Torque to 3.0 Nm.
3. Install in accordance with all local and national electric codes.

The Invertec V250-S 50/60 Hz machine is supplied with one cord connector. The cord connector provides a strain relief for the input power cord as it passes it through the rear access hole. The cord connector is designed for a cord diameter of 7.9 to 27.2mm (.310 to 1.070 in).

Strip away outer jacket of cord, trim fillers and insert conductors through cord connector. The jacketed portion of the cord must go through the cord connector. Tighten both connector screws.

INPUT FUSE AND SUPPLY WIRE

Refer to the ***Technical Specifications*** page at the beginning of this chapter for the proper fuse sizes and supply cable sizes.

- Fuse the input circuit with recommended super lag fuses or delay type circuit breakers.

- Install the proper fuse in the fuse holder in the main disconnect panel.

OUTPUT CONNECTIONS

Refer to figure A.1 for the location of the 6 Pin Remote Receptacle and the Output Terminals.

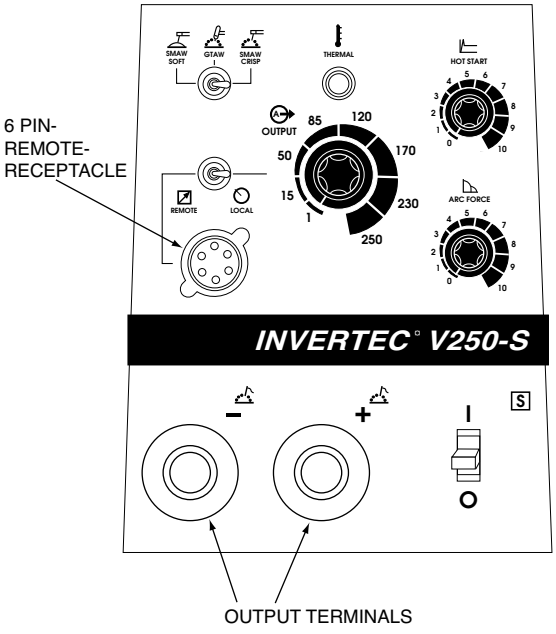


FIGURE A.1 OUTPUT CONNECTIONS

REMOTE CONTROL RECEPTACLE

Remote control (K857), Arc start switch (K814), Hand amptrol (K963) and Foot amptrol (K870) connect directly to 6 pin amphenol on the front of the unit.

OUTPUT CABLES

Select the output cable size based on Table A.1.

TABLE A.1
Cable Sizes for Combined Length of Electrode and Work Cable (Copper Cable Rated at 75°C).

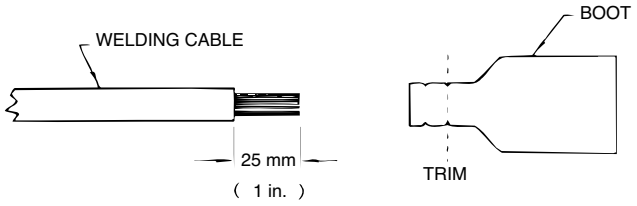
Length	Cable Size
up to 150 ft.(46m)	1/0 (50mm²)
up to 250 ft.(72m)	2/0 (70mm²)

QUICK DISCONNECT PLUGS

A quick disconnect system is used for the welding cable connections. The welding plug included with the machine is designed to accept a welding cable size of 1/0 to 2/0.

1. Remove 1 in. (25mm) of welding cable insulation.

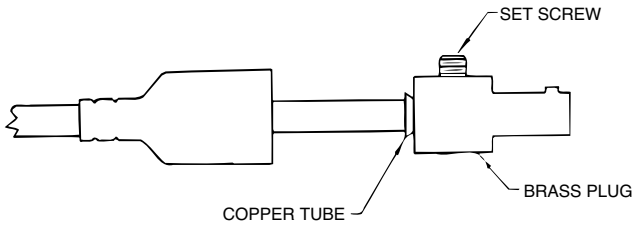
2. Slide rubber boot onto cable end. The boot end may be trimmed to match the cable diameter. Soap or other lubricant will help to slide the boot over the cable.



3. Slide the copper tube into the brass plug.

4. Insert cable into copper tube.

5. Tighten set screw to collapse copper tube. Screw must apply pressure against welding cable. The top of the set screw will be well below the surface of the brass plug after tightening.



6. Slide rubber boot over brass plug. The rubber boot must be positioned to completely cover all electrical surfaces after the plug is locked into the receptacle.

Read and understand this entire section before operating your machine.

SAFETY INSTRUCTIONS

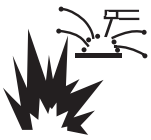
⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically live parts such as output terminals or internal wiring.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

FUMES AND GASES can be dangerous.

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



WELDING, CUTTING and GOUGING SPARKS can cause fire or explosion

- Keep flammable material away.
- Do not weld, cut or gouge on containers that have held combustibles.

ARC RAYS can burn.

- Wear eye, ear and body protection.

Only qualified personnel should operate this equipment. Observe all safety information throughout this manual.

GENERAL DESCRIPTION

The Invertec V250-S is a 250 amp arc welding power source that utilizes three phase input power, to produce constant current output. The welding response of this Invertec has been optimized for stick (SMAW) and TIG (GTAW).

OPERATIONAL FEATURES

The Invertec V250-S provides continuous total range output current adjustment, selectable welding modes and local or remote output control. Welding characteristics can be controlled via an arc force control. Additionally, starting characteristics can be adjusted via a “hot start” control.

WELDING CAPABILITY

The Invertec V250-S is rated at 250 amps, 35% duty cycle (based on a 10 minute cycle). It is also rated at 165 amps, 100% duty cycle, and 200 amps, 60% duty cycle.

LIMITATIONS

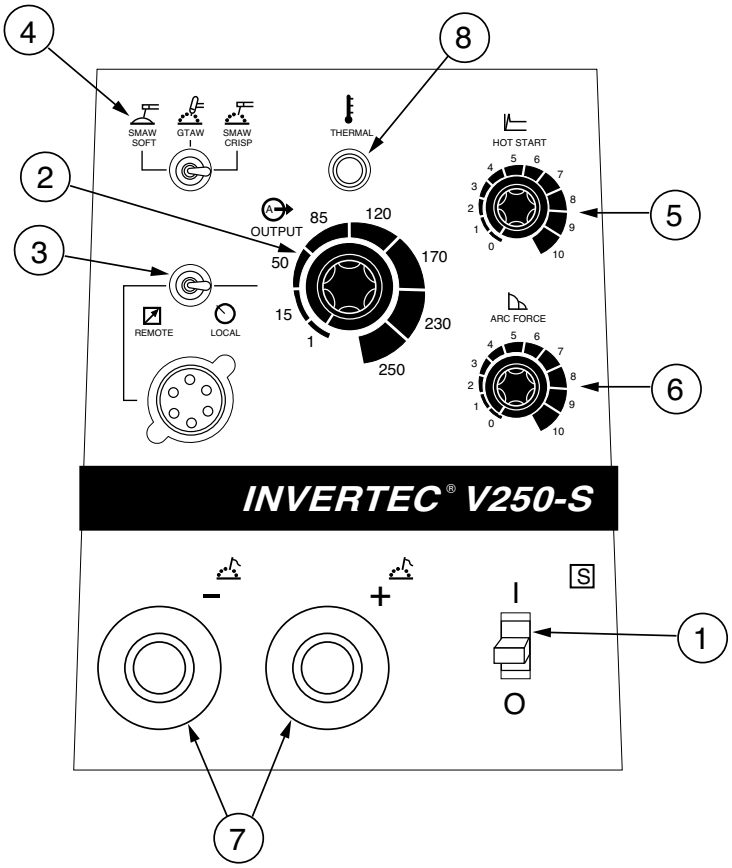
The V250-S is not recommended for pipe thawing.

The V250-S should not be powered from the auxiliary power supply of an engine welder. Special protection circuits may operate causing loss of output.

CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the V250-S. Refer to Figure B.1 and corresponding explanations.

FIGURE B.1 — CASE FRONT CONTROLS.



1. Power Switch - Place the lever in the "ON" position to energize the machine. When the power is on, the fan will operate and the output will be energized in SMAW modes. GTAW mode requires remote trigger to energize the output.

2. Output Control - This controls the output current. Control is provided over the entire output range of the power source with 1 turn of the control knob. This control may be adjusted while under load to change power source output. When using remote control this function becomes the limit setting.

3. Local/Remote Switch - Place in the "LOCAL" position to allow output adjustment at the machine. Place in the "REMOTE" position to allow output adjustment at remote pot or amptrol. In Remote, the machine output control pot is the limit setting for remote control.

4. Mode Switch

GTAW Optimized for touch start use. Triggering at amphenol is required using an Arc Start Switch, Amptrol or similar means. Short circuit current is limited to approximately 25 amps to aid in touch starting.

CC Soft Best for EXX18 thru EXX28 stick electrodes. Output energized when machine is on.

CC Crisp Use this mode for stick welding with EXX10 thru EXX14 electrodes. Output energized when machine is on.

5. Hot Start - Controls the amount of starting energy in SMAW. The Hot Start setting will set the amount of extra power given during the initial strike.

A Hot Start setting of 100% will give you an additional striking current 100% above the welding set current*. (Striking current in this example will be 200% of the set current). For a Hot Start setting of 100%, the current will decrease back to the set current in one second.

A Hot Start setting of 50% will give you an additional striking current 50% above the welding set current*. (Striking current in this example will be 150% of the set current). For a Hot Start setting of 50%, the current will decrease back to the set current in .5 second.

* The maximum striking current is 300 Amps.

6. Arc Force - This control functions in SMAW modes to adjust the Arc Force. The arc is soft at the minimum settings and more forceful or driving at the maximum settings. Higher spatter levels may be present at the maximum settings.

RECOMMENDED ARC FORCE SETTINGS FOR SELECTED APPLICATIONS

FULL RANGE IS 1-10. 1 is VERY SOFT, 10 IS VERY CRISP

Mode	Process	Nominal Setting	Recommended Adjustment Range
CC SMAW 1 (soft)	EXX18 thru EXX28 stick	5	1 (gentle, may stick) to 9 (forceful, more spatter)
CC SMAW 2 (crisp)	EXX10 thru EXX14 stick	6	3 to 10
	Air Carbon Arc Cutting	1	None

7. Output Terminals - These quick disconnect terminals provide connection points for the electrode and work cables. Refer to ***Output Connections*** in the Installation chapter for proper cable sizes. For positive polarity welding connect the electrode cable to the positive terminal and the work cable to the negative terminal. To weld negative polarity reverse the electrode and work cables.

8. Thermal Shutdown Indicator - This light will illuminate if an internal thermostat has been activated. Machine output will return after the internal components have returned to a normal operating temperature. See ***Thermal Protection*** later in this chapter.

CONSTANT CURRENT PROCESSES

MANUAL ARC WELDING (STICK)

The Invertec may be utilized as a manual DC arc welder with the electrode cable, work cable, and electrode holder being the only equipment required.

AIR CARBON ARC CUTTING

Air carbon arc cutting may be performed with the Invertec within its output rating using 5/32" (3.9mm) and 3/16" (4.7mm) diameter carbon rods. Output cables, an air carbon arc electrode cable assembly, and a source of compressed air are required.

NOTE:

1. Best performance will be at settings of 200 amps and below.

2. The electronic protection circuit in the V250S will limit the current to approximately 290 amps.

TIG WELDING

The V250S is capable of touch start TIG welding. An electrode cable, work cable, Arc Start Switch or Amptrol, TIG torch, and gas supply with regulator are required. Refer to ***Accessories*** section of this manual.

Touch starting is done as follows:

1. Place the shield cup edge on the work piece.
2. Rock the tungsten down to touch.
3. Trigger the output.
4. Gently rock back the tungsten from the workpiece.

Note: The short circuit current is limited to 25 amps to aid in touch starting. Panel output control becomes the current limit setting when in remote control

PARALLEL OPERATION

The Invertecs are operable in parallel. For best results, the currents of each machine should be reasonably well shared. As an example, with two machines set up in parallel for a 300 amp procedure, each machine should be set to deliver approximately 150 amps, not 200 amps from one and 100 amps from the other. This will minimize nuisance foldback conditions. In general, more than two machines in parallel will not be effective due to the voltage requirements of procedures in that power range.

To set machine outputs, start with output control pots and arc force pots in identical positions. Adjust outputs and arc forces to maintain current sharing while establishing the proper output current.

OVERLOAD PROTECTION

The machine is electrically protected from producing high output currents. Should the output current exceed 290A, an electronic protection circuit will reduce the current to less than 200A. The machine will continue to produce this low current until the protection circuit is reset. Reset occurs when the output load is removed.

THERMAL PROTECTION

Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostats will prevent output voltage or current.

Thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fans are operating normally, the Power Switch may be left on and the reset should occur within a 15 minute period. If the fans are not turning or the air intake louvers were obstructed, then the power must be switched off for 15 minutes in order to reset. The fan problem or air obstruction must also be corrected.

OPTIONS / ACCESSORIES

CABLE PLUGS

K852-70 - Cable Plug Kit for 1/0-2/0 cable. Attaches to welding cable to provide quick disconnect from machine.

K852-95 - Cable Plug Kit for 2/0-3/0 cable.

NOTE: Two K852-70 plugs are included with the V250-S.

REMOTE CONTROLS

K857 - Remote Output Control for stick welding.

K963 - Hand Amptrol™ for TIG welding. When the V250-S's Output Control is in the "Remote" position, the hand Amptrol energizes the output and controls the output remotely. The Hand Amptrol connects directly to the 6 pin Amphenol.

K870 - Foot Amptrol™ for TIG welding. When the V250-S's Output Control is in the "REMOTE" position, the foot Amptrol energizes the output and controls the output remotely. The Hand Amptrol connects directly to the 6 pin Amphenol.

K814 - Arc Start Switch. Energizes the output for TIG welding if remote output control of the amperage is not desired. When using the Arc Start Switch set the Output Control to the "LOCAL" position.

⚠ 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.
- Prior to Performing preventative maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

1. Turn off input power or disconnect input power lines.

2. Remove the 5/16" hex head screws from the side and top of the machine and remove wrap-around machine cover.

3. Be careful not to make contact with the capacitor terminals that are located in the top and bottom of the Power Board.

4. Obtain a high resistance and high wattage resistor (25-1000 ohms and 25 watts minimum). This resistor is not supplied with machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.

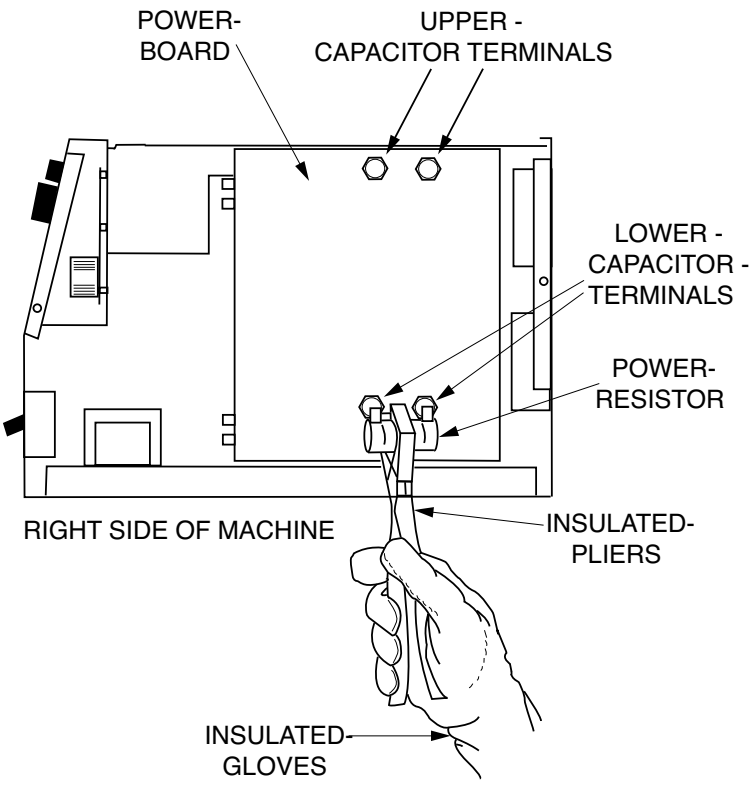
5. Locate the four capacitor terminals (large hex head cap screws) shown in Figure D.1. One pair at the top and one pair at the bottom of the Power Board.

6. Use electrically insulated gloves and insulated pliers. Hold body of the resistor and connect resistor leads across the two capacitor terminals. Hold resistor in place for 10 seconds. DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.

7. Repeat discharge procedure for the capacitor on other two terminals.

8. Check voltage across terminals of all capacitors with a DC voltmeter. Polarity of capacitor terminals is marked on PC board above terminals. Voltage should be zero. If any voltage remains, repeat this capacitor discharge procedure.

FIGURE D.1 — LOCATION OF INPUT FILTER CAPACITOR TERMINALS.



ROUTINE MAINTENANCE

1. Perform the following preventive maintenance procedures at least once every six months. It is good practice to keep a preventive maintenance record; a record tag attached to the machine works best.

2. Remove the machine wrap-around cover and perform the input filter capacitor discharge procedure (detail at the beginning of this chapter).

3. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean the following areas with a low pressure air stream. See figure D.2 for component locations.

- Power and control printed circuit boards
- Power switch
- Main transformer
- Input rectifier
- Heat sink fins
- Input Filter Capacitors
- Output Terminals

4. Examine capacitors for leakage or oozing. Replace if needed.

5. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to ensure that high voltage parts are protected and correct spacings are maintained. All external sheet metal screws must be in place to assure case strength and electrical ground continuity.

6. Check electrical ground continuity. Using an ohmmeter, measure resistance between either output terminal and an unpainted surface of the machine case. (See Figure D.2 for locations.) Meter reading should be 500,000 ohms or more. If meter reading is less than 500,000 ohms, check for electrical components that are not properly insulated from the case. Correct insulation if needed.

7. Replace machine cover and screws.

FILTER CAPACITOR CONDITIONING

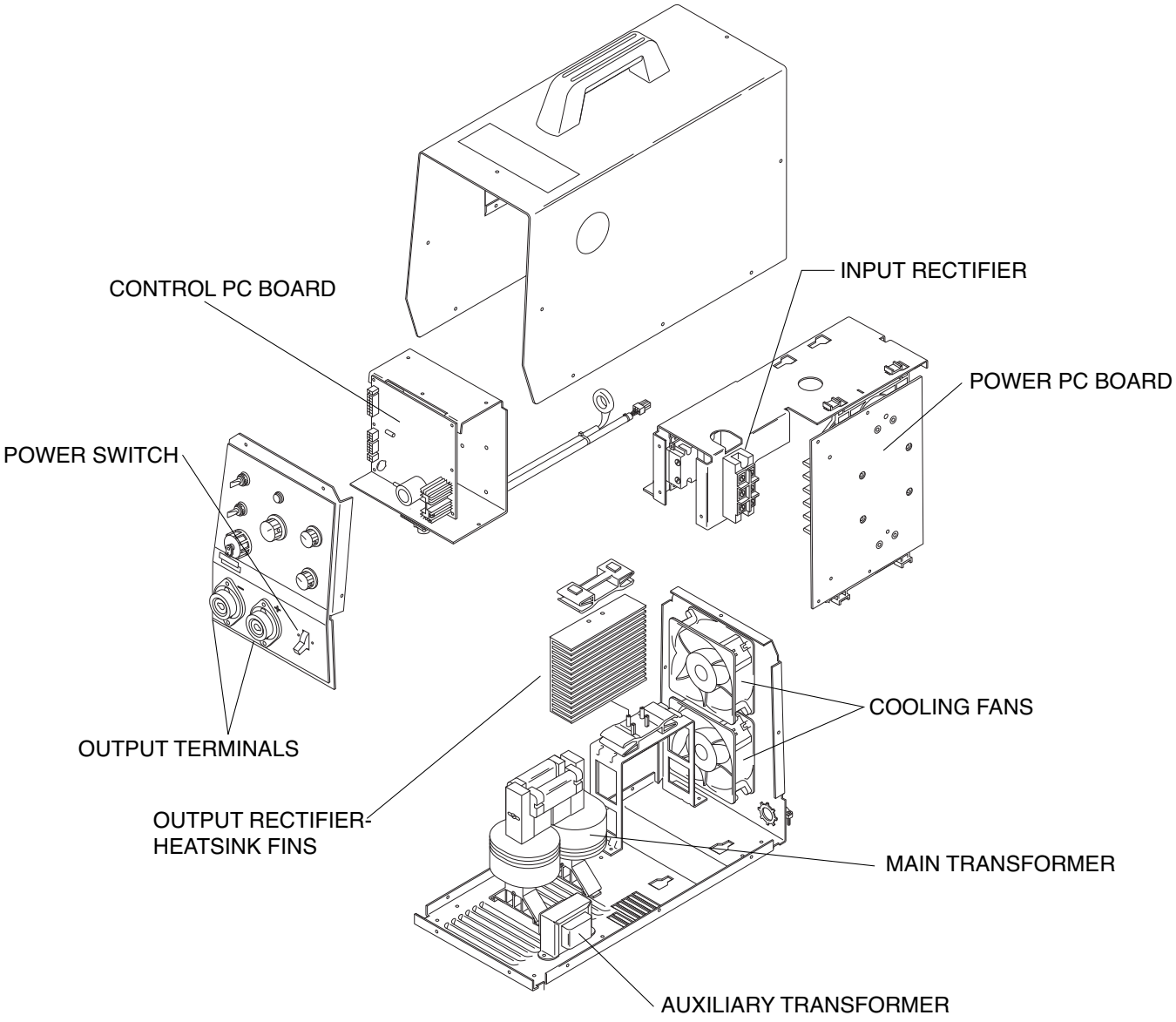
A protection circuit is included to monitor the voltage across filter capacitors C1 and C2. In the event that the capacitor voltage is too high, the protection circuit will prevent output. Nominal trip setting is at 460 VAC +15%. Reset occurs about 3% lower (460 VAC +12%).

On new installations, the protection circuit may also prevent output providing both these circumstances occur:

1. Machine did not have power applied for many months.
2. Machine will not produce output when power is first switched on.

If these circumstances apply, the proper action is to switch the machine on and let it idle for up to 30 minutes. This is required to condition the filter capacitors after an extended storage time. The protection circuit will automatically reset once the capacitor conditioning and resultant voltage levels are acceptable. It may be necessary to turn the power switch off and back on again after this period.

FIGURE D.2 — LOCATION OF MAINTENANCE COMPONENTS.



TROUBLESHOOTING & REPAIR

E-1

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is observed when cover wrap-around is removed.		If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**
The machine is dead - no output - no fan.	1. The input power switch must be in the ON position. 2. Make sure the input voltage is correct for the machine. 3. Check continuity of the 0.6-amp slow blow fuse located on the reconnect panel.	

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No output but the fan operates normally.	1. The mode switch must be in one of the SMAW modes or if in the GTAW mode the remote trigger circuit must be activated. 2. The Local/Remote switch (S3) must be in the LOCAL position unless a remote control device is attached to the remote receptacle. 3. If the machine has not been used for a long time and is connected for 380 VAC or higher, the capacitors may need "conditioning". See ***Input Filter Capacitor Conditioning***. 4. The machine may be overheated. Check the thermal indicator light. Wait for the machine to cool and the thermostats to reset.	If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Output turns on momentarily, then switches off and repeats cycle.	1. Check the input voltage. Make sure the input voltage is correct for the machine. See ***Installation Section*** of this manual. 2. Check or replace remote control device. (If used)	If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**
Remote output control not functioning. The machine operates normally on LOCAL control.	1. Make sure the Local/Remote switch (S3) is in the REMOTE position. 2. The remote control device may be faulty. Replace.	

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No output - Main input fuses open, indicating excessive current draw.	1. Inspect input leads for possible shorts or grounds or mis-connections. 2. Install new fuses and reapply power. If fuses open again, consult a Lincoln Authorized Field Service Facility.	If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine will not produce more than 200 amps.	1. This may be normal operation. If the output current exceeds 290 amps, an electronic protection circuit will reduce the current to less than 200 amps. The machine will continue to produce this low current until the protection circuit is reset. Reset occurs when the output load is removed. 2. Check the input voltage for correct voltage being applied to the machine. 3. Check for loose or faulty welding cables.	If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

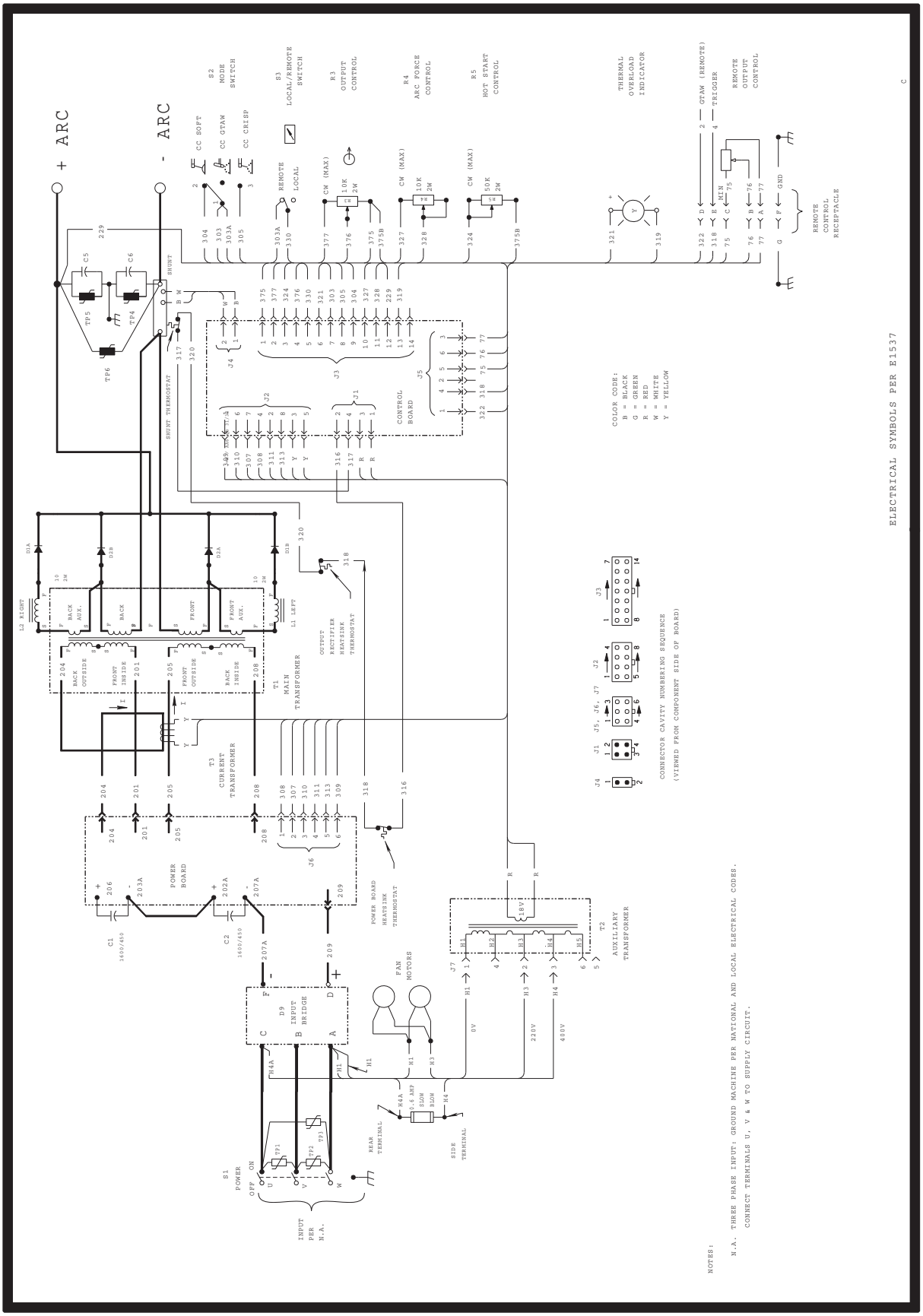
Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
Poor welding, weld settings drift, or output power is low.	1. Make sure the machine settings are correct for the weld process being used. 2. Check machine performance on LOCAL control. If OK then the remote control device may be faulty. Check or replace. 3. Check the input voltage. See ***Installation Section*** of this manual.	If all recommended possible areas of misadjustment have been checked and the problem persists, **Contact your local Lincoln Authorized Field Service Facility.**
Poor stick electrode welding performance. The arc pops out.	1. Check for loose or faulty welding cables. 2. Is the electrode DRY? Try welding with another electrode from a different container. Make sure you have the correct electrode for the application. 3. Make sure the machine settings are correct for the weld process being used.	

⚠ CAUTION

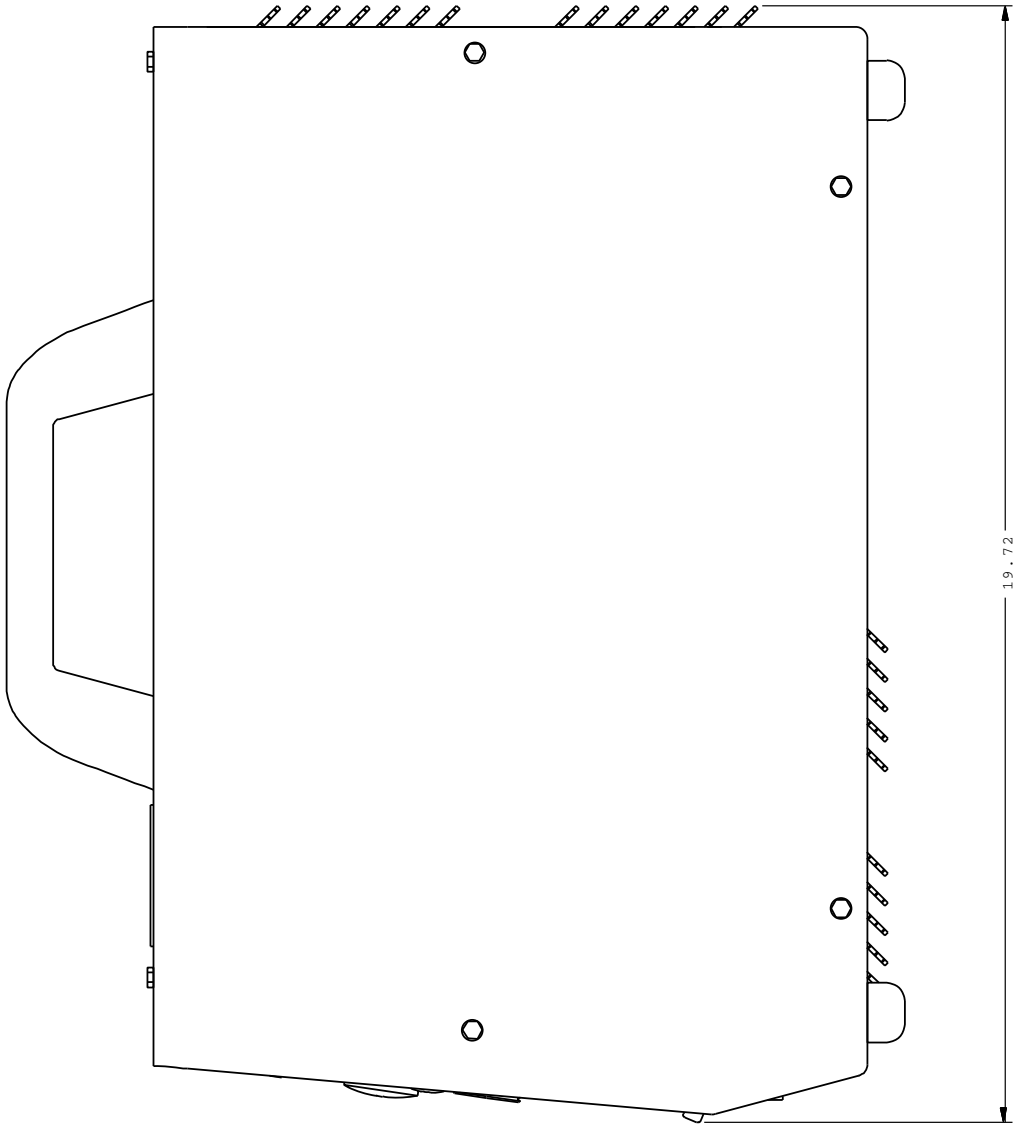
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your local authorized field service facility for technical troubleshooting assistance before you proceed.

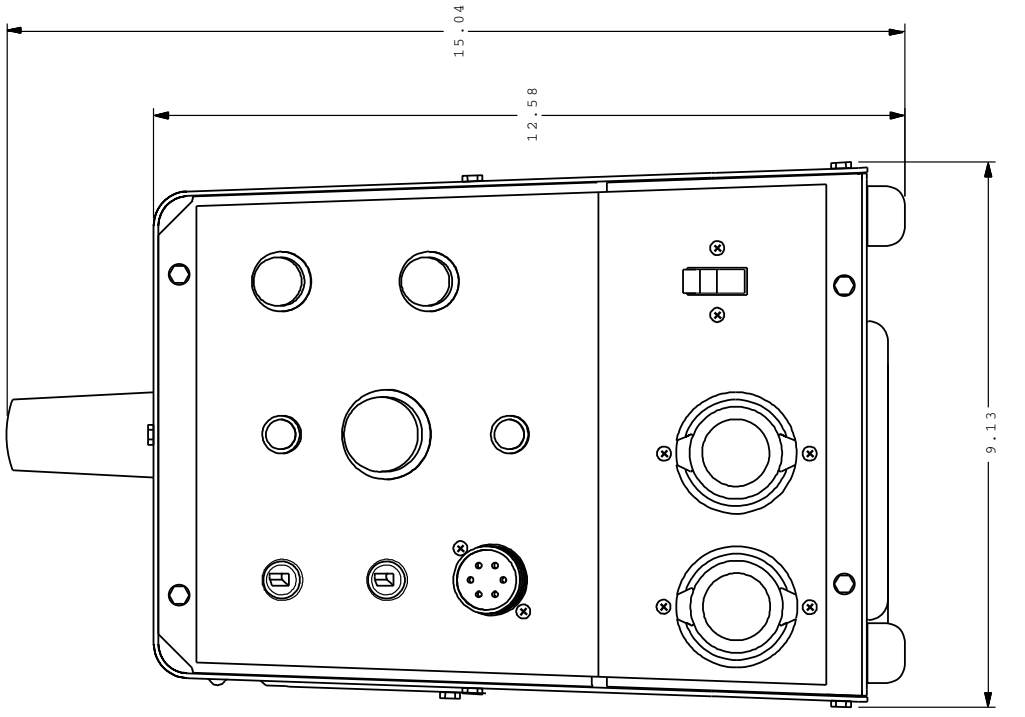
WIRING DIAGRAM- CODES: 10467



NOTE: This diagram is for reference only. It may not be 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 equipment code number..

DIMENSION PRINT





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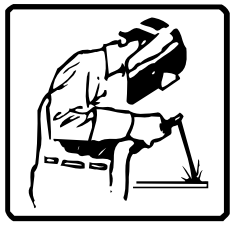

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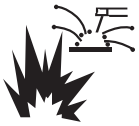
			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● 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絕緣。	● 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 INSTRUCTION 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.

			
● 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 Schweibrauch! ● 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 paineis 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**

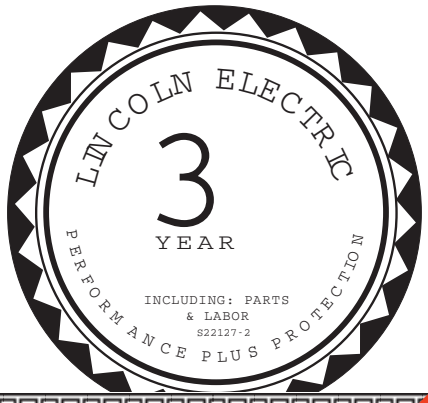
LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

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説明以及應該使用的銀捍材料，並請遵守貴方的有関勞動保護規定。

이 제폼에 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
Inverter Welders
Automatic Wire Feeders
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, engine accessories and Power-Arc 4000 generator/welders) with operating speed over 2,000 RPM

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

One Year:

Equipment not listed above such as gun and cable assemblies, water coolers, FAS TRAK or MIG-TRAK equipment, air compressor on the SAE400 WELD'N AIR, Power-Arc 4000 generator/welders, Wire Feed Module (Factory Installed) and field-installed optional equipment.

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 shall 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.

April, '97