LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

IDEALARC® DC-1500

Constant Voltage and Constant Current DC Arc Welding Power Source, 3 Phase Rectifier Type

For use with machines having Code Numbers:

8294 and above

SERVICE MANUAL

SVM202-A | Issue Date 10-Jul

THE LINCOLN ELECTRIC COMPANY
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⚠ 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.

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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 within applicable OSHA PEL and ACGIH TLV limits 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. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. 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.d. 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.e. 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.f. Also see item 1.b.

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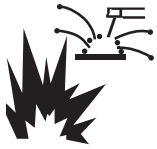

WELDING and CUTTING SPARKS can cause fire or explosion.

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.

6.I. Read and follow NFPA 51B " Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park,PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

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-I, "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.

Refer to **http://www.lincolnelectric.com/safety** for additional safety information.

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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.

Electromagnetic Compatibility (EMC)

Conformance
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction
All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

Installation and Use
The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to access whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of Area
Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

Electromagnetic Compatibility (EMC)

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply
Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment
The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables
The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

Equipotential Bonding
Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

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[1] Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

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TECHNICAL SPECIFICATIONS – IDEALARC® DC-1500

INPUT - THREE PHASE ONLY	
Standard Voltage	**Input Current at Rated Output**
380/440/460	216/187/184

RATED OUTPUT		
Duty Cycle	**Amps**	**Volts at Rated Amperes**
100%	1500	60

OUTPUT			
Mode	**Current Range**	**Maximum Open Circuit Voltage**	**Auxiliary Power**
Contstant Current Contstant Voltage	200-1500 Amps 200-1500 Amps	98 VDC	115 VAC, 8 Amps

RECOMMENDED INPUT WIRE AND FUSE SIZES				
Input Voltage/Frequency	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Type 75C Copper Wire in Conduit AWG (IEC) Sizes	Type 75C Copper Ground Wire in Conduit AWG (IEC) Sizes
460/60 380/440/50/60	300	184	000 (85 mm_2)	3 (25mm_2)

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
57.2 in 1453 mm	22.3 in 566 mm	38 in 965 mm	1420 lbs. 644 kg.

[1]Also called “inverse time” or “thermal/magnetic” circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of the current increases.

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WARNING

FALLING EQUIPMENT can cause injury.

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

LOCATION

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

INPUT WIRING

WARNING

ELECTRIC SHOCK can kill.

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

Failure to fuse the input lines per the specifications in this manual will constitute customer abuse and void the warranty.

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

Have a qualified electrician remove the lower right side case panel and connect 3 phase AC power to terminals L_1, L_2 and L_3 of the input contactor in accordance with the Na-tional Electrical Code, all local codes and the wiring diagram located inside the machine.

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

Recommended Input Wire, Grounding Wire and Fuse Sizes Based on National Electrical Code For 60 Hertz, 3 Phase Welders at 100% Duty Cycle

Input Volts	Amps Input	Copper Wire Size Type 75° In Conduit		Super Lag Fuse Size in Amps
		3 Input Wires	Grounding Conductor	
460	184	000	3	300

NOTE: The standard machines are designed to operate on 460 volt-60 Hertz, 440 volt-50 Hertz and 380 volt-50 Hertz input power systems. However, to use the machines on 380 volt-50 Hertz power, reconnect the transformer input leads in accordance with the connection diagram pasted to the inside of the lower right side case panel.

OUTPUT CONNECTION (Turn Power Source Off)

a. Output Studs

The “Positive” and “Negative” output studs are located on the front panel. Two of each are provided to simplify connecting multiple electrode or work cables as suggested in the table below.

Connect the electrode cables to the “Positive” studs for electrode positive (DC+) polarity or to the “Negative” stud for electrode negative (DC-) polarity as required by the welding procedures. Connect the work cables to the other set of studs. Tighten the nuts with a wrench.

Suggested Copper Cable Sizes — 80% Duty Cycle		
Below 1000 amps	Two 4/0	Up to 200’
1000 to 1200 amps	Three 4/0	
1200 to 1500 amps	Four 4/0	

b. Auxiliary Power

This machine supplies the 1000 volt-amperes of 115 volt, AC power needed for the automatic wire feeders. The power is available from terminals #31 and #32 on the terminal strip.

c. “NL Option” (K783) (OBSOLETE)

Installation of an NL option is *required* when connecting a DC-1500 to LAF-3, NA-2, LT-3 or LT-34 wire feeding systems. See the section on page 9 entitled “NL Option Kit” for full information.

d. Wire Feeder Connection — Without NL Option

Turn the welder off. Remove the screw and lift the hinged door on the front of the control panel to expose the terminal strips. Connect the leads of the wire feeder input control cable to the terminal strip *exactly* as specified in the appropriate connection diagram included in the wire feeder Operating Manual. Attach the control cable to the panel at the right of the terminal strip using the clamp attached to the control cable. Close the door and replace the screw.

To connect the DC-1500 to wire feeders not covered in available connection diagrams, write to the factory for instructions giving complete nameplate information for the DC-1500 and wire feeder.

e. Optional Remote Control (K775)

This control is included as part of the "NL Option". Connect it to the "NL Option" box per instructions shipped with the option. (Not required with the NA-3, NA-5, LT-7 or LT-56.)

It can be purchased separately when the DC-1500 is used for other applications.

To install, turn the power off. Remove the screw and lift the hinged door on the front of the control panel to expose the terminal strips. Connect the numbered leads to the appropriate terminals — 75 to 75, etc — on the terminal strip and the green lead to the stud marked with the symbol  . Attach the control cord to the panel at the right of the terminal strip using a suitable clamp. Close the door and replace the screw. The Remote Control cord can be lengthened to any length by properly splicing an appropriate four conductor rubber-covered cable to the standard 25' cord before connecting to the DC-1500 terminal strip.

f. Connecting for Air Carbon Arc

To use the DC-1500 for air carbon arc or other applications, disconnect all wire feeder welding cables and control leads and connect a jumper between #2 and #4 on the terminal strip on the front of the DC-1500. With the #2 to #4 jumper connected, the output studs are en-ergized whenever the machine is on.

WARNING: If the electrode leads to the wire are not disconnected per instructions, the wire feeder nozzle or gun and electrode will be electrically "hot".

g. DC-1500 Paralleling Kit

A kit for field installation only, (order K1900-1) is avail-able for paralleling two DC-1500's for currents up to 3000 amperes, 100% duty cycle. Complete installation instructions are shipped with the kit.

h. Connecting for High Frequency Starting

As shipped, these welders can be used with a high frequency unit for improved automatic welding starting characteristics.

RATINGS

IP21 enclosure
Main Transformer insulation class 155 (F)

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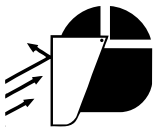
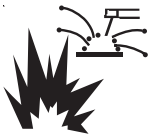
OPERATING INSTRUCTIONS

WARNING			
 ELECTRIC SHOCK can kill.	• Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground.	 ARC RAYS can burn.	• Wear eye, ear and body protection.
 FUMES AND GASES can be dangerous.	• Keep your head out of fumes. • Use ventilation or exhaust to remove fumes from breathing zone.	 WELDING SPARKS can cause fire or explosion.	• Keep flammable material away.

DUTY CYCLE

The DC-1500 is rated for 100% duty cycle at 1500 amps and 60 volts.

To Set Polarity

Connect the electrode cable to the “Positive” or “Negative” studs depending upon the electrode polarity desired. Connect the work cable to the other studs.

Set the “Electrode Negative — Electrode Positive” switch to correspond to the polarity of the electrode cable connection. This switch setting is necessary for proper operation of the Lincoln wire feeder attached to the power source.

To Start the Welder

Press the “On-Off” pushbuttons to start and stop the welder. The red pilot light near the center of the control panel indicates when the welder is on.

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To Set for Machine or Remote Control

The output can be controlled either at the wire feeder or the DC-1500. When the NL Option Kit is installed, however, output is controlled only from the K775 Remote Con-trol usually mounted at the wire feeder.

To adjust the output from the wire feeder, set the toggle switch on the front of the DC-1500 to "Output Control Remote". To adjust the output using the DC-1500 "Output Control" rheostat, set this switch to "Output Control at DC-1500".

To Set the Welder Output

With the toggle switch set to "Output Control at DC-1500", rotating the "Output Control" rheostat on the DC-1500 from 1 to 10 increases the machine output from minimum to maximum. The same full range control is set from the wire feeder or K775 when the toggle switch is set to "Output Control Remote".

Set the output as required by the welding procedures.

Mode Switch

The toggle switch labeled CV Innershield, CV submerged arc, VV submerged arc, is used to select the proper welder characteristics for the process being used.

NOTE: Some machines say "VV" for variable voltage while other machines use the terminology "CC" for constant current.

The CV Innershield Mode permits the DC-1500 to produce essentially a flat output characteristic that can be varied from approximately 20 to 60 volts. In this position the dy-namic characteristics of the machine under welding con-ditions provides optimum welding characteristics for Innershield welding and other open arc processes.

The CV Submerged Arc Mode also produces an essentially flat output characteristics that can be varied from approximately 20 to 60 volts. The dynamic characteristics of the CV Submerged Arc Mode are such that excellent submerged arc welding can be obtained for most procedures that previously required a constant current type power source.

The VV Submerged Arc Mode permits the DC-1500 to produce a constant current output characteristic through the range of 200A-28V to 1500A-60V with an open circuit voltage of 45 to 98 volts. Although almost all submerged arc welding can now be done in the CV mode, the VV mode is available for those procedures where VV (CC) may still be desirable.

Set-up for Various Processes

Selection of mode switch position — There are several general rules to follow in the selection of the mode switch position.

1. Use the CV Innershield mode for all Innershield weld-ing.
2. Use the CV Submerged Arc mode for most submerged arc welding. However, some high speed welding procedures may perform better on the CV Innershield mode.
3. The VV (CC) mode is available for high current, large puddle submerged arc procedures that cannot be done as well with the constant voltage mode.
4. *Air Carbon Arc Gouging or Cutting* — For air carbon arc gouging, the constant voltage Innershield mode is used with the output control set between 4 and max. depending on the application, carbon size, etc. Up to 1/2" carbons, start with the machine control set at 4 and increase as required for long cable lengths. With 1/2" and 5/8" carbons, short (100') cable lengths can lead to occasional tripout of the protection circuit when the carbon is shorted to the work. Cutting back the output setting will reduce the short circuit current and minimize tripping. Longer cable lengths do an even better job since this also reduces the short circuit current but even more significantly permits raising the open circuit voltage (by increasing control setting) for smoother operation. See the table below for optimum cable size and length.

Carbon Size	Typical Current Range	Combined Total Electrode and Work Lead Length (Min)	Combined Total Electrode and Work Lead Length (Max)	Electrode and Work Lead Size
1/2	600-1000 Amps	250'	825'	2 — 4/0
5/8	800-1200 Amps	375'	925'	3 — 4/0

If ever longer leads are used and the output control is already set on max., the unit has reached its maximum air carbon arc capability.

3/4" carbons are not recommended for use with the DC-1500 because the high surge currents that occur with this diameter can cause the DC-1500 fault protection circuitry to trip the machine off the line, if the operator does not gouge in such a way to limit the currents.

General Set-Up Procedures When Using DC-1500 and Lincoln Automatic Head NA-3

(Read the following and refer also to the chart on page 9.)

1. *NA-3* — The NA-3 should be set for the mode being used on the power source. If using either of the CV modes, the NA-3 VV board switch should be set for CV. If the power source is used in the VV mode, then the NA-3 VV board mode switch should be placed in the VV position.

   All NA-3's when used with the DC-1500 are capable of cold starting with the variable voltage board mode switch in VV. Cold starting permits the wire to be inches down to the work, automatically stop and automatically energize the flux hopper valve. All NA-3's made after September 1976, are capable of cold starting on either CV or VV settings of the variable voltage board switch.

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2. *Arc striking with DC-1500 mode switch on Cv sub-arc or CV Innershield* — There are a number of basic techniques for good arc striking that apply to all processes and power sources. It may not be necessary in every application to follow these guidelines, but when striking problems do occur, following the suggestions below should provide trouble-free starting. These procedures apply to all single solid wire, Innershield wire, and Twinarc $^{1}/_{8}$ and $^{3}/_{32}$ solid wire.
   a. Except for long stickout Innershield procedures and Tiny Twinarc $^{1}/_{16}$ procedures, an NA-3 start board is *not* needed. If a start board is *not* needed, it *should* be *removed* from the machine, or at least disconnected and the logic board jumper plug replaced. Leaving it connected makes the setup for arc striking more difficult. Also, if a crater board is *not* needed, it should be removed from the NA-3 or at least electrically disconnected and the jumper plug replaced.
   b. Cut electrode to a sharp point.
   c. For cold starts, make certain work piece is clean and electrode makes positive contact with plate.
   d. For hot starts, travel should be started before wire contacts the work ("on the fly" starting).
   e. Set NA-3 open circuit voltage control to approximately the same setting as the weld setting. For initial test welds, choose the voltage setting based on the table below. Set the inch control to 2.

      These are approximate settings only until the weld-ing procedure has been set.

      It should be noted that with the DC-1500 the OCV required for optimum starting is lower than that required with other type power sources.

Approximate Voltage	Voltage Control Setting
22-24	2
34-36	4
46-48	6
56-60	8

   f. Run a test weld, setting the proper current, voltage and travel speed.
   g. Once the proper welding procedure is established and if the start is poor — wire blast-off, stub, etc., adjust the OCV and inch speed for optimum start-ing. In general, a low inch speed will provide the best starting.

      Adjust the OCV by making repeated starts and observing the voltmeter action.

      With proper adjustment of the OCV control, the voltmeter needle will swing smoothly up to the de-sired arc voltage and thus provide repeatable starts.

      If the voltmeter swings *above* then back to the desired welding voltage, the OCV setting is *too high*. This usually results in a bad start where the wire tends to "blast-off".

      If the voltmeter needle *hesitates* before coming up to the desired voltage, the OCV is set *too low*. This will cause the electrode to stub.
   h. For Twinarc welding, clipping both wires to equal lengths will be beneficial to make consistently good starts.

3. *Single Innershield Wire* — Procedures and techniques are the same as above, except starting is generally better "hot" than "cold". For electrical stickouts above $1^{3}/_{4}$ an NA-3 start board is required.

4. *Twinarc Innershield* — Procedures and techniques are the same as above, except starting is generally better "hot than "cold". Use of an NA-3 start board improves starting.

5. *Twinarc Submerged Arc* $^{1}/_{16}$ — Procedures and techniques are the same as above, except starting is best when using CV Innershield and the NA-3 start board.

6. *Use of the NA-3 Start Board* — For those processes above that recommend use of the NA-3 start board, the following method should be used to set up the procedure.
   a. Set start time at 0 and start current and voltage at mid-range. Start the weld and set the proper current and voltage for the welding procedure.
   b. Turn the start board timer to maximum.
   c. Set start board current 1 to $1^{1}/_{2}$ dial numbers below NA-3 front control settings.
   d. Place start board's voltage control approximately equal to NA-3 voltage control setting.

      When set per c and d, above, the starting only procedure will provide a current setting lower than the NA-3 current setting and a voltage setting nearly equal to the desired welding procedure.
   e. With the start board time delay set at maximum, establish the correct arc striking procedure as described previously by changing OCV and inch speed.
   f. Now increase the start board current and voltage to bring the start current and voltage closer to the welding procedure. The start board current and voltage should be as close to the welding procedure as possible while still getting satisfactory starts.
   g. Now decrease the start time as low as possible for optimum starts.

7. Arc striking with the DC-1500 mode switch in VV.
   a. NA-3 — The NA-3 variable voltage board mode switch should be set to the VV position.
   b. Set OCV control at 6.5 to 7.0.
   c. Other techniques recommended in the previous sections for good arc striking apply here also.

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General Set-Up Procedures When Using DC-1500 and Lincoln Automatic Head NA-5

(See chart below.)

1. Install the NA-5 per the information in the NA-5 operating manual (IM-305). Connect the NA-5 to the DC-1500 as described on the connection diagram.
2. Place the DC-1500 mode switch in the proper position according to the process and procedure to be used.
3. Place the machine/remote switch in remote.
4. Connect the work lead to the work or a suitable piece of scrap. Clip the end of the electrode to a sharp point.
5. Preset the Start (if used), Weld and Crater (if used) Controls to the wire speed and voltage specified in the procedure.
6. Make several test welds, readjusting the starting and stopping controls in the following order:
   a. Set the Arc Striking Wire Speed and Volts Controls for optimum arc striking. For initial test welds, set the NA-5 arc striking wire speed control to 1/2 the weld wire feed speed and the arc striking voltage control 4 volts above the weld voltage.
   b. If striking is still not satisfactory, see the NA-5 op-erating manual for information on the feed motor acceleration.
   c. If installed, adjust the “Start Controls” to set the welding procedures for the time set on the timer to provide the bead size, penetration, or other factor as needed for the application. If not used, this board should be disconnected and the jumper plug replaced.
   d. If installed, adjust the “Crater Controls” to set the welding procedures for the set time after the stop button is pressed to provide the bead size or fill the crater as needed for the application. If not used, this board should be disconnected and the jumper plug replaced.
   e. Set the “Burnback Time” to provide the stopping characteristics needed.

RECOMMENDED SET-UP PROCEDURES FOR NA-3/DC-1500, NA-5/DC-1500

Equipment and Control Settings	INNERSHIELD						SUBMERGED ARC							
	Single Innershield Stickout under $1^3/^4$”		Single Innershield Stickout over $1^3/^4$”		Twinarc Innershield		Single Solid Wire		Tiny Twin $^1/^{16(1)}$		Tiny Twin Over $^1/^{16}$		High Current Very Large Puddle	
Wire Feed Type Control	NA-3S or NA-3N	NA-5	NA-3S or NA-3N	NA-5	NA-3S or NA-3N	NA-5	NA-3S	NA-5	NA-3S	NA-5	NA-3S	NA-5	NA-3S	NA-5
NA-3S VV Board Mode Switch	CV	—	CV	—	CV	—	CV	—	CV	—	CV	—	VV	—
NA-3 Inch Speed Dial Setting (5)	2	—	2	—	2	—	2	—	2	—	2	—	2	—
NA-5 Arc Striking Wire Speed(5)	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)
NA-3 OCV Control(5)	(6)	—	(6)	—	(6)	—	(6)	—	(6)	—	(6)	—	6.5 - 7.0	—
NA-5 Arc Striking Volts Control	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)	—	(4)
NA-3 Start Board	(2)	—	Req’d (2)	—	Req’d (2)	—	(2)	—	(2)	—	(2)	—	(2)	—
DC-1500 Output Control Switch — Machine or Remote	Remote		Remote		Remote		Remote		Remote		Remote		Remote	
DC-1500 Mode Switch	CV Innershield		CV Innershield		CV Innershield		CV Submerged Arc (3)		CV Innershield		CV Submerged Arc (3)		NA-3S	NA-5
													CC	CVS
DC-1500 Output Control	Inoperative		Inoperative		Inoperative		Inoperative		Inoperative		Inoperative		Inoperative	

(1) Starting is best with “hot” starting. Start button is pressed with wire above the work.
(2) If an Na-3 start board is called for, refer to page 7 for details on how to set the controls. If an NA-3 start board is not required, it should be electrically disconnected and the jumper plug replaced.
(3) Some high speed welding procedures may perform better on the CV Innershield mode. Merely change the switch between CV Innershield and CV Submerged arc position and select the best welding.
(4) The NA-5 arc striking wire speed should initially be set at 1/2 the welding wire feed speed, and the NA-5 arc striking volts control 4 volts above the welding voltage. These controls can be adjusted as required for optimum arc striking.
(5) Exact dial setting depends on cable size and length, carbon size, etc.
(6) Set the OCV control to the same dial setting as the NA-3 voltage control. For initial test welds, choose the setting based on the table on page 7.

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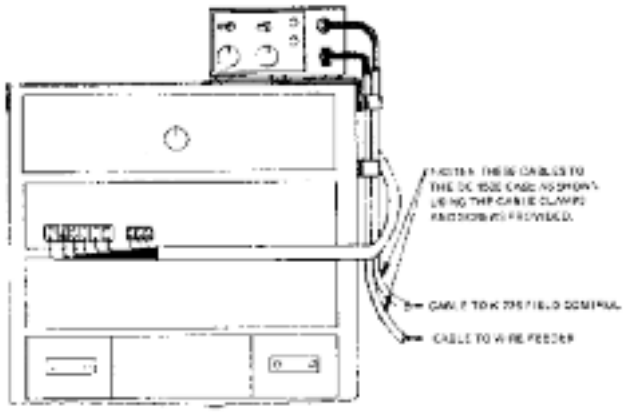
NL Option Kit (OBSOLETE FEATURE)
(Not Required With NA-3, NA-5, LT-7 or LT-56)

The K783 NL option kit (for field installation) is designed to permit use of the NA-2, LAF-3, LT-3 (OBSOLETE) and the LT-3 section of the LT-34 (OBSOLETE) tractor with DC-1500's assigned code 7687 and above. It provides the necessary DC control power for the operation of the equipment and the necessary circuitry for proper inching, cold starting and arc striking. **In using the NL option kit a K775 remote field control is required and is included as part of the option kit.** (See pg 6, paragraph e.)

The NL option kit consists of a sheet metal box, 12.5" long, 11.5" deep and 5.7" high. This box mounts on top of the DC-1500 and the following controls are located on the front of the box:

1. Inch speed control — used for LT tractor only.
2. Hot start control — used to obtain optimum arc strik-ing.
3. Polarity switch — changes polarity of control circuit to correspond with electrode polarity.
4. Contactor dropout delay switch — switches in or out a slight contactor dropout delay to prevent sticking of the wire in the crater at the end of welding.

The terminal strip for connection to the automatic equipment is located under the front cover. All necessary control leads for connection to the DC-1500 are wired into the NL kit for easy connection to the DC-1500 terminal strip.



Before proceeding with any installation, be certain the DC-1500 is turned off.

(OBSOLETE FEATURE)

1. Mount the NL option box to the top of the DC-1500 with the screws used to fasten the roof and sides.
2. Remove the cover of the NL option for access to the terminal strip.
3. Feed the control cable from the automatic wire feed control unit through the grommet on the front of the NL box. Connect the control leads per the appropriate connection diagram. Secure the cables to the case with the clamps and screws provided.
4. Using the same diagram, connect the leads from the option kit to the DC-1500 terminal strip.
5. Feed the K775 control cable through the clamp on the front of the NL option box and connect the leads to terminals 75,76, and 77 per connection diagram.
6. Replace the cover. This completes the installation.

NOTE: An NL Option was **factory installed** inside DC-1500's built to codes 7562-NL, 7636-NL and 7676-NL. The instructions for the K783 apply except as follows:

1. The factory-installed NL Option does not have a separate "POS — NEG" switch.
2. The factory-installed NL Option does not have an "Inch Speed" control.
3. It cannot be used with LT-3 or LT-34 wire feeders.
4. The fuse protecting the 115 volt DC circuit is a 2 amp fuse located on the NL Option panel inside the welder.

Operation When Connected to the NA-2 (OBSOLETE FEATURE)

1. Set the "POS — NEG" switch (on both NL Option & DC-1500) to correspond to the polarity of the electrode cable connection.
2. Set the mode switch on the front of the DC-15000 to "Constant Voltage — Innershield" or "Constant Voltage — Sumerged Arc".
3. Set the toggle switch on the front of the DC-1500 to "Output Control Remote".
4. Set the output as required for the procedures using the K775 Remote Output Control shipped with the NL Option.
5. Set the NA-2 inch speed to a speed lower than welding feed speed for good starting using the control on the NA-2. The NL Option "Inch Speed" control is not in the circuit.
6. Set the "Hot Start Control" on the NL Option to 4.
7. Set the "Contactor Drop-Out Delay" switch to "Off". Refer to the NA-2 Operating Manual for instructions for setting the contactor drop-out delay and crater filling features built into the NA-2 circuit.

Operation When Connected to the LAF-3 and the K783 NL Option Kit (OBSOLETE FEATURE)

For proper arc striking and welding when using the LAF-3 with the DC-1500 and K783 NL Option Kit, follow the instructions below (Turn the input power off at the fuse box before working inside the machine.):

1. Connect the DC-1500 NL option, and LAF-3 per the connection diagram M13321.
2. Remove the cover from the LAF-3 control box.

3. Remove the blue jumper lead connected between #1 on the coil of the main relay and #7 on the coil of the transfer relay. (The main relay is the upper right relay when facing the left end of the control box. The transfer relay is just to the left of the main relay.)
4. Replace the LAF-3 control cover.
5. Set the "POS — NEG" switch (on both the NL Option and the DC-1500) to correspond to the polarity of the electrode cable connection.
6. Set the mode switch on the front of the DC-1500 to "Variable Voltage".
7. Set the toggle switch on the front of the DC-1500 to "Output Control Remote".
8. Set the DC-1500 welding current as required by the procedures using the K775 Remote Output Control shipped with the NL Option.
9. Set the LAF-3 "Inch Speed" control near minimum so the electrode touches the work lightly before starting the arc. The NL Option "Inch Speed" control is not in the circuit.
10. Set the "Hot Start Control" on the NL Option at #2. This setting does not change the open circuit voltage, but it will improve starting, particularly at low currents. Adjust the control for optimum starting.

NOTE: The "Hot Start Control" does not affect the starting method of the LAF-3, i.e., "cold" start, "hot" start, etc. See IM-198-B, Sec. 2.4.9.

11. Set the NL Option "Contactor Drop-Out Delay" switch to "On". This circuit delays opening of the output contactor for a fixed length of time after wire feeding stops to prevent sticking.

Operation When Connected to the LT-3 or LT-34 (OBSOLETE FEATURE)

Follow the same instructions as above except in Step 1, connect per M13322. Omit Steps 2, 3 and 4. Set the "Inch Speed" control on the NL Option as low as possible so the electrode touches the work piece lightly before starting the arc.

Overload Protection

The NL Option kit includes two fuses on the front panel. The upper fuse (2 amp slow blow) protects the inching circuit when the option is used with LT-3 and LT-34 wire feeders. The lower fuse (2.8 amp slow blow) protects the 115 volt DC circuit (#1 and #2). If replacing either fuse use the same size and type.

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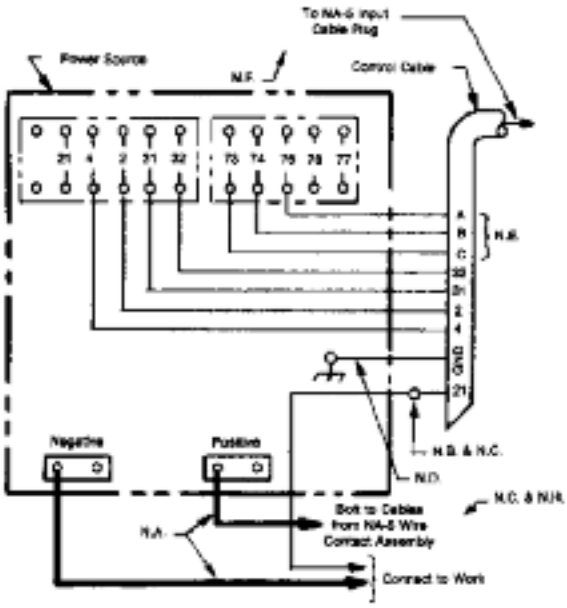
Connection of DC-1500 to NA-5



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 to proper polarity.

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 or larger insulated wire physically suitable for the installation. An S16586-[ ] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it separate from the welding work cable connection to work piece. For convenience, this extended #21 lead should be taped along the welding work cable. (This extended #21 lead connection replaces the need to employ the remote work lead accessory on LN-9's which have a direct work lead jack.)

N.C. Tape up bolted connection.

N.D. Connect the NA-5 control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source must be properly grounded.

N.E. If using an older automatic control cable with leads 75, 76, 77; connect lead 75 to #75 on terminal strip, connect lead #76 to #74 on terminal strip, connect lead #77 to #73 on terminal strip.

N.F. Connect the jumpers on the NA-5 voltage board as follows: connect RED jumper to pin "S", connect WHITE jumper to pin "B".

N.G. Set the DC-1500 controls as follows:
Set the control switch to "Output Control Remote". For C.V. Submerged Arc Processes, set the mode switch to "C.V. Submerged Arc". For Open Arc Processes, set the mode switch to "C.V. Innershield".

N.H. For proper operation, the electrode cable **must** be snugged under the clamp bar on the left side of the NA-5 control box.

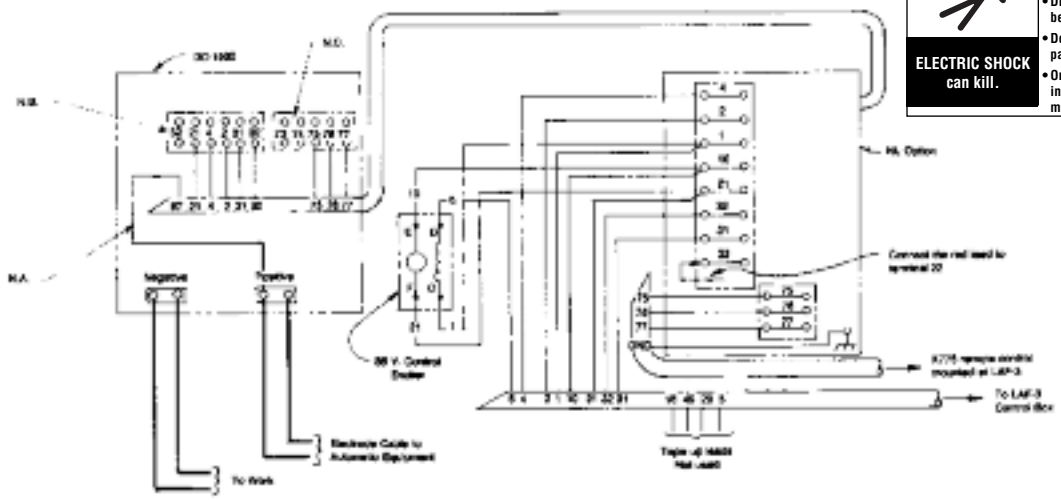
S16889
7-6-84G

Connection of DC-1500 With NL Option Kit (K783) to LAF-3 (Obsolete)

WARNING

ELECTRIC SHOCK can kill.

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



N.A. On codes above 8234 extend lead 67 and connect it to the electrode cable going to the au-tomatic equipment.

N.B. On codes below 8234 this is #67 and the LAF-3 #67 lead can be connected either to the #67 ter-minal or the electrode cable ter-minal as shown. Terminal 82 not present on later D.C. 1500's.

N.C. Terminals 73 & 74 not present on earlier D.C. 1500's.

This diagram shows the electrode connected positive. To change polarity, turn power source off, reverse the electrode and work leads at the power source and position the leads on the back of the ammeter and voltmeter in the LAF-3 control box.

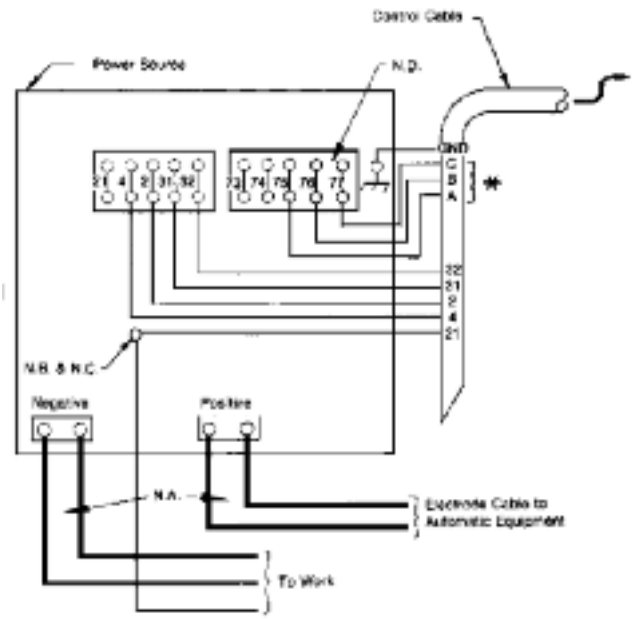
Contactor drop out delay switch on the NL option kit must be in the "on" position.

The 4/0 cables shown will handle up to 1000 amps at 80% duty cycle. For higher currents or duty cycle add additional cables to the power source output studs.

For best arc striking when connected to an LAF-3 make the following inside the LAF-3 control unit. Remove the jumper lead connected between #1 on the coil on the main relay and #7 on the coil of the transfer relay. (The main relay is the upper right relay when facing the left end of the control box. The transfer relay is just to the left of the main relay.

M13321
2-26-82C

Connection of DC-1500 to NA-3 (All), LT-5 or LT-7



Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source must be properly grounded.

To automatic control box.

* If using an older control cable: Connect lead #75 to #75 on terminal strip, connect lead #76 to #76 on terminal strip, connect lead #77 to #77 on terminal strip.

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 or larger insulated wire physically suitable for the installation. An S16586 remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it separate from the welding work lead circuit and connection for convenience, this extended #21 lead should be taped to the welding work lead.

N.C. Tape up bolted connection.

N.D. Terminals 73 and 74 not present on earlier DC-1500.

Above diagram shows electrode connected positive. To change polarity, turn power source off, reverse the electrode and work leads at the power source and position the switch on power source to proper polarity. Also reverse the leads on the back of the ammeter and voltmeter in the automatic control box.

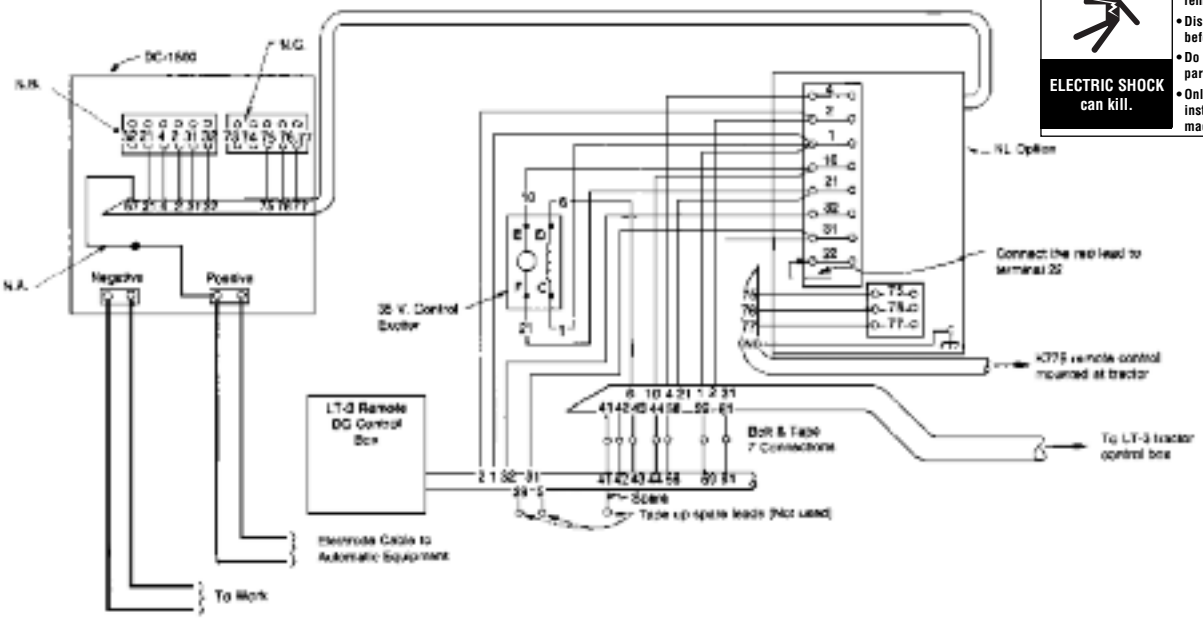
S15534
2-26-82B

Connection of DC-1500 With NL Option Kit (K783) to LT-3 or LT-34 (Obsolete)

WARNING

ELECTRIC SHOCK can kill.

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



N.A. On codes above 8234 extend lead 67 and connect it to the electrode cable going to the automatic equipment.

N.B. On codes below 8234 this is #67 and the LT-3 or LT-34 #67 lead can be connected either to #67 or to the electrode cable ter-minal as shown. Terminal 82 not present on later DC-1500's.

N.C. Terminals 73 and 74 not present on earlier DC-1500's.

This diagram shows the electrode connected positive. To change polarity, turn power source off, reverse the electrode and work leads at the power source and position the switch on the power source and th NL option kit to the proper polarity. Also reverse the leads on the back of the ammeter and voltmeter in the LT-3 control box.

Contactor drop out delay switch on the NL option kit must be in the "On" position.

The 4/0 cables shown will handle up to 1000 amps at 80% duty cycle. For higher currents or duty cycle add additional cables to the power source output studs.

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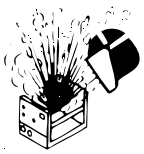
SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.
- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground**
- **Always wear dry insulating gloves.**



EXPLODING PARTS can cause injury.
- **Failed parts can explode or cause other parts to explode when power is applied.**
- **Always wear a face shield and long sleeves when servicing.**

See additional warning information throughout this Operator's Manual

ROUTINE MAINTENANCE

1. Every 6 months or so, the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean these areas: ***See Figure D.1.***

   - All printed circuit boards
   - Power switch
   - Main transformer and reactor
   - Input contactor
   - Auxiliary Transformer
   - Reconnect Switch Area
   - Fans (Blow air through the rear louvers)
   - Rectifiers

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

GENERAL MAINTENANCE

1. The fan motors have sealed bearings which require no service.
2. In extremely dusty locations, dirt may clog the air channels causing the welder to run hot. Blow out the welder with low pressure air at regular intervals. Also blow dirt out of the NL Option box.

OVERLOAD PROTECTION

The DC-1500 has built-in protective thermostats. If the rectifier or transformer reaches the maximum safe operating temprature because of frequent overload or high room temprature because of frequent overload or high room temprature plus overload, the conductor drops out stopping the welder. The thermostat automatically reset when the temprature reaches a safe operating level. Press the "On" button to start the welder.

The power rectifiers are also protected by a special solid state circuit. With the occurence of a short circuit or excessively high overloads, the input contactor opens. When the overload is removed, press the "On" button to start the welder.

An 8 amp slow blow fuse located on the front of the machine protects the 115 volt auxiliary AC circuit (#31 and #32) from overload. If replacing use the same type and size fuse.

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.**

GENERAL MAINTENANCE

1. The fan motors have sealed bearings which require no service.
2. In extremely dusty locations, dirt may clog the air channels causing the welder to run hot. Blow out the welder with low pressure air at regular intervals. Also blow dirt out of the NL Option box.

OVERLOAD PROTECTION

The DC-1500 has built-in protective thermostats. If the rectifier or transformer reaches the maximum safe operating temperature because of frequent overload or high room tem-perature plus overload, the contactor drops out stopping the welder. The thermostat automatically reset when the temperature reaches a safe operating level. Press the “On” button to start the welder.

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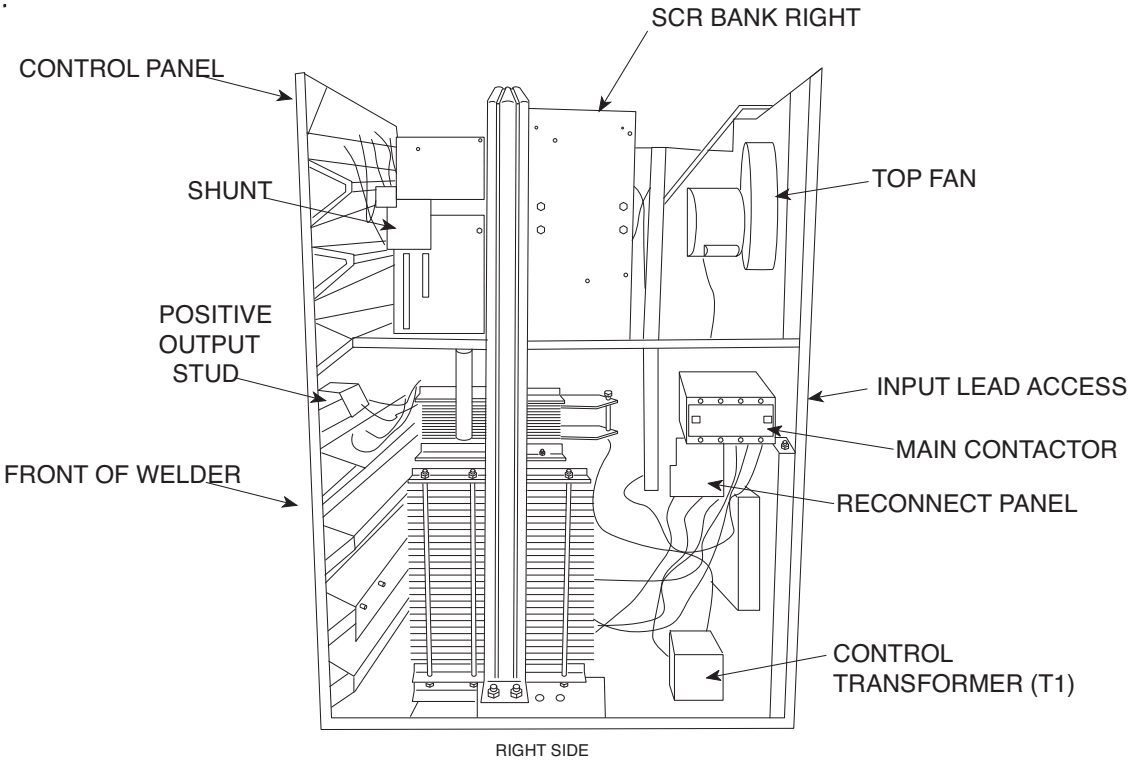
An 8 amp slow blow fuse located on the front of the machine protects the 115 volt auxiliary AC circuit (#31 and #32) from overload. If replacing, use the same type and size fuse.

Figure D.1 - Major Component Location



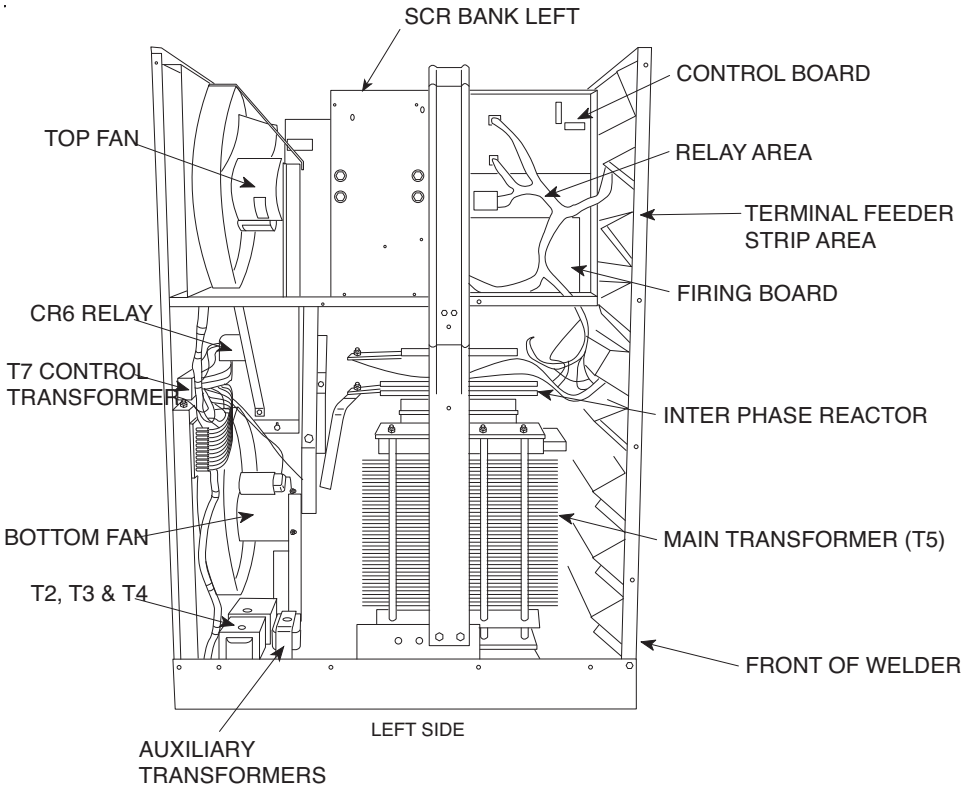


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FIGURE E.1 BLOCK LOGIC DIAGRAM

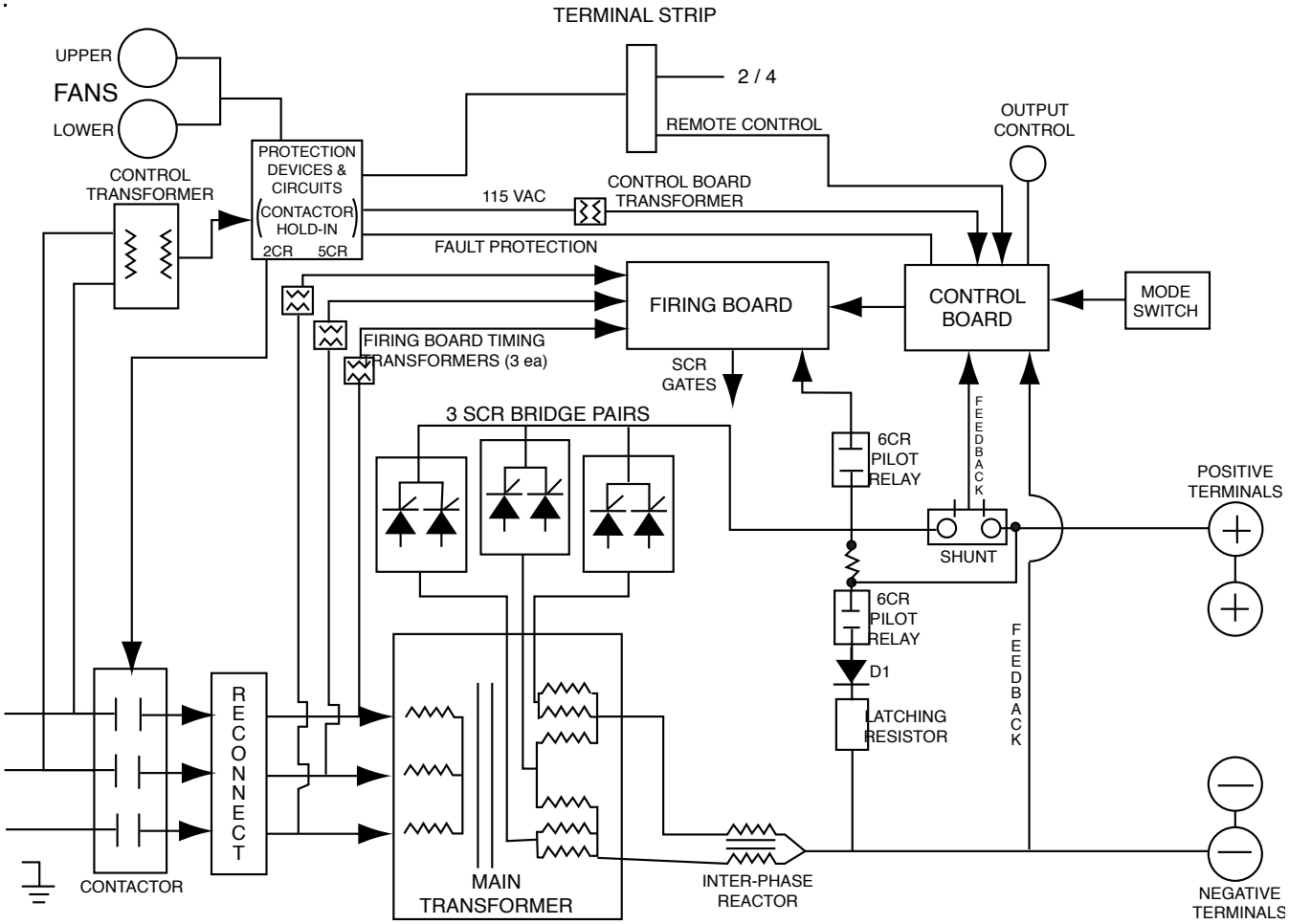
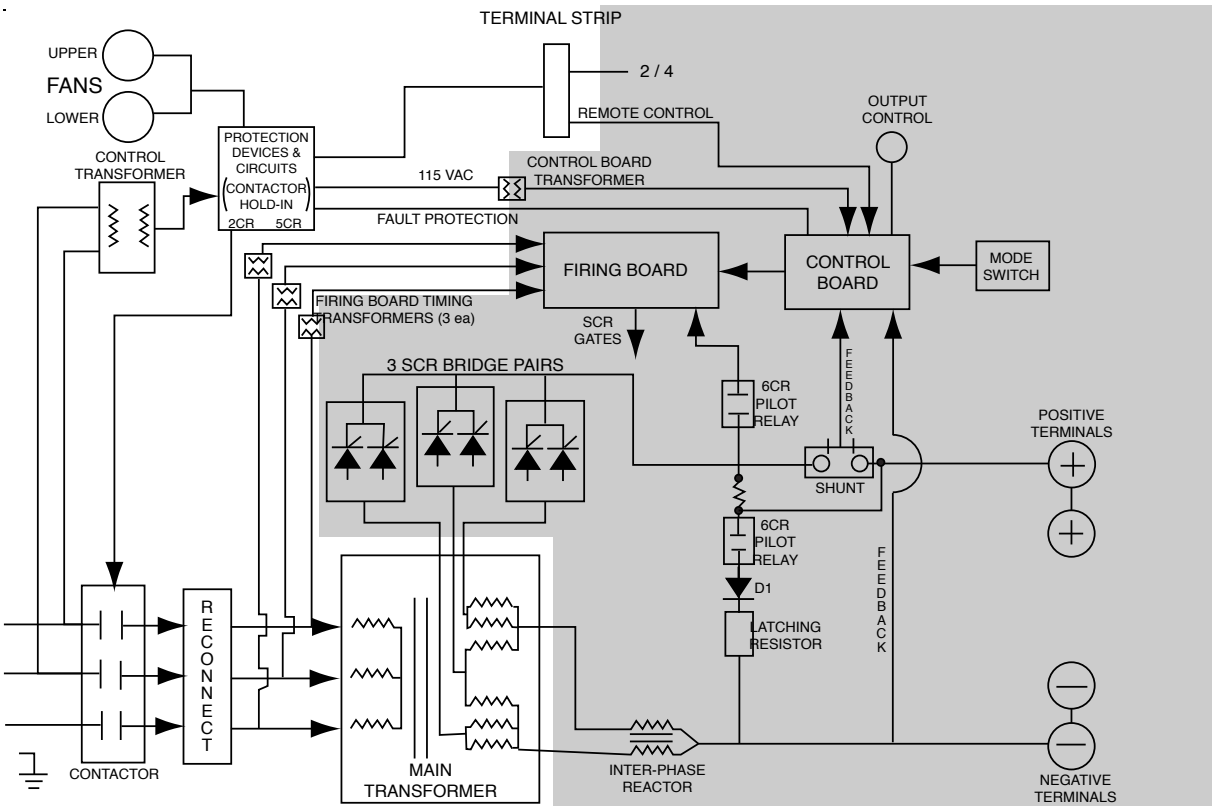


FIGURE E.2 - GENERAL DISCRIPTION



GENERAL DESCRIPTION

The DC 1500 is an SCR - controlled DC power source. It is designed to be controlled with a single range potentiometer output control. It can be used for submerged arc or open arc automatic and semiautomatic welding.

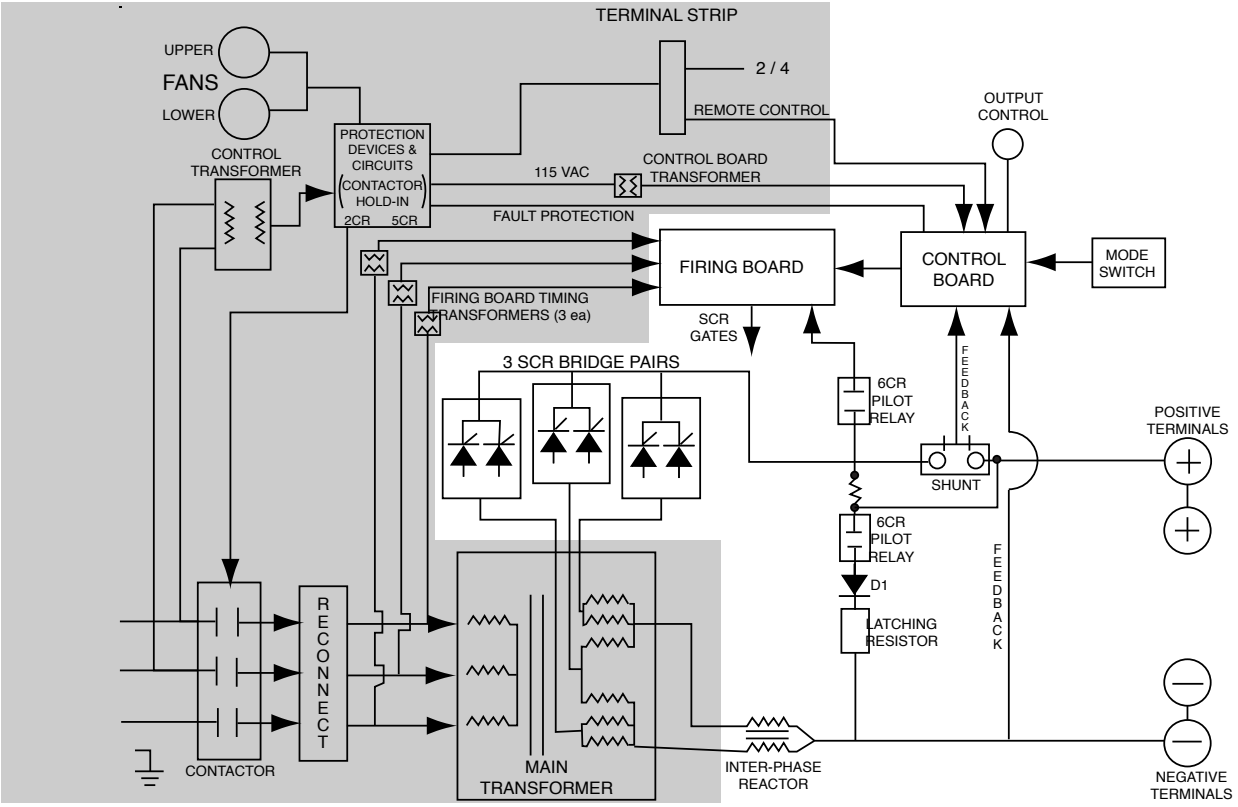
INPUT LINE VOLTAGE, CONTACTOR, AND MAIN TRANSFORMER

The desired three phase power is connected to the DC-1500 through an Input Contactor located in the input box at the rear of the machine. Two phases of the input lines are also connected to the Control Transformer which supplies power to the Contactor Hold-In Circuit. The Contactor Hold-In Circuit will disable the Input Contactor if the DC-1500 is overloaded or overheated.

A Reconnect Panel allows the user to configure the machine for the desired input voltage. This AC input voltage is applied to the primary of the Main Transformer. The transformer changes the high voltage, low current input power to a low voltage, high current output. The finishes or “neutrals” of the main secondary coils are connected together and the six starts of the secondary windings are connected to the rectifier assemblies. The three 115 VAC phase angle transformers are located in the base area (left rear). These transformers provide power and “timing” to the Firing Board.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.3 - OUTPUT RECTIFICATION, CONTROL & FEEDBACK



OUTPUT RECTIFICATION, CONTROL AND FEEDBACK

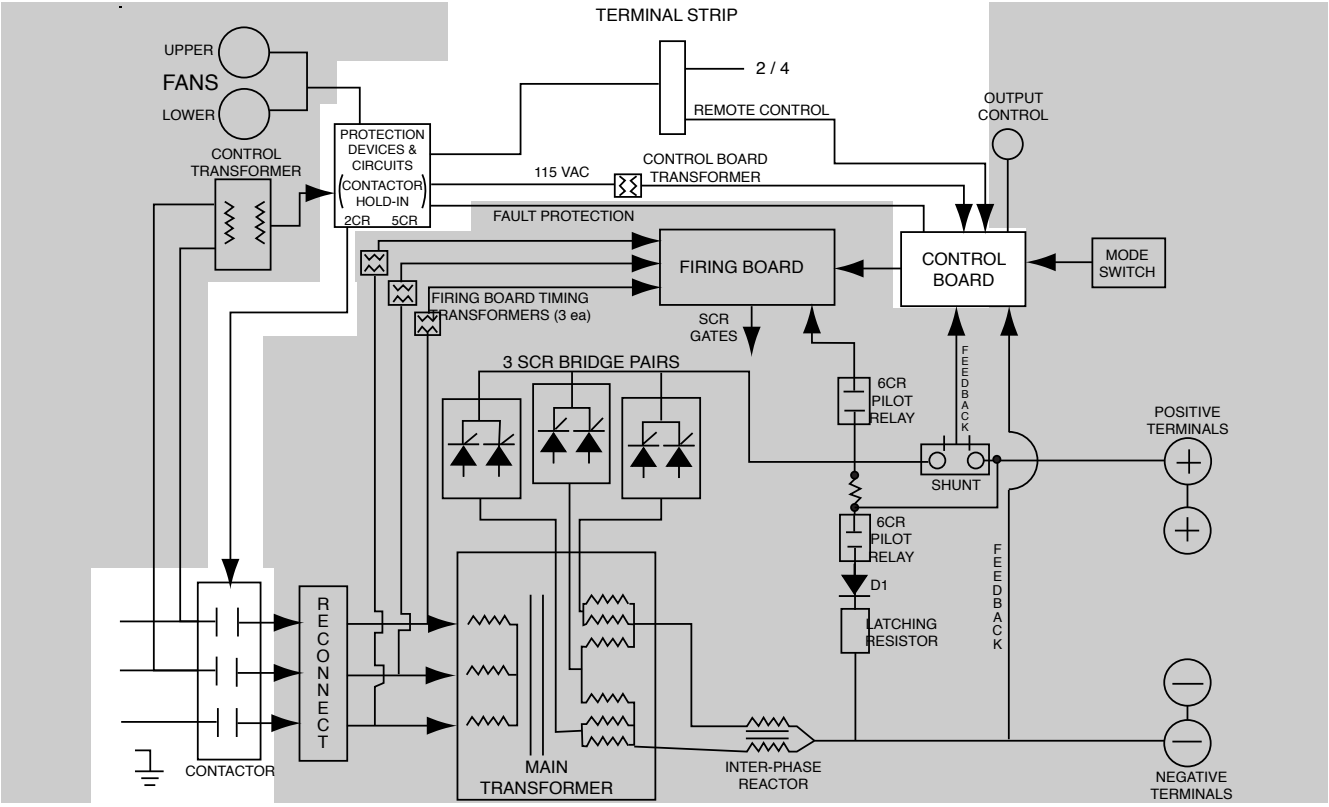
The neutrals of the Main Transformer secondary windings are connected together and the six starts are connected to the six SCR assemblies to form a six phase output. This six phase AC output from the Main Transformer secondary is rectified and controlled through the SCR bridge. Output current is sensed at the shunt, and output voltage is monitored at the welding output terminals. This feedback information is processed in the control board. The control board compares the commands of the Mode switch and the Output Control Potentiometer (or Remote Control) with the feedback information and sends the appropriate signal to the Firing Board.

The Firing Board is a three phase circuit. Each phase provides two firing pulses, one for each of the two Silicon Controlled Rectifiers (SCR) controlled by that phase. The firing circuit supplies the proper amount of energy to the gates of the power SCRs. When this gate signal is applied, at the correct time, the SCR will turn “ON”. The amount of “ON” time versus “OFF” time determines the output of the machine. See ***SCR Operation***.

The Pilot Relay signals the Firing Board circuit to supply gate pulses to the SCR Bridge. Closing of the Pilot Relay (a “dry” closure of leads #2 and #4) also brings the Latching Resistor into the machine output circuit. The Latching Resistor provides a pre-load for the SCR Bridge.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

FIGURE E.4 - PROTECTION DEVICES & CIRCUITS



PROTECTION DEVICES AND CIRCUITS (CONTACTOR HOLD-IN)

Three thermostats protect the DC-1500 from excessive operating temperatures. Excessive operating 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 thermostat(s) will deactivate the input contactor, turning the machine off. The input contactor will remain open until the machine cools. The machine can then be restarted by operating the start push button.

Upon restart, if the fans do not turn or the air intake louvers are obstructed, then the input power must be removed and the fan problem or air obstruction be corrected.

The DC-1500 is also protected against high current overloads. This electronic protection circuit senses an overload on the power source and opens the input contactor should the overload remain for a predetermined time. If the overload is great the machine will shut down immediately. The input contactor will remain open until the start push button is operated.

The Remote Control circuit is also protected from “grounds” or voltage intrusions. If the #73, #74, #75, #76 or #77 leads come in contact with either of the machine’s output cables, the DC-1500 will only operate at a minimum output or the input contactor will open.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

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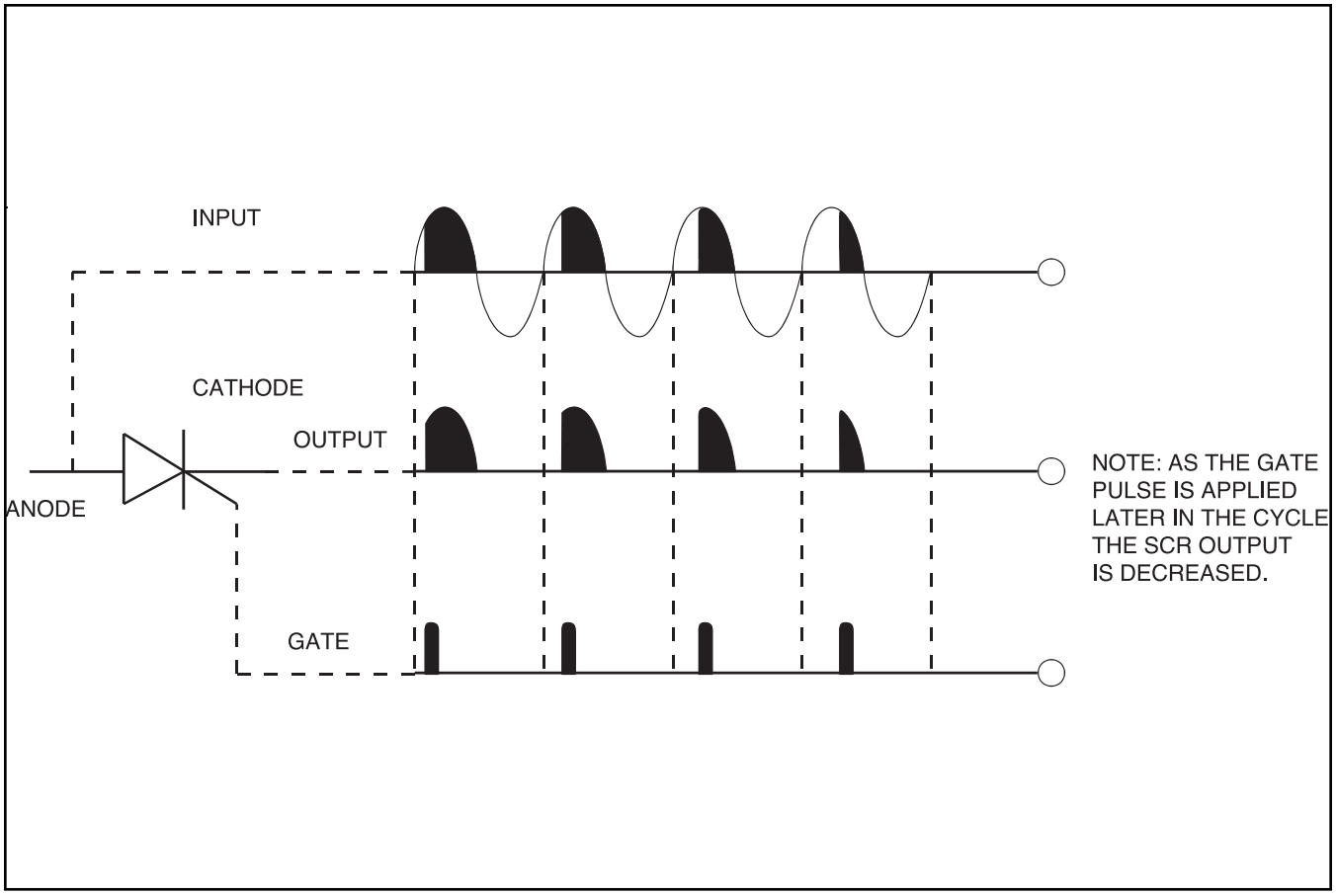
FIGURE E.5 - SCR Operation



SCR OPERATION

A silicon controlled rectifier (SCR) is a three terminal device used to control rather large currents to a load. An SCR acts very much like a switch. When a gate signal is applied to the SCR it is turned ON and there is current flow from anode to cathode. In the ON state the SCR acts like a closed switch. When the SCR is turned OFF there is no current flow from anode to cathode thus the device acts like an open switch. As the name suggests, the SCR is a rectifier, so it passes current only during positive half cycles of the AC supply. The positive half cycle is the portion of the sine wave in which the anode of the SCR is more positive than the cathode.

When an AC supply voltage is applied to the SCR, the device spends a certain portion of the AC cycle time in the on state and the remainder of the time in the off state. The amount of time spent in the ON state is controlled by the Gate.

An SCR is fired by a short burst of current into the gate. This gate pulse must be more positive than the cathode voltage. Since there is a standard PN junction between gate and cathode, the voltage between these terminals must be slightly greater than 0.6 V. Once the SCR has fired it is not necessary to continue the flow of gate current. As long as current continues to flow from anode to cathode the SCR will remain on. When the anode to cathode current drops below a minimum value, called holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave. If the SCR is turned on early in the positive half cycle, the conduction time is longer resulting in greater SCR output. If the gate firing occurs later in the cycle the conduction time is less resulting in lower SCR output.

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: output problems, function problems, wire feeding problems, and welding problems.

Step 2. PERFORM EXTERNAL TESTS.
The second column labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)" lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. RECOMMENDED COURSE OF ACTION
The last column labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the specified test points, components, terminal strips, etc. can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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PC BOARD TROUBLESHOOTING PROCEDURES

⚠ 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.

⚠ CAUTION

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.

ATTENTION Static-Sensitive Devices Handle only at Static-Safe Workstations

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.

- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.

- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.

- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major Physical or Electrical Damage is Evident.	Contact the Lincoln Electric Service Dept. 1-888-935-3877	
The Machine is dead - The Input contactor does not operate.	1. Check for blown or missing fuses in input lines. 2. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel.	1. The.Start/Stop button (S1) may be faulty- Check for proper operation. See ***wiring diagram***. 2. The Auxiliary Transformer (T1) may be faulty. Perform the ***Auxiliary Transformer Test. (T1)*** 3. The primary or secondary thermostats may be open. Check or replace. Also check the associated wiring. See ***wiring diagram***. 4. The shut down relay (2CR) may be faulty. Check or replace. See ***wiring diagram***. 5. The input contactor coil may be open. See ***wiring diagram***. 6. The Control board may be faulty - Replace.
Input contactor (1CR) chatters.	1. The input line voltage may be low. Check all three phases. 2. Make sure input line voltage matches machine rating and reconnect panel.	1. The pilot relay (2CR) may have bad contacts. Check or replace relay. 2. Check for loose or faulty wiring between the fault protection relay (2CR) and input contactor (1CR) coil connections. 3. The input contactor (1CR) may be faulty - Replace. 4. Check the T7 isolation transformer. See ***wiring diagram***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Input contactor pulls in when start button is pressed but immediately drops out when start button is released.	1. Make sure input voltages match machine rating and reconnect panel. 2. Remove all external wires attached to terminal strip (2, 4, 31, 32, 73, 74, 75, 76, 77). If contactor (1CR) functions correctly, there may be a ground or negative intrusion on the remote control leads (73, 74, 75, 76, or 77). There may also be a short at the welder output terminals. 3. If the problem persists after performing steps #1 and #2, the problem is in the DC-1500.	1. The 5CR interlock relay may be faulty. Replace if necessary (some older codes will not have 5CR). An interlock set of contactors will be on 1CR input contactor. 1CR will have to be replaced. 2. The Start/Stop button may be faulty. Check or replace. 3. Check internal remote control circuit (leads 73, 74, 75, 76 and 77) and switch SW4 for grounds or shorts. 4. The control board may be faulty - Replace. 5. Check for a dirty or wet control box area or terminal strip area. Clean or dry out. 6. A control pot, mode switch, remote switch, and/or polarity switch could be defective and/or going to ground (case). Remove from case to test what component is grounded. Replace defective component. 7. Check T7 isolation transformer. See ***wiring diagram***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Machine input contactor operates but machine has no weld output. Fan runs and pilot light glows.	1. Install a jumper from #2 to #4 on machine terminal strip. If machine weld output is restored, the problem is in the wire feeder or control cable. 2. If remote control is not being used, make certain the output control switch (SW4) is in the "OUTPUT CONTROL AT DC 1500" position. 3. Check 8 AMP fuse in the front panel. Replace if blown. 4. Check for loose or faulty weld cable connections.	1. Check operation of output pilot relay (6CR). There should be 115 VAC present on leads #31 and #4 at (6CR) when #2 and #4 are jumpered together at the terminal strip. USE CAUTION AROUND ROTATING LOWER FAN!!! a. If the correct voltage is present and the relay does not activate, the relay may be faulty - Replace. b. If the 115 VAC is missing, check the associated wiring for loose or faulty connections. See ***wiring diagram***. 2. Check the output control potentiometer (R1) and associated circuitry for loose or faulty connections. See ***wiring diagram***. 3. Perform ***Main Transformer Test*** 4. Perform ***Firing Board Test***. 5. Perform ***Control Board Test***. 6. Perform ***SCR Output Bridge Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Machine has maximum weld output and no control.	1. If remote control is being used, put output control switch (SW4) in "OUTPUT CONTROL AT DC-1500" position and control weld output with the output control (R1) at DC-1500. If the problem is solved, check the remote control unit (or wire feeder) and associated control cable.	1. Check output control switch (SW4) and associated wiring. 2. Check feedback leads #222 (negative output terminal) and #234, #232 (output shunt) for loose or faulty connections. See ***wiring diagram***. 3. Check the #75 lead for continuity (zero ohms) from the output control potentiometer (R1) to the control board plug 12 pin 7. See ***wiring diagram***. 4. Perform ***Firing Board Test***. 5. Perform ***Control Board Test***. 6. Perform ***SCR Output Bridge Test***.
Machine has minimum output and no control.	1. If a remote control unit is NOT connected to the terminal strip #73, #74,#75, #76, and/or #77 terminals, the output control switch must be in the "OUTPUT CONTROL AT DC-1500" position. 2. If a remote control cable is connected to terminals #73, #74, #75, #76, and/or #77, the leads may be shorted to the positive weld output. 3. Make certain the three phase input voltage is correct and matches the machine rating and the reconnect panel.	1. Check the output control potentiometer (R1) and associated wiring. 2. Check the output control switch (SW4) the welding mode switch (SW5) and associated wiring. 3. Perform the ***Control Board Test***. 4. Perform the ***Firing Board Test***. 5. Perform the ***SCR Output Bridge Test***.. 6. Perform ***Main Transformer Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine does not have maximum weld output.	1. Check all three-phase input lines at the DC-1500. Make sure input voltages match machine rating and reconnect panel. 2. Put output control switch (SW4) in "OUTPUT CONTROL AT DC-1500" position. If problem is solved, then check remote control unit or wire feeder.	1. Check the output control potentiometer (R1) and associated circuitry for loose or faulty connections. See ***wiring diagram***. 2. Perform ***Control Board Test***. 3. Perform ***Firing Board test***. 4. Perform ***Main Transformer Test***. 5. Perform ***SCR Output Bridge Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Machine shuts off (input contactor drops out) when the welder output terminals are electrically energized. (#2 to #4 closure at terminal strip.)	1. Remove all welding cables and control cables from the DC-1500. Jumper #2 to #4 at the terminal strip. If the machine does NOT shut off and normal open circuit voltage is present at the welder output terminals, the problem is external to the DC-1500. Either the remote leads #73, #74, #75, #76 or #77 are grounded to the negative output cable, or there is a short on the welding output terminals. 2. If the machine still shuts off when all control and welding cables are removed, then the problem is internal to the DC-1000.	1. Check for grounds and or shorts in the #73, #74, #75, #76, #77 circuit. See ***wiring diagram.*** 2. Check for grounds and shorts in the welder output terminals and associated leads. See ***wiring diagram***. 3. Check the output shunt and associated leads. See ***wiring diagram***. 4. Perform the ***Control Board Test***.
The DC-1500 will NOT shut off when the Stop button is pushed.	1. Input contact frozen. 2. Pilot relay contacts stuck closed.	1. The input contactor (1CR) contacts may be stuck closed. Check and replace if necessary. 2. The Interlock contacts (part of 1CR) may be faulty. Replace if necessary. 3. The Start/Stop button may be faulty. Check or replace.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The weld output terminals are always electrically "hot".	1. Remove any external leads hooked to #2 and #4 on the terminal strip. If the problem disappears, the fault is in the control cable or wire feeder. 2. If some open circuit voltage is present (over 3 VDC.) after performing Step #1, then the problem is within the DC-1500.	1. Check for an internal short between leads #2 and #4. See ***wiring diagram***. 2. The Pilot Relay (6CR) may be stuck closed. Check or replace. 3. Perform ***Firing Board Test***. 4. Perform ***Control Board Test***. 5. Perform the ***SCR Output Bridge Test***. 6. The SCR Snubber(s) may be "leaky". Check or replace. See ***wiring diagram***.
Machine trips off with high current procedures upon starting.	1. OCV setting is too high. 2. Defective control board.	1. Reduce OCV setting. 2. Perform ***Control Board Test***. Replace if needed.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Poor arc starting when the DC-1500 is in the CV Sub-Arc or CV Innershield Modes.	1. Make sure the proper welding procedures are being used (wire feed speed, arc voltage and wire size). 2. Check weld cables for loose or faulty connections.	1. Check the 4CR reed switch. The voltage from lead #210 to lead #220 should be 8 VDC when the DC-1500 is in an idle condition (on but not welding). When the machine is producing welding current, the reed switch (4CR) should close and the voltage from #210 to #220 should drop to zero. Note: Check 7CR on Code 8146-8293. 2. Perform the ***Firing Board Test***. 3 Perform the ***SCR Output Bridge Test***. 4. The control board may be faulty - Replace.
Poor arc characteristics in all processes.	1. Check for the correct input voltages on the three phase input lines at the DC-1500. 2. Make sure the proper welding procedures are being used (wire feed speed, arc voltage and wire size). 3. Check the welding cables for loose or faulty connections.	1. Check the Mode Switch (SW5) and the associated wiring for loose or faulty connections. See ***wiring diagram.*** 2. Check the 4CR reed switch. The voltage from lead #210 to lead #220 should be 8 VDC when the DC-1500 is in an idle condition. When the machine is producing welding current, the reed switch (4CR) should close and the voltage from #210 to #220 should drop to zero. 3. Perform the ***Firing Board Test***. 4. Perform the ***SCR Output Bridge Test***. 5. The control board 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 the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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AUXILIARY TRANSFORMER (T1) VOLTAGE TEST PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the correct voltage is being:
a. applied to the primary of the auxiliary transformer.
b. induced on the secondary winding of the auxiliary transformer.

MATERIALS NEEDED

Volt/Ohm Meter (Multimeter)
IDEALARC® DC-1500 wiring diagrams (See Electrical Diagram Section of Manual).

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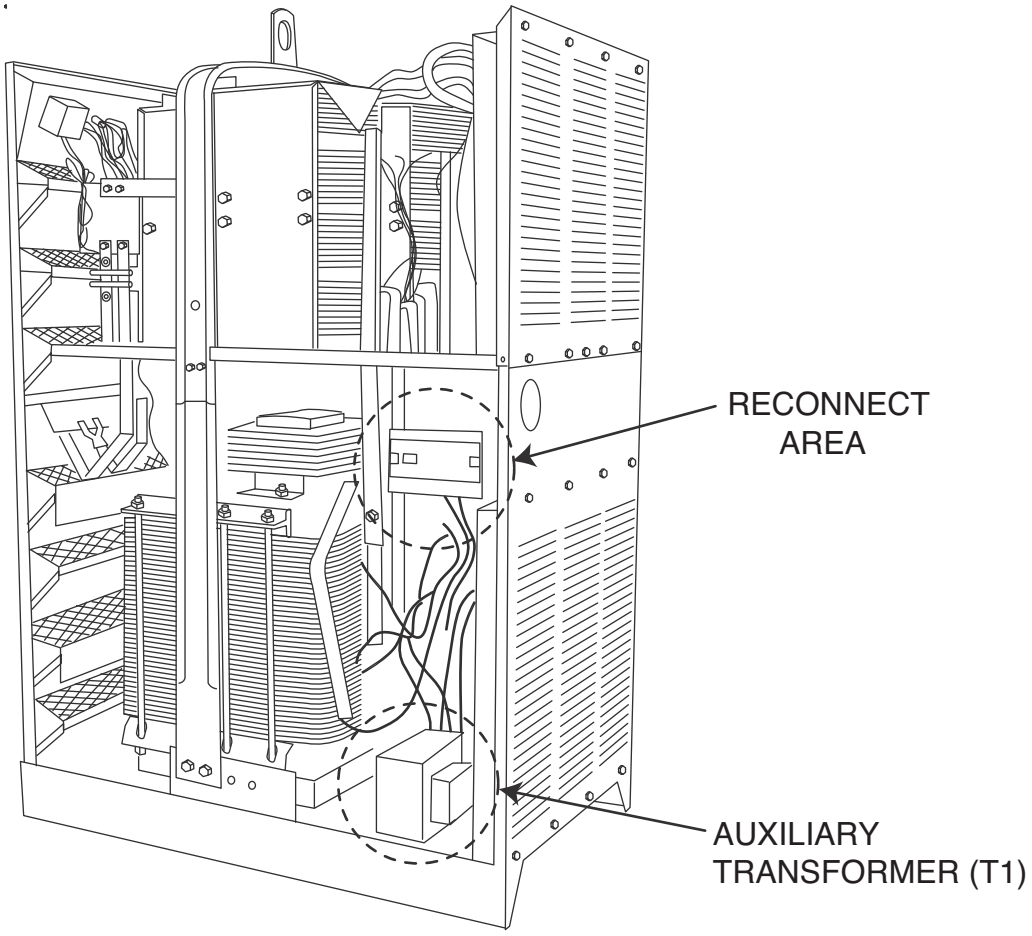
AUXILIARY TRANSFORMER (T1) VOLTAGE TEST PROCEDURE (continued)

FIGURE F.1 – Auxiliary Transformer Location



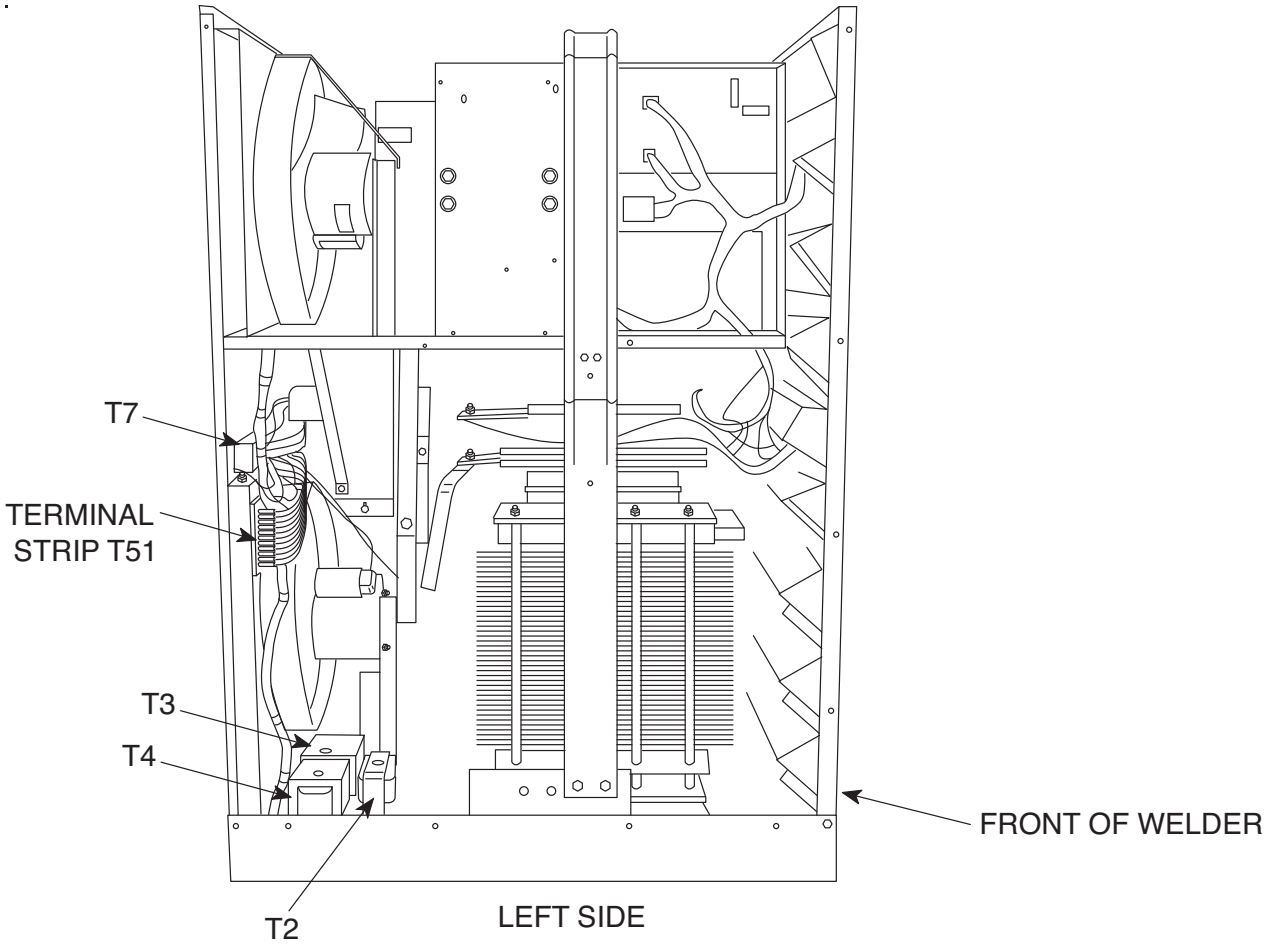
PROCEDURE

1. Disconnect main AC input power to the machine.
2. Remove the lower left and right case sides.
3. Locate the Auxiliary Transformer (T1) on the left lower right rear of machine. See Figure F.1.
4. Locate the Auxiliary Transformer above primary leads (H1, H3, etc.) at the reconnect area. (T1). See ***wiring diagram***.

   NOTE: Unused leads should be taped. Check for loose or faulty connections.

AUXILIARY TRANSFORMER (T1) VOLTAGE TEST PROCEDURE (continued)

FIGURE F.2 – Auxiliary Transformer 201,202 (32)



5. Locate Auxiliary Transformer leads 201 and 202 (32) at the terminal.

6. Apply power and test for 115 VAC between leads 201 to 202 (32).

7. If 115 VAC is not present between leads 201 and 202 (32), test for correct main AC input power to the Auxiliary Transformer primary windings (H1, H3, etc.) at the reconnect area. See ***Wiring Diagram***.

   If the correct main AC input power to the Auxiliary Transformer is present, and the secondary voltage is not correct, the Auxiliary Transformer may be faulty. Replace.

Note: Newer codes will have a 5 Amp slow blow fuse on the reconnect area for the primary connection to T1 (fuse may be blown).

8. With the input power disconnected check for meg ohms of resistance to case ground of welder from H1, H3, Primary leads to case, from 201, 202 (32) leads to case. If less than 1 meg ohm, replace T1 Transformer.

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MAIN TRANSFORMER (T5) VOLTAGE TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

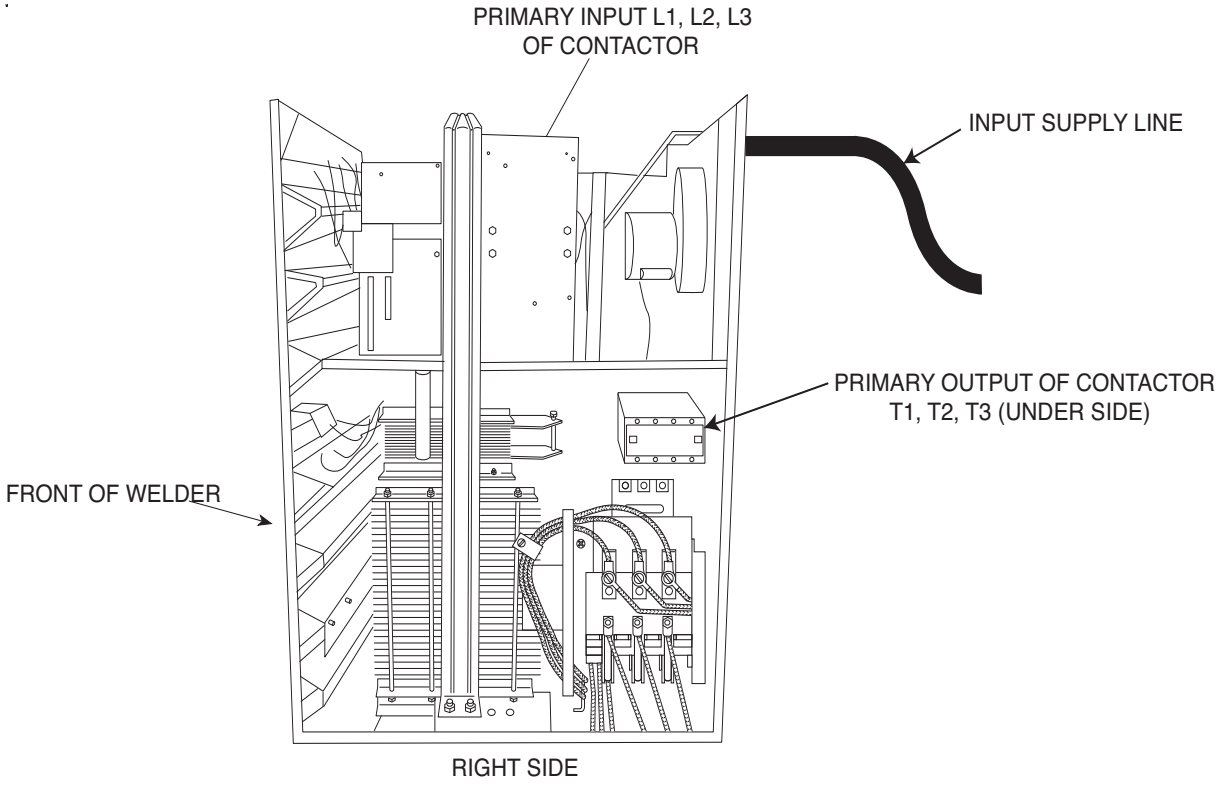
This test will determine if the correct voltages are being:
a. applied to the primary windings of the Main Transformer (T5).
b. induced on the secondary winding.

MATERIALS NEEDED

Volt/Ohm Meter (Multimeter)
IDEALARC® DC-1500 wiring diagrams (See Electrical Diagram Section of Manual).

MAIN TRANSFORMER (T5) VOLTAGE TEST (continued)

FIGURE F.3 – Primary Output Of Contactor T1, T2, T3 (Not Shown)



PROCEDURE

1. Disconnect main AC input power to the machine.
2. Inspect the Input Contactor, Reconnect Panel, and primary leads to the Main Transformer for loose or faulty connections. See Figure F.3.
3. Apply input power, push start button, and make sure the Input Contactor (1CR) energizes.
4. Carefully test with an AC voltmeter for proper main AC input voltage to the line side of the Input Contactor (1CR). See ***wiring diagram***.

   L1 to L2.

   L2 to L3.

   L1 to L3.

   a. If proper voltage is not present in any or all of the three phases, check input fuses and leads.

5. Test with an AC voltmeter for proper main AC input voltage from the output side of the Input Contactor. (1CR). See ***wiring diagram***.

   T1 to T2.

   T2 to T3.

   T1 to T3.

   a. If correct voltage is present, the Contactor is working properly.

   b. If the correct voltage is not present for any or all of the three phases, the contactor may be faulty.

6. Carefully test with an AC voltmeter for approximately 70.0 Volts on the six main transformer secondary leads. Check from each of the six secondary leads, where they are connected to the SCR bridge, to the negative output terminal. Note that the negative leads also pass through the interphase reactor coils. See ***Wiring Diagram***. ***See Figure F.4***.
7. If one or more of the secondary voltages are incorrect, check for loose or faulty leads and connections. It the leads and connections are good, then the main transformer may be faulty.

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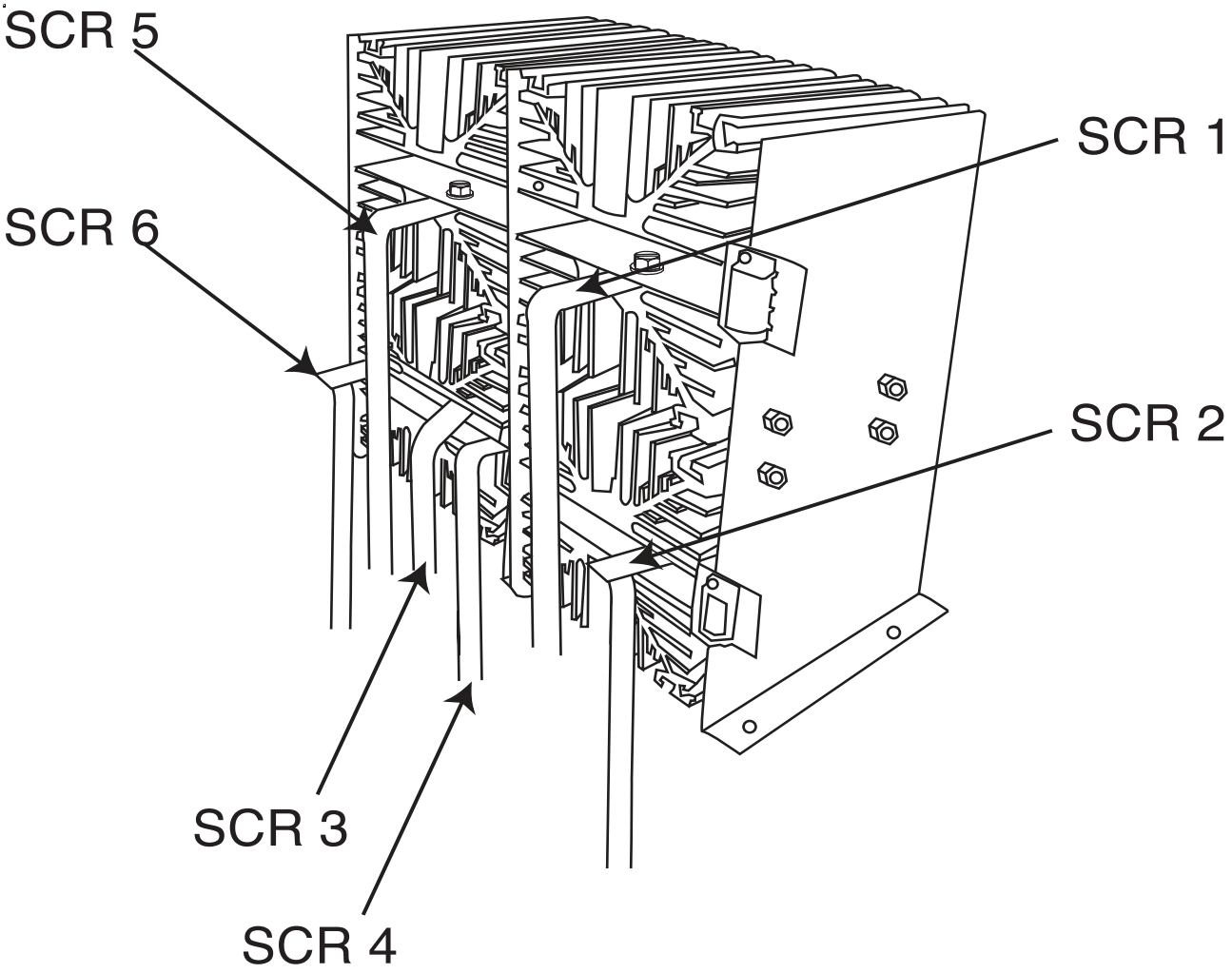
MAIN TRANSFORMER (T5) VOLTAGE TEST (continued)

FIGURE F.4. – SCR's



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CONTROL TRANSFORMERS (T2, T3 & T4) VOLTAGE TEST PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the correct voltages are being:
a. applied to the primary windings of the Control Transformer (T2, T3 & T4).
b. induced on the secondary windings of the Control Transformers.

MATERIALS NEEDED

Volt/Ohm Meter (Multimeter)
IDEALARC® DC-1500 wiring diagrams (See Electrical Diagram Section of Manual).

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CONTROL TRANSFORMERS (T2, T3 & T4) VOLTAGE TEST PROCEDURE (continued)

TABLE F.1

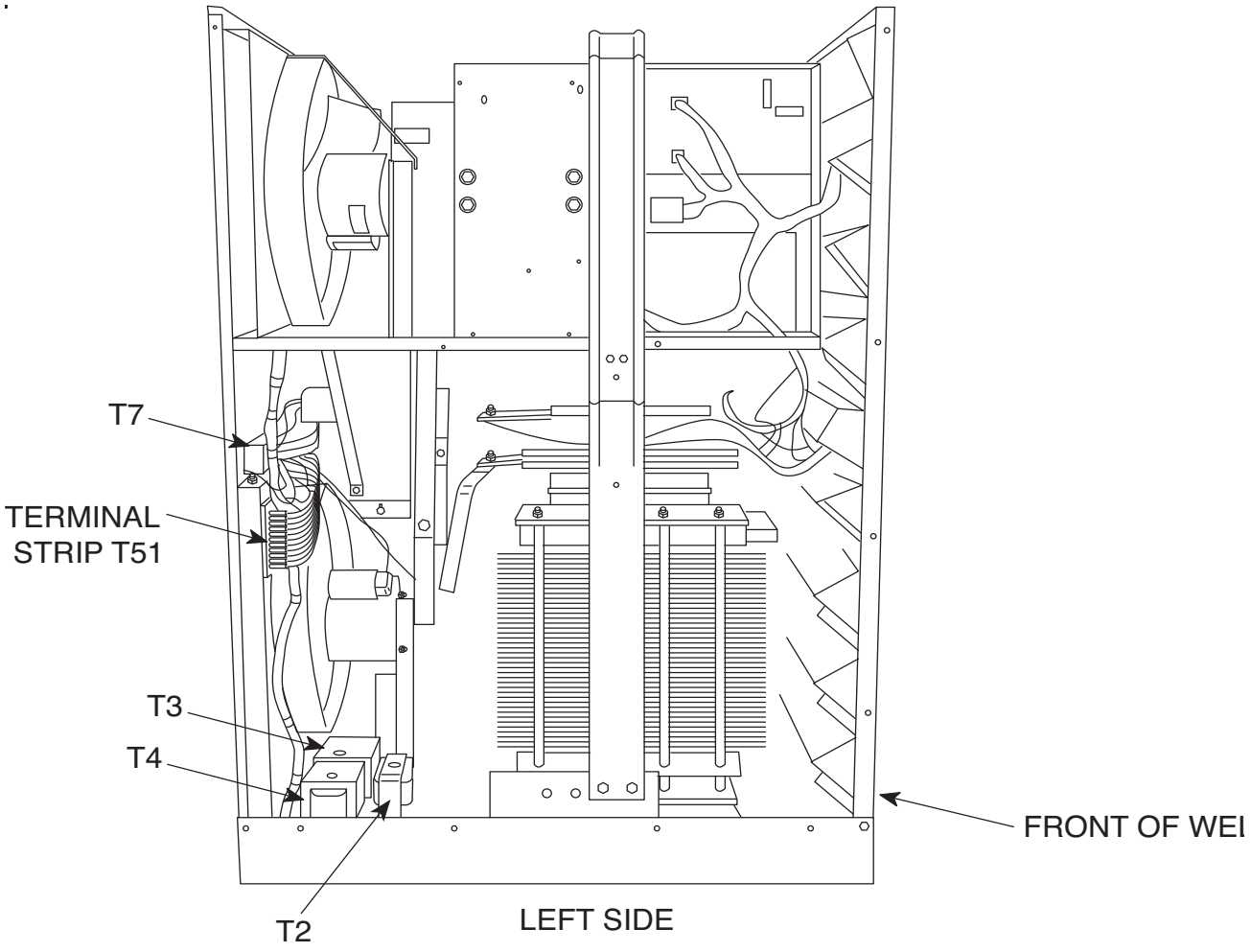
Test Point (From)	Test Point (To)	Expected Reading
Lead 203	Lead 204	115 VAC
Lead 205	Lead 206	115 VAC
Lead 207	Lead 208	115 VAC

PROCEDURE

1. Turn the DC-1500 machine off.
2. Remove the input power to the DC-1500.
3. Remove the left case sides.
4. Locate the Control Transformers T2, T3 & T4. ***See Figure F.5.***
5. Locate the TS1 Terminal strip. ***See Figure F.5.***
6. Check to make sure the correct input power is being applied to the primary windings of the Control Transformers. Note that the phasing of the Control Transformers is very important. They provide input power and SCR firing information to the Firing Board. Make certain that both the primary windings and secondary windings are connected properly. See ***Wiring Diagram***.
7. Apply the correct input power to the machine and carefully check for the correct secondary voltages at the TS1 terminal strip. See Table F.5. See ***Wiring Diagram***.
8. If any of the secondary voltages are missing or incorrect, check for loose or faulty connections. See Wiring Diagram. If the leads and connections are good and the correct input voltages are being applied to the primary windings, the Control Transformer may be faulty.
9. Also make sure that the leads and connections between the TS1 terminal strip and 12 pin connector on the firing board are good. See ***Wiring Diagram***.
10. When testing is complete, replace the left case sides.

CONTROL TRANSFORMERS (T2, T3 & T4) VOLTAGE TEST PROCEDURE (continued)

FIGURE F.5 – TERMINAL STRIP



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FIRING BOARD TEST PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test determines whether or not the Firing Board is receiving the correct voltages and gate signals. The LED's (Light Emitting Diodes) will help you determine if the Firing Board is generating gate signals to the main SCR's.

MATERIALS NEEDED

Volt/Ohm Meter (Multimeter)
IDEALARC® DC-1500 Wiring Diagram and Firing Board Schematic Diagram (See Electrical Diagram Section of Manual).

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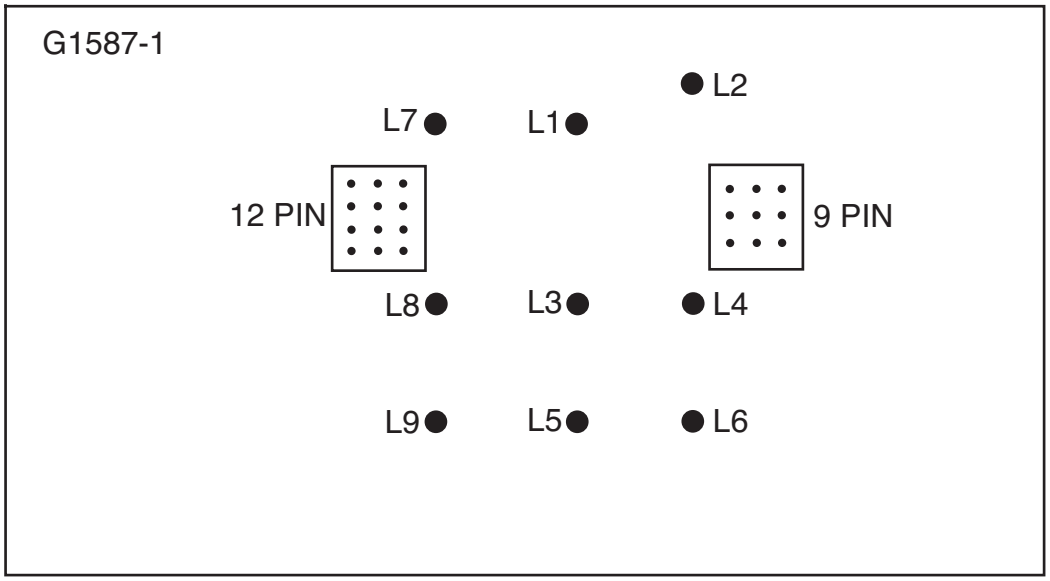
FIRING BOARD TEST PROCEDURE (continued)

FIGURE F.6 – FIRING BOARD



TEST PROCEDURE FOR NORMAL FIRING BOARD OPERATION

1. Disconnect main AC input power to the machine.
2. Remove the top left case side. Locate the Firing Board. **See Figure F.7**.
3. Visually inspect the Firing Board for loose or faulty connections.
4. Reconnect the input power and turn the DC-1500 on.
5. Locate LEDs 7, 8, and 9 on the Firing Board. See Figure F.6. Each LED should be ON and equally bright. Refer to next page to check LED operation.
6. Connect a jumper wire from terminal #2 to terminal #4 on the terminal strip. These can be accessed through the Front Panel Assembly door. See Figure F.6.

⚠ WARNING

JUMPERING LEADS 2 AND 4 ELECTRICALLY ENERGIZES MACHINE'S OUTPUT TERMINALS. DO NOT TOUCH ELECTRICALLY HOT COMPONENTS.

7. Locate LEDs 1 thru 6. Each LED should glow with equal brightness. See Figure F.6.

NOTE: LEDs 1 through 6 indicate that the gate firing signals are being generated to send to each of the output SCRs.

8. Set the output control switch (SW4) in the "Output Control at DC-1500" position.
9. Set the welding mode switch (SW5) in either of the "CV" positions.

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FIRING BOARD TEST PROCEDURE (continued)

FIGURE F.7 – FIRING & CONTROL BOARD LOCATION(S)

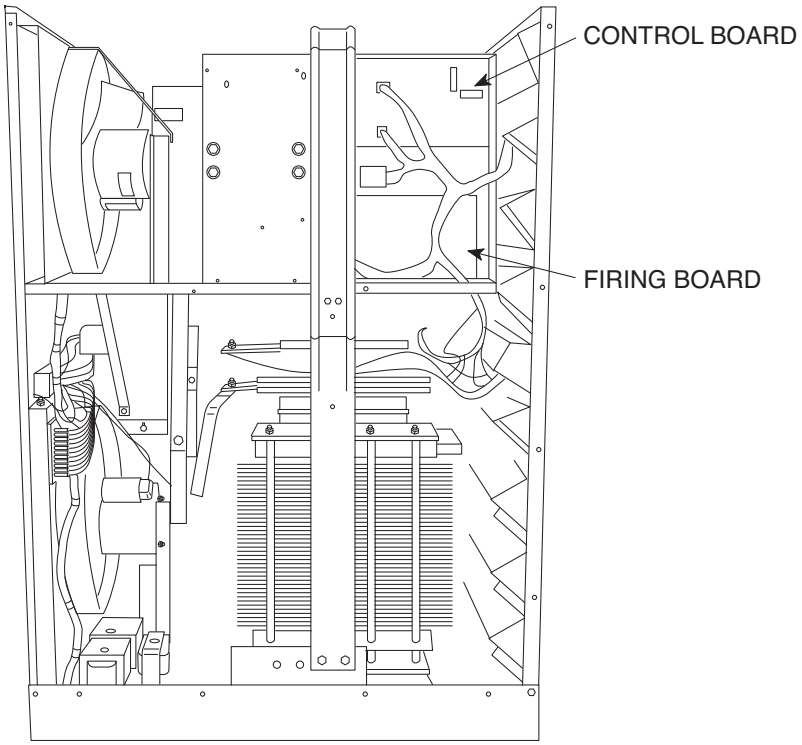

TABLE F.2 – LED 7,8 AND 9 CHECKLIST

IF	THEN
LED 7 is ON	AC power is being supplied to the Firing Board from leads #203 and #204 connected to the phase angle winding on the T2 Control Transformer.
LED 7 is OFF or is DIMMER than other LED's	The proper AC voltage may not be reaching the Firing Board. Check for loose or faulty connections. Perform the ***Control Transformer Test***
LED 8 is ON	AC power is being supplied to the Firing Board from leads #205 and #206 connected to the phase angle winding on the T3 Control Transformer.
LED 8 is OFF or is DIMMER than other LED's	The proper AC voltage may not be reaching the Firing Board. Check for loose or faulty connections. Perform the ***Control Transformer Test***
LED 9 is ON	AC power is being supplied to the Firing Board from leads #207 and #208 connected to the phase angle winding on the T4 Control Transformer.
LED 9 is OFF or is DIMMER then other LED's	The proper AC voltage may not be reaching the Firing Board. Check for loose or faulty connections. Perform the ***Control Transformer Test***

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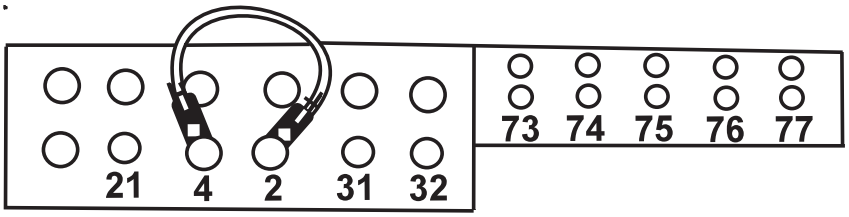
FIRING BOARD TEST PROCEDURE (continued)

FIGURE F.8 – TERMINAL STRIP JUMPER WIRE CONNECTIONS
(Located under small door at front left of machine)



10. Rotate the output control potentiometer (R1). As the potentiometer is turned clockwise, the LEDs should glow brighter. As the potentiometer is turned counter-clockwise, the LEDs should dim.

    a. If the LEDs glow and change in brightness equally as the potentiometer is turned and the problem continues, then the SCR bridge may be faulty. Perform the ***SCR Bridge Test***.

    b. If any or all of LEDs 1 through 6 do not glow, or do not change in brightness equally as the potentiometer is turned, continue to next step.

    c. If one or two LEDs stay bright or dim while the others change, this could indicate either an open or shorted gate or a faulty snubber on the related SCR snubber assembly. Perform the ***SCR Bridge Test***.

11. Locate and test for 6 to 15 VDC between leads #231 and #214 on the Firing Board in the CV mode. When the output control potentiometer (R1) is rotated, the DC voltage between leads #231 and #214 should vary from 6 to 15 VDC.

12. If an LED continues to be lit and should not be, a circuit may be faulty on the Firing Board between a Molex plug and LED. Replace Firing Board.

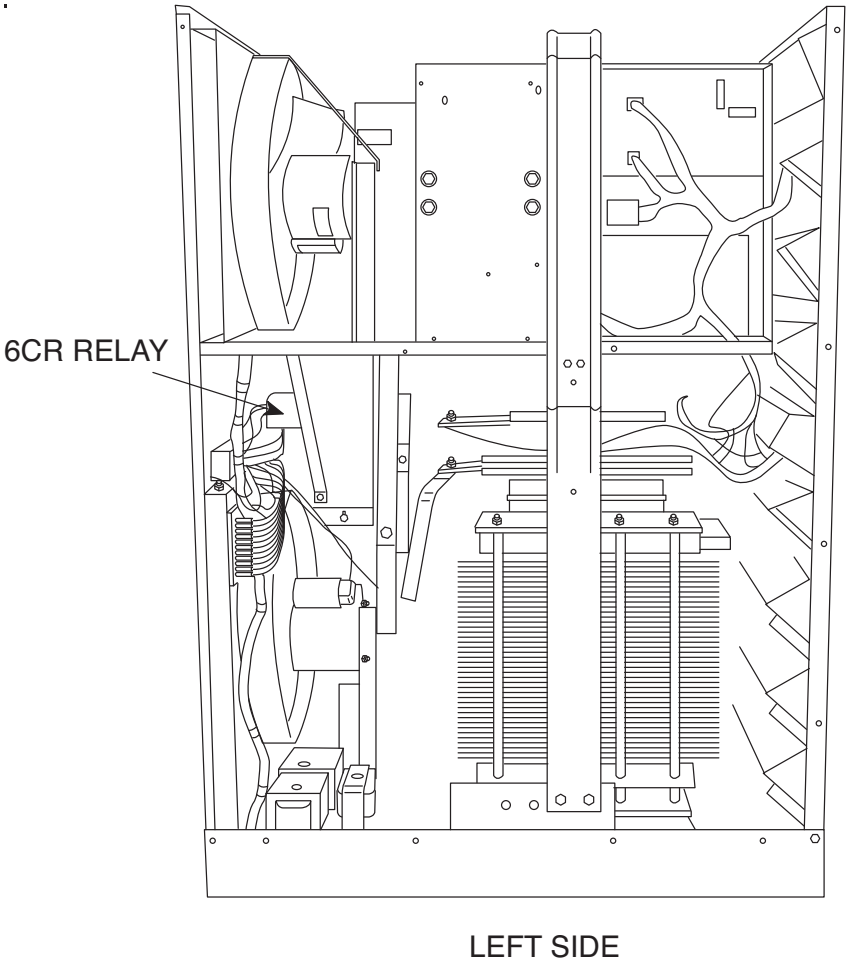
13. If the DC voltage does NOT vary, as potentiometer (R1) is rotated, the Control Board may be faulty.

14. Locate and test for approximately 5.8 VDC between leads #231 and #214 on the Firing Board in VV (CC) mode. When the output control potentiometer (R1) is rotated, the DC voltage between leads #231 and #214 should NOT vary and should remain at a constant approximate 5.8 VDC.

    NOTE: The DC voltage may vary slightly at the lower portion of the range.

FIRING BOARD TEST PROCEDURE (continued)

FIGURE F.9 – 6CR LOCATION



15. Test the Output Pilot Relay (6CR) for operation by removing and replacing the jumper wire repeatedly from terminal #2. ***See Figure F.8.*** This should cause the relay contacts to open and close. The contacts can be heard or felt (on cover) opening and closing. If the Output Pilot Relay (6CR) does not close when energized, check for loose or faulty wiring. See ***Wiring Diagram***.

16. Replace the Firing Board if the above voltage and control relay tests are passed. It may be faulty.

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CONTROL BOARD TEST PROCEDURE

⚠ WARNING

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If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

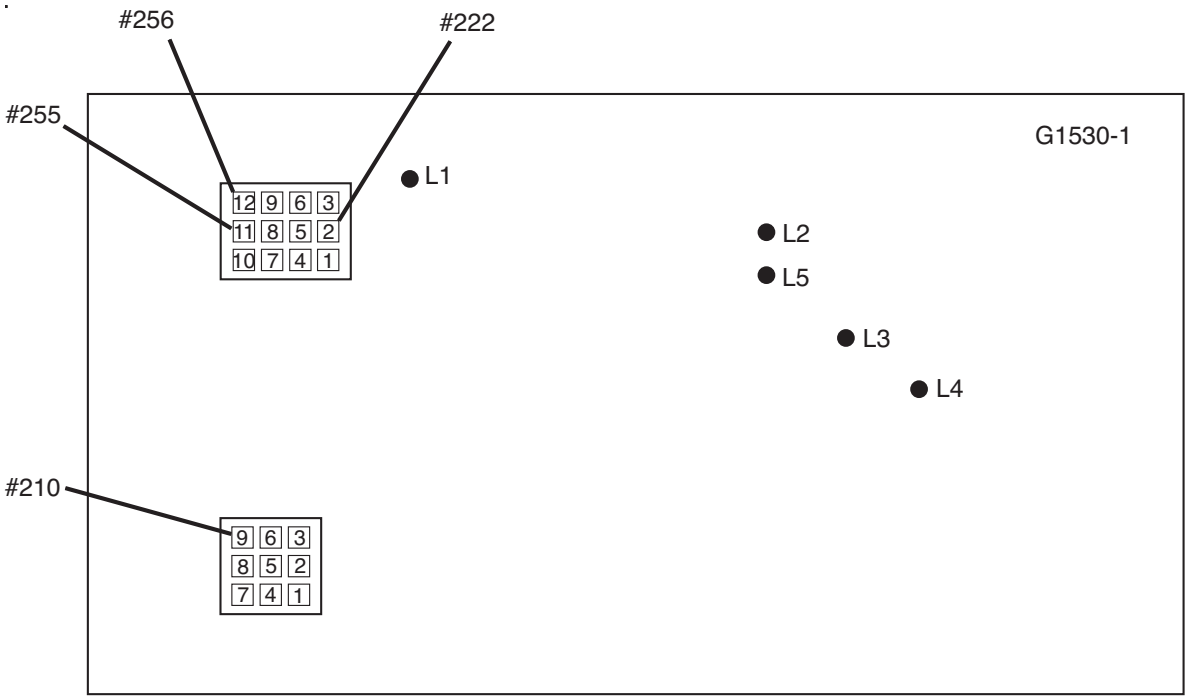
This test will determine if the Control Board is receiving the correct voltages and feedback signals.

MATERIALS NEEDED

Volt/Ohm Meter (Multimeter)
IDEALARC® DC-1500 Wiring Diagram and Control Board Schematic (See Electrical Diagram Section of Manual).

CONTROL BOARD TEST PROCEDURE (continued)

FIGURE F.10 – JUMPER



TEST PROCEDURE FOR NORMAL CONTROL BOARD OPERATION

1. Remove main supply power to the DC-1500.
2. Remove screws, loosen and lower the top left case side panel to access and inspect the Control Board located in the upper control box of the welder.
3. Apply the correct three-phase input power to the DC-1500. Turn on the machine.
4. Connect a jumper wire from terminal #2 to terminal #4 on the terminal strip. These can be accessed through the front panel assembly door.

⚠ WARNING

JUMPERING LEADS 2 AND 4 ELECTRICALLY ENERGIZES MACHINE'S OUTPUT TERMINALS. DO NOT TOUCH ELECTRICALLY HOT COMPONENTS.

5. LED 1 should be lit indicating the presence of 115 VAC at leads #255 to #256 of 12 Pin Molex Plug. See Figure F.10.
6. LED 3 should be lit indicating power is being applied to the fault protection relay (2CR).
7. LED 4 should NOT be lit. LED 4 should light only if there is a "fault" condition.
8. LED 2 should be lit indicating output voltage feedback is being supplied to the Control Board. With the Output Control Switch (SW4) in the "Output Control At DC-1500" (Panel) position and the Welding Mode Switch (SW5) in a CV position, LED 2 should change in brightness as the Output Control Potentiometer is rotated. As the open circuit voltage is increased, LED 2 should get brighter and vice versa.
9. LED 5 indicates a control signal (lead #231) is being supplied to the firing circuit. As the output is varied, LED 5 should change in brilliancy from bright (at low output) to dim (at high output). When the Weld Mode Switch (SW5) is in the CC (Stick) position, the open circuit voltage is at maximum, and LED 5 will be very dim or not lit.

CONTROL BOARD TEST PROCEDURE (continued)

POSSIBLE PROBLEMS PERTAINING TO THE CONTROL BOARD

IF LED 1 (Control Board Power) does not light, when the start switch is ON.

1. Check for 115 VAC at leads #255 to #256 of 12 pin molex plug. ***See Figure F.11.***

    a. If the correct voltage is not present, check leads #255 and #256 and associated wiring for loose or faulty connections. See ***wiring diagram*** and ***Figure F.11.***

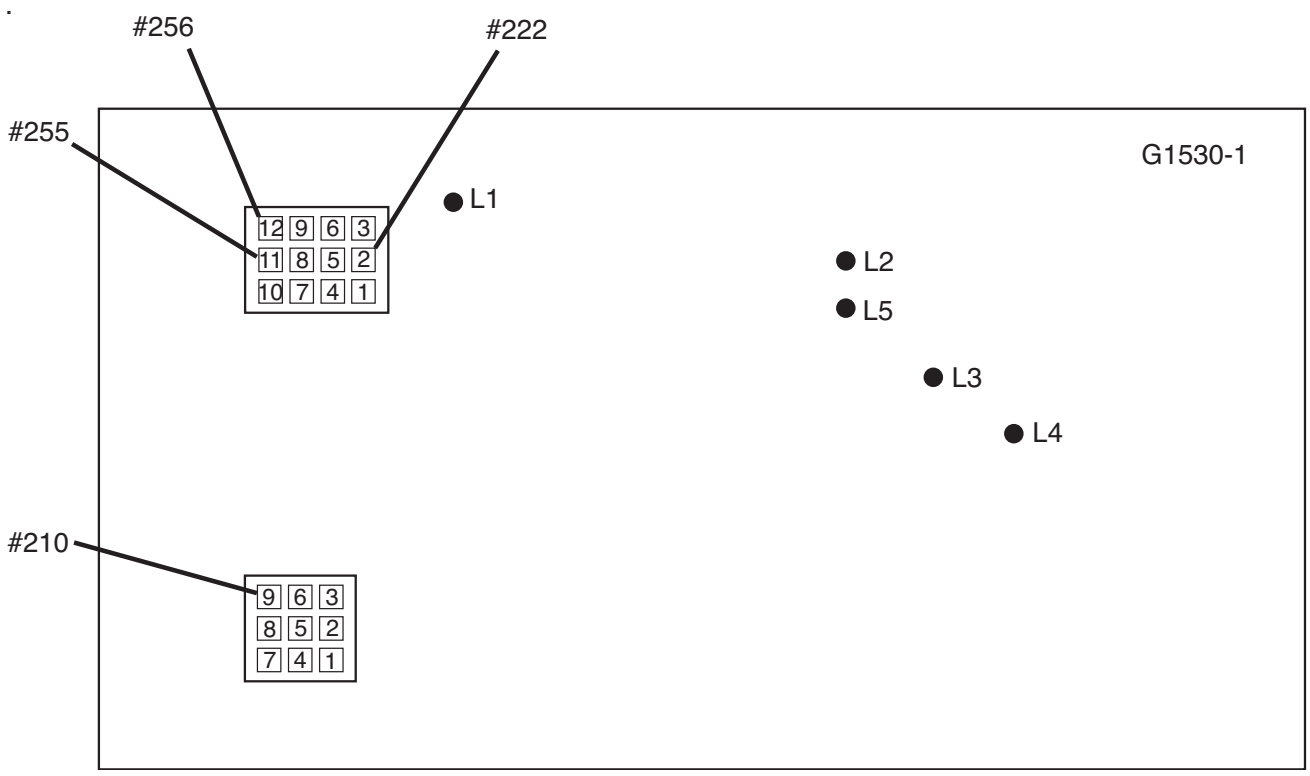
    b. Remove main supply power to the DC-1500. Test for continuity (zero ohms) from lead #255 to #256 on the 12 pin molex plug. If open, T7 control board transformer may be defective. ***See Figure F.11.***

    c. Check for 115 VAC at TS1 terminal strip leads 31 to 202 (32) if present and wiring is intact. If 115 VAC is not present between #255 and #256, T7 may be defective.

    d. If the 115 VAC is present at leads #255 to #256 at 12 pin molex plug and LED 1 does not light, the Control Board may be faulty. Replace.

CONTROL BOARD TEST PROCEDURE (continued)

FIGURE F.11 – CONTROL BOARD



IF LED 2 (Volage Feedback) does not light when #2 and #4 are jumpered together.

1. Check for the presence of open circuit voltage at the weld output terminals (20 to 65 VDC in constant voltage mode, 45 to 98 VDC in constant current mode).
   a. If open circuit voltage IS present at the output terminals, then check for open circuit voltage from lead #222 (-) 12 pin molex plug to lead #210 (+) 9 pin molex plug on the Control Board See Figure F.11.
   b. If open circuit voltage is NOT present at the Control Board, then check leads #222 and #210 and associated wiring for loose or faulty connections. See wiring diagram. Remove main supply power to the DC-1500.
2. Test for continuity (zero ohms) from the positive output stud to lead #210 at 9 pin molex plug on the Control Board. See wiring diagram and Figure F.11.
3. Test for continuity (zero ohms) from the negative output terminal to lead #222 at 12 pin molex plug on the Control Board. See ***wiring diagram***.
4. If the previous tests do not reveal the problem then the Control Board may be faulty. Replace.
5. If open circuit voltage is NOT measured at the weld output terminals, then check the Output Choke and associated heavy current carrying leads for loose or faulty connections.

- Perform the ***Main Transformer Test***.
- Perform the ***Firing Board Test.***
- Perform the ***SCR Output Bridge Test.***

If the previous tests do not reveal the problem then the Control Board may be faulty. Replace.

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CONTROL BOARD TEST PROCEDURE (continued)

IF LED 3 (24 VDC Internal Supply) does not light when the Start Button is depressed (but LED 1 does light).

The Fault Protection Relay (2CR) is not receiving supply voltage (24 VDC) and the Input Contactor (1CR) will not stay closed. Check to see if LED 4 lights or “flickers” when the Start Button is held in.

If LED 4 (Fault) lights,

1. There may be a “short” at the welder output terminals or the remote control circuit (leads #73, #74, # 75, #76 and #77) may be shorted to the negative welding voltage. Check the weld output terminals and associated leads and also the remote control circuitry. See ***wiring diagram***.
2. If the above procedures do not reveal the problem, then the Control board may be faulty- Replace.

IF LED 5 (Control Signal) does not light and varies in brightness when #2 and #4 are jumpered together, while the Output Control Potentiometer is rotated .

The Control Board may be faulty- Replace.

NOTE: The Weld Mode Switch (SW5) must be in the CV position and the Output Control Switch (SW3) in the “Output Control at DC-1500” position. Also check the Output Control Potentiometer and associated circuitry.

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STATIC SCR TEST PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

The Static SCR Test is a quick check to determine if an SCR is shorted or “leaky”. See machine waveform section for normal and abnormal SCR waveforms.

MATERIALS NEEDED

Analog ohmeter Volt/Ohm Meter (Multimeter)
DC-1500 Wiring Diagrams (See Electrical Diagram Section of Manual).

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STATIC SCR TEST PROCEDURE (continued)

PROCEDURE

1. Remove main supply power to the DC-1500.
2. Remove all Molex plugs from the firing board and control board. See Figure F.12 and F.13.

FIGURE F.12 – CONTROL BOARD

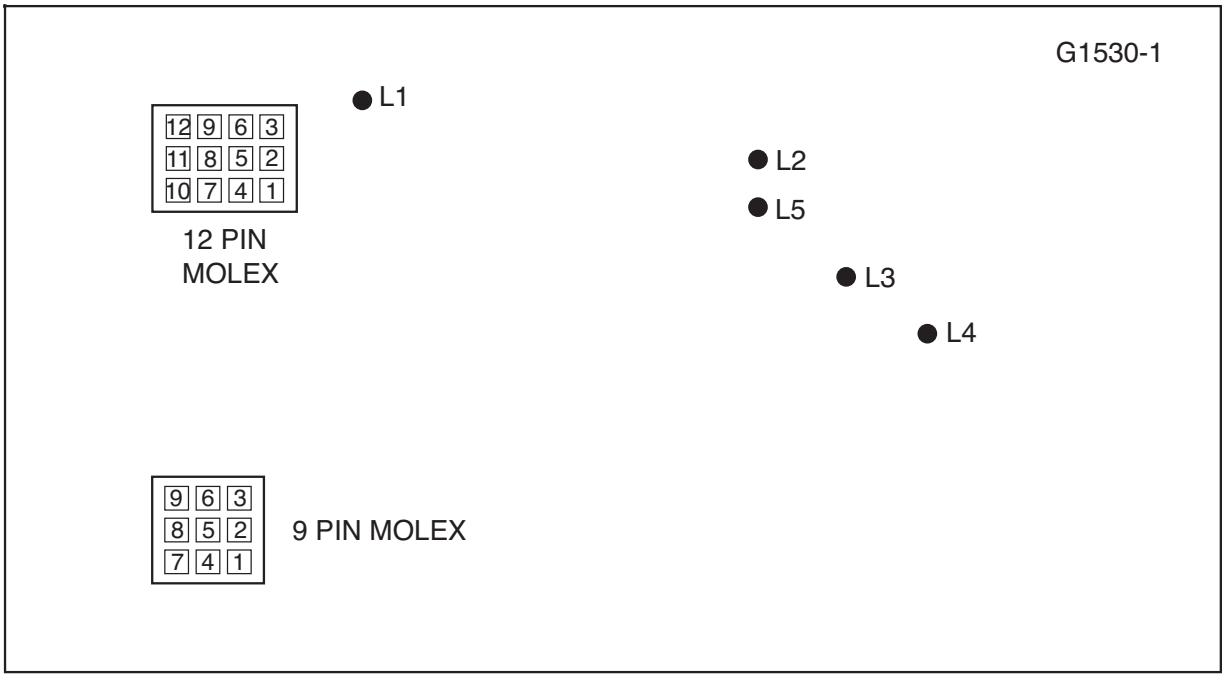
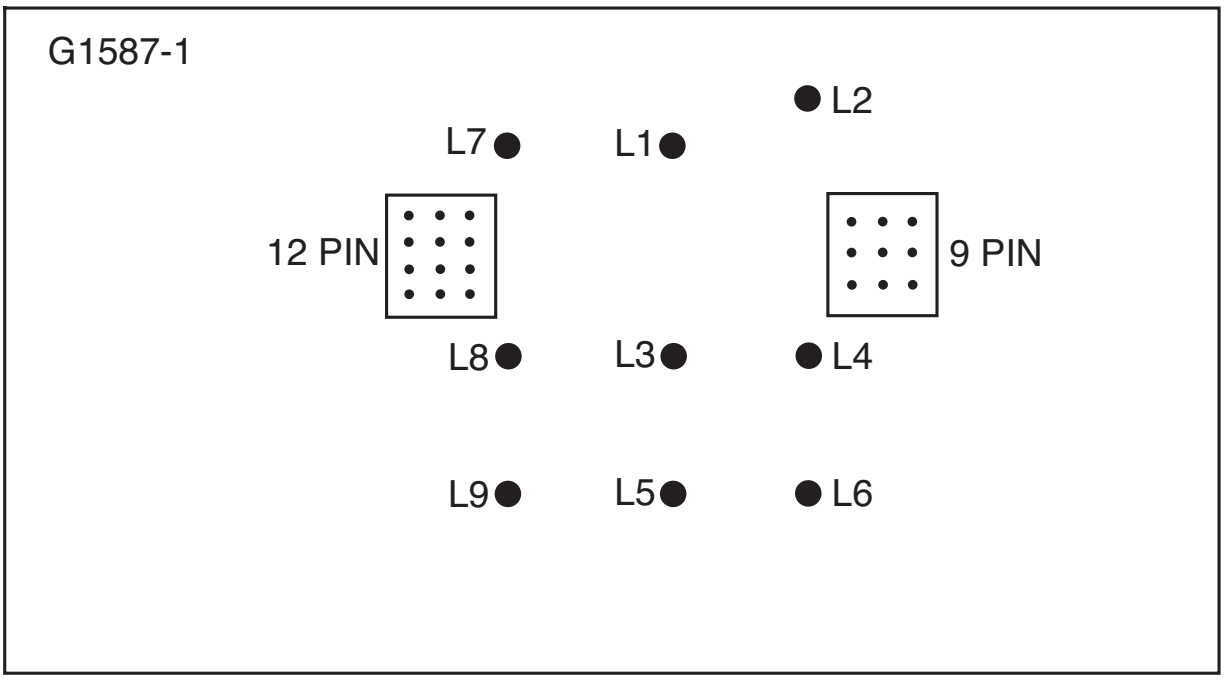
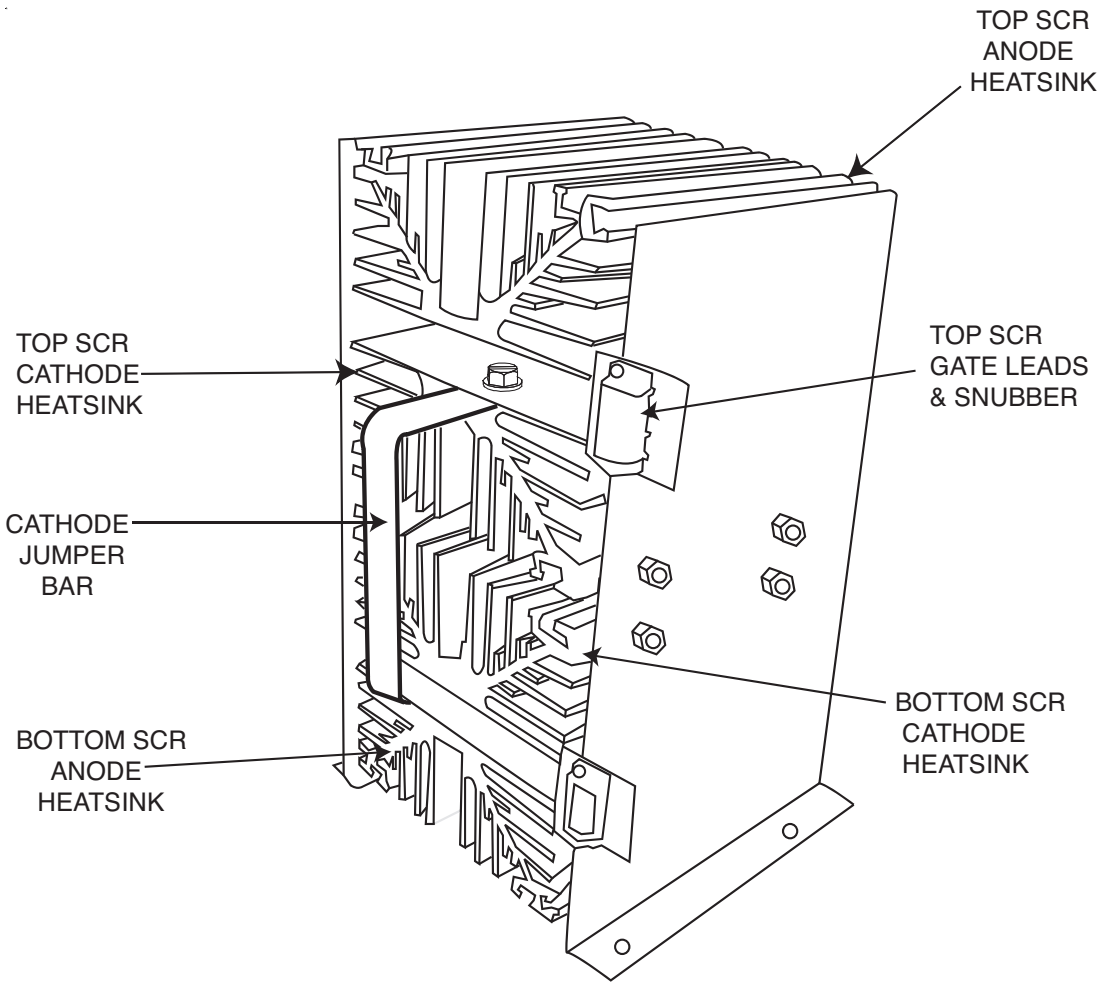


FIGURE F.13 – FIRING BOARD



STATIC SCR TEST PROCEDURE (continued)

FIGURE F.14 – SCR/HEATSINK LOCATION(S) (VIEWED FROM FRONT)



NOTE: DO NOT DISASSEMBLE THE HEAT SINKS. THIS TYPE OF SCR NEEDS TO BE COMPRESSED BETWEEN THE FACTORY HEATSINK IN ORDER TO CONDUCT CURRENT.

3. Using an analog ohmmeter, test the resistance from anode to cathode of SCR 1. Reverse the meter leads and check from cathode to anode of SCR 1. (R x 1000 SCALE)

   a. If a low resistance is indicated in either direction, disconnect the associated snubber board mounted on SCR inside mounting channel. See wiring diagram and retest SCR 1. If a low resistance is still indicated, SCR 1 is faulty - Replace. If a very high or infinite resistance is indicated without the snubber circuit, then replace the snubber circuit, See Figure F.14.

4. Repeat Step 4 testing SCR 2, SCR 3, SCR 4, SCR 5, and SCR 6.

NOTE: To further check the SCRs' functions use an SCR tester and proceed to ***Active SCR Test.***

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ACTIVE SCR TEST PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

The Active SCR Test will determine if the device is able to be gated “ON” and conduct current from anode to cathode.

MATERIALS NEEDED

An SCR tester as outlined in this procedure.

DC-1500 Wiring Diagram (See Electrical Diagrams Section of this manual).

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ACTIVE SCR TEST PROCEDURE (continued)

PROCEDURE

1. Remove main supply power to the DC-1000.
2. Remove all Molex plugs from the Firing Board and Control Board. See Figure F.15 and F.16.

FIGURE F.15 – CONTROL BOARD

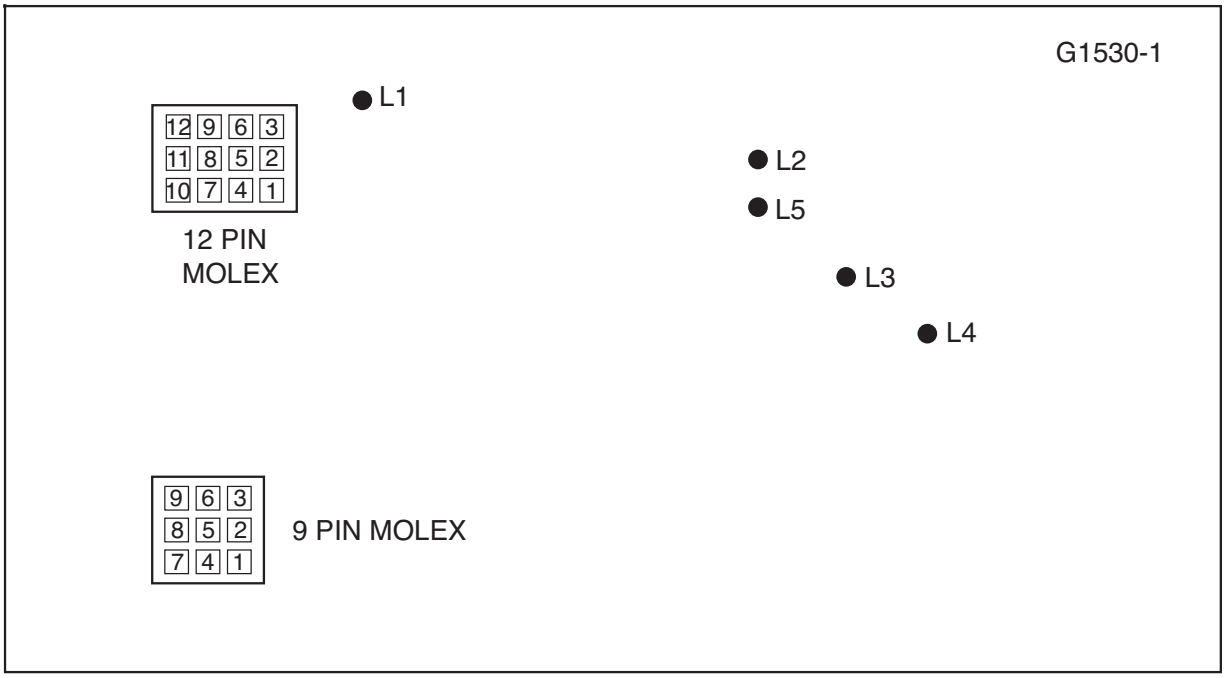
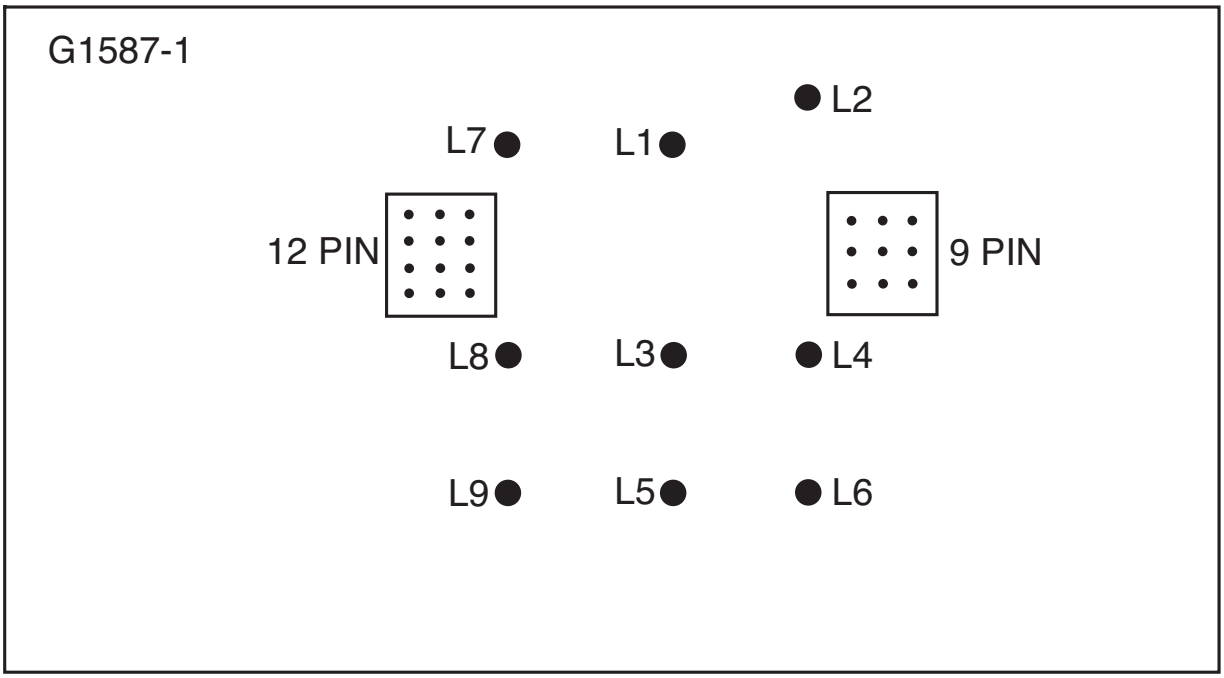
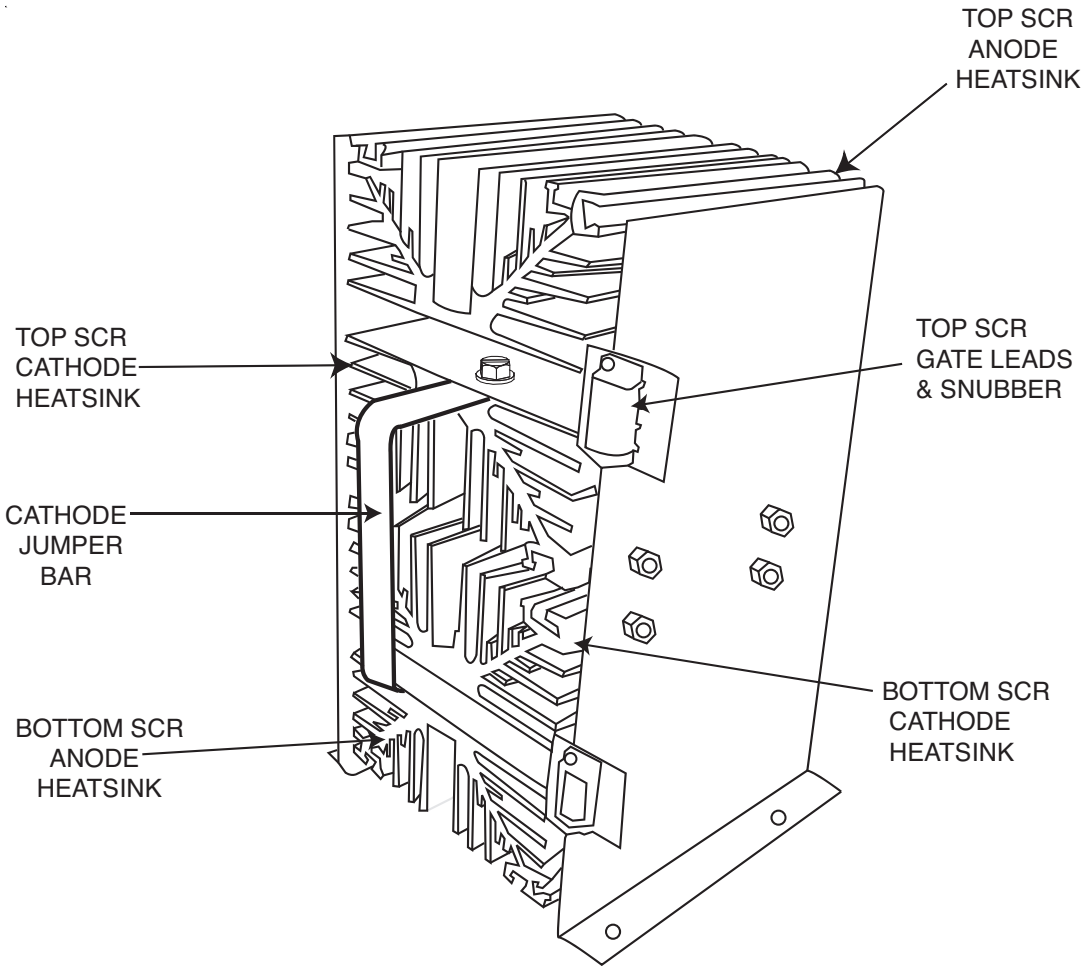


FIGURE F.16 – FIRING BOARD



ACTIVE SCR TEST PROCEDURE (continued)

FIGURE F.17 – SCR/HEATSINK LOCATION(S)



3. Perform test procedure as follows. Refer to Figure F.17. Repeat test for all six SCRs.

NOTE: DO NOT DISASSEMBLE THE HEAT SINKS. THIS TYPE OF SCR NEEDS TO BE COMPRESSED BETWEEN THE FACTORY HEATSINK IN ORDER TO CONDUCT CURRENT.

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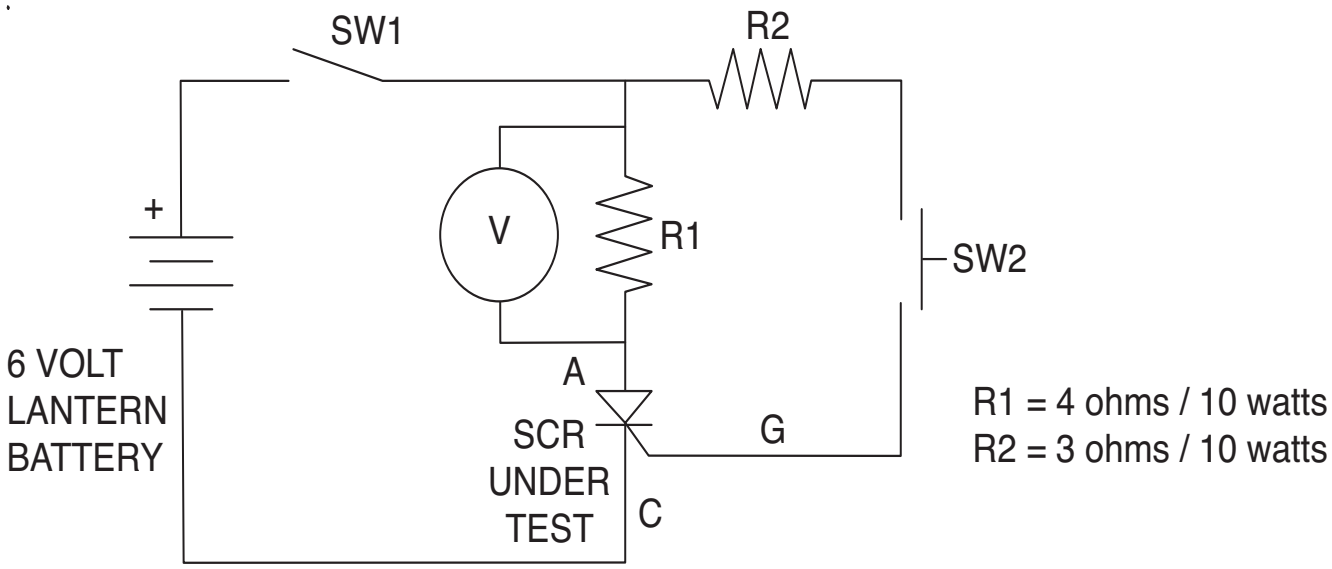
ACTIVE SCR TEST PROCEDURE (continued)

FIGURE F.18 – SCR TEST SETUP



To test SCRs construct the circuit outlined above. Resistor values are plus or minus ten percent. The voltmeter scale should be low, approximately 0-5 or 0-10 volts DC.

4. To test SCRs, construct the circuit outlined in Figure F.18. Use one 6V lantern battery. Resistor values are in ohms ±10%. The voltmeter scale should be low, approximately 0-5 or 0-10 volts.

BATTERY TEST

Check the battery by shorting leads (A) and (C) and then close switch SW1. Replace battery if voltage is less than 4.5 volts.

A. Connect SCR into the test circuit as shown (A) lead to anode (C) lead to cathode and (G) lead to the gate. See ***Wiring Diagram***.

B. Close switch SW1 (switch SW2 should open), voltmeter should read zero. If the voltmeter reads higher than zero the SCR is shorted.

NOTE: Do not disassemble the heat sinks.

5. With switch SW1 closed, close switch SW2 for two seconds and release. The voltmeter should read 3 to 6 volts before and after switch SW2 is released. If the voltmeter does not read, or reads only while SW2 is depressed, the SCR or battery is defective (repeat Battery Test Procedure).

6. Open switch SW1, disconnect the gate lead (G) and reverse the (A) and (C) leads on the SCR. Close switch SW2. The voltmeter should read zero. If the voltage is higher than zero, the SCR is shorted.

7. Replace any SCR assembly that does not pass test in Step 4.

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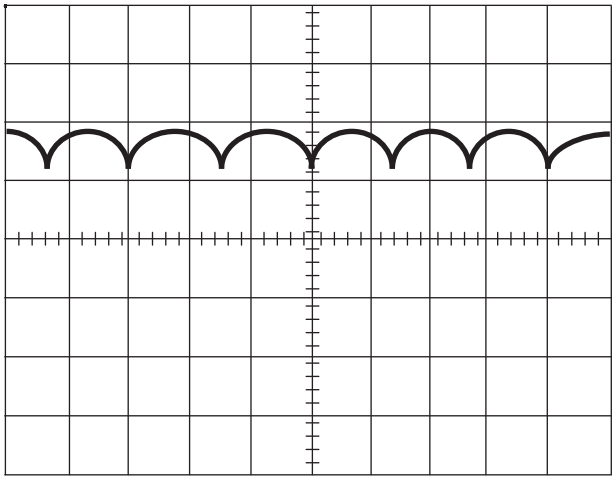
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT CURRENT MODE - NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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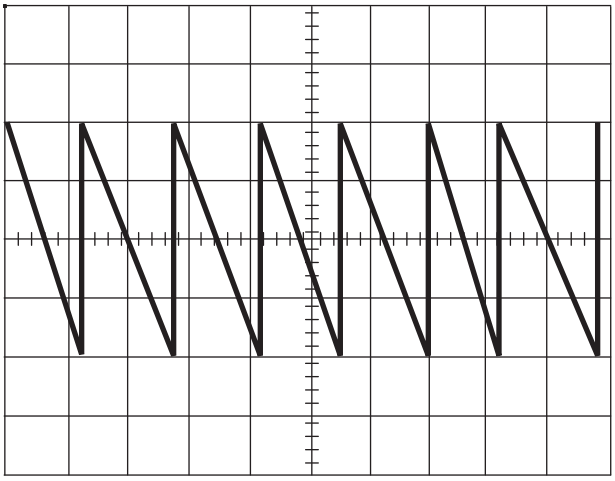
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT VOLTAGE INNERSHIELD - MAXIMUM OUTPUT SETTING - NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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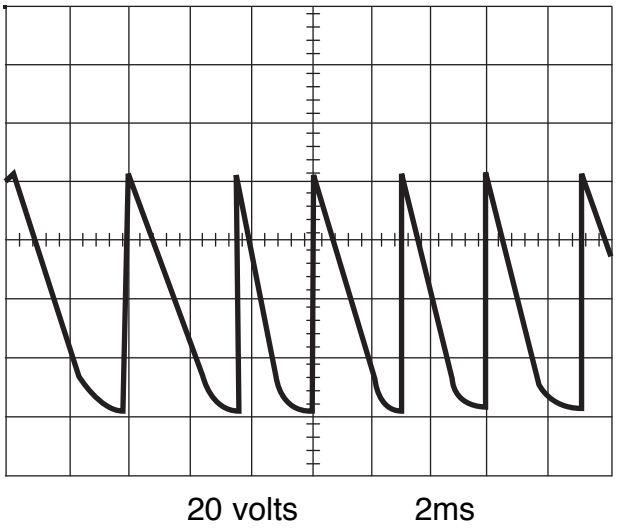
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT VOLTAGE INNERSHIELD
MINIMUM OUTPUT SETTING - NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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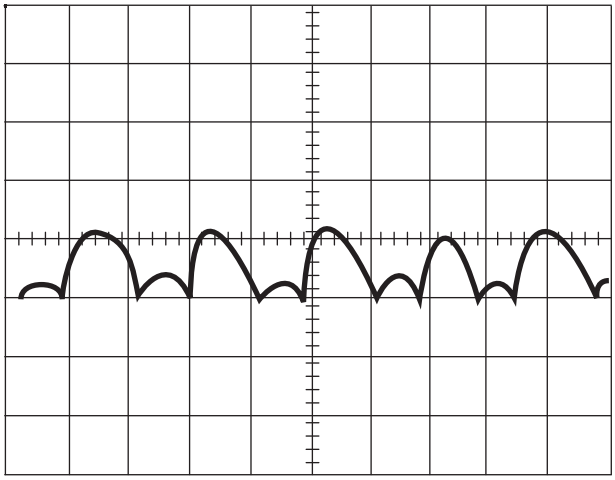
TYPICAL OUTPUT VOLTAGE WAVEFORM -MACHINE LOADED CONSTANT VOLTAGE INNERSHIELD MODE



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 10 volts and that each horizontal division represents 2 milliseconds in time. The machine was loaded with a resistance grid bank. The grid bank meters read 200 amps at 20 VDC.

Note: Scope probes connected at machine ouput terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	10 V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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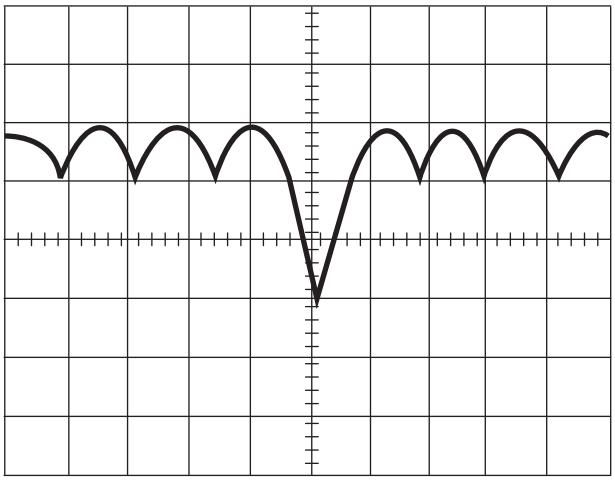
ABNORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
CONSTANT VOLTAGE INNERSHIELD
ONE OUTPUT SCR NOT FUNCTIONING
MAXIMUM OUTPUT SETTING



This is NOT the typical DC output voltage waveform. One output SCR is not functioning. Note the “gap” in the waveform. One SCR gate is disconnected to simulate an open or non-functioning output SCR. Each vertical division represents 20 volts and each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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INPUT CONTACTOR (1CR) REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the cleaning and/or replacement of the Input Contactor (1CR).

MATERIALS NEEDED

7/16” socket wrench
1/2” open end wrench
11/16” socket wrench
Phillips head screwdriver
Flat head screwdriver
Low pressure air source

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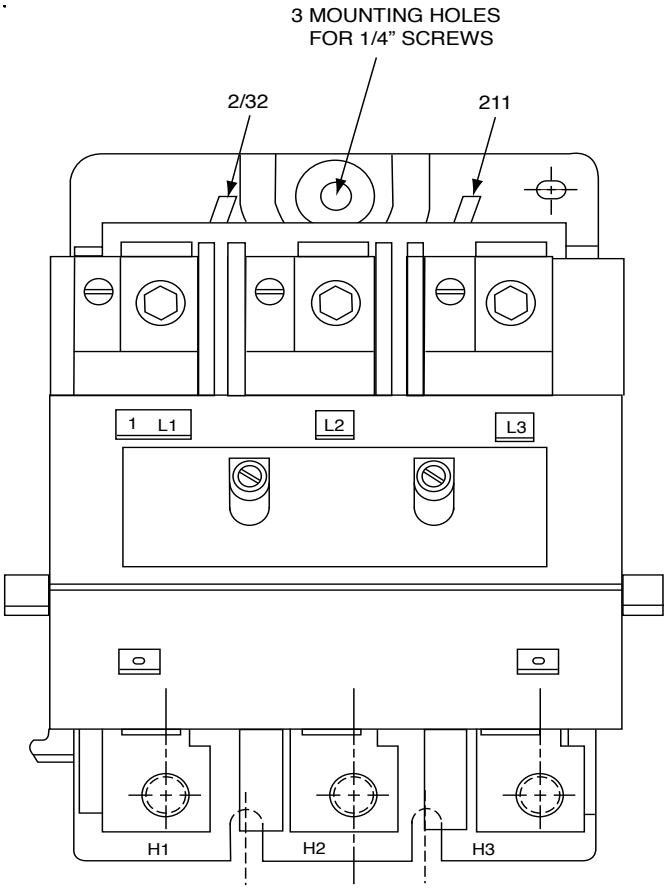
INPUT CONTACTOR (1CR) REPLACEMENT (continued)

FIGURE F.19 – INPUT CONTACTOR



⚠ WARNING

DO NOT APPLY INPUT POWER TO THE DC-1500 WITH THE CONTACTOR COVERPLATE REMOVED. POWER APPLIED WITHOUT COVER PLATE IN POSITION MAY CAUSE SEVERE ARCING RESULTING IN BODILY INJURY.

PROCEDURE

1. Remove the input power from the DC-1500.
2. Remove case top, upper and lower right case sides.
3. Disconnect 2 #211 leads and leads #2 and #32 from the input contactor CR1 coil. See Figure F.19
3. Remove the input supply lines from the input contactor.
4. Remove H1, H2, and H3 leads from bottom of CR1.
5. Remove 3 self tapping screws from contactor mounting bracket and remove contactor.

INSTALLATION

1. Mount contactor to bracket with 3 self tapping screws.
2. Connect H1, H2, H3, leads to bottom of CR1.
3. Connect the input supply leads.
4. Connect 2 #211 leads and #2 - #32 leads to the CR1 coil.

Note: Ensure all the leads are connected correctly. See ***wiring diagram***.

5. Install case sides and case top.

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SCR OUTPUT BRIDGE REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the SCR output bridge replacement.

MATERIALS NEEDED

9/16” socket wrench
9/16” open end wrench
1/2” long-handled flat rachet wrench
1/2” socket wrench
1/2” open end wrench
3/8” socket wrench
5/16” socket wrench
Lincoln E1868 (Dow Corning #340) heat sink compound

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SCR OUTPUT BRIDGE REPLACEMENT (continued)

Removal Procedure:

1. Remove the input power from the DC-1500.
2. Remove the roof and all case sides.
3. Use a static strap when working with the control and firing p.c. boards. Disconnect all molex plugs from the two p.c. boards. Disconnect leads #74 and the ground lead from the control p.c. board.
4. Disconnect lead #31A from the 5CR relay.
5. Remove screws that mount relays 5CR and 2CR.
6. Disconnect the ground lead from the enclosure.
7. Remove the firing p.c. board (bottom) and set aside.
8. Remove the two screws that mount the p.c. board enclosure to the front (-4) rectifier. Set these two smaller mounting screws aside for use later.
9. Remove the two screws that mount the enclosure to the horizontal panel.
10. Carefully remove the enclosure.
11. Disconnect the copper connection that's behind the enclosure. Note that this connection also has three flex leads attached.
12. On the other side of the unit remove the (4) bolts that connect the L-shaped copper leads to the rectifier copper straps.
13. Cut cables ties from at terminal strips G1,G2 and G6.
14. Un-plug both snubber p.c. boards.
15. Disconnect leads G5 and G6 from rectifier #6 (left - viewed from rear).
16. Disconnect flex lead #240 from the top aluminum lead on rectifier #6. Disconnect flex lead #243 from the bottom aluminum lead on rectifier #6.
17. Disconnect leads #211 and #247 from the bottom thermostat on rectifier #6.
18. Disconnect the top aluminum lead on rectifier #6. Disconnect the bottom aluminum lead on rectifier #6.
19. Remove the (4) screws that mount rectifier #6.
20. Remove the top fiber air baffle.
21. Carefully remove rectifier #6 from the unit.
22. Disconnect flex lead #241 from the top aluminum lead on rectifier #5. Disconnect flex lead #244 from the bottom aluminum lead on rectifier #5.
23. Disconnect flex lead #242 from the top aluminum secondary lead on rectifier #4. Disconnect flex lead #245 from the bottom aluminum secondary lead on rectifier #4.
24. Disconnect leads G1 and G2 from rectifier #4.
25. Disconnect leads #212 and #247 from the top thermostat on rectifier #4.
26. Disconnect leads G3 and G4 from rectifier #5.
27. Disconnect the top aluminum secondary lead on rectifier #4. Disconnect the bottom aluminum secondary lead on rectifier #4.
28. Remove the (4) screws that mount rectifier #4.
29. Carefully remove rectifier #4 from the unit.
30. Disconnect the top aluminum secondary lead on rectifier #5. Disconnect the bottom aluminum secondary lead on rectifier #5.
31. Remove the (4) screws that mount rectifier #5.
32. Carefully remove rectifier #5 from the unit.

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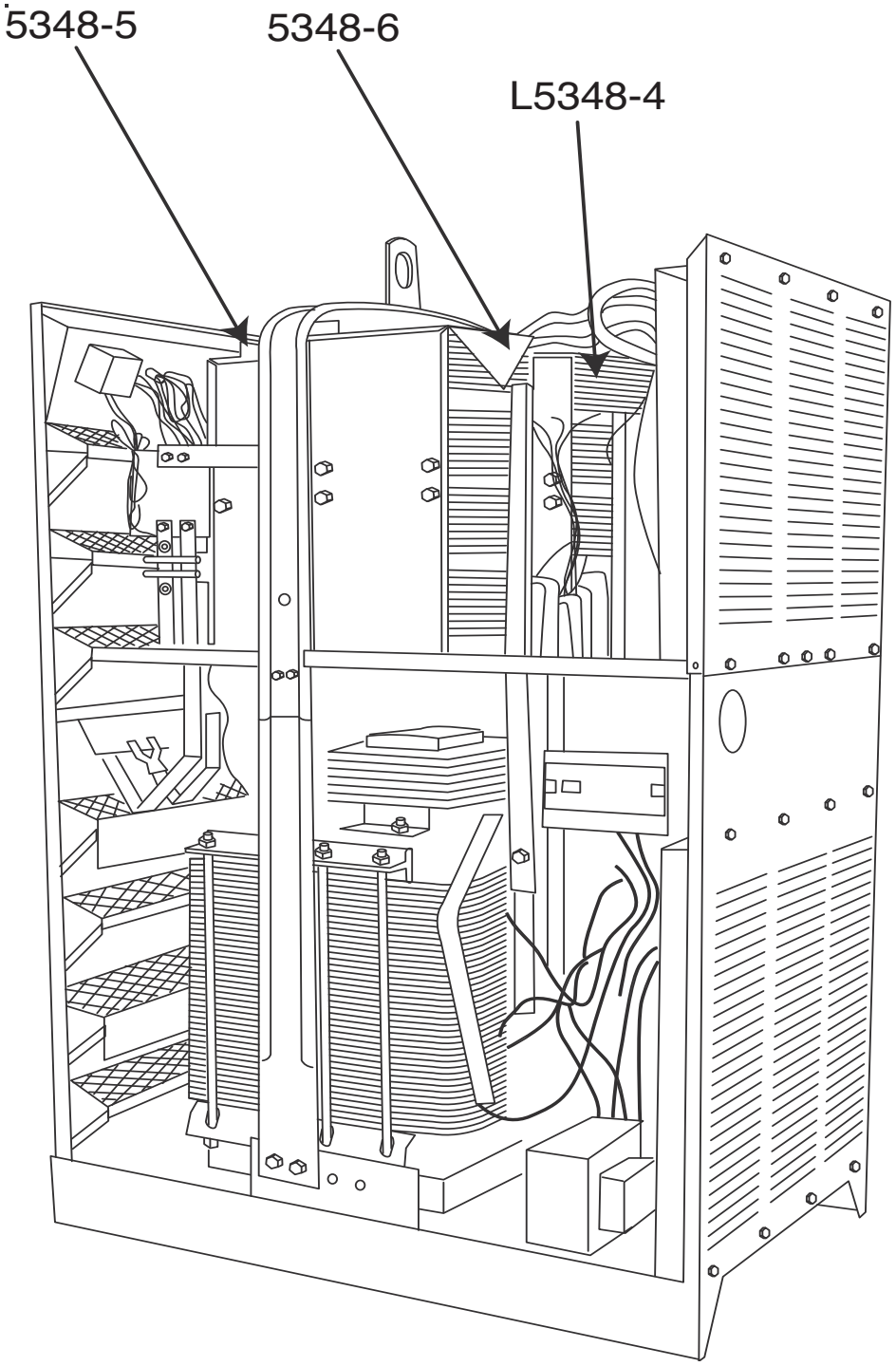
SCR OUTPUT BRIDGE REPLACEMENT (continued)

FIGURE F.20 – RECTIFIER ASSEMBLY



SCR OUTPUT BRIDGE REPLACEMENT (continued)

PRE-ASSEMBLY OF RECTIFIERS

L5348-4 Rectifier

1. Remove the steel vertical baffle from the removed rectifier and mount to a new -4 rectifier.
2. Remove the bottom fiber baffle from the removed rectifier and mount to a new -4 rectifier. Note: The location of the notch in the baffle must be positioned correctly.
3. Remove the L6981-1 snubber p.c. board from the removed rectifier and mount to a new -4 rectifier.
4. Disconnect the red and white SCR leads from the terminal strip. Remove the terminal strip and number plate from the removed rectifier and mount to a new -4 rectifier. Connect the red lead on top and the white lead on the bottom of the terminal strip.
5. Apply E1868 Joint Compound on the heat sink surfaces (2 places) where the aluminum secondary leads connect.

L5348-5 Rectifier

1. Disconnect the red and white SCR leads from the terminal strip. Remove the terminal strip and number plate from the removed rectifier and mount to a new -5 rectifier. Connect the red lead on top and the white lead on the bottom of the terminal strip.
2. Apply E1868 Joint Compound on the heat sink surfaces (2 places) where the aluminum secondary leads connect.

L5348-6 Rectifier

1. Remove the steel vertical baffle from the removed rectifier and mount to a new -6 rectifier.
2. Remove the bottom fiber baffle from the removed rectifier and mount to a new -6 rectifier.
3. Remove the L6980-1 snubber p.c. board from the removed rectifier and mount to a new -6 rectifier.
4. Disconnect the red and white SCR leads from the terminal strip. Remove the terminal strip and number plate from the removed rectifier and mount to a new -4 rectifier. Connect the red lead on top and the white lead on the bottom of the terminal strip.
5. Apply E1868 Joint Compound on the heat sink surfaces (2 places) where the aluminum secondary leads connect.

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SCR OUTPUT BRIDGE REPLACEMENT (continued)

REPLACEMENT PROCEDURE

1. Place rectifier #5 into the front of the unit.
2. Connect the bottom aluminum secondary lead to the bottom heat sink of rectifier #5. Connect the top aluminum secondary lead to the top heat sink of rectifier #5.
3. Mount the rectifier to the horizontal baffle. (4 places)
4. Tighten the two aluminum secondary lead connections on rectifier #5.
5. Place rectifier #4 into the rear of the unit. Route the harness through the notch in the air baffle.
6. Connect the bottom aluminum secondary lead to the bottom heat sink of rectifier #4. Connect the top aluminum secondary lead to the top heat sink of rectifier #4.
7. Mount the rectifier to the horizontal baffle. (4 places)
8. Tighten the two aluminum secondary lead connections on rectifier #4.
9. Connect the GI and G2 leads to the terminal strips on rectifier #4.
10. Connect lead #212 to the top thermostat on rectifier #4.
11. Route harness leads G6 and #211 to the other side of the machine.
12. At the p.c. board enclosure area, route the harness through the copper strap on rectifier #4.
13. Connect the G3 and G4 leads to the terminal strips on rectifier #5.
14. Connect the molex plug to the snubber p.c. board on rectifier #4.
15. Connect lead #247 to the top thermostat on rectifier #4.
16. Connect lead # 242 to the top aluminum secondary lead on rectifier #4. Connect lead # 245 to the bottom aluminum secondary lead on rectifier #4.
17. Connect lead #241 to the top aluminum secondary lead on rectifier #5. Connect lead # 244 to the bottom aluminum secondary lead on rectifier #5.
18. Tighten all (4) flex lead connections to the aluminum secondary leads.
19. Place rectifier #6 into the rear of the unit.
20. Connect the bottom aluminum secondary lead to the bottom heat sink of rectifier #6. Connect the top aluminum secondary lead to the top heat sink of rectifier #6.
21. Tighten all rectifier mounting bolts. (12 places)
22. Tighten the two aluminum secondary lead connections on rectifier #6.
23. Connect lead #240 to the top aluminum secondary lead on rectifier #6. Connect lead #243 to the bottom aluminum secondary lead on rectifier #6.
24. Tighten both flex lead connections to the aluminum secondary leads.
25. Connect the G5 and G6 leads to the terminal strips on rectifier #6.
26. Connect leads #211 and #247 to the top thermostat on rectifier #6.
27. Anchor the lead harness at the G1, G2 and G6 terminal strip locations.
28. Place the L-shaped copper leads between the rectifier copper straps. Connect both copper leads to the shunt. (2 places) Connect both copper leads to the rectifier copper straps. (3 places) Note: The rectifier #4 connection also includes (3) flex leads. Tighten all.
29. Inspect for any shorted turns between the secondary coil turns and the six secondary lead stick outs.
30. Place the p.c. board enclosure in place.
31. Route the lead bundle through the cutout in the enclosure.
32. Mount to the horizontal baffle with self-tapping screws. (2 places)
33. Mount the enclosure braces to rectifier #5. (2 places) (use the smaller silver colored screws)
34. While using a static strap mount the Firing p.c. board. (6 places)
35. Mount the 5CR relay.
36. Mount the 2CR relay.
37. Connect the ground lead to the p.c. board enclosure.
38. Connect all molex plugs to the two p.c. boards.
39. Connect leads #74 and the ground lead to the control p.c. board.

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SCR OUTPUT BRIDGE REPLACEMENT (continued)

REPLACEMENT PROCEDURE (CONT.)

39. Connect leads #74 and the ground lead to the control p.c. board.
40. Connect lead #3IA to the 5CR relay.
41. Mount the top fiber air baffle to the two rear rectifier brackets.
42. Blow out the unit.
43. Re-test units per instructions provided.

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RETEST AFTER REPAIR

Testing is required after the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced.

INPUT IDLE AMPS AND WATTS

Input Volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
460/3/60	12.5	3.84
575/3/60	9.9	3.84

OPEN CIRCUIT VOLTAGES

Mode	Input Hertz	Open Circuit Volts
Variable Voltage	60	101/97
Auxiliary Output (#31-#32)	60	118/112 AC @ 5amp load

MAXIMUM ACCEPTABLE OUTPUT VOLTAGE - AT MINIMUM OUTPUT SETTINGS

Mode	Input Hertz	Load
Constant Voltage Innershield	60	200 amps @ 20/17 VDC
Variable Voltage	60	200 amps @ 20/17 VDC

MINIMUM ACCEPTABLE OUTPUT VOLTAGE AT MAXIMUM OUTPUT SETTINGS

Mode	Input Hertz	Load
Variable Voltage	60	1500 Amps @ 70/60 VDC
Constant Voltage Submerged Arc	60	1500 Amps @ 64/60 VDC

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TABLE OF CONTENTS - DIAGRAM SECTION

*** NOTE:** Many PC Board Assemblies are now totally encapsulated, surface mounted and or multi-layered and are therefore considered to be unserviceable. Assembly drawings of these boards are no longer provided.

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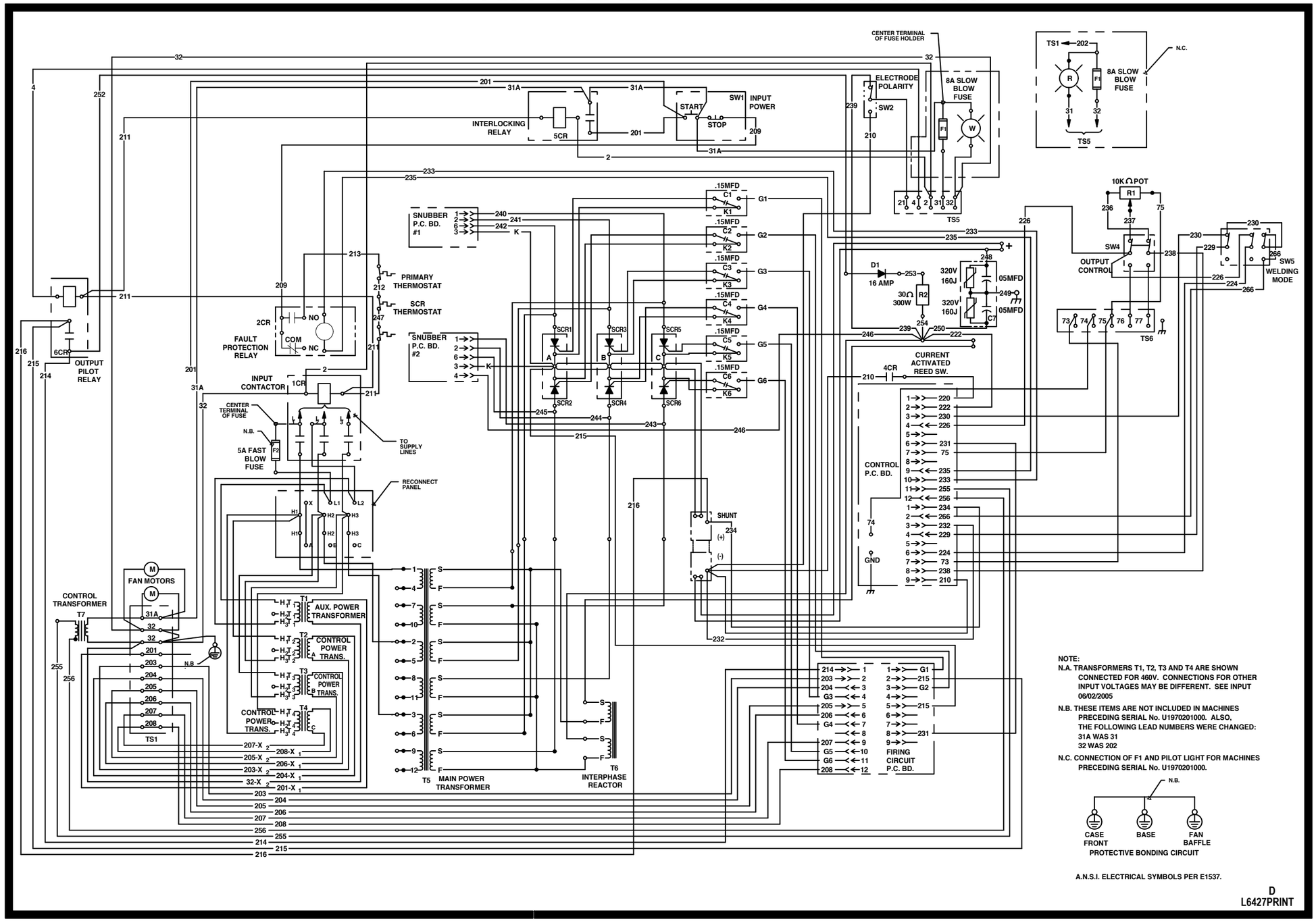
WIRING DIAGRAM - COMPLETE MACHINE - (L6427)

DC1500 AMP IDEALARC - WIRING DIAGRAM



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

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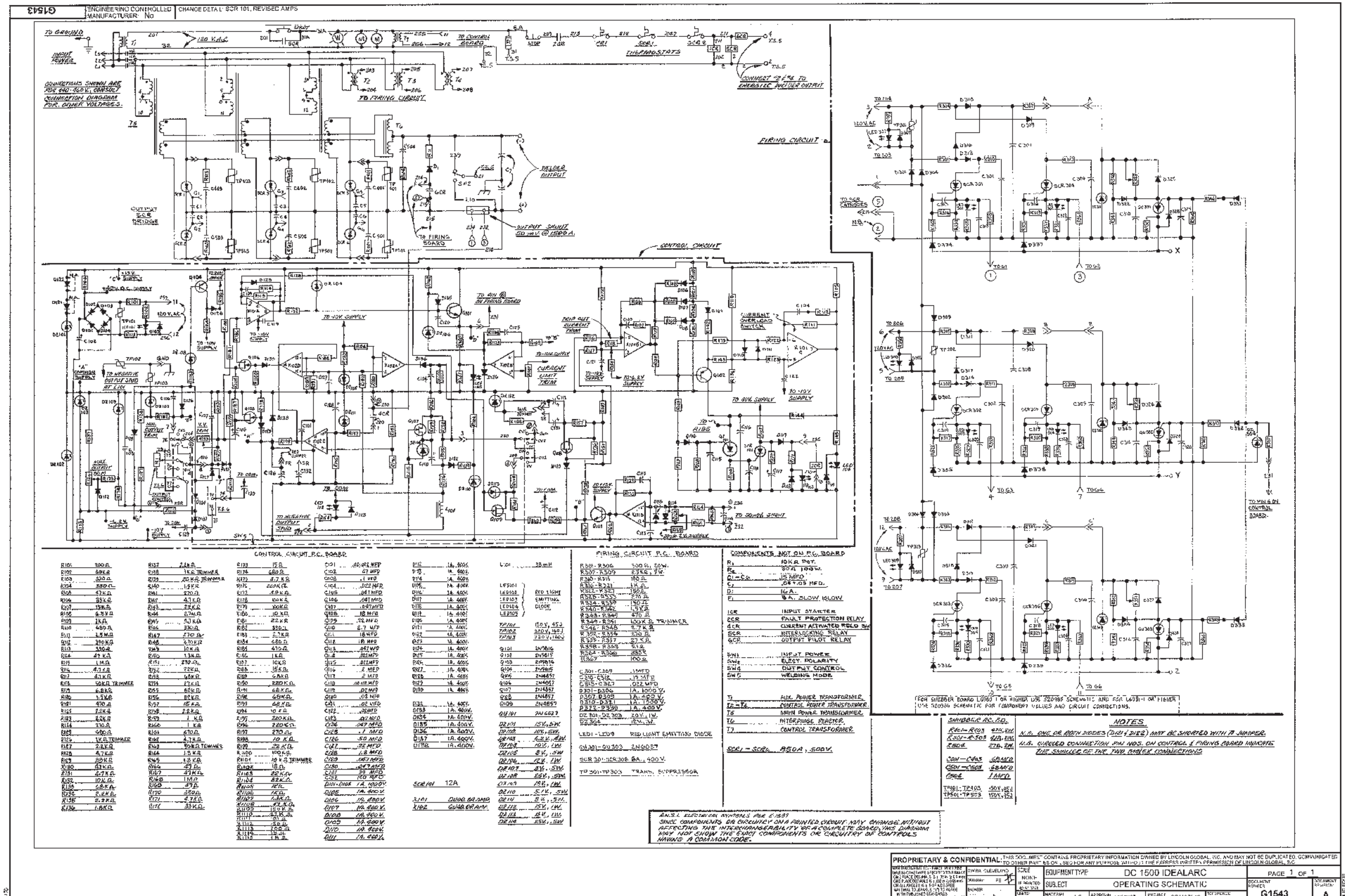
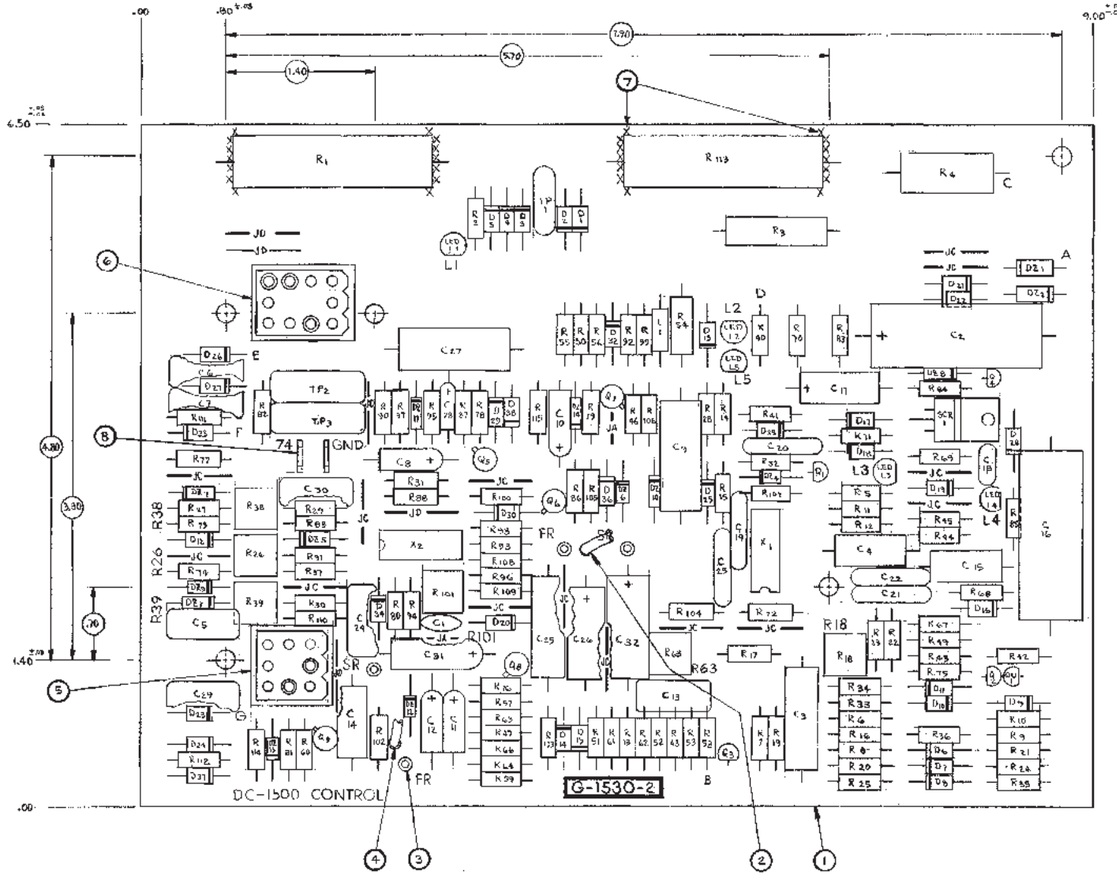
SCHEMATIC - COMPLETE MACHINE - (G1543)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - CONTROL PC BOARD - (G1530-2)

G1530-2 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: DZ1, MANUFACTURED AS AND IDENTIFICATION CODE, REVISED PART NUMBER.



ITEM	REQ'D	PART No	IDENTIFICATION
C1, C18	2	T-11577-40	.05-.022/25
C2	1	S-13490-48	47/160
C3, C25	2	T-11577-26	.10/100
C4, C23, C15	3	S-13490-4	.022/100
C5, C6, C7, C8, C24, C20, C30	7	S-13490-13	.0047/100
C9, C11, C12	3	S-13490-39	18/15
C19, C37	2	T-11577-28	.22/100
C10	1	S-13490-27	2.7/35
C16	1	S-13490-47	2/50
C17	1	S-13490-47	2/50
C13, C20, C21, C22, C29	5	T-11577-38K	.02/600
C26	1	S-13490-38	50/15-16
C28	1	S-13490-19	1.8/20
C31	1	S-13490-44	39/20
C32	1	S-13490-15	100/15-16
D1, D2, D3, D4	4	T-12199-2	IN4007
DS-THRU D20, D32 THRU D38	33	T-12199-1	IN4004
DZ1	1	T-12702-58	IN5383
DZ2	1	T-12702-33	IN5347B
DZ3	1	T-12702-18	IN821
DZ4	1	T-12702-27	IN4740A
DZ5, DZ6	2	T-12702-31	IN5338
DZ6	1	T-12702-19	IN4742A
DZ7	1	T-12702-30	IN5225B
DZ8, DZ14	2	T-12702-12	IN823B
DZ9, DZ11, DZ13	3	T-12702-29	IN4744A
DZ10	1	T-12702-15	IN5349B
L1	1	T-12218-4	.033
LED1 THRU LED5	5	T-13687-2	
Q1, Q3	2	T-12704-69	2N4401
Q2, Q4	2	T-12704-67	2N4403
Q5 THRU Q9	5	T-12704-30	2N4887
QU1	1	T-12707-4	2N6027
SCR1	1	S-15161-6	L.E.CO. PART NO.
X1	1	S-15178-4	L.E.CO. PART No.
TP1	1	T-13640-11K	65 JOULES
TP2, TP3	2	T-13640-18	160 JOULES
XZ	1	249128-18	
R1, R113	2	T-12300-47	220
R2, R22, R23, R24, R32, R33	6	T-12731-13	68K
R3	1	T-14649-14	390
R4	1	T-14648-6	330
R5, R14, R67, R108	4	T-12731-55	47K
R6, R29, R75	3	T-12731-6	33K
R7, R27, R88	3	T-12731-25	15K
R8, R13, R82	3	T-12731-16	6.8K
R9, R31, R40, R66, R105, R106	6	T-12731-12	11K
R10, R35, R76, R84	4	T-12731-10	680
R11	1	T-12731-4	1.5MEG
R12	1	T-12731-23	390K
R15, R44, R16, R81	4	T-12731-15	330
R17, R68, R115	3	T-12731-67	1 MEG
R18, R19, R28, R30, R41, R42, R45, R62, R71, R78	10	T-12731-17	4.7K
R20, R63	2	T-10812-35	56K
R21, R40	2	T-12731-7	1.5K
R24	1	T-12731-9	470
R25, R26, R27, R36, R38, R37, R98, R91	8	T-12731-11	2.2K
R34, R43, R53, R81, R97	5	T-12731-59	270
R35, R39	2	T-10813-65	1K
R42, R49, R50, R83, R94, R96	6	T-12731-9	10K
R39	1	T-12731-45	1.8K
R39	1	T-10812-77	20K
R45, R52, R99, R105, R110	5	T-12731-34	22K
R94	1	T-14444-6	2.7 MEG
R46	1	T-12731-57	470K
R50, R64, R65, R107	4	T-12731-76	1.8K
R54	1	595140-2702	27K
R55, R56, R104	3	T-12731-66	82K
R61, R85	2	T-12731-9	470
R69, R69	2	T-12731-31	47
X73, R102, F1M	3	T-12231-3	1K
R70, R90, R95, R96	4	T-12731-75	220K
R77	1	T-12731-16	3.9K
R78, R79, R100	3	T-12731-32	100K
R83	1	T-12731-14	5.7K
R101	1	T-10812-61	10K
R111	1	T-12731-23	100
R112	1	T-12731-5	150
R105	1	T-12731-42	150K
JUMPER A	2	E2387-450-2.00	
JUMPER C	15	E2387-450-2.00	
JUMPER D	4	E2387-28-2.00	

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS
INDUCTANCE = HENRYS

N.A. STAND OFF FROM BOARD .26 MAX. INSPECT BEFORE AND AFTER ENCAPSULATION, THERE MUST BE NO CRACKS IN THE EPOXY CASE, PARTICULARLY AT THE POINT WHERE THE LEADS ENTER THE CASE.

N.B. RESISTOR FEET MUST BE FLAT AGAINST BOARD. APPLY ITEM 7 TO RESISTOR FEET TO ANCHOR RESISTOR TO BOARD (2 RESISTORS)

N.C. DO NOT COAT WITH ENCAPSULATION MATERIAL

N.D. MOUNT .16/.06 OFF BOARD

N.E. CONNECT BLUE AND RED JUMPERS TO CORRESPONDING "FR" PINS AFTER ENCAPSULATION.

N.F. AFTER P.C. BOARD TEST IS COMPLETED, SEAL R63 WITH .375 WIDE E1058 TAPE.

FOR PARTS ORDERS:
SEAL TRIMMER WITH A DROP OF E4018.
INCLUDE S17710 INSTRUCTION DECAL

MAKE PER E-1911
ENCAPSULATE WITH E-1844 (5 COATS)
TEST PER E-2495-C

MANUFACTURED AS
G-1530-2D5
IDENTIFICATION CODE

	ITEM	PART No	DESCRIPTION	REQ'D
N.C.	8	T-13157-15	TERMINAL	2
N.B.	7	E2861	RTV COATING	.04 oz
N.C.	6	T-13140-76	P.C.BD. PLUG ASS'BLY.	1
N.C.	5	T-13140-117	P.C.BD. PLUG ASS'BLY.	1
N.C. & N.E.	4	S-14165-204	LEAD ASS'BLY.	1
N.C.	3	T-13157-2	TERMINAL	4
N.C. & N.E.	2	S-14165-246	LEAD ASS'BLY.	1
	1	L-6358-D	P.C. BOARD BLANK	1

UNLESS OTHERWISE SPECIFIED TOLERANCE FOR: ON 2 PLACE DECIMALS (.0 = .02 in. (±0.5 mm)) ON 3 PLACE DECIMALS (.0 = .005 in. (±0.05 mm)) ON ALL ANGLES (0 = .5 OF A DEGREE) MATERIAL TOLERANCE ("T") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND | DRAWN BY: fivory | ENGINEER: - | APPROVED: BS

SCALE: NONE IF PRINTED AT A1 SIZE | UNITS: INCH

EQUIPMENT TYPE: IDEALARC D.C. 1500
SUBJECT: CONTROL P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF | APPROVAL DATE: 4/23/2010 | PROJECT NUMBER: CRM42848 | REFERENCE: -

PAGE 1 OF 1
DOCUMENT NUMBER: G1530-2 | DOCUMENT REVISION: F

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC

Return to Section TOC
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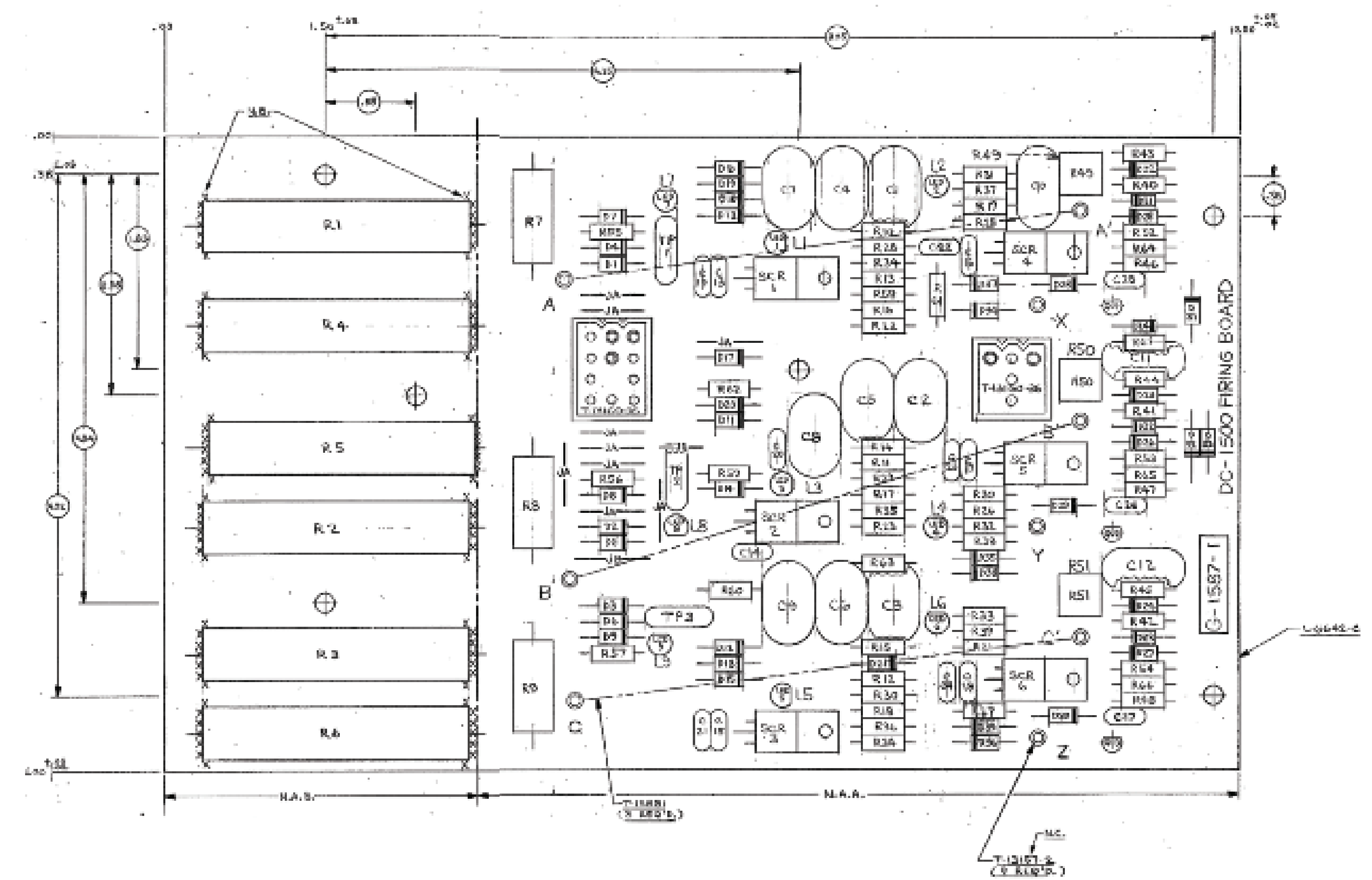
Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - FIRING CIRCUIT PC BOARD - (G1587-1)

G1587-1 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED PARTS ORDERS NOTE



	ITEM	REQD.	PART NO.	IDENTIFICATION
N.A.	C1 THRU C9	9	S-13490-81	.1/400
N.A.	C13 THRU C27	15	T-11577-40	.02-.022/25
N.A.	C10 THRU C12	3	S-13490-24	.15/200
	D1 THRU D6 & D10 THRU D21	18	T-12199-2	1N4007
	D7 THRU D9 & D22 THRU D39	21	T-12199-1	1N4004
	D21, D22, D23	3	T-12702-4	1N4747
	D24	1	T-12702-19	1N4742A
	R1, R2, R3, R4, R5, R6	6	T-12300-74	500
	R7, R8, R9	3	T-14648-9	2.5 K
	R10, R11, R12, R13, R14, R15	6	T-14231-11	100
	R16, R17, R18, R19, R20, R21	6	T-12731-12	1 K
	R22 THRU R27 & R34 THRU R39	12	T-12731-5	150
	R28 THRU R33 & R52, R53, R54	9	T-12731-53	270
	R40, R41, R42	3	T-12731-7	1.5 K
	R43, R44, R45	3	T-12731-9	470
	R46, R47, R48	3	T-12731-14	2.7 K
N.C.	R49, R50, R51	3	T-10812-67	100 K
	R55, R56, R57	3	T-12731-2	27 K
	R43 THRU R48	6	T-14231-6	5.1
	R64, R65, R66	3	T-12731-82	330 K
	R67	1	T-12731-23	100
	QU1, QU2, QU3	3	T-12707-4	2N6027
	SCR1 THRU SCR6	6	S-15161-19	MCR850
N.A. & N.F.	TP1, TP2, TP3	3	T-13640-11	150 V A.C. 45 Joule
	LED1 THRU LED9	9	T-13657-2	
	JUMPER "A"	8	E-2387-#20-2.00	
	JUMPER "B"	1	E-2387-#20-2.00	
	JUMPER "D"	1	E-2387-#20-2.00	

CAPACITORS = MFD / VOLTS
RESISTORS = OHMS

NOTES

N.A. STAND OFF FROM BOARD .25 MAX. INSPECT BEFORE AND AFTER ENCAPSULATION. THERE MUST BE NO CRACKS IN THE EPOXY CASE, PARTICULARLY AT THE POINT WHERE THE LEADS ENTER THE CASE.

N.B. RESISTOR FEET MUST BE FLAT AGAINST BOARD. APPLY E2861 SEALANT TO RESISTOR FEET TO ANCHOR RESISTOR TO BOARD (X RESISTORS)

N.C. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.F. PERMISSIBLE TO ENCAPSULATE LOWER 1/2 OF TRANSIENT PROTECTOR ONLY.

MAKE PER E1911

TEST PER E-1458-F

N.A.A. ENCAPSULATE WITH E-1844, .5 COATS IN AREA SHOWN.

N.A.B. ENCAPSULATE WITH E-1844, 1 COAT IN AREA SHOWN.

A.I.C.F. - AUTOMATICALLY INSERTED COMPONENT FORM

MANUFACTURED AS G-1587-[C] IDENTIFICATION CODE

FOR PARTS ORDERS:
SEAL ALL TRIMMERS WITH A DROP OF E4018 AFTER FINAL TESTING IS COMPLETE.

CONTROL	CLEVELAND
SCALE	NONE
EQUIPMENT TYPE	IDEALARC DC-1500
SUBJECT	FIRING P.C. BOARD ASSEMBLY
PAGE	1 OF 1
DOCUMENT NUMBER	G1587-1
DOCUMENT REVISION	A
UNITS	INCH
MATERIAL DISPOSITION	UF
APPROVAL DATE	8-3-2007
PROJECT NUMBER	CRM38379-D

DO NOT SCALE THIS DRAWING

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

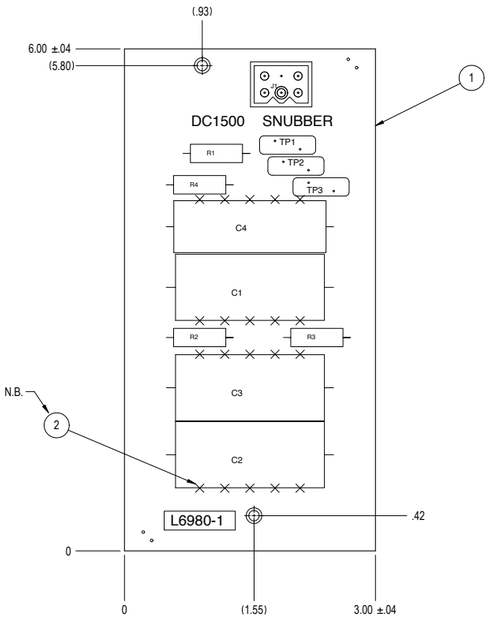
PC BOARD ASSEMBLY - SNUBBER PC BOARD (L6980-1)

L6980-1 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: CHANGED TEST SPEC. # & PARTS ORDERS NOTE.

	ITEM	REQ'D	PART NO.	DESCRIPTION
	C1, C2, C3	3	T11577-68	0.68 MFD / 400 WVDC CAPACITOR
	C4	1	S13490-140	1/400V
N.A.	J1	1	T13160-15	HEADER
	R1, R2, R3	3	S24002-47RO	47/2.5W
	R4	1	S24002-27RO	27.0/2.5W
	TP1, TP2, TP3	3	T13640-11	45J

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

P.C. BOARD BLANK INFORMATION
MAKE FROM S19399 (MAKES 12 BOARDS PER PANEL)
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION
BLANK PART NUMBER L6980-C



ITEM	REQ'D	PART NO.	DESCRIPTION
1	1	L6980-C	P.C. BD. BLANK
2	.13 OZ.	E2861	ADHESIVE SEALANT

MAKE PER E1911
TEST PER E4125
ENCAPSULATE WITH E1844, 2 COATS

NOTES:

N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.B. ANCHOR CAPACITORS TO BOARD WITH A .19 WIDE, 1.50 LONG BEAD OF ITEM (2) ADHESIVE, 4 PLACES.

MANUFACTURED AS
L6980-1C0
IDENTIFICATION CODE

FOR PARTS ORDERS ONLY:
APPLY 115 VAC FOR 2 SECONDS BETWEEN PINS 3 & 1, 3 & 2, 3 & 4, AND 3 & 6, THEN TEST PER E4125.

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE (*) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION		REFERENCE: -
DRAWN BY:	MAP	
ENGINEER:	DRS	SCALE: 1:1
APPROVED:	-	

EQUIPMENT TYPE: IDEALARC DC1500
SUBJECT: SNUBBER #2 P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF | APPROVAL DATE: 12/05/2003 | PROJECT NUMBER: CRM34644

PAGE 1 OF 1
DOCUMENT NUMBER: **L6980-1**
DOCUMENT REVISION: **A**

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - SNUBBER PC BOARD - (L6981-1)

L6981-1

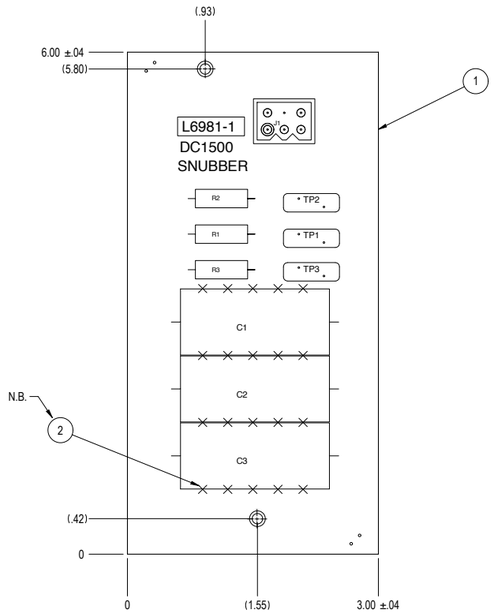
ENGINEERING CONTROLLED
MANUFACTURER: No

CHANGE DETAIL: CHANGED TEST SPEC. # & PARTS ORDERS NOTE.

	ITEM	REQ'D	PART NO.	DESCRIPTION
	C1, C2, C3	3	T11577-68	0.68 MFD / 400 WDC CAPACITOR
N.A.	J1	1	T13160-39	HEADER
	R1, R2, R3	3	S24002-47RO	47/2.5W
	TP1, TP2, TP3	3	T13640-11	45J

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

P.C. BOARD BLANK INFORMATION
MAKE FROM S19399 (MAKES 12 BOARDS PER PANEL)
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION
BLANK PART NUMBER L6981-C



ITEM	REQ'D	PART NO.	DESCRIPTION
1	1	L6981-C	P.C. BD. BLANK
2	.13 OZ.	E2861	ADHESIVE SEALANT

MAKE PER E1911
TEST PER E4125
ENCAPSULATE WITH E1844, 2 COATS

NOTES:

N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.B. ANCHOR CAPACITORS TO BOARD WITH A .19 WIDE, 1.50 LONG BEAD OF ITEM (2) ADHESIVE, 4 PLACES.

MANUFACTURED AS
L6981-1C0
IDENTIFICATION CODE

FOR PARTS ORDERS ONLY:
APPLY 115 VAC FOR 2 SECONDS BETWEEN PINS 3 & 1, 3 & 2, 3 & 4, AND 3 & 6, THEN TEST PER E4125.

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("T") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION	REFERENCE
DRAWN BY: MAP	-
ENGINEER: DRS	SCALE: 1:1
APPROVED: -	

EQUIPMENT TYPE: IDEALARC DC1500
SUBJECT: SNUBBER #1 P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF
APPROVAL DATE: 12/05/2003
PROJECT NUMBER: CRM34644

PAGE 1 OF 1

DOCUMENT NUMBER: **L6981-1**
DOCUMENT REVISION: **A**

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Return to Section TOC
Return to Master TOC