LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

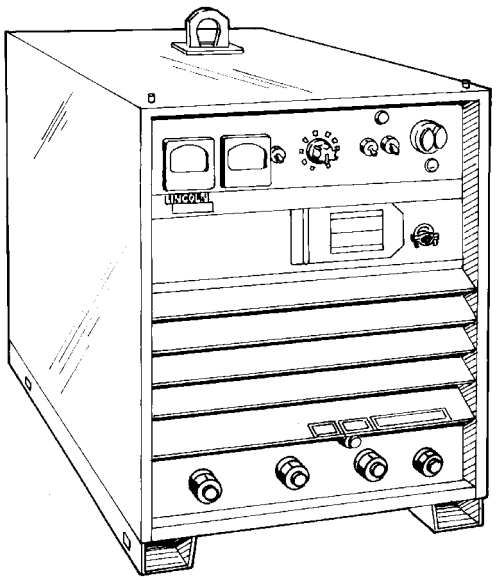
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

IDEALARC® DC-1000

For use with machines having Code Numbers:

9919, 9920, 9921, 9922, 9923, 9924, 9925, 10293, 11305, 11330, 11331, 11332, 11333, 11334, 11681, 11682, 11683, 11684, 11950, 11951, 11952, 11953

SERVICE MANUAL



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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.

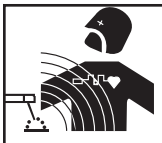
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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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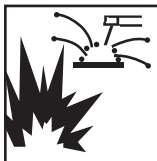

WELDING and CUTTING SPARKS can cause fire or explosion.

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-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

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

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

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

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.

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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.

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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 – DC-1000

INPUT - THREE PHASE ONLY			
Standard Voltage	**Input Current at Rated Output**		
	100% Duty Cycle	**60% Duty Cycle**	**50% Duty Cycle**
230/460/60	193/96.5	215/108	230/115
575/60	77.2	86	92
220/380/440/50/60	193/112/96.5	215/124/108	230/133/115
380/500/50/60	112/85	124/94	133/101
415/50/60	102	113	121

RATED OUTPUT		
Duty Cycle	**Amps**	**Volts at Rated Amperes**
100% Duty Cycle	1000	44
60% Duty Cycle	1140	44
50% Duty Cycle	1250	44

OUTPUT		
Output Range	**Maximum Open Circuit Voltage**	**Auxiliary Power**
150A/16V-1300A/46V	75V for 60 HZ models 72V for 50/60 HZ models	See the OPERATION section for Auxiliary Power information by model

RECOMMENDED INPUT WIRE AND FUSE SIZES					
INPUT VOLTAGE / FREQUENCY	**HERTZ**	**INPUT AMPERE RATING ON NAMEPLATE**	**TYPE 75°C COPPER WIRE IN CONDUIT AWG(IEC-MM²) SIZES 30°C (86°F) Ambient**	**TYPE 75°C GROUND WIRE IN CONDUIT AWG(IEC-MM²) SIZES**	**TYPE 75°C (SUPER LAG) OR BREAKER SIZE (AMPS)[1]**
230	60	193	000 (85)	4 (21)	300 Amp
460	60	96.5	3 (27)	6 (14)	150 Amp
575	60	77.2	4 (21)	6 (14)	125 Amp
220	50/60	193	000 (85)	4 (21)	300 Amp
380	50/60	112	2 (34)	6 (14)	175 Amp
415	50/60	102	2 (34)	6 (14)	150 Amp
440	50/60	96.5	3 (27)	6 (14)	150 Amp
500	50/60	85	4 (21)	6 (14)	125 Amp

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
30.75 in 781 mm	22.25 in 567 mm	39.0 in 991 mm	821 lbs. 372 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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SAFETY PRECAUTIONS

Read this entire installation section before you start installation.

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.**
- **Do not touch electrically hot parts.**
- **Always connect the Power Wave grounding lug (located inside the reconnect input access door) to a proper safety (Earth) ground.**

LOCATION

Even though the machine is designed to operate under a wide variety of environmental conditions, for maximum reliability and long life the machine should be located in a clean, dry place where there is free circulation of clean air in through the front and out the back of the machine. Dirt and dust that can be drawn into the machine should be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown of the machine.

The case front incorporates a recessed control panel which protects the controls and minimizes the possibilities of accidental contact. This cover panel can be flipped open to permit access to the enclosed control section.

The individual case sides are removable for easy access for internal service or inspection.

The case rear is equipped with a removable cover plate, permitting easy access to the input panel.

The total enclosure, designed to permit outdoor operation, resists dust, salt, rain, humidity, and high and low temperature extremes.

The machine uses a 38” (965mm) long base. The low profile case facilitates installation of the machine under a workbench and stacking the machines two high to conserve floor space.

A permanent lifting eye is located at the top of the machine and is positioned so that it acts as nearly as possible through the center of gravity. This lift eye fits under the case of the second machine without interference when stacking.

STACKING

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- Do not lift this machine using lift bale if it is equipped with a heavy accessory such as trailer or gas cylinder.
- Lift only with equipment of adequate lifting capacity.
- Be sure machine is stable when lifting.
- Do not stack more than two high.
- Do not stack the DC-1000 on top of any other machine.

Two DC-1000’s may be stacked by observing the following safety precautions:

1. Make sure the first or bottom unit is setting on a level, well-supported surface.

2. The units must be stacked with their fronts flush, making sure the two holes in the base rails of the top unit are over the two pins located on top of the bottom unit.

INPUT WIRING

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

Dual voltage (e.g. 230/460) models are shipped connected for the highest voltage. To change the connection, see the connection diagram pasted to the inside of the access panel in the case back.

Have a qualified electrician remove the rear access panel and connect 3 phase AC power to terminals L_1, L_2 and L_3 of the input panel in accordance with the U.S. National Electrical Code, all local codes and the Wiring Diagram located inside the machine.

The welder frame must be grounded. A stud marked with the symbol ⏚ located inside the machine near the input panel is provided for this purpose. See the U.S. National Electrical Code for details on proper grounding methods. (See ***Technical Specifications***)

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RECONNECT PROCEDURE

Multiple voltage machines are shipped connected to the highest input voltage listed on the machine's rating plate. Before installing the machine, check that the Reconnect Panel in the Input Box Assembly is connected for the proper voltage.

⚠ CAUTION

Failure to follow these instructions can cause immediate failure of components within the machine.

When powering welder from a generator be sure to turn off welder first, before generator is shut down, in order to prevent damage to the welder.

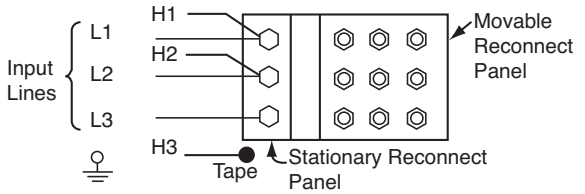
To reconnect a multiple voltage machine to a different voltage, remove input power and change the position of the reconnect board on the Reconnect Panel. Follow The Input Connection Diagram located on the inside of Case Back Input Access Door. These connection diagrams for the following codes are listed below.

1. For Single and Dual Voltage except 380/500 see Figure A.1, (S17172).
2. For 220/380/460, ***See Figure A.2***, (M14358).
3. For 380/500, ***See Figure A.3***, (S17344).
4. For Voltages not listed, see the Input Connection Diagram pasted on the inside of the Case Back Input Access Door.

FIGURE A.1

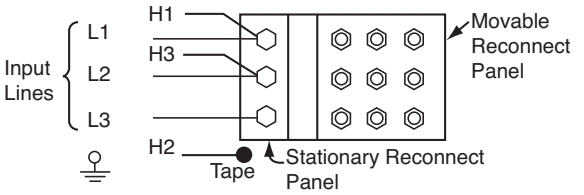
INPUT CONNECTION DIAGRAM
WARNING: All input power must be electrically disconnected before touching panel.
NOTE: Dual voltage machines are shipped from factory connected for high voltage.

CONNECTION FOR UNDER 300 VOLTS



1. Mount the movable reconnect panel to the stationary reconnect panel studs in the position shown, and secure firmly with the nine hex nuts provided.
2. Connect L1, L2 & L3 input supply lines & H1 and H2 control transformer leads to the input side of the reconnect panel.
3. Insulate unused H3 lead terminal with adequate tape to provide at least 600 volt insulation.
4. Connect terminal marked ⏚ to ground per National Electrical Code.

CONNECTION FOR OVER 300 VOLTS



1. Mount the movable reconnect panel center set of holes to the stationary reconnect panel in the position shown, and secure firmly with the six hex nuts provided. Secure the three reminaing hex nuts over the remaining three studs for future use.
2. Connect L1, L2 & L3 input supply lines & H1 and H3 control transformer leads to the input side of the reconnect panel as shown.
3. Insulate unused H2 lead terminal with adequate tape to provide at least 600 volt insulation.
4. Connect terminal marked ⏚ to ground per National Electrical Code.

S-17172

FIGURE A.2

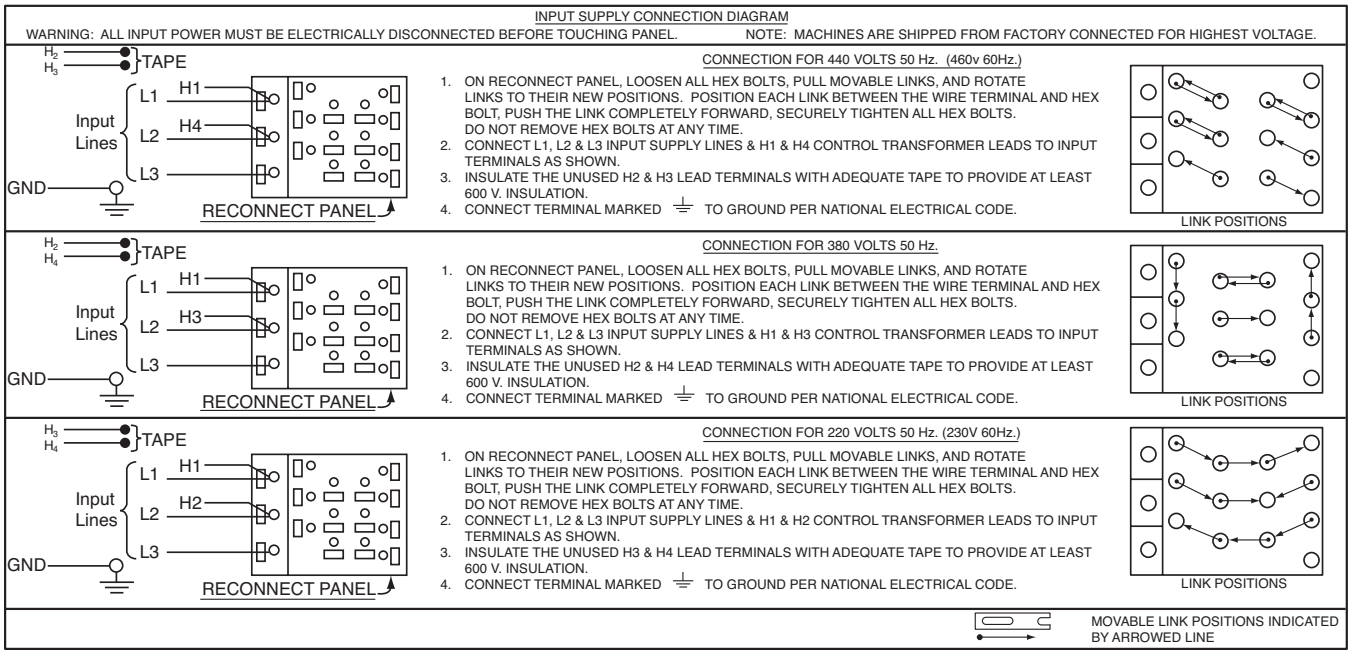
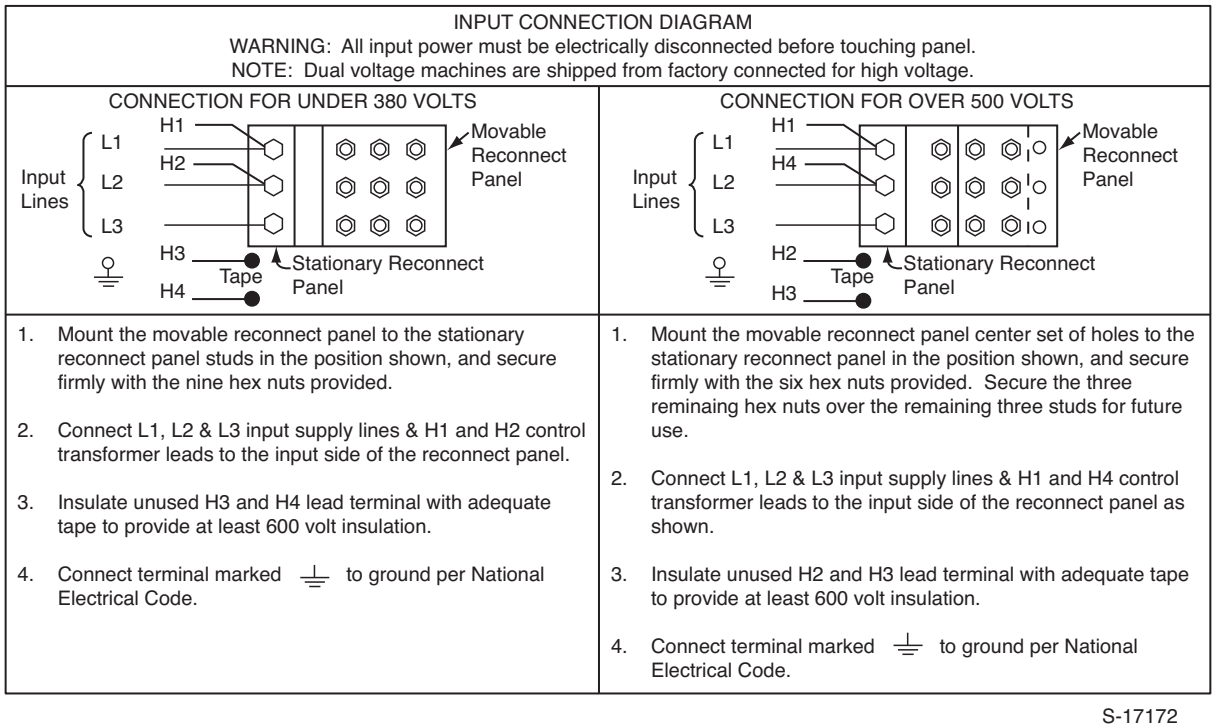


FIGURE A.3



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OUTPUT CONNECTIONS

Output Studs

The output leads are connected to the output terminals. The output terminals are located on the lower case front and labeled "+" and "-". There are 1000 amp rated "+" terminals on the right side, one 500 amp rated "+" terminal near the center and "-" terminals on the left side. They are fully recessed to minimize the possibility of accidental contact by an object or a person. Strain relief is provided by the oval holes in the base. The leads are run through these oval holes before they are connected to the output terminals.

The 1000 amp output connections provide the full rated output range of the machine. See Table1 for recommended DC-1000 cable sizes for combined lengths of electrode and work cables.

The 500 amp output connections provide enhanced lower current arc characteristics, especially for submerged arc and GMAW procedures below 450 amps.

Auxiliary Power

This machine supplies the 115 volt, AC power needed for operating wire feeding equipment. The power is available from terminals #31 and #32 on the terminal strip. An 8 amp slow blow fuse on the machine control panel protects the auxiliary power from excessive overloads. The circuit has a 1000 volt-ampere rating.

Control Cable Connection

Terminal strips with screw connections are located behind the hinged door on the front of the power source to make all the control cable connections for operating wire feeding equipment. See the appropriate connection diagram for exact instructions covering the wire feeder being used.

With the DC-1000 turned off, the control cable from the automatic wire feeding equipment is connected to the terminal strip. A strain relief box connector is provided for access into the terminal strip section. A chassis grounding screw is also provided below the terminal strip marked with the symbol ⏚ for connecting the wire feeding equipment grounding wire. See the appropriate connection diagram for the exact instructions for the wire feeder being used. A spare hole is provided for an additional box connector if required.

Connecting for Air Carbon Arc:

a. Turn off all power.

b. Disconnect all wire feed unit control, electrode and work leads.

c. Connect a jumper from 2-4 on terminal strip.

d. Place mode switch in the CV(I) position.

With the DC-1000 connected for air carbon arc welding, the output terminals will be energized at all times.

TABLE A.1
DC-1000 Cable Sizes for Combined Lengths of Copper Electrode and Work Cable at 100% Duty Cycle

ELECTRODE, WORK AND #21 LEAD

Cable Length	Parallel Cables	Cable Size
Lengths up to 150 ft. (46m)	3	1/0 (53mm^2)
150 ft.(46m) to 200 ft (61m)	3	2/0 (67mm^2)
200 ft.(61m) to 250 ft.(76m)	3	3/0 (85mm^2)

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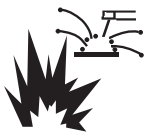
OPERATING INSTRUCTIONS

⚠ WARNING

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

FUMES AND GASES can be dangerous.
- **Keep your head out of fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**



WELDING SPARKS can cause fire or explosion.
- **Keep flammable material away.**
- **Do not weld on closed containers.**

ARC RAYS can burn eyes and skin.
- **Wear eye, ear and body protection.**

See additional warning information at front of this operator's manual.

PRODUCT DESCRIPTION

The DC-1000 is an SCR-controlled three phase DC power source. It is designed with a single range potentiometer control for submerged arc or open arc automatic and semiautomatic welding. It can be used for air carbon arc cutting with carbon rods up to and including 5/8" (15.9mm) dia. The DC-1000 (below code 9500) is *not* recommended for stick welding or for solid wire and gas in the short arc welding mode. With the addition of the 500 amp output stud to DC-1000 models above code 9500, GMAW procedures can be performed. This connection provides the enhanced lower current arc characteristics required for this type of welding.

The DC-1000 is provided with a three position mode switch that selects CV Innershield®, CV Submerged Arc or CC (Variable Voltage) Submerged Arc.

The unit is designed to be used with the NA-5, NA-5R and NA-3 automatics, the LT-56 and LT-7 tractors, and can also be used with the LN-7, LN-8 or LN-9 semiautomatic wire feeders.

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

TO SET POLARITY

Turn off the DC-1000 and connect the electrode cable to the "Positive" or "Negative" studs depending upon the electrode polarity desired. Connect the work cable to the other stud. (See "Output Connections").

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 some Lincoln wire feeders and does not change the welding polarity.

Starting the Machine - The push button power "on" switch at the extreme right side of the control panel energizes and closes the three phase input contactor from a 115 volt auxiliary transformer. This in turn energizes the main power transformer.

The red light below the stop-start button indicates when the input contactor is energized.

Output Control - The output control in the center of the control panel is a continuous control of the machine output. The control may be rotated from min. to max. while under load to adjust the machine output.

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

Output Control at DC-1000 or Output Control Remote Switch

The toggle switch on the control panel labeled "Output Control at DC-1000" / "Output Control Remote" gives the operator the option of controlling the output at the machine control panel or at a remote station. For remote control, the toggle switch is set in the "Output Control Remote" position and controlled at the wire feed unit control or by connecting a K775 control to the appropriate terminals (as indicated on the connection diagram) on the terminal strip at the front of the machine. For control at the machine control panel, the toggle switch is set in the "Output Control at DC-1000" position.

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Remote Output Control - (Optional)

The K775 Remote Output Control consists of a control box with 28 ft. (8.4m) of four conductor cable. This connects to terminals 75, 76, 77 on the terminal strip, and the case grounding screw so marked with the symbol ⏚ on the machine. These terminals are made available by opening the terminal access cover on the left side of the case front. This control will give the same control as the output control on the machine.

Mode Switch

The toggle switch labeled C (I) Innershield, CV(S) Submerged Arc, CC (or Variable Voltage) is used to select the proper welder characteristics for the process being used. The CC (or Variable Voltage) mode is primarily available for use with older wire feeding equipment such as the LAF-3, LT-34 and so forth. Use of this type of older equipment requires the addition of an NL Option Kit.

SET-UP FOR VARIOUS PROCEDURES

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

   a. Use the CV(I) mode for all FCAW and GMAW processes. The CV(I) mode is also used for air carbon arc using carbon rods up to and including 5/8" (15.9mm) dia.

      Welding with NR®-151, 202, 203 and other electrodes below 20 volts, is not recommended.

   b. Use the CV(S) mode for all submerged arc welding. This applies to both low and high travel speeds.

   c. The CC (Variable Voltage) mode is available for high current large puddle submerged arc procedures that cannot be done as well with the constant voltage mode. CC mode should be used for 3/16" (4.8mm) diameter electrode and above where high current surges cause machine shutdown when starting. This occurs primarily when the slag ball is not cut from the electrode prior to starting. (Also requires a wire feeder that has a constant current mode - i.e. NA-3S).

NOTE: Some processes and procedures may be better with the mode switch in the other CV position. If the mode switch position initially selected is not producing the desired results, then place the mode switch in the other CV position and make a test weld. Then use the CV mode switch position that gives the desired results.

2. **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 CC board switch should be set for CV. If the power source is used in the CC mode, then the NA-3 CC board mode switch should be placed in the CC position.

All the NA-3's when used with the DC-1000 are capable of cold starting with the constant current board mode switch in CC. Cold starting permits the wire to be inched 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 CC settings of the constant current board.

On the NA-3, set the open circuit voltage control to the same dial setting as the arc voltage control. If the procedure has not yet been established, a good starting point is to set the OCV to #6.

Run a test weld, setting the proper current, voltage and travel speed. Once the proper welding procedure is established and if the start is poor - wire blast off, stub, etc. - adjust the NA-3 OCV and inch speed controls for optimum starting. In general, a low inch speed and an OCV dial setting identical to the voltage dial setting will provide the best starting.

To further optimize starting, adjust the OCV by making repeated starts and observing the NA-3 voltmeter action. With proper adjustment of the OCV control, the voltmeter needle will swing smoothly up to the desired arc voltage and thus provide repeatable starts.

If the voltmeter swings above the set voltage and 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.

3. **NA-5** - Set the DC-1000 mode switch to the process being used - CV(I) Innershield or CV(S) Sub Arc. Set the DC-1000 machine/remote switch in the remote position. Set the OCV control four volts higher than the welding voltage and the inch speed at 1/2 the welding wire feed speed for the initial test weld. Adjust the OCV and inch speed as required for optimum starting. Refer to the NA-5 instruction manual for data regarding the setup of controls and modes on the NA-5.
4. **LN-8** - Set the LN-8 mode switch (located on the CC board) to the CV position. Set the DC-1000 mode switch on CV(I) Innershield or CV(S) Sub Arc according to the process being used.
5. **LN-7, LN-9 and other constant wire feed units** - Set the DC-1000 mode switch on CV(I) Innershield or CV(S) Sub Arc according to the process being used. If using an LN-9, refer to the LN-9 instruction manual for further instructions on its use. If using an LN-7, it will be necessary to use either a K775 Remote Control or operate the DC-1000 with the machine/remote switch in the machine position.

NL Option Kit (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 obsolete NA-2, LAF-3, LT-3 and LT-3 section of the LT-34 tractor. 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 kit.* Installation instructions are included with the NL Option Kit.

CONNECTIONS FOR SEMI-AUTOMATIC OR AUTOMATIC WIRE FEEDER CONTROL

1. Set the ON/OFF PUSH BUTTON to OFF.
2. Locate and open the hinged access door on the Front Case Assembly.
3. Insert control cable through the strain relief box connector and pull enough cable through to reach the terminal strip.
4. Connect the automatic wire feeder control cable to the terminal strip. See corresponding connection diagram in this section of the manual, or the instructions included with the wire feeder.
5. Connect the wire feeder grounding wire to the chassis ground screw marked with the symbol ⏚.

NOTE: The IDEALARC® DC-1000 Auxiliary Power Circuit (at #31 and #32 on the terminal strip) supplies 115-volt AC power to the wire feeding equipment. The circuit has a 1000 volt ampere rating. An 8-amp slow blow fuse on the machine's control panel protects the auxiliary power supply from excessive overloads or short circuits.

CONNECTING THE NA-3 OR LT-7 TO IDEALARC® DC-1000

1. Disconnect main AC input power to the IDEALARC® DC-1000.
2. Set IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.
3. Connect the wire feeder control cable leads to the IDEALARC® DC-1000 terminal strip as shown in Figure B.1.

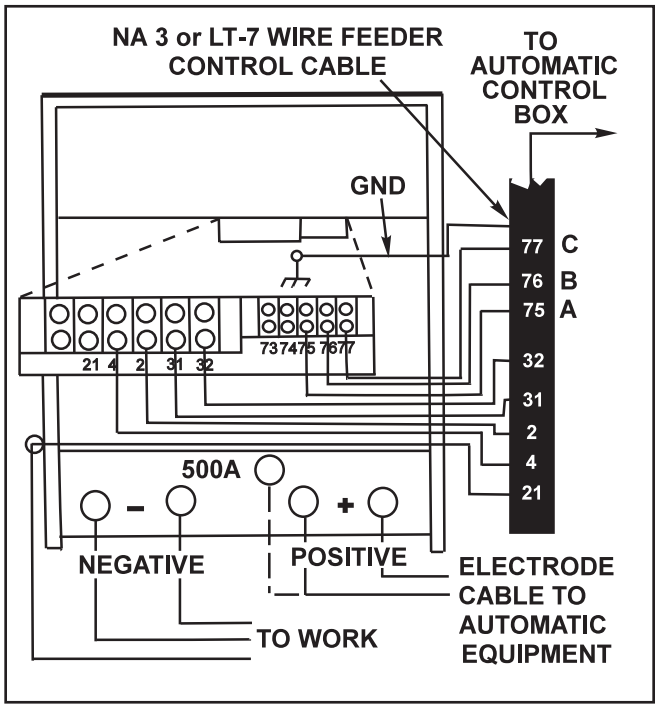

FIGURE B.1 - NA-3 or LT-7 Wire Feeder Connection to the IDEALARC® DC-1000

4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

⚠ CAUTION

The IDEALARC® DC-1000 must be properly grounded.

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5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire.
   b. Tape the bolted connection with insulating tape.

NOTE: An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.

6. Connect the welding cables as shown in ***Figure B.1***.

NOTE: Welding cables must be of proper capacity for the current and duty cycle for immediate and future applications.

NOTE: The connection diagram shown in ***Figure B.1*** shows the electrode connected for positive polarity. To change polarity:

   a. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.
   b. Move the electrode cable to the Negative (-) output terminal.
   c. Move the work cable to the Positive (+) output terminal.
   d. Set the IDEALARC® DC-1000 CONTROL CIRCUIT POLARITY SWITCH to NEGATIVE.
   e. Reverse the leads at the back of the ammeter and voltmeter on the wire feeder automatic control box.

CONNECTING THE NA-5 TO THE IDEALARC® DC-1000

NOTE: For optimum performance, use the NA-5 with IDEALARC® DC-1000 codes 8288 and above.

1. Disconnect main AC input power to the IDEALARC® DC-1000.
2. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.
3. Connect the wire feeder control cable leads to the IDEALARC® DC-1000 terminal strip as shown in Figure B.2.

NOTE: If using a K215 control cable, connect control cable leads #75 to #75 on the terminal strip, #76 to #74 on the terminal strip, and #77 to #73 on the terminal strip.

4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

⚠ CAUTION

The IDEALARC® DC-1000 must be properly grounded.

5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire.
   b. Tape the bolted connection with insulating tape.

NOTE: An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.

6. Connect NA-5 wire feeder control jumpers on the Voltage Control Board. See NA-5 Operator's Manual.
   a. Connect red jumper on Voltage Control Board to pin "S."
   b. Connect white jumper on Voltage Control Board to pin "B."
7. Connect the welding cables as shown in Figure B.2.

NOTE: Welding cables must be of proper capacity for the current and duty cycle for immediate and future applications.

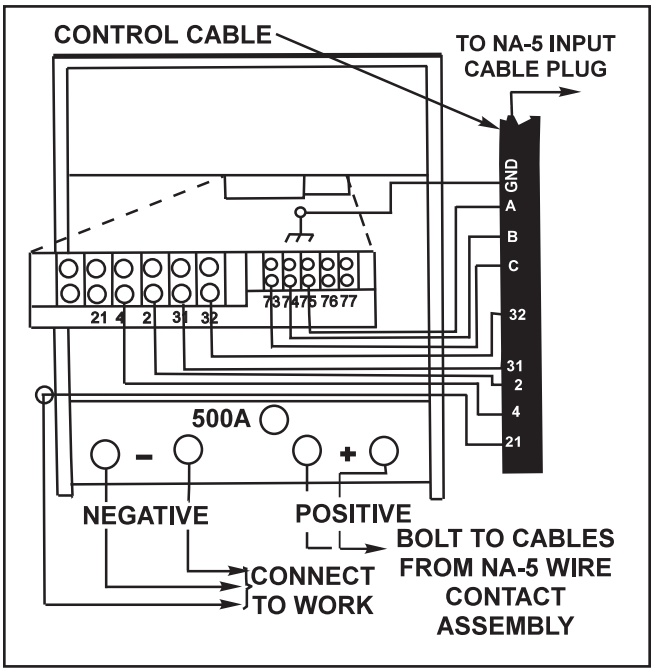

FIGURE B.2 - NA-5 Wire Feeder Connection to the IDEALARC® DC-1000

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NOTE: The connection diagram shown in ***Figure B.2*** shows the electrode connected for positive polarity. To change polarity:

a. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.

b. Move the electrode cable to the Negative (-) output terminal.

c. Move the work cable to the Positive (+) output terminal.

d. Set the IDEALARC® DC-1000 CONTROL CIRCUIT POLARITY SWITCH to NEGATIVE.

e. Refer to NA-5 operator's manual for proper control box polarity connections.

NOTE: For proper NA-5 operation, the electrode cables must be secured under the clamp bar on the left side of the NA-5 Control Box.

CONNECTING THE LN-8 TO THE IDEALARC® DC-1000

1. Set the ON/OFF PUSH BUTTON to the OFF position.
2. Disconnect AC input power to the IDEALARC® DC-1000.
3. Connect the wire feeder control cable leads to the DC-1000 terminal strip. See Figure B.3.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

⚠ CAUTION

The IDEALARC® DC-1000 must be properly grounded.

5. Extend the wire feeder control cable #21 lead so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire.
   b. Tape the bolted connection with insulating tape.

NOTE: An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to the work cable for ease of use.

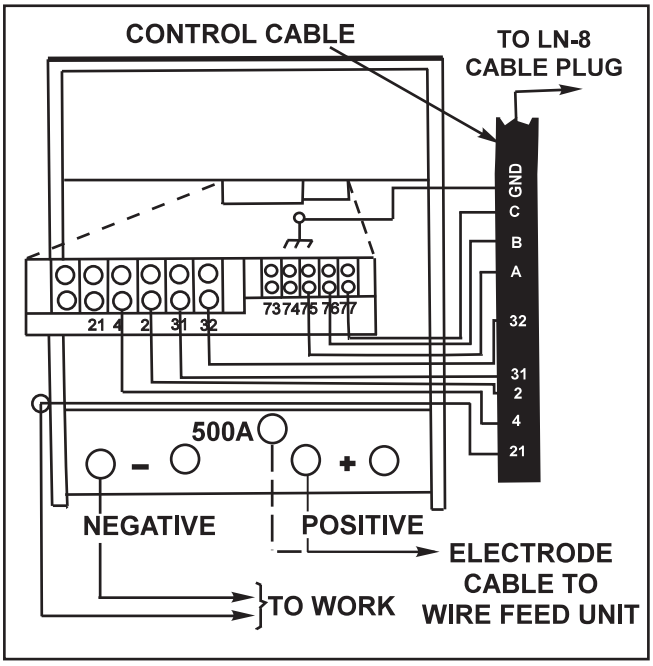

FIGURE B.3 - LN-8 Wire Feeder Connection to the IDEALARC® DC-1000

6. Connect lead #75(A) to #75 on the terminal strip.
7. Connect lead #76(B) to #76 on the terminal strip.
8. Connect lead #77(C) to #77 on the terminal strip.
9. Connect the welding cables as shown in Figure B.3.

NOTE: Welding cables must be of proper capacity for the current and duty cycle for immediate and future applications.

10. Set the DC-1000 output control switch to the "Output Control Remote" position.

NOTE: The connection diagram shown in figure B.3 shows electrode connected positive. To change polarity:

a. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.

b. Move the electrode cable to the Negative (-) output terminal.

c. Move the work cable to the Positive (+) output terminal.

d. Set the IDEALARC® DC-1000 CONTROL CIRCUIT POLARITY SWITCH to NEGATIVE.

e. Refer to LN-8 operator's manual for proper control box polarity connections.

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CONNECTING THE LN-9 WIRE FEEDER TO THE IDEALARC® DC-1000

1. Set the ON/OFF PUSH BUTTON to the OFF position.
2. Disconnect AC input power to the IDEALARC® DC-1000.
3. Connect the wire feeder control cable leads to the DC-1000 terminal strip. See Figure B.4.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚.

⚠ CAUTION

The IDEALARC® DC-1000 must be properly grounded.

5. Extend the wire feeder control cable #21 lead so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire.
   b. Tape the bolted connection with insulating tape.

NOTE: An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to the work cable for ease of use.

6. Connect lead #75(A) to #75 on the terminal strip.
7. Connect lead #76(B) to #74 on the terminal strip.
8. Connect lead #77(C) to #73 on the terminal strip.
9. Connect the welding cables as shown in Figure B.4.

NOTE: Welding cables must be of proper capacity for the current and duty cycle for immediate and future applications.

10. Connect LN-9 wire feeder jumpers on voltage board as follows: See LN-9 operator's manual.
    a. White jumper on voltage board to pin "S"
    b. Blue jumper on voltage board (later models) or on start board (earlier models) to pin "B".

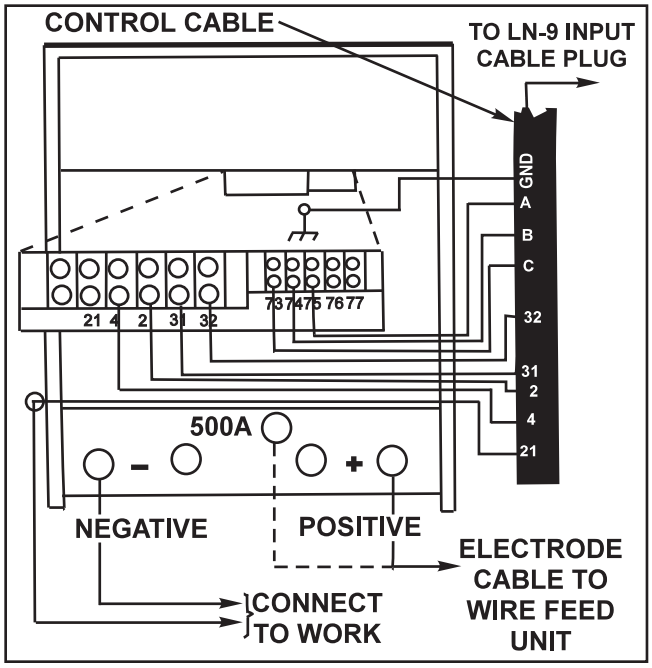

FIGURE B.4 - LN-9 Wire Feeder Connection to the IDEALARC® DC-1000

11. Set the DC-1000 output control switch to the "Output Control Remote" position.

NOTE: The connection diagram shown in figure B.4 shows electrode connected for positive polarity. To change polarity:

   a. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.
   b. Move the electrode cable to the Negative (-) output terminal.
   c. Move the work cable to the Positive (+) output terminal.
   d. Position the positive-negative switch on the power source to correspond to the polarity of the electrode cable connection.
   e. Refer to LN-9 operating manual for required polarity connections.

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CONNECTING THE LN-7 WIRE FEEDER TO THE IDEALARC® DC-1000

1. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.
2. Disconnect main AC input power to the IDEALARC® DC-1000.
3. Connect the wire feeder control cable leads to the IDEALARC® DC-1000 terminal strip as shown in Figure B.5.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚.

⚠ CAUTION

The IDEALARC® DC-1000 must be properly grounded.

5. PERFORM THIS STEP ONLY IF THE LN-7 IS EQUIPPED WITH A METER KIT.

Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.

a. Make a bolted connection using AWG #14 or larger insulated wire.

b. Tape the bolted connection with insulating tape.

NOTE: If the work cable length is less than 25 feet and the connections to the work piece are secure, then wire feeder control cable lead #21 can be connected directly to the DC-1000 terminal strip.

NOTE: An S-16586-X remote voltage sensing work lead is available for this purpose.

b. Keep the #21 lead electrically separate from the work cable circuit and connection.

c. Tape the #21 lead to work cable for ease of use.

6. Connect the welding cables as shown in Figure B.5.

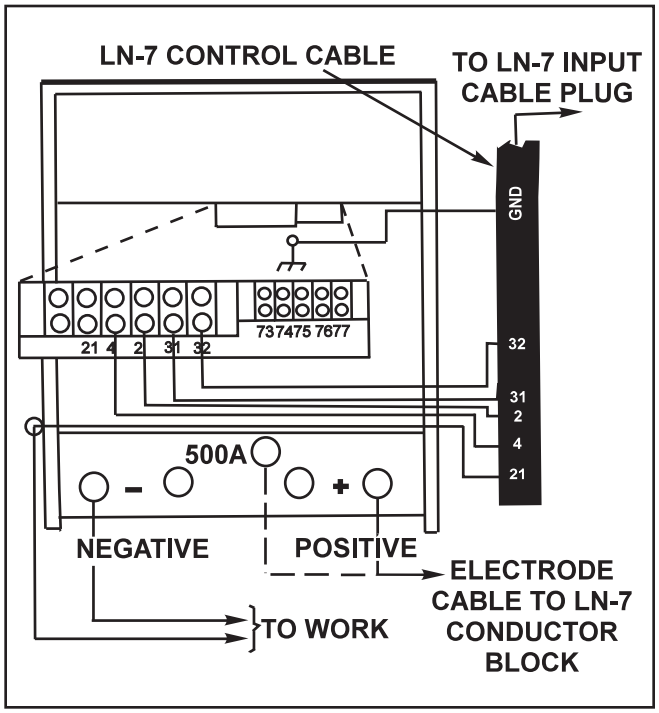

FIGURE B.5 - LN-7 Wire Feeder Connection to the IDEALARC® DC-1000

NOTE: Welding cables must be of proper capacity for the current and duty cycle for immediate and future applications.

NOTE: The connection diagram shown in Figure B.5 shows the electrode connected for positive polarity. To change polarity:

a. Set the IDEALARC® DC-1000 ON/OFF PUSH BUTTON to OFF.

b. Move the electrode cable to the Negative (-) output terminal.

c. Move the work cable to the Positive (+) output terminal.

d. Set the IDEALARC® DC-1000 CONTROL POLARITY SWITCH to NEGATIVE.

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OPTIONS / ACCESSORIES

- Remote Control Box Assembly (K775)
- LN-7
- LN-8 } Semi-Automatic Wire Feeders
- LN-9
- NA-3
- NA-5 } Automatic Wire Feeders
- LT-7 and LT-56 Tractors

METERS

Optional factory-installed voltmeter and ammeter are available.

REMOTE OUTPUT CONTROL - (OPTIONAL)

The K775 Remote Output Control consists of a control box with 28 ft. (8.4 m) four conductor cable. This connects to terminals #75, #76, #77 on the terminal strip, and the case grounding screw marked with the symbol ⏚ on the machine. These terminals are made available by opening the terminal access cover on the case front. This control will give the same control as the output control on the machine.

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SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this 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 as required to eliminate excessive dirt and dust buildup on internal parts.

OVERLOAD PROTECTION

The power source is thermostatically protected with two proximity thermostats against overload or insufficient cooling. One thermostat is located on the transformer secondary Negative Output Lead, and the other thermostat is located on the choke coil. The thermostats are connected in series in the machine control circuit so that if an excessive overload is applied to the machine, or the machine should receive insufficient cooling on either the main transformer, SCR bridge assembly or choke, the input contactor would open and remain open until the machine cools. It can then be manually restarted by operating the start push button.

The power source is also protected against heavy overloads on the SCR bridge assembly through an electronic protection circuit. This circuit senses an overload on the power source and opens the input contactor should the overload remain for a predetermined time. The predetermined time varies with the amount of overload; the greater the overload, the shorter the time. The input contactor will remain open until the power source is manually started with the start push button.

The control board is designed with adequate protection so that no damage will occur if the remote control leads are shorted together or are grounded to the case. The machine will automatically shut down if such faults do occur.

An 8-amp fuse located on the machine control panel 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 Locations

1. Case Front & Control Box
2. Case Back Assembly
3. Base, Fan, Roof and Case Sides
4. Output Rectifier & Choke Assembly
5. Lift Bale & Transformer Assembly
6. S78 Contactor

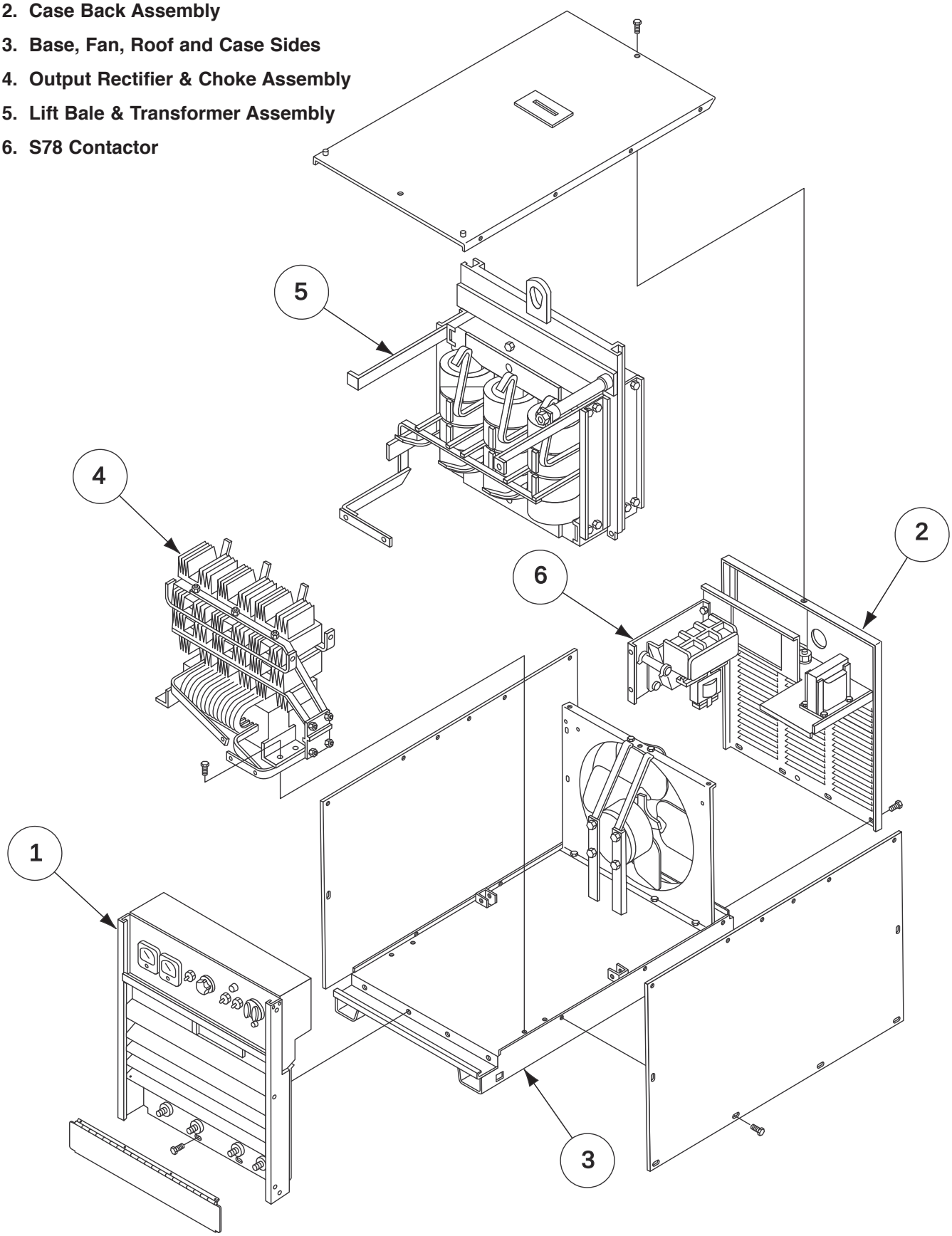

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FIGURE E.1 BLOCK LOGIC DIAGRAM

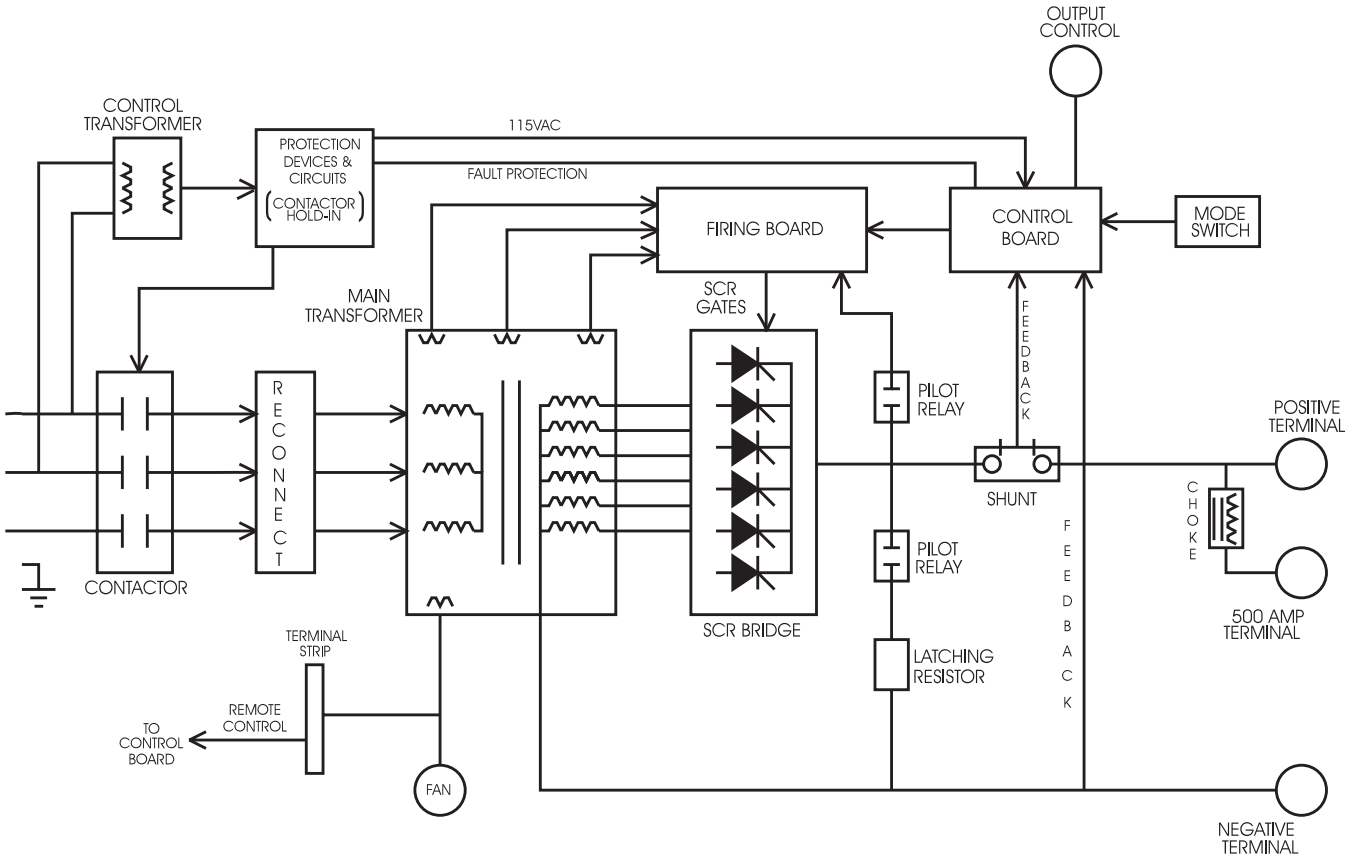
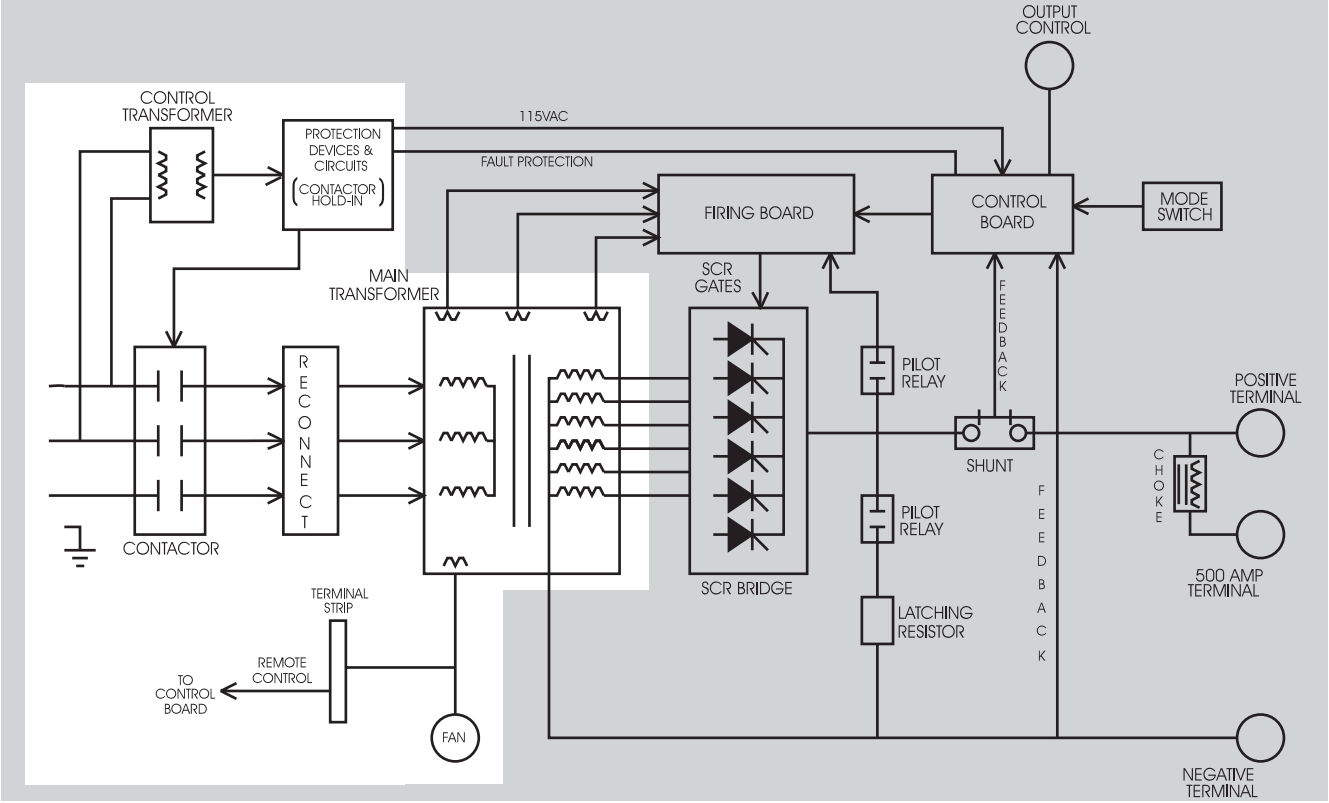


FIGURE E.2 - INPUT LINE VOLTAGE, CONTACTOR, AND MAIN TRANSFORMER



GENERAL DESCRIPTION

The DC 1000 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-1000 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-1000 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 assembly. In addition, the main transformer also has an isolated 115 VAC auxiliary winding that supplies 115 VAC to operate the cooling fan and offers 8 amps of auxiliary power to operate wire feeding equipment. The three 75 VAC phase angle windings are also housed in the Main Transformer assembly. These windings provide power and “timing” to the Firing Board.

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

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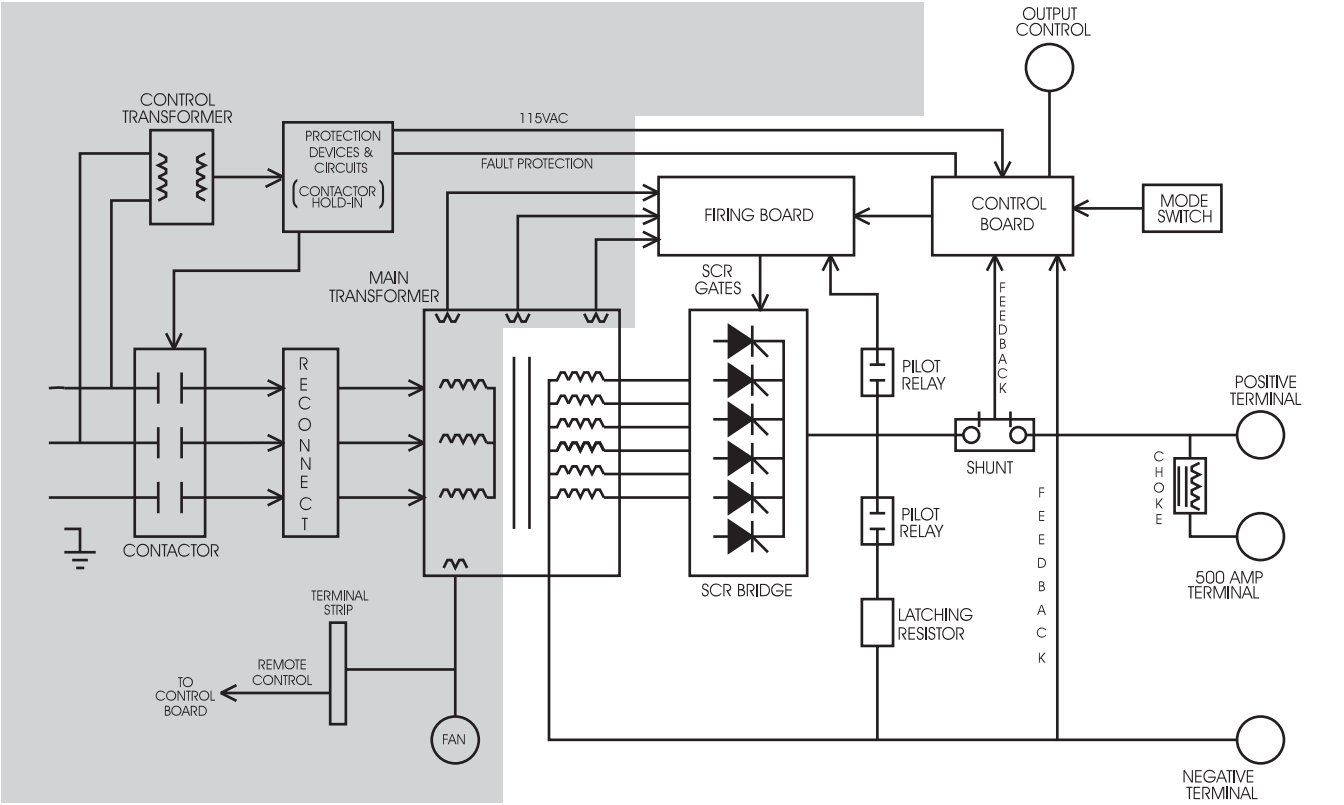
FIGURE E.3 - OUTPUT, RECTIFICATION, CONTROL AND FEEDBACK



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.

In later models (above code 9500) a Choke and separate 500 amp output terminal is provided to enhance lower current arc characteristics, especially for submerged arc and GMAW procedures below 450 amps.

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

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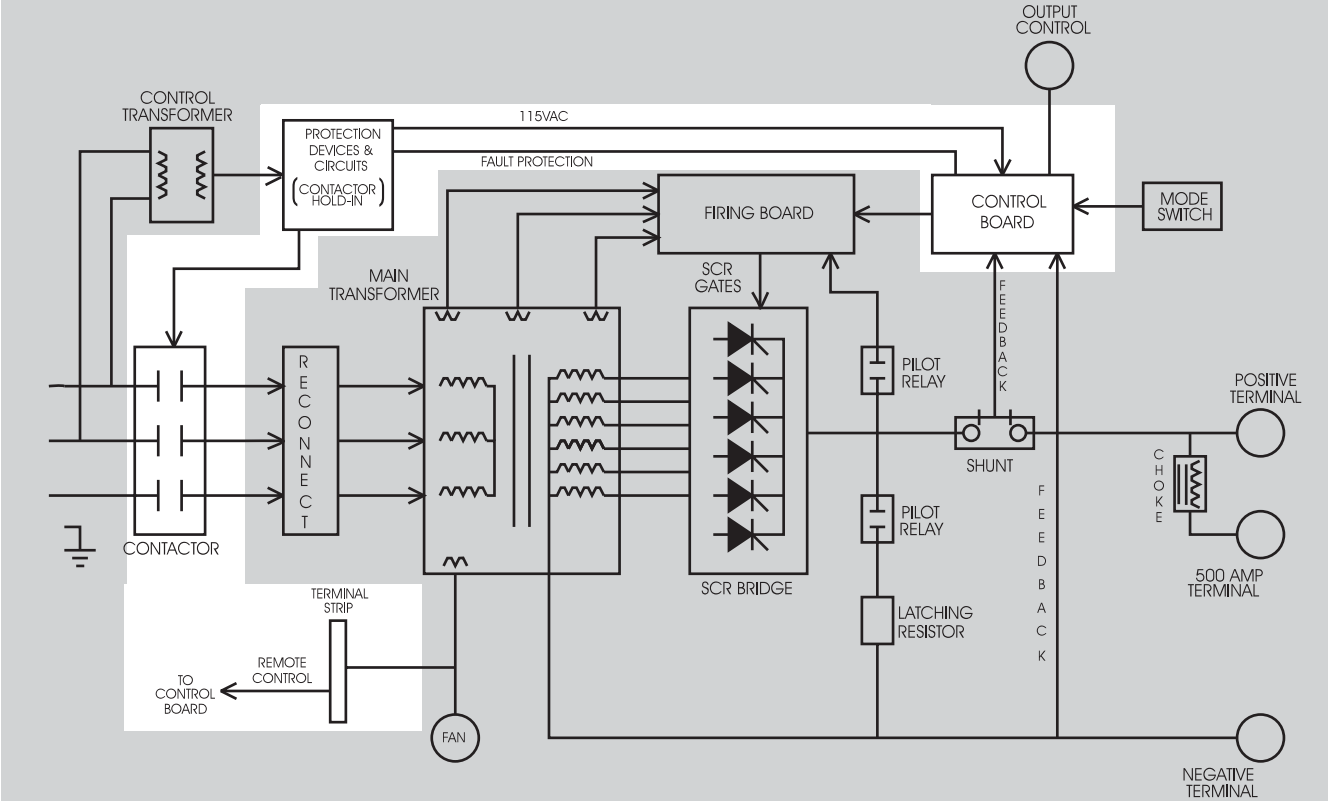
FIGURE E.4 - PROTECTION DEVICES AND CIRCUITS (CONTACTOR HOLD-IN)



PROTECTION DEVICES AND CIRCUITS (CONTACTOR HOLD-IN)

Two thermostats protect the DC-1000 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 fan does 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-1000 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-1000 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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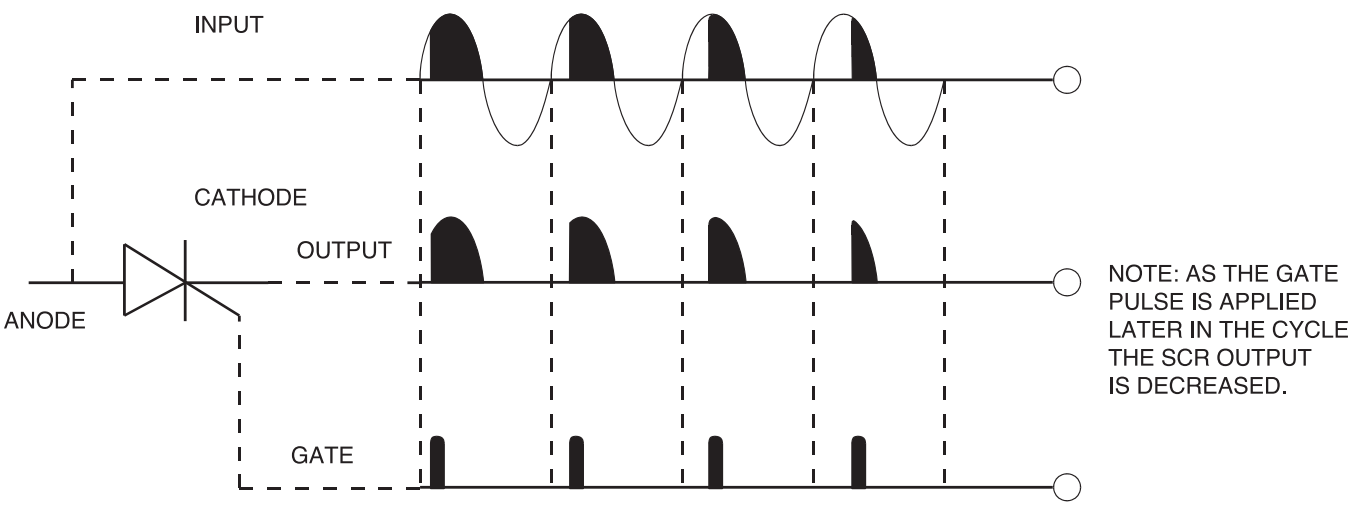
FIGURE E.5 - SCR OPERATION



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.

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

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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 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.

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 Control Transformer (T2) may be faulty. Perform the ***Control Transformer Test***. 3. The primary or secondary thermostats may be open. Check or replace. Also check the associated wiring. See Wiring Diagram. 4. The pilot 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 pilot relay (2CR) and input contactor (1CR) coil connections. 3. The input contactor (1CR) 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.

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-1000.	1. The 1CR interlock may be faulty. Replace if necessary. 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 SW3 for grounds or shorts. 4. 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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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 (SW3) is in the "OUTPUT CONTROL AT DC 1000" 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 (4CR). There should be 115 VAC present on leads #31 and #4 at (4CR) when #2 and #4 are jumpered together at the terminal strip. 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 ***Static SCR Test.*** 7. Perform ***Active SCR 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 (SW3) in "OUTPUT CONTROL AT DC-1000" position and control weld output with the output control (R1) at DC-1000. If the problem is solved, check the remote control unit (or wire feeder) and associated control cable.	1. Check output control switch (SW3) and associated wiring. 2. Check feedback leads #222 (negative output terminal) and #215, #210(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 10J1. See Wiring Diagram. 4. Perform ***Firing Board Test***. 5. Perform ***Control Board Test***. 6. Perform ***Static SCR Test.*** 7. Perform ***Active SCR 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-1000" 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 (SW3) the welding mode switch (SW4) and associated wiring. 3. Perform the ***Control Board Test***. 4. Perform the ***Firing Board Test***. 5. Perform ***Static SCR Test.*** 6. Perform ***Active SCR Test.*** 7. 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-1000. Make sure input voltages match machine rating and reconnect panel. 2. Put output control switch (SW3) in "OUTPUT CONTROL AT DC-1000" 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 ***Static SCR Test.*** 6. Perform ***Active SCR 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
FUNCTION 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-1000. 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-1000. 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-1000 will NOT shut off when the Stop button is pushed.	1. Contact your local Lincoln Authorized Field Service Facility.	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
FUNCTION 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-1000.	1. Check for an internal short between leads #2 and #4. See Wiring Diagram. 2. The Pilot Relay (4CR) may be stuck closed. Check or replace. 3. Perform ***Firing Board Test***. 4. Perform ***Control Board Test***. 5. Perform ***Static SCR Test.*** 6. Perform ***Active SCR Test.*** 7. The SCR Snubber(s) may be “leaky”. Check or replace. 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
WELDING PROBLEMS		
Poor arc starting when the DC-1000 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 3CR reed switch. The voltage from lead #215 to lead #220 should be 8 VDC when the DC-1000 is in an idle condition (on but not welding). When the machine is producing welding current, the reed switch (3CR) should close and the voltage from #215 to #220 should drop to zero. 2. Perform the ***Firing Board Test***. 3. Perform ***Static SCR Test.*** 4. Perform ***Active SCR Test.*** 5. 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-1000. 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 (SW4) and the associated wiring for loose or faulty connections. See Wiring Diagram. 2. Check the 3CR reed switch. The voltage from lead #215 to lead #220 should be 8 VDC when the DC-1000 is in an idle condition. When the machine is producing welding current, the reed switch (3CR) should close and the voltage from #215 to #220 should drop to zero. 3. Perform the ***Firing Board Test***. 4. Perform ***Static SCR Test.*** 5. Perform ***Active SCR Test.*** 6. 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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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
Poor performance (including arc outages) while welding at low current (less than 450 amps) when connected to 1000 amp (+) output terminals.	1. Change the welding cable(s) to the 500 amp terminal (later models only).	
The machine frequently shuts off while using the 500 amp (+) output terminal (later models only).	1. The output current demand may be over 500 amps, causing the choke to overheat. Change the welding cable(s) to the 1000 amp output terminals.	1. The choke thermostat 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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CONTROL TRANSFORMER (T2) VOLTAGE TEST

⚠ WARNING

Service and repair should be performed only by 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 Control Transformer.
b. induced on the Secondary Winding of the Control Transformer.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
IDEALARC® DC-1000 Wiring Diagrams (See ***Electrical Diagram Section*** Of Manual).

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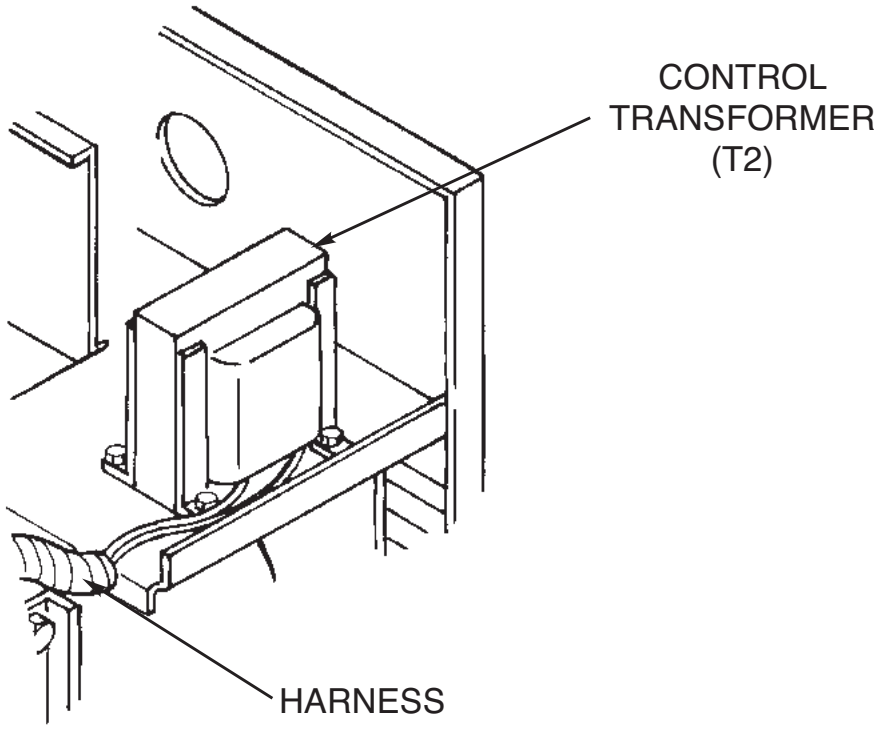
CONTROL TRANSFORMER (T2) VOLTAGE TEST (continued)

FIGURE F.1 – CONTROL TRANSFORMER LEAD LOCATION

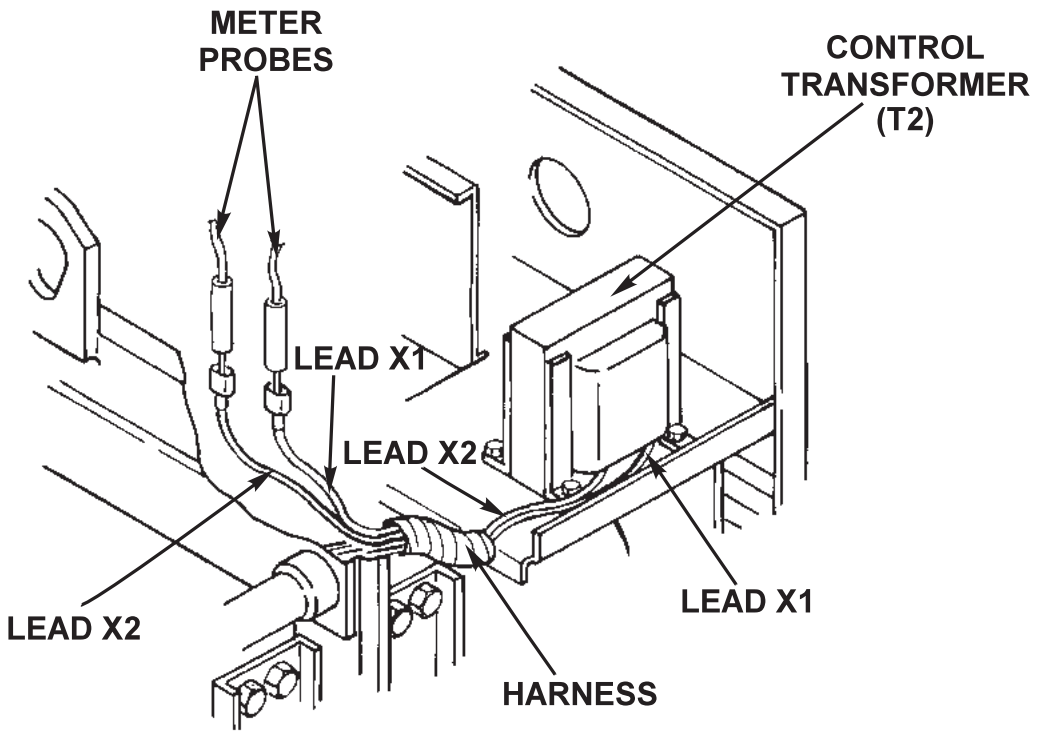


PROCEDURE

1. Disconnect main AC input power to the machine.
2. Remove the Top and Case Sides.
3. Locate the Control Transformer (T2) on the left side of the Input Box (facing the back of the machine). See Figure F.1.
4. Locate the Control Transformer primary leads (H1, H2, H3, etc.). See Wiring Diagram.
   NOTE: Unused leads should be taped. Check for loose or faulty connections.

CONTROL TRANSFORMER (T2) VOLTAGE TEST (continued)

FIGURE F.2 – CONTROL TRANSFORMER X1 AND X2 TEST POINTS



5. Locate Control Transformer leads X1 and X2 at in line connectors. See Figure F.2.
6. Apply power and test for 115 VAC between leads X1 to X2.
7. If 115 VAC is not present between leads X1 and X2, test for correct main AC input power to the Control Transformer primary windings (H1, H2, H3, etc.) See Wiring Diagram.

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

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Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST

⚠ WARNING

Service and repair should be performed only by 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

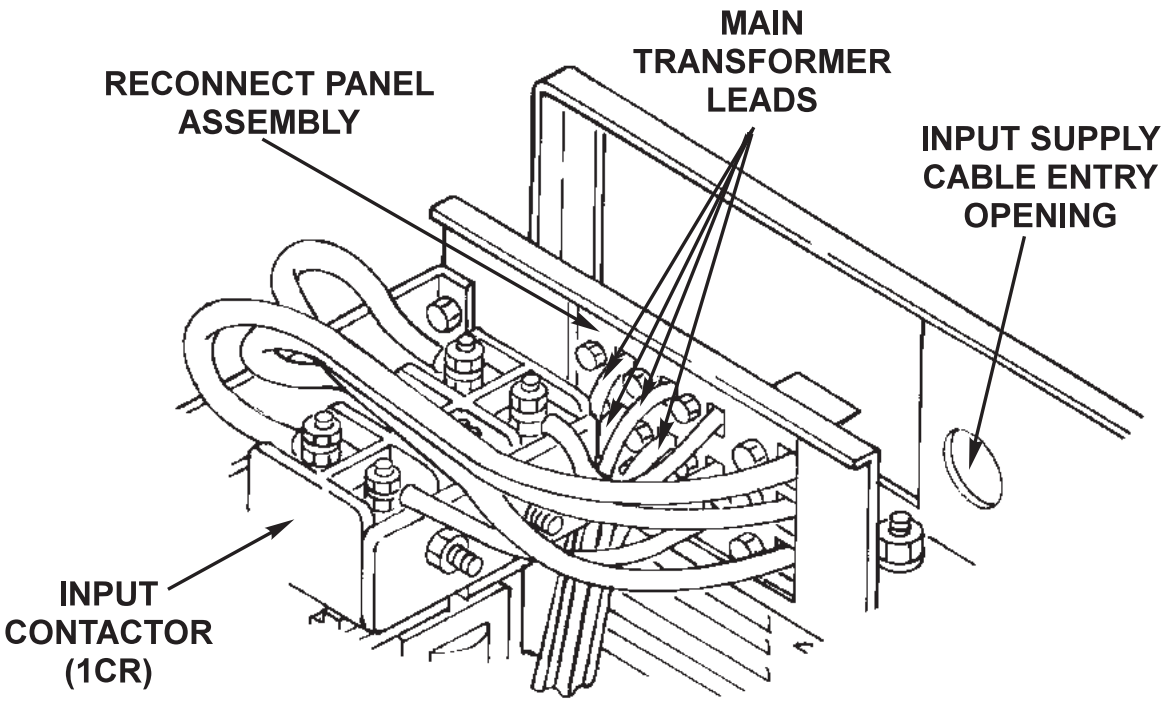
This test will determine if the correct voltages are being:
a. applied to the Primary Windings of the Main Transformer (T1).
b. induced on the Secondary Winding, Auxillary Windings, and Phase Angle Windings.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
IDEALARC® DC-1000 Wiring Diagrams (See ***Electrical Diagram Section*** Of Manual).

MAIN TRANSFORMER (T1) VOLTAGE TEST (continued)

FIGURE F.3 – INPUT CONTACTOR, RECONNECT PANEL, AND PRIMARY LEADS TO MAIN TRANSFORMER LOCATIONS



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. 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. Test with an AC voltmeter for approximately 60 VAC from each of the six main transformer secondary leads to the common buss connected to the negative output terminal. ***See Figure F.4***.

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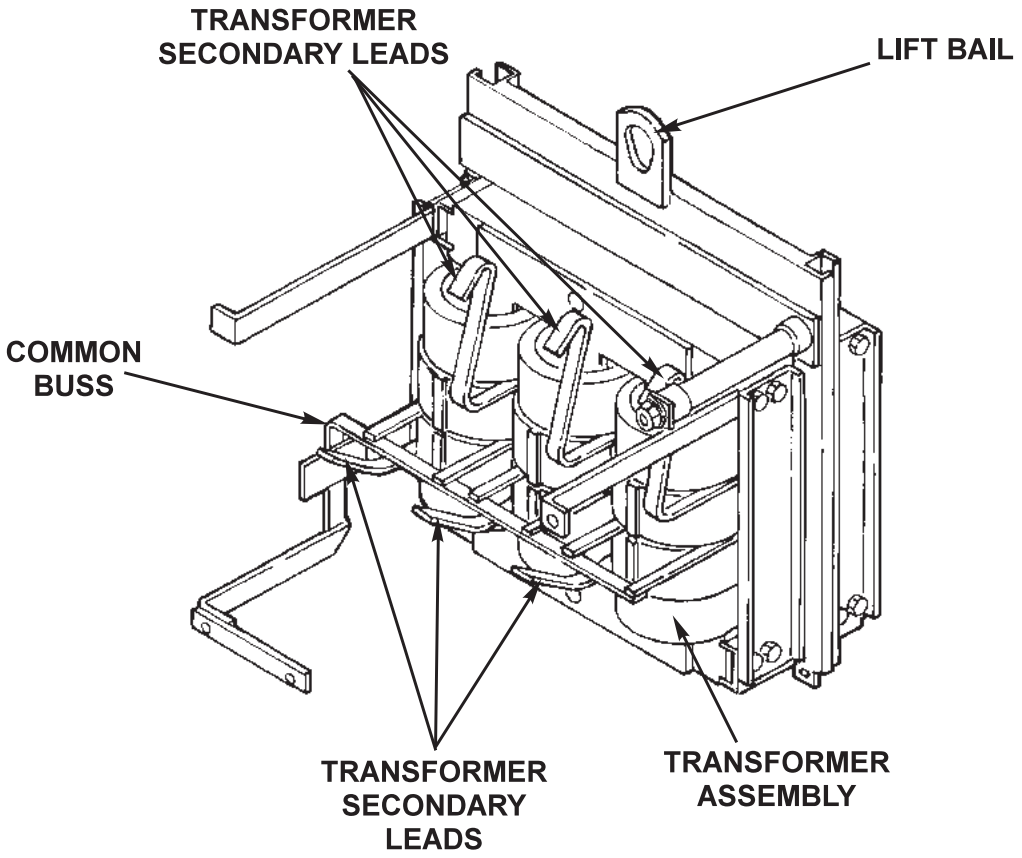
MAIN TRANSFORMER (T1) VOLTAGE TEST (continued)

FIGURE F.4 – MAIN SECONDARY LEAD TEST POINTS



a. If one or more of the above voltage tests are incorrect, check for loose or faulty wiring. If the wiring is good, then the Main Transformer may be faulty.

NOTE: A long wire with clip or a long probe may be required to reach the lower middle lead.

7. Test for 115 VAC between leads #31 to #32 on the terminal strip. These can be accessed through the front panel assembly door.

   a. If the 115 VAC is not present, check for loose or faulty wiring or blown fuse. If necessary, untape and track the continuity of leads #31 and #32 through the entire harness.

   b. If the wiring is good, then the Main Transformer may be faulty.

8. Remove the screws from the control box cover. It does not have to be completely removed to perform this test.

9. Test with an AC voltmeter for 75 VAC for each phase angle winding as shown. ***See Figure F.5***.

NOTE: If the main supply voltage varies, the Main Transformer voltages will vary proportionately. ***See Figure F.5***.

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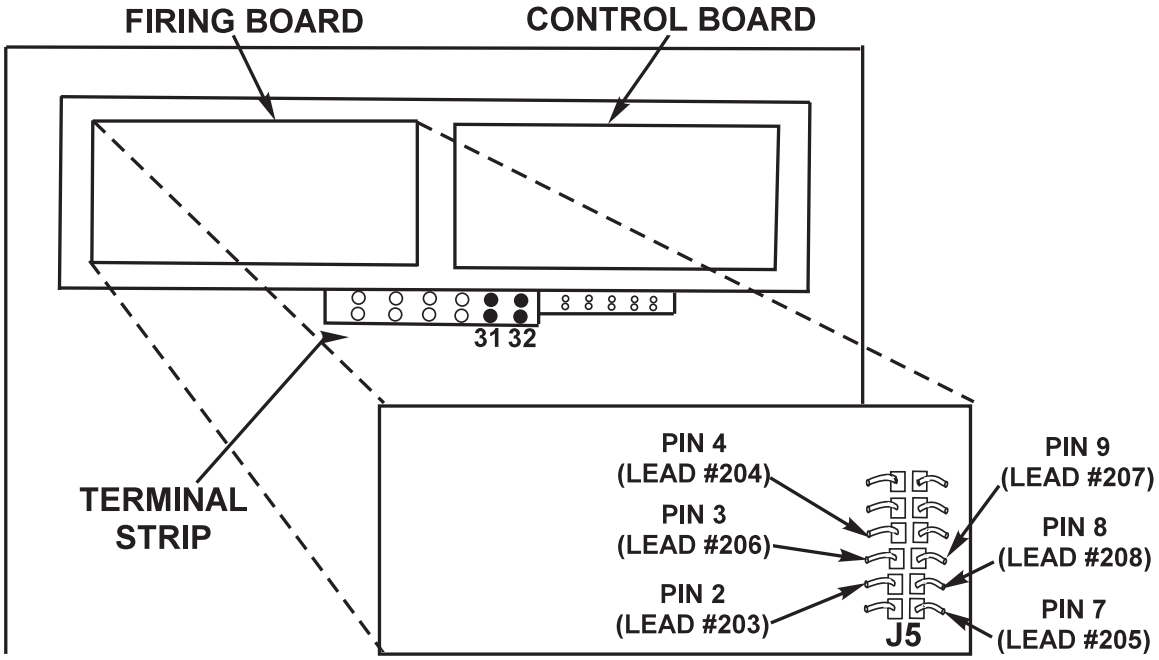
MAIN TRANSFORMER (T1) VOLTAGE TEST (continued)

FIGURE F.5 – PHASE ANGLE WINDINGS TEST POINTS AND FIRING BOARD PIN LOCATION



From			To			Expected VAC
Plug	Pin	Lead	Plug	Pin	Lead	
J5	2	#203	J5	4	#204	75 VAC
J5	7	#205	J5	3	#206	75 VAC
J5	9	#207	J5	8	#208	75 VAC

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FIRING BOARD TEST

⚠ WARNING

Service and repair should be performed only by 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

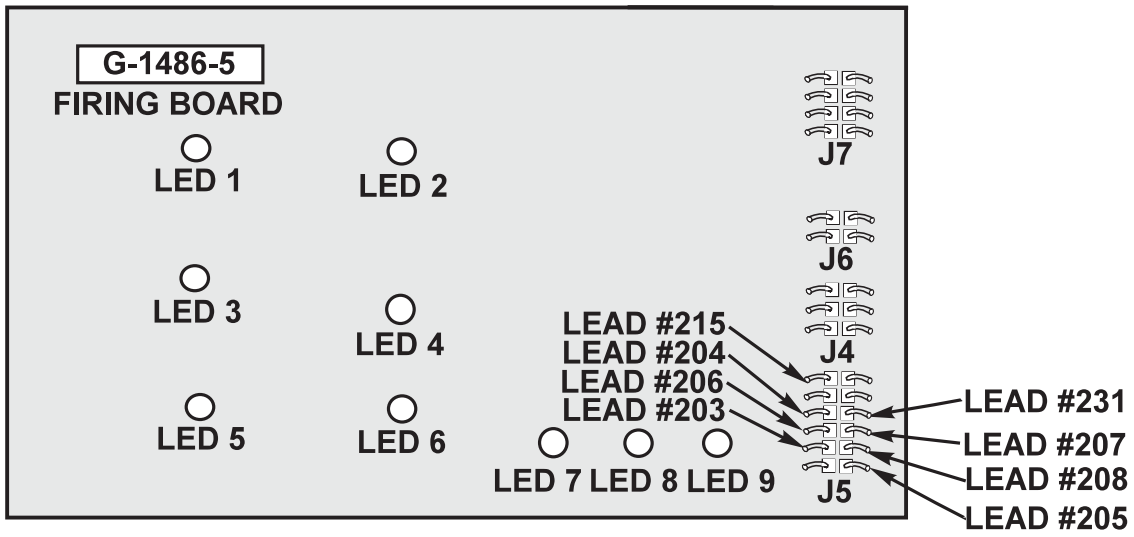
This test determines whether or not the Firing Board is receiving the correct voltages and gate signals. The LEDs (Light Emitting Diodes) will help you determine if the Firing Board is generating gate signals to the Main SCRs.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
IDEALARC® DC-1000 Wiring Diagram And Firing Board Schematic Diagram (See ***Electrical Diagram Section*** Of Manual)

FIRING BOARD TEST (continued)

FIGURE F.6 – FIRING BOARD LED AND MOLEX PLUG LOCATIONS



TEST PROCEDURE FOR NORMAL FIRING BOARD OPERATION

1. Disconnect main AC input power to the machine.
2. Remove screws, loosen and lower the front panel to access the Firing Board on the left side of Control Box facing the machine.
3. Visually inspect the Firing Board for loose or faulty connections.
4. Reconnect the input power and turn the DC-1000 on.
5. Locate LEDs 7, 8, and 9 on the Firing Board. See Figure F.6. Each LED should be ON and equally bright. Use ***Table F.1*** 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.7***.

⚠ 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.

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 (SW3) in the "Output Control at DC-1000" position.
9. Set the welding mode switch (SW4) in either of the "CV" positions.

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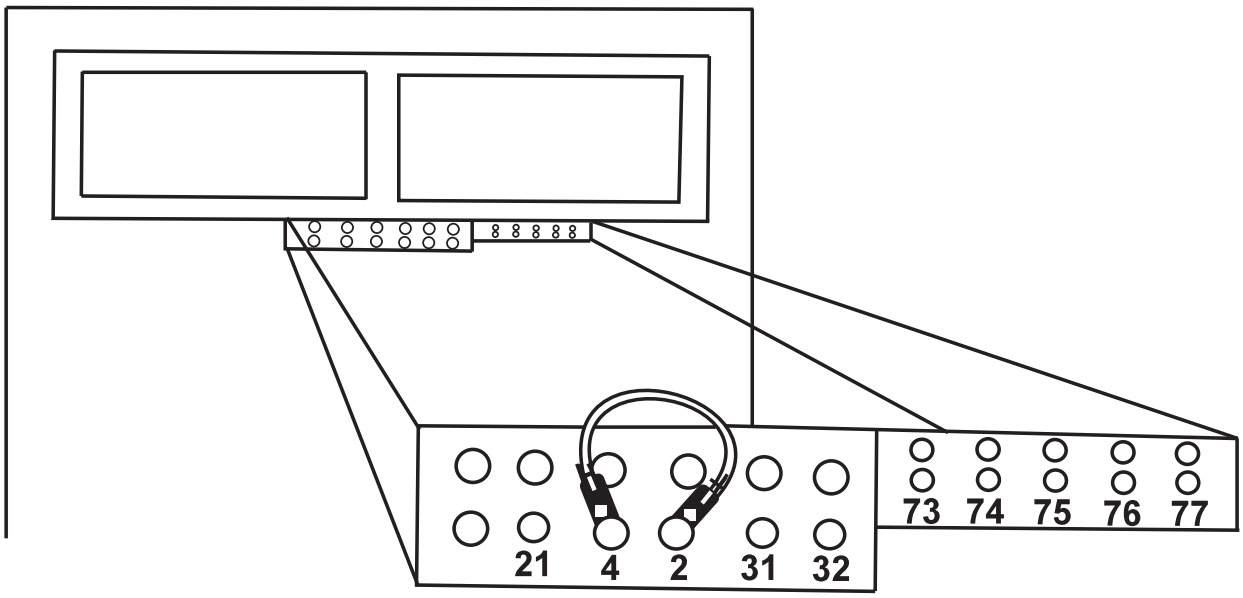
FIRING BOARD TEST (continued)

FIGURE F.7 – TERMINAL STRIP JUMPER WIRE CONNECTIONS



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 ***Static and Active SCR Tests***.
    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 assembly. Perform ***Static and Active SCR Tests***.
11. Locate and test for 6 to 15 VDC between leads #231 and #215 on the Firing Board in the CV mode. When the output control potentiometer (R1) is rotated, the DC voltage between leads #231 and #215 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 #215 on the Firing Board in VV (CC) mode. When the output control potentiometer (R1) is rotated, the DC voltage between leads #231 and #215 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.

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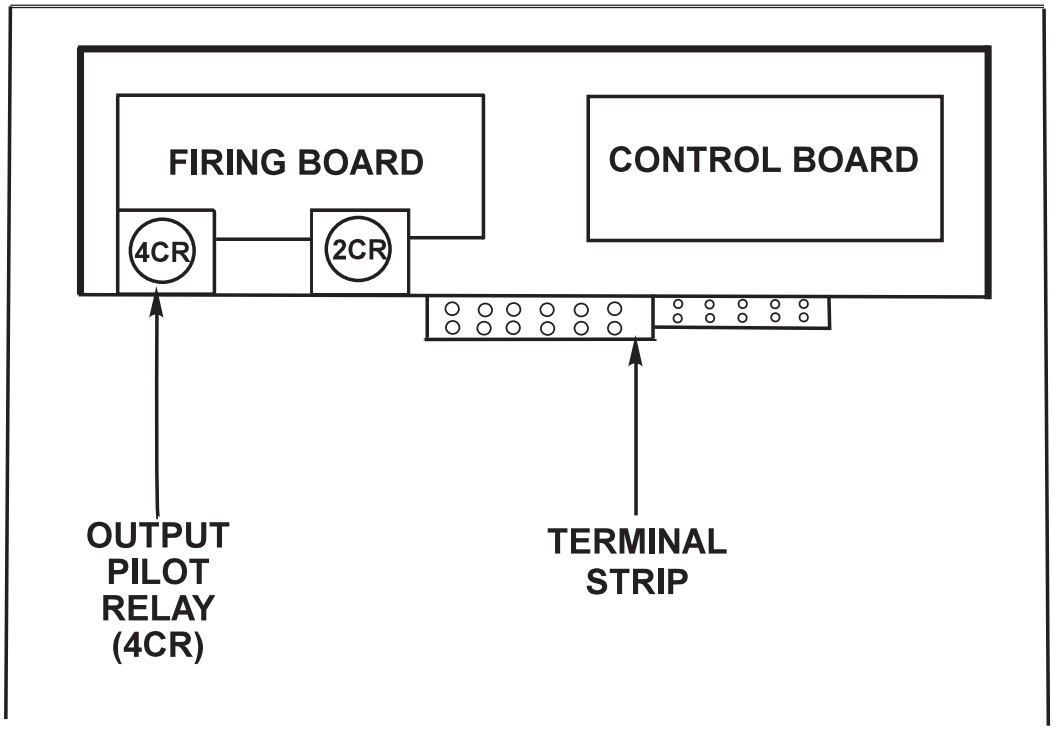
FIRING BOARD TEST (continued)

FIGURE F.8 – OUTPUT PILOT RELAY 4CR LOCATION



15. Test the Output Pilot Relay (4CR) for operation by removing and replacing the jumper wire repeatedly from terminal #2. ***See Figure F.7***. This should cause the relay contacts to open and close. The contacts can be seen closing and opening through the clear plastic relay case or can be heard opening and closing. If the Output Pilot Relay (4CR) does not close when energized, check for loose or faulty wiring. See Wiring Diagram and Figure F.8.

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

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FIRING BOARD TEST (continued)

TABLE F.1 – LED 7, 8 AND 9 CHECK LIST

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 in the Main Transformer.
LED 7 is OFF or is DIMMER than other LEDs	The proper AC voltage may not be reaching Firing Board. Check for loose or faulty connections. Perform ***Main 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 in the Main Transformer.
LED 8 is OFF or is DIMMER than other LEDs	The proper AC voltage may not be reaching Firing Board. Check for loose or faulty connections. Perform ***Main 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 in the Main Transformer.
LED 9 is OFF or is DIMMER than other LEDs	The proper AC voltage may not be reaching Firing Board. Check for loose or faulty connections. Perform ***Main Transformer Test.***

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CONTROL BOARD TEST

⚠ WARNING

Service and repair should be performed only by 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

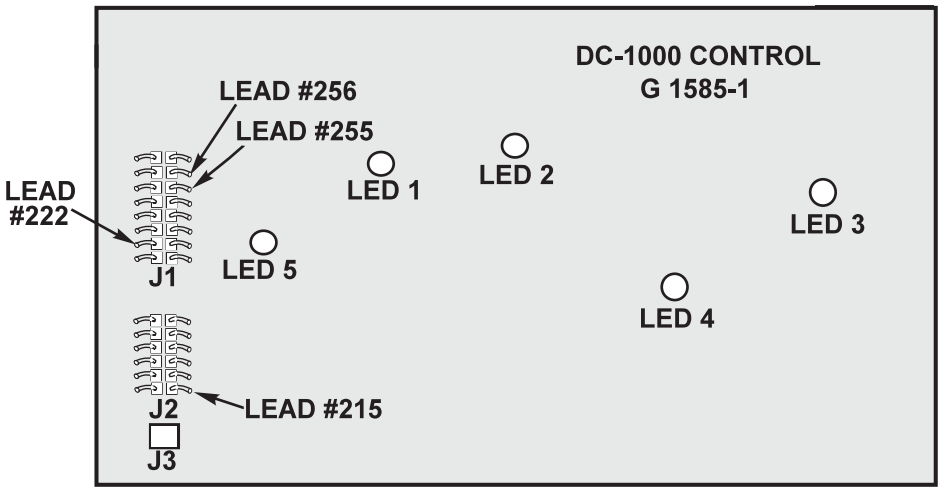
This test will determine if the Control Board is receiving the correct voltages and feedback signals.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
IDEALARC® DC-1000 Wiring Diagram And Control Board Schematic (See ***Electrical Diagram Section*** Of Manual)

CONTROL BOARD TEST (continued)

FIGURE F.9 – CONTROL BOARD LED AND PIN LOCATIONS



TEST PROCEDURE FOR NORMAL CONTROL BOARD OPERATION

1. Remove main supply power to the DC-1000.
2. Remove screws, loosen and lower the Front Panel to access and inspect the Control Board located in the right front control box. See Figure F.9.
3. Apply the correct three-phase input power to the DC-1000. 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. ***See Figure F.7***.

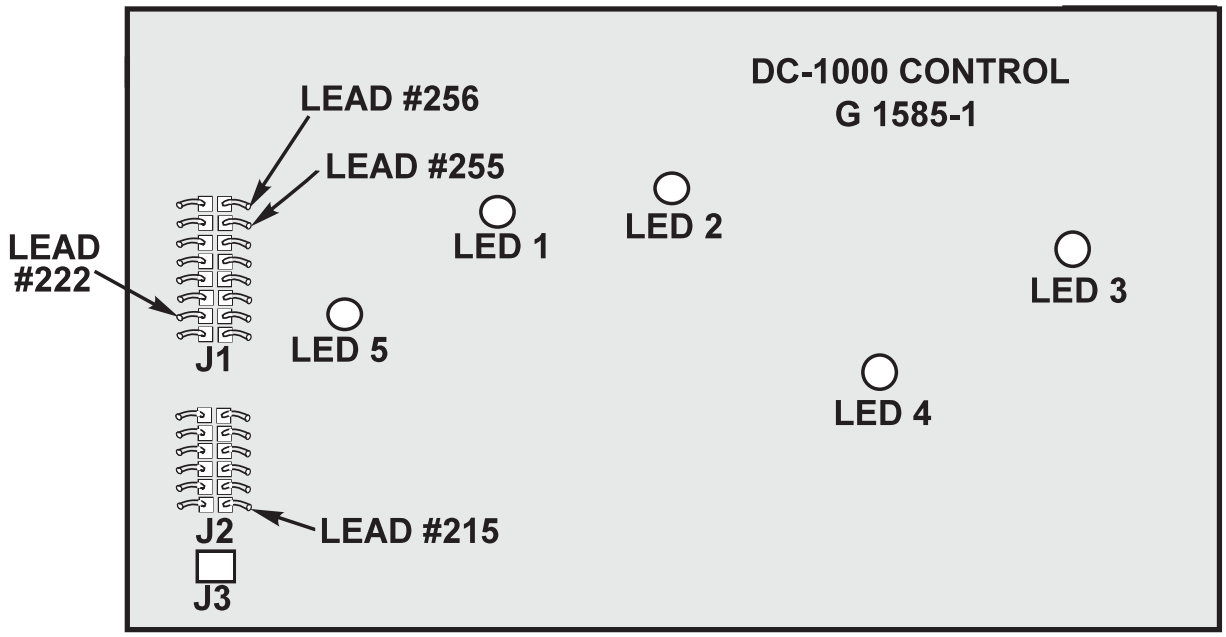
WARNING

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 Plug J1.
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 (SW3) in the "Output Control At DC-1000" (Panel) position and the Welding Mode Switch (SW4) 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 (SW4) 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 (continued)

FIGURE F.10 – LED 1 TEST POINTS



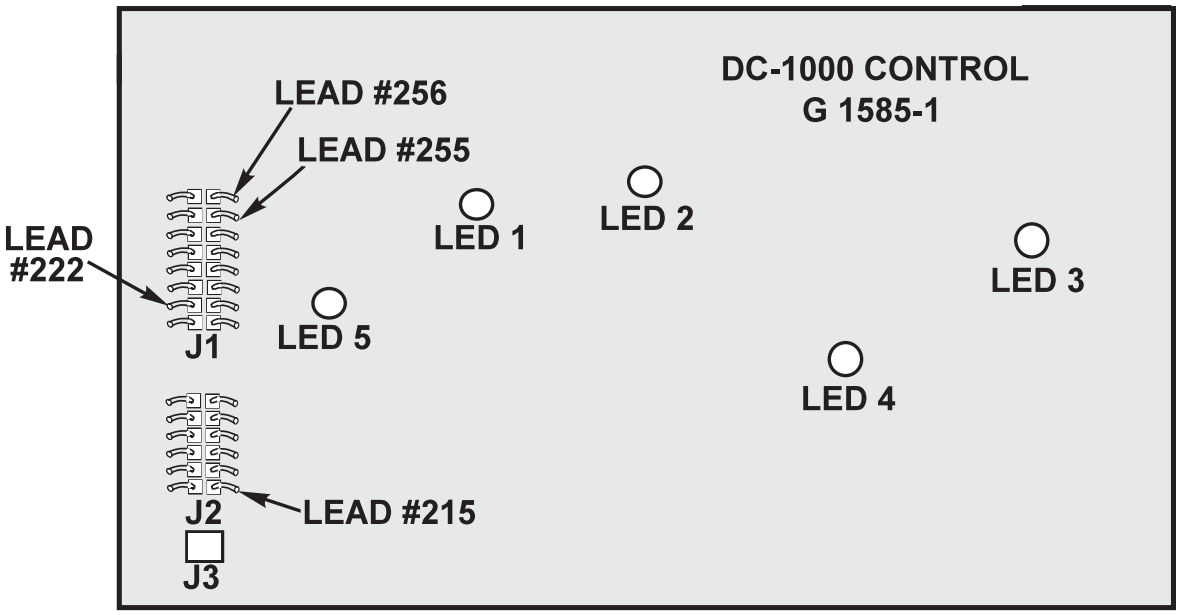
POSSIBLE PROBLEMS PERTAINING TO THE CONTROL BOARD

IF LED 1 does not light, when the start switch is ON.

1. Check for 115 VAC at leads #255 to #256 plug J1.
   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.10.
   b. Remove main supply power to the DC-1000. Test for continuity (zero ohms) from lead #255 plug J1 at the Control Board to lead #212 at the Start/Stop Button.
   c. Test for continuity (zero ohms) from lead #256 plug J1 at the Control Board to the pilot light. See Wiring Diagram.
   d. If the 115 VAC is present at leads #255 to #256 at plug J1 and LED 1 does not light, the Control Board may be faulty. Replace.

CONTROL BOARD TEST (continued)

FIGURE F.11 – LED 2 OPEN CIRCUIT VOLTAGE TEST POINTS



IF LED 2 does not light when #2 and #4 are jumpered together.

1. Check for the presence of open circuit voltage at the weld output terminals (27 to 75 VDC in constant voltage mode, 75 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 (-) plug J1 to lead #215 (+) plug J2 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 #215 and associated wiring for loose or faulty connections. See Wiring Diagram. Remove main supply power to the DC-1000.
2. Test for continuity (zero ohms) from the output shunt to lead #215 at plug J2 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 plug J1 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 ***Static and Active SCR Tests***.

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

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CONTROL BOARD TEST (continued)

IF LED 3 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 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 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 (SW4) must be in the CV position and the Output Control Switch (SW3) in the "Output Control at DC-1000" position. Also check the Output Control Potentiometer and associated circuitry.

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STATIC SCR TEST

⚠ WARNING

Service and repair should be performed only by 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 Ohmmeter
Volt/Ohmmeter (Multimeter)
DC-1000 Wiring Diagrams (See ***Electrical Diagram Section*** Of Manual)

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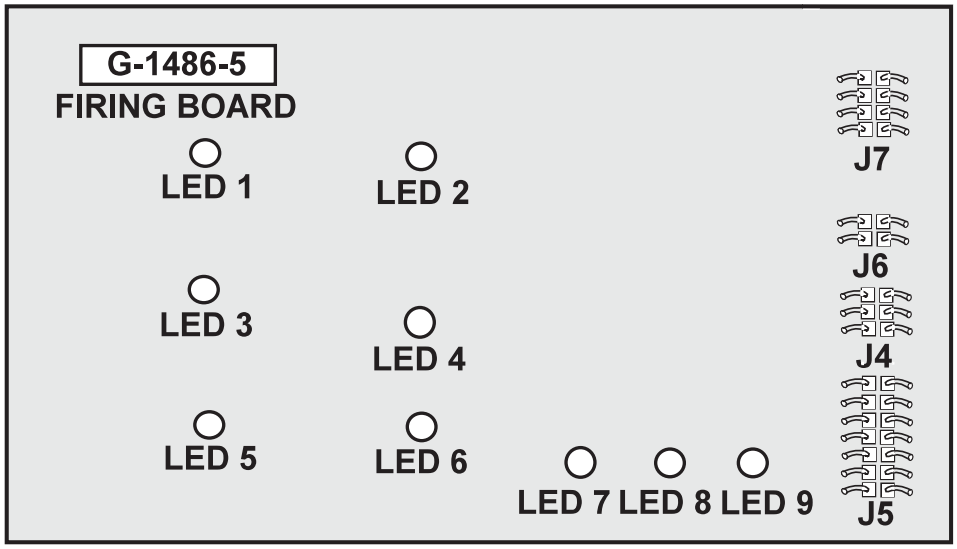
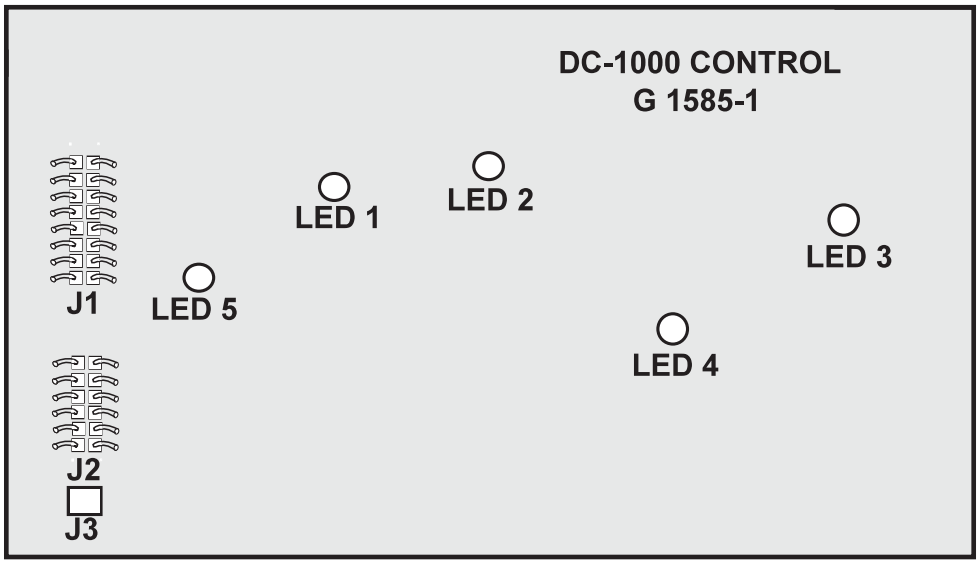
STATIC SCR TEST (continued)

FIGURE F.12 – FIRING AND CONTROL BOARD MOLEX PLUG LOCATIONS



FIRING BOARD



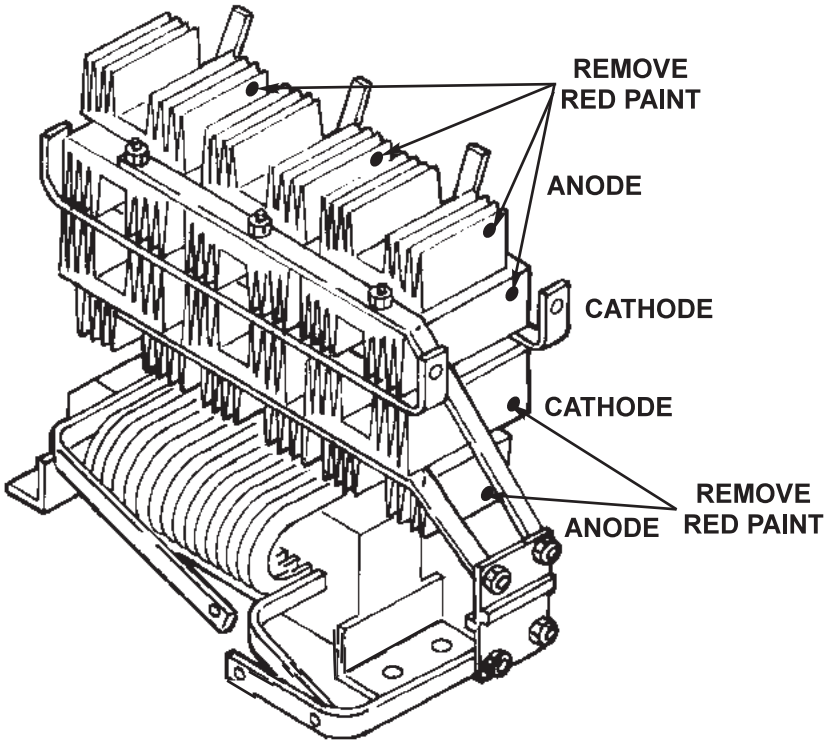
CONTROL BOARD

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.12.

STATIC SCR TEST (continued)

FIGURE F.13 – SCR HEAT SIN ASSEMBLY TEST POINTS



3. Remove the red insulating paint from heat sink test points. See Figure F.13.

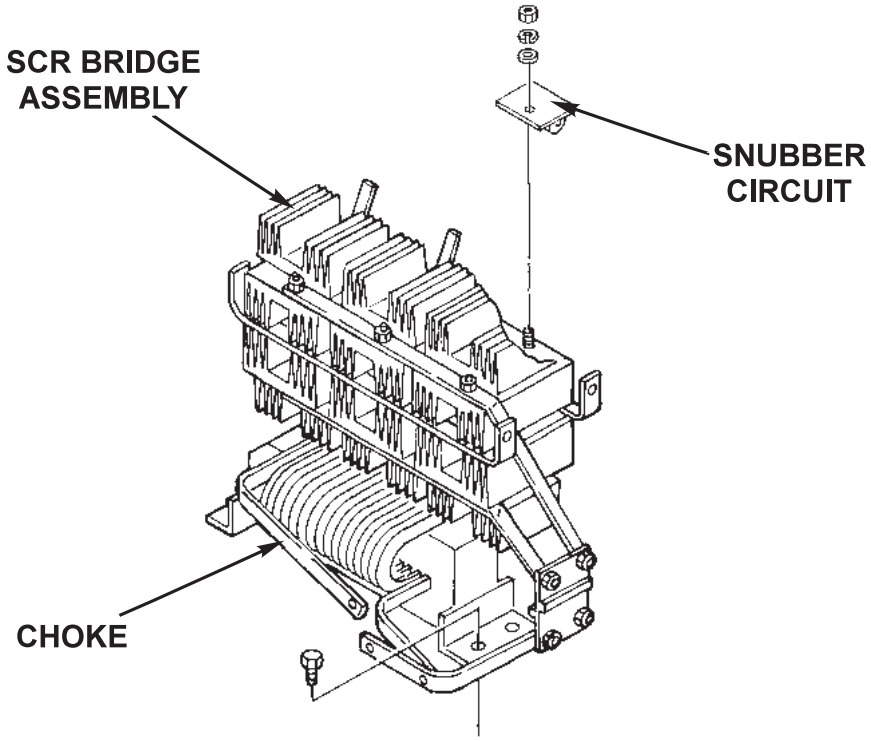
   NOTE: DO NOT DISASSEMBLE THE HEAT SINKS.

4. 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 snubber circuit (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***.

STATIC SCR TEST (continued)

FIGURE F.14 – SNUBBER LOCATION AND CIRCUIT



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

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

ACTIVE SCR TEST

⚠ WARNING

Service and repair should be performed only by 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

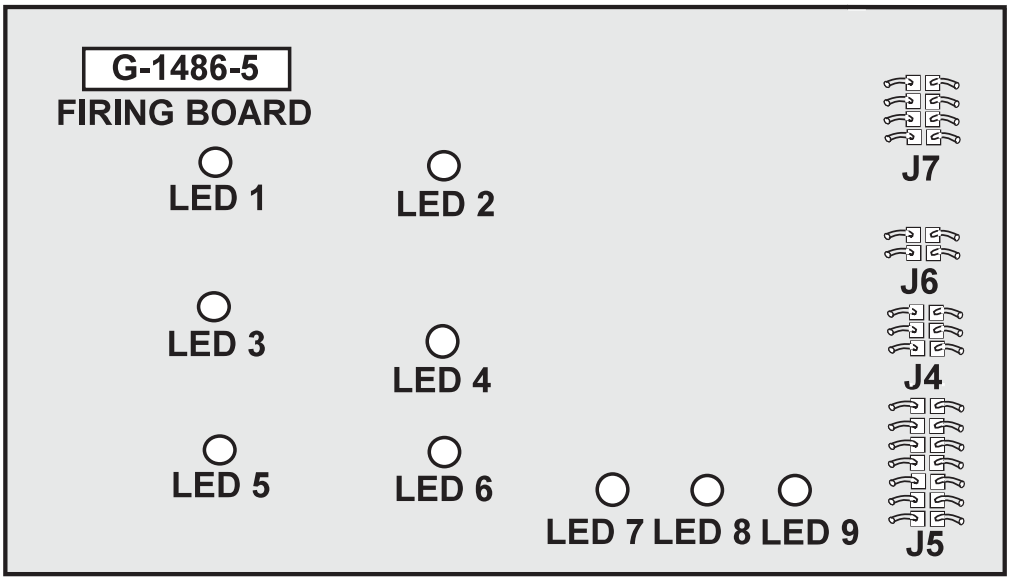
The Active SCR Test will determine if the device is able to be gated “ON” and conduct current from Anode to Cathode.

MATERIALS NEEDED

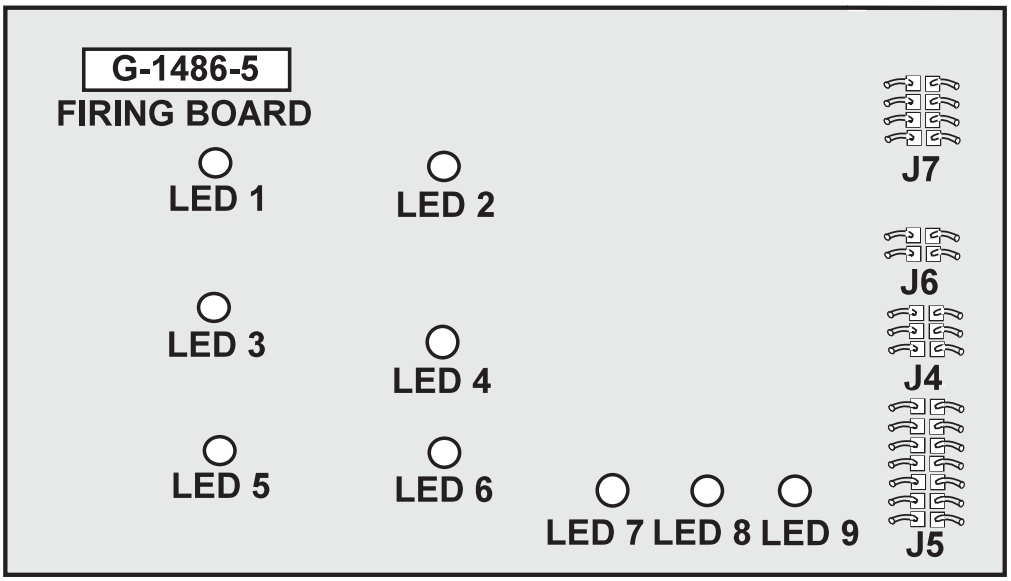
An SCR Tester As Outlined In This Procedure
DC-1000 Wiring Diagram (See ***Electrical Diagrams Section*** Of this manual)

ACTIVE SCR TEST (continued)

FIGURE F.15 – FIRING BOARD AND CONTROL BOARD MOLEX LOCATIONS



FIRING BOARD



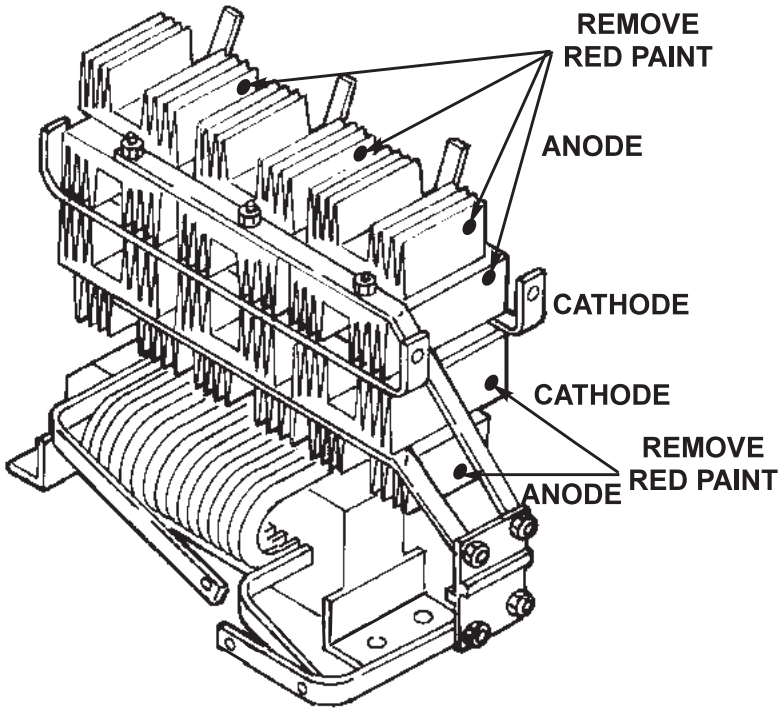
CONTROL BOARD

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.

ACTIVE SCR TEST (continued)

FIGURE F.16 – HEAT SINK ASSEMBLY TEST POINTS



3. Remove the red insulating paint from heat sink test points. See Figure F.16.
4. Perform test procedure as follows. Refer to ***Figure F.17***. Repeat test for all six SCRs.

NOTE: Do not disassemble the heat sinks.

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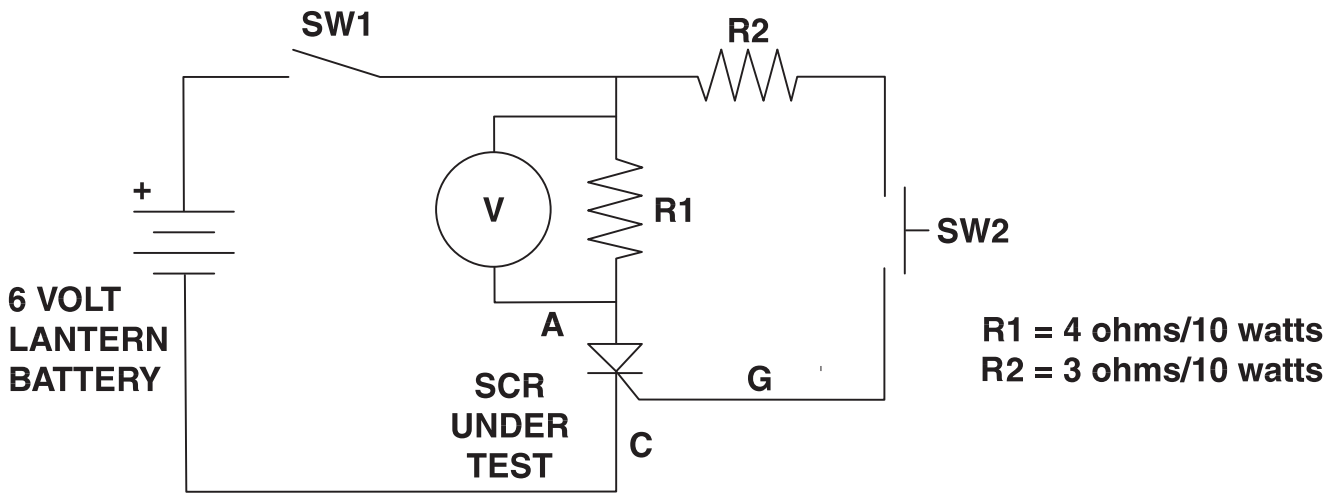
ACTIVE SCR TEST (continued)

FIGURE F.17 – SILICON CONTROLLED RECTIFIER (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.

5. To test SCRs, construct the circuit outlined in Figure F.17. 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.

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.

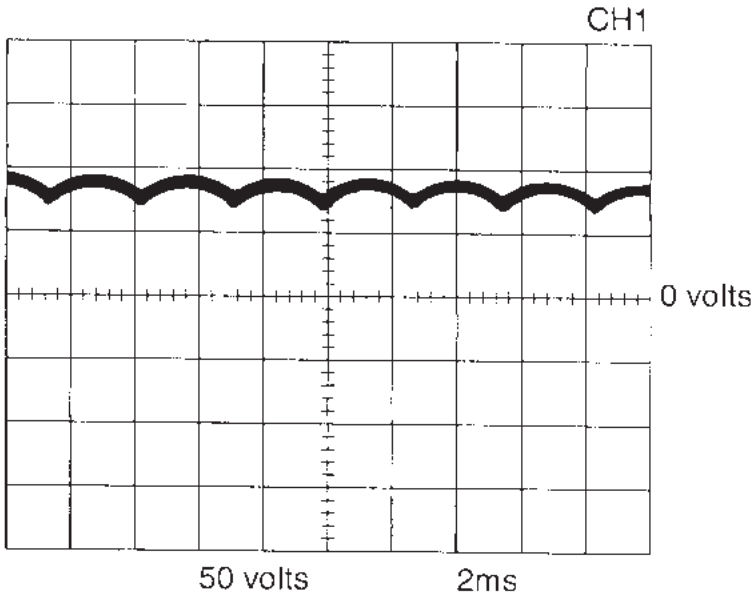
6. With switch SW1 closed, close switch SW2 for two seconds and release. The voltmeter should read 3 to 6 volts before and after switch SW2 is released. If the voltmeter does not read, or reads only while SW2 is depressed, the SCR or battery is defective (repeat Battery Test Procedure).

7. 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.

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

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 50 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive 1000 Amp terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
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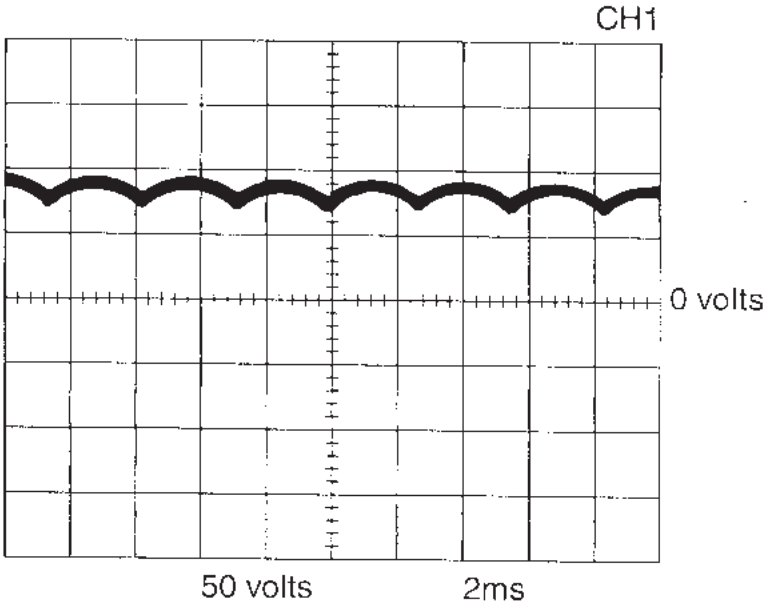
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM

CONSTANT VOLTAGE INNERSHIELD - MAXIMUM

OUTPUT SETTINGS – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive 1000 Amp terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

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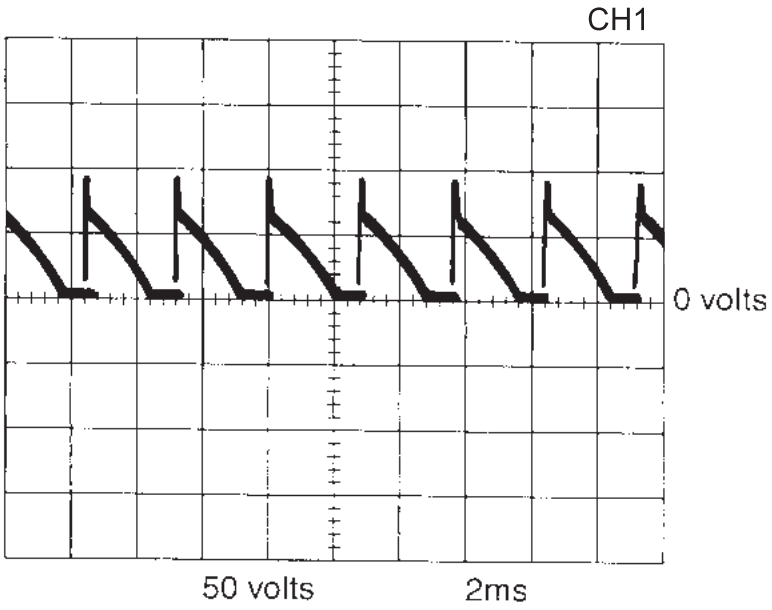
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM

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 50 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive 1000 Amp terminal, (-) probe to negative terminal

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

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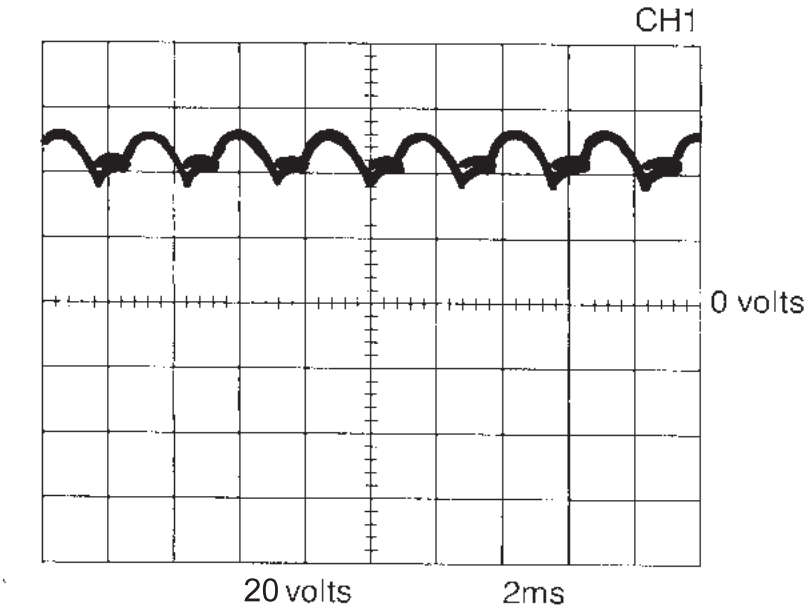
TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED CONSTANT VOLTAGE INNERSHIELD MODE



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 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 600 amps at 44 VDC.

Note: Scope probes connected at machine output terminals: (+) probe to positive 1000 Amp terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
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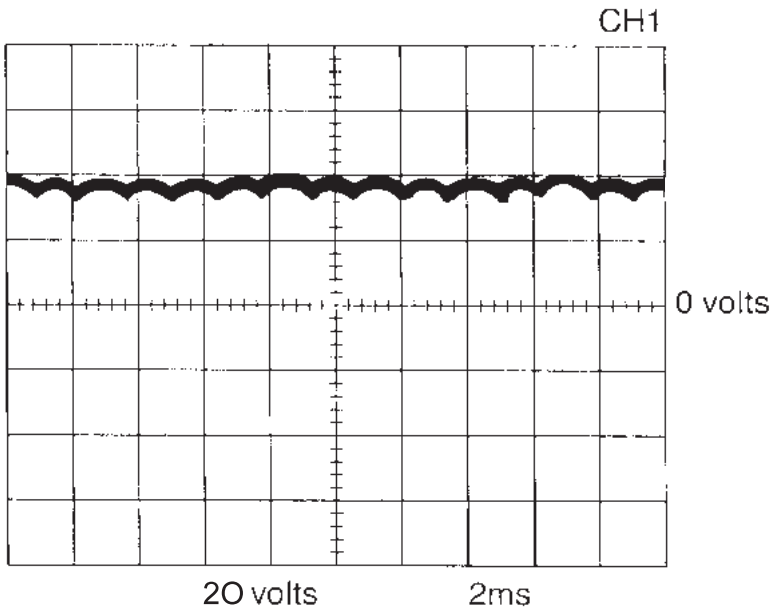
TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED - 500 AMP OUTPUT TERMINAL

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 20 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 400 amps at 36 VDC.

Note: Scope probes connected at machine output terminals: (+) probe to positive 500 amp terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

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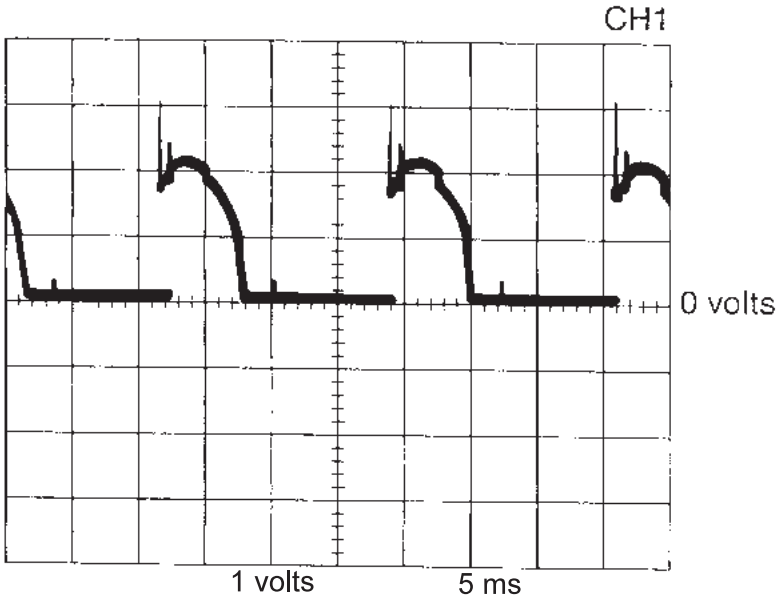
TYPICAL SCR GATE VOLTAGE WAVEFORM
CONSTANT VOLTAGE INNERSHIELD
MAXIMUM OUTPUT SETTING - NO LOAD



This is the typical SCR gate pulse voltage waveform. The machine was in an open circuit condition (no load) and operating properly. Note that each vertical division represents 1 volt and that each horizontal division represents 5 milliseconds in time.

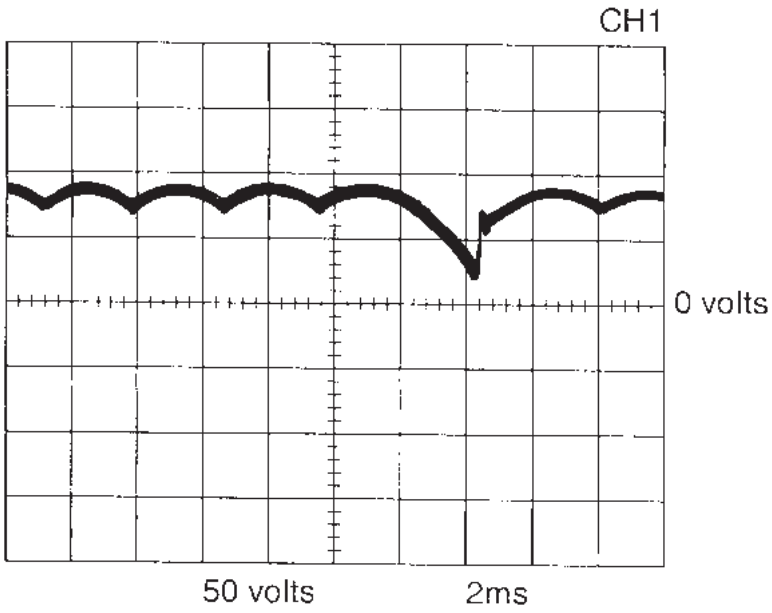
Note: Scope probes connected at SCR gate and cathode: (+) probe to gate, (-) probe to cathode.

SCOPE SETTINGS

Volts/Div	1V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC

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 50 volts and each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive 1000 amp terminal, (-) probe to negative terminal.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

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Return to Master TOC

INPUT CONTACTOR (1CR) CLEANING AND/OR REPLACEMENT

⚠ WARNING

Service and repair should be performed only by 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.

MATERIALS NEEDED

7/16” Socket Wrench
1/2” Open End Wrench
11/16” Socket Wrench
Phillips Screwdriver
Flat Screwdriver
Low Pressure Air Source

INPUT CONTACTOR (1CR) CLEANING AND/OR REPLACEMENT (continued)

FIGURE F.18 – INPUT CONTACTOR COVER REMOVAL

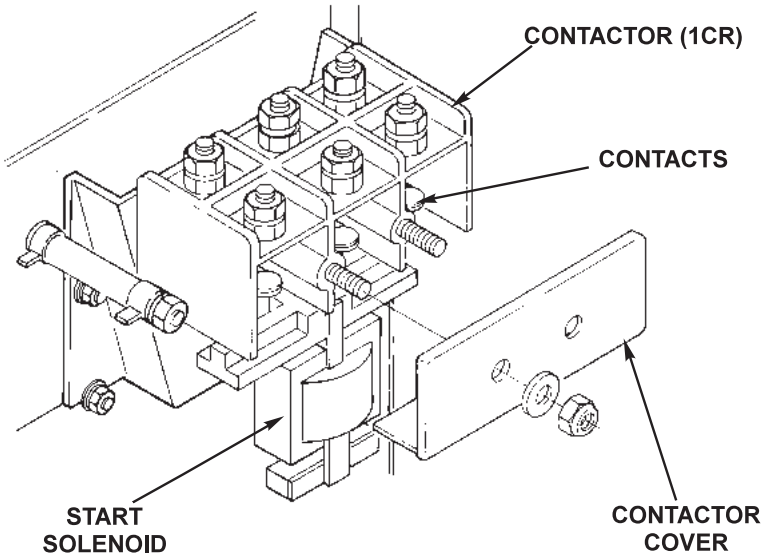
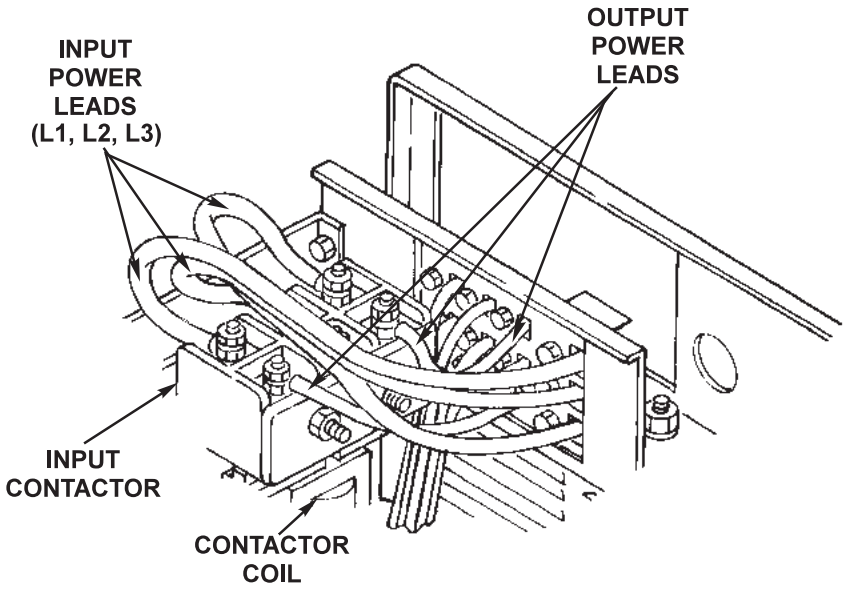


FIGURE F.19 – INPUT CONTACTOR REMOVAL



CLEANING PROCEDURE

1. Remove main input supply power to the DC-1000 and remove case top and sides.
2. Locate the input contactor. Using a 1/2” wrench, remove the cover plate from the input contactor. Mark, label, and remove leads as necessary to access the two nuts and washers on the studs. See Figures F.18 and F.19.

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INPUT CONTACTOR (1CR) CLEANING AND/OR REPLACEMENT (continued)

FIGURE F.20 – LEAD #257 AT SECONDARY THERMOSTAT

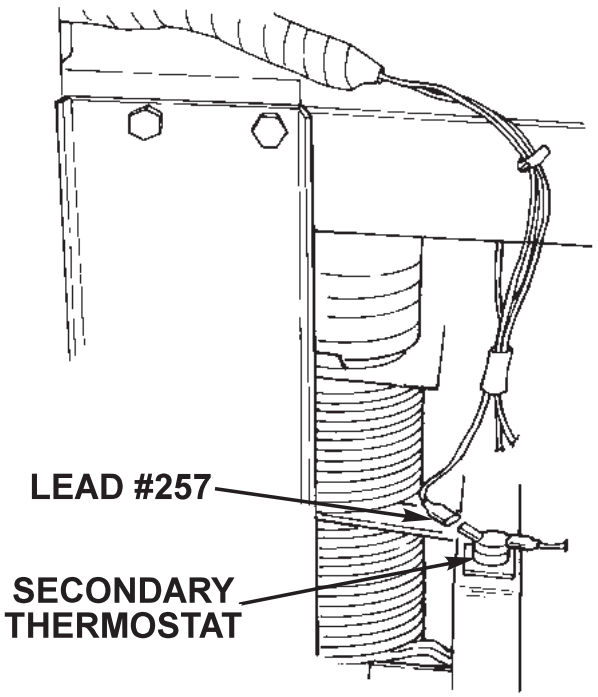
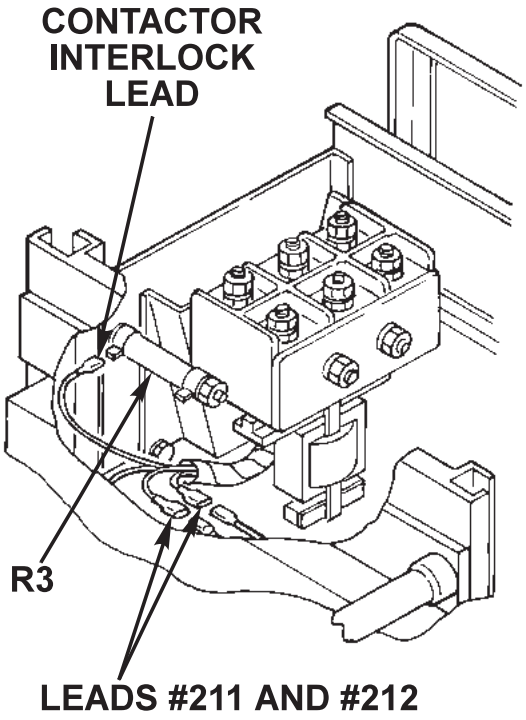


FIGURE F.21 – LEAD #211 AND #212 QUICK DISCONNECTS



⚠ WARNING

DO NOT APPLY INPUT POWER TO THE DC-1000 WITH THE CONTACTOR COVER PLATE REMOVED. POWER APPLIED WITHOUT COVER PLATE IN POSITION MAY CAUSE SEVERE ARCING RESULTING IN BODILY INJURY.

3. Blow out any dirt or dust from in and around contacts.
4. Examine contacts for signs of wear.
5. If contacts are stuck together or overheated, parts of the contactor, or the entire assembly, should be replaced.

CONTACTOR REPLACEMENT

Removal

1. Using a 11/16” wrench, remove leads L1, L2, L3 and output power leads from 1CR contactor. Mark and label all leads for proper reconnection. ***See Figure F.19***.
2. Remove lead #257 at secondary thermostat. See Figure F.20 and refer to Wiring Diagram. Remove any cable ties and/or harness looms as necessary.
3. Remove the contactor interlock leads from quick disconnects (leads 211 and 212) and from resistor R3. See Figure F.21 and refer to Wiring Diagram.
4. Remove input contactor using a 7/16” socket wrench. Remove the four mounting bolts, nuts, and associated washers (or loosen the two bottom bolts and nuts, and remove the top two).

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INPUT CONTACTOR (1CR) CLEANING AND/OR REPLACEMENT (continued)

INSTALLATION

1. Install input contactor using a 7/16" socket wrench. Attach the four mounting bolts, nuts, and associated washers (or tighten the two bottom bolts and nuts, and attach the top two).
2. Attach leads to contactor interlock. Connect quick connects on leads #211 and #212. ***See Figure F.21***.
3. Attach leads from contactor coil. Attach any cable ties and/or harness looms cut at removal. Attach lead #257 at secondary thermostat. ***See Figure F.20***.
4. Using a 11/16" wrench, attach leads L1, L2, L3 and output power leads to 1CR contactor. ***See Figure F.19***.

NOTE: Ensure all leads are connected correctly. See Wiring Diagram.

SCR OUTPUT BRIDGE REPLACEMENT

⚠ WARNING

Service and repair should be performed only by 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.

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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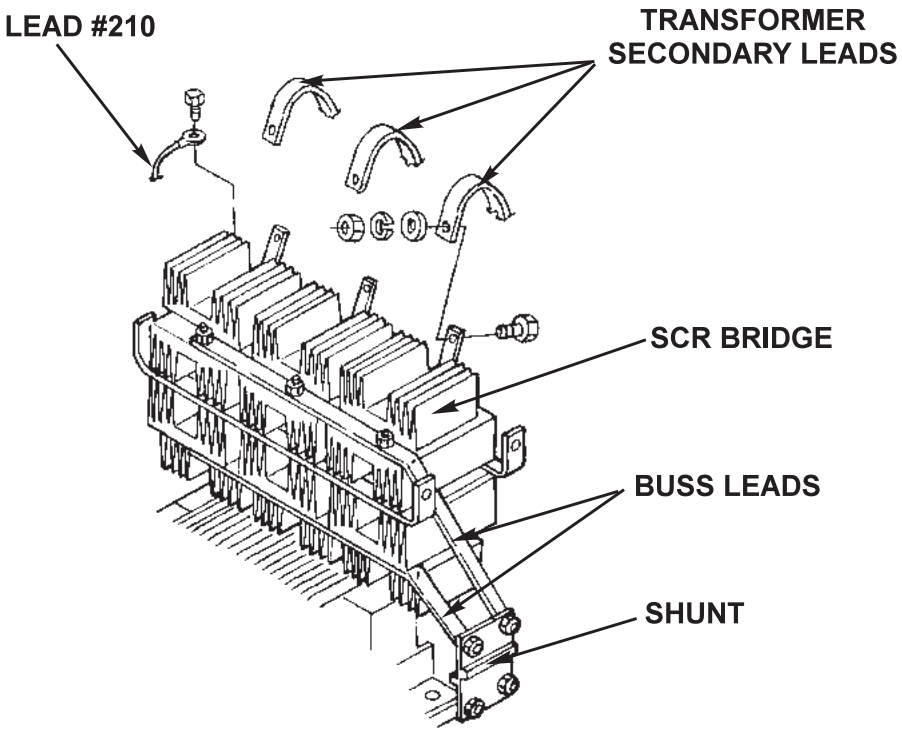
SCR OUTPUT BRIDGE REPLACEMENT (continued)

FIGURE F.22 – PREPARATION FOR SCR OUTPUT BRIDGE REMOVAL



PROCEDURE

1. Remove input power to machine.
2. Using a 5/16 (8mm) nut driver or flat head screw driver, remove 20 screws (ten per side) to remove case sides and 2 screws to remove top.
3. Using a 5/16 (8mm) nut driver or flat head screw driver, remove 6 screws, then lower the front control panel.
4. Remove the J4 gate lead Molex plug from firing board, and feed the plug down through the hole in bottom of the PC board compartment.
5. Using a 9/16” socket and open-end wrench, remove the two bolts and nuts holding the shunt assembly to the two positive buss leads connected to the SCR bridge. See Figure F.22.
6. Using a 5/16” socket, remove the screw and small reed switch lead (#210) from the left, top rear SCR heat sink.

NOTE: It may be necessary to move or remove the output choke to gain access to the bottom anode leads. For access to the bottom middle screw, nut, and associated washers, a long handled flat ratchet is recommended.

7. Identify and label the six transformer secondary (heavy aluminum) leads that connect to the anodes of the SCR heat sink assemblies. Using a 1/2” socket and open-end wrench, remove the secondary leads see Figure F.22.
8. Support the SCR bridge assembly with a lift hook or rope.
9. Using a 3/8” socket wrench, remove the two screws (one on each side) holding the SCR assembly rails to the front panel assembly.

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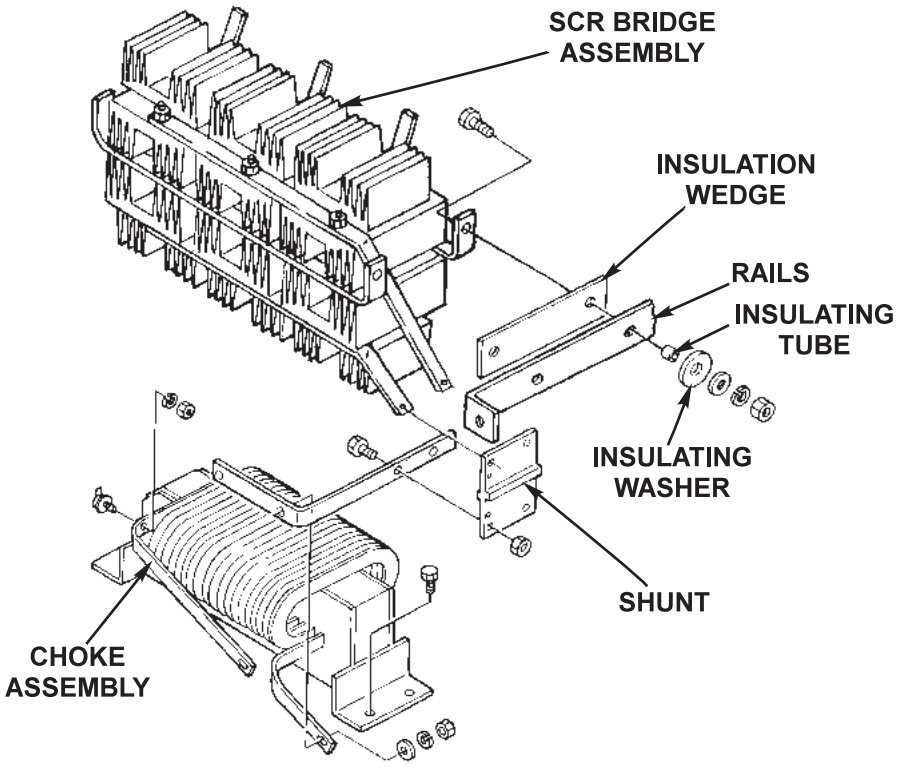
SCR OUTPUT BRIDGE REPLACEMENT (continued)

FIGURE F.23 – SCR OUTPUT BRIDGE REMOVAL



10. Cut any necessary cable ties to allow for the SCR bridge assembly removal.
11. Using a 1/2” socket wrench, remove the four screws (2 on each side) holding the transformer side panels and SCR assembly rails to the main transformer. See Figure F.23.
12. Remove leads #217 and #222 from resistor R2 located on the lift bail assembly. Remove resistor R2 using a 7/16” wrench.
13. With the 5/16” socket wrench, remove the bottom six screws holding the front panel assembly to the base. Carefully pull the front panel forward to allow room to remove the SCR bridge assembly.
14. Clear all leads and carefully remove the SCR bridge assembly.

NOTE: Upon reassembly, apply a thin layer of Lincoln E1868 (Dow Corning 340) heat sink compound to all bolted electrical connections on the aluminum heat sinks.

⚠ WARNING

UPON REASSEMBLY, THE SCR BRIDGE ASSEMBLY MUST BE ELECTRICALLY ISOLATED FROM GROUND.

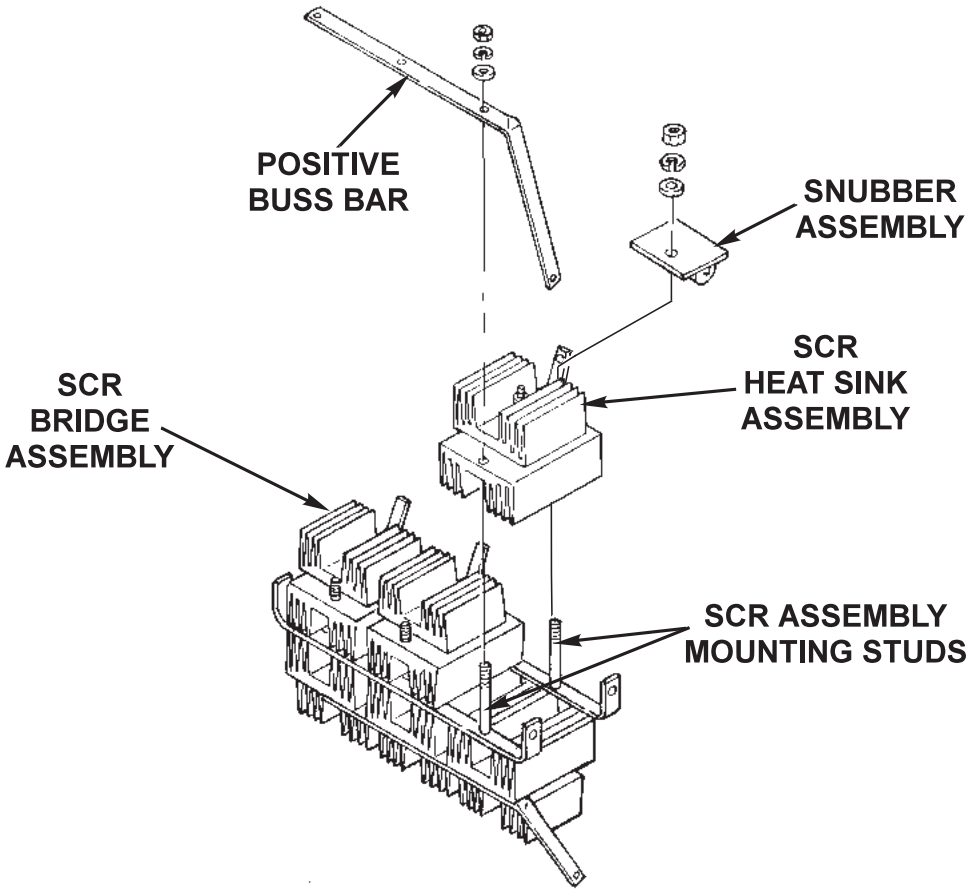
15. Place insulators between SCR bridge assembly and the output rectifier mounting bracket (see Figure F.23). Check for electrical isolation with an analog ohmmeter.

⚠ WARNING

MINIMUM ACCEPTABLE RESISTANCE TO GROUND IS 500,000 OHMS.

SCR OUTPUT BRIDGE REPLACEMENT (continued)

FIGURE F.24 – INDIVIDUAL SCR ASSEMBLY HEAT SINK REMOVAL



REMOVAL OF INDIVIDUAL SCR HEAT SINK ASSEMBLIES

1. Using a 9/16” wrench, remove two nuts, flat washers, and lock washers from the SCR assembly mounting studs. See Figure F.24.
2. Using a 5/16 (8mm) nut driver or flat head screw driver, remove snubber ground wire attachment. The snubber assembly can now be removed. Replace if necessary.
3. Carefully remove the positive buss bar from the heat sink in question. It may be necessary to remove the buss bar completely.
4. Carefully slide the SCR assembly from the mounting studs. Replacement will be made with a new SCR assembly.

⚠ WARNING

DO NOT DISASSEMBLE THE SCR FROM THE HEAT SINK. MACHINE DAMAGE MAY RESULT. REPLACE THE SCR ONLY AS AN ASSEMBLY.

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SCR OUTPUT BRIDGE REPLACEMENT (continued)

SCR HEAT SINK INSTALLATION

NOTE: Upon reassembly, apply a thin layer of Lincoln E1868 (Dow Corning #340) heat sink compound to all bolted electrical connections on the aluminum heat sinks, including positive buss bar.

1. Slide a new SCR assembly onto the mounting studs.
2. Carefully attach the positive buss bar onto the heat sink which had been removed. If it had been necessary to remove the buss bar, replace it at this time.
3. Align snubber assembly in position on SCR output bridge assembly.
4. Using a 9/16" wrench, secure the SCR output bridge and snubber assemblies with two nuts, flat washers, and lock washers.
5. Using a 5/16 (8mm) nut driver or flat head screw driver, attach snubber assembly ground wire with screws previously removed.

SCR OUTPUT BRIDGE INSTALLATION

NOTE: Upon reassembly, apply a thin layer of Lincoln E1868 (Dow Corning #340) heat sink compound to all bolted electrical connections on the aluminum heat sinks.

1. Support the SCR bridge assembly with a lift hook or rope.
2. Clear all leads and carefully position the SCR bridge assembly in place.
3. Place insulators between SCR bridge assembly and the output rectifier mounting bracket. ***See Figure F.23***. Check for electrical isolation with an analog ohmmeter. Minimum acceptable resistance to ground is 500,000 ohms.
4. With the 5/16" socket wrench, attach bottom six screws securing the front panel assembly to the base. Carefully push the front panel rearward into position.
5. Attach resistor R2 to the unit using a 7/16" wrench Secure leads #217 and #222 to resistor R2.
6. Using a 1/2" socket wrench, attach the four screws (2 on each side) holding the transformer side panels and SCR assembly rails to the main transformer.

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SCR OUTPUT BRIDGE REPLACEMENT (continued)

7. Using a 3/8” socket wrench, attach the two screws (one on each side) holding the SCR assembly rails to the front panel assembly. ***See Figure F.23***.

NOTE: It may have been necessary to move or remove the output choke to gain access to the bottom anode leads. For access to the bottom middle screw, nut, and associated washers, a long handled flat ratchet is recommended.

8. Using a 1/2” socket and open-end wrench, attach the secondary leads that connect the anodes of the SCR heat sink assemblies to the six transformer secondary (heavy aluminum) leads as labeled during disassembly.
9. Using a 5/16” socket, attach the small reed switch lead (#210) to the left, top rear SCR heat sink using the screw previously removed.
10. Using a 9/16” socket and open-end wrench, attach the two bolts and nuts holding the shunt assembly to the two positive buss leads connected to the SCR bridge.
11. Feed the J4 gate lead Molex plug up through the hole in bottom of the PC board compartment. Attach the plug onto the firing board.
12. Secure any cable ties removed previously to allow for the SCR bridge assembly removal.
13. Using a 5/16 (8mm) nut driver or flat head screw driver, attach 20 screws (ten per side) to attach the case sides. Attach the top using 2 similar screws.
14. Raise the front control panel into position, and, using a 5/16 (8mm) nut driver or flat head screw driver, secure in position using 6 screws.

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REMOVAL AND REASSEMBLY OF LIFT BALE

⚠ WARNING

Service and repair should be performed only by 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 reassembly of the Lift Bale.

MATERIALS NEEDED

3/8” Socket Wrench
9/16” Socket Wrench

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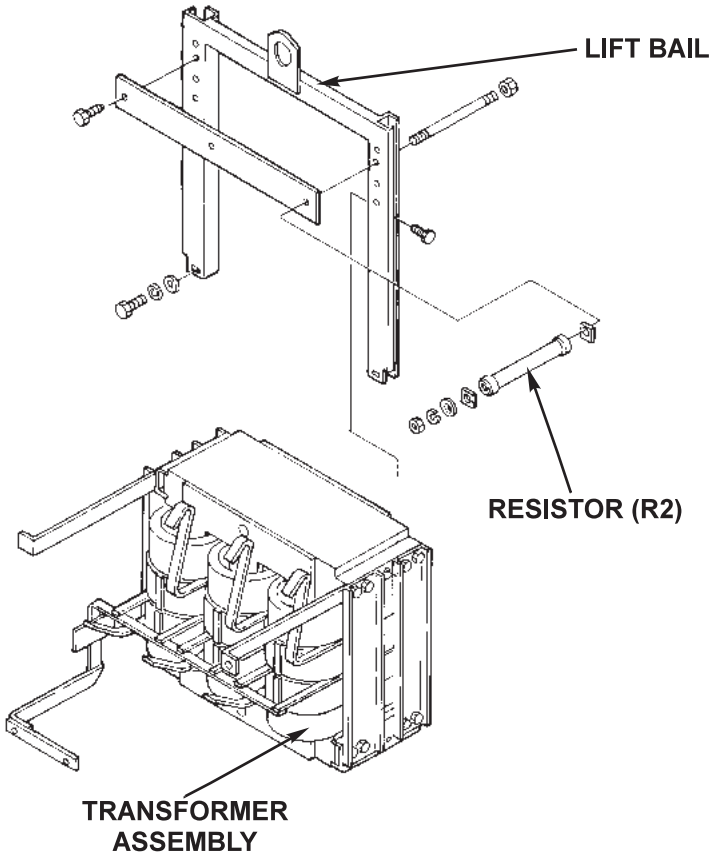
REMOVAL AND REASSEMBLY OF LIFT BALE (continued)

FIGURE F.25 – LIFT BAIL REMOVAL



REMOVAL PROCEDURE

1. Remove input power to machine.
2. Using a 5/16 (8mm) nut driver or flat head screw driver, remove 20 screws (ten per side) to remove case sides and 2 screws to remove top.
3. Remove two leads, #217 and #222 from resistor R2.
4. Using a 3/8” socket wrench, remove the two screws holding the input contactor bracket to the lift bail.
5. Using a 9/16” socket wrench, remove the four bolts mounting the lift bail to the main transformer assembly.
6. Using a 9/16” socket wrench, remove the four bolts and associated washers mounting the lift bail to the base assembly. See Figure F.25.
7. Loosen or remove any cable or wire ties necessary for lift bail removal.
8. Carefully remove the lift bail by lifting straight up and clear.

REMOVAL AND REASSEMBLY OF LIFT BALE (continued)

REASSEMBLY PROCEDURE

1. Place the lift bail onto the IDEALARC® DC-1000 from the top, lowering straight onto the unit.
2. Using a 9/16” socket wrench, attach the four bolts and associated washers mounting the lift bail to the base assembly.
3. Using a 9/16” socket wrench, attach the four bolts mounting the lift bail to the main transformer assembly.
4. Using a 3/8” socket wrench, attach the two screws holding the input contactor bracket to the lift bail.
5. Reattach leads #217 and #222 to resistor R2.
6. Reattach or reconnect any cables or wire ties previously removed.
7. Using a 5/16 (8mm) nut driver or flat head screw driver, attach 20 screws (ten per side) to secure case sides, and 2 screws to secure top.

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MAIN TRANSFORMER REMOVAL AND INSTALLATION

⚠ WARNING

Service and repair should be performed only by 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 Main Transformer.

MATERIALS NEEDED

3/8” Socket Wrench
1/2” Socket Wrench
3/4” Socket Wrench

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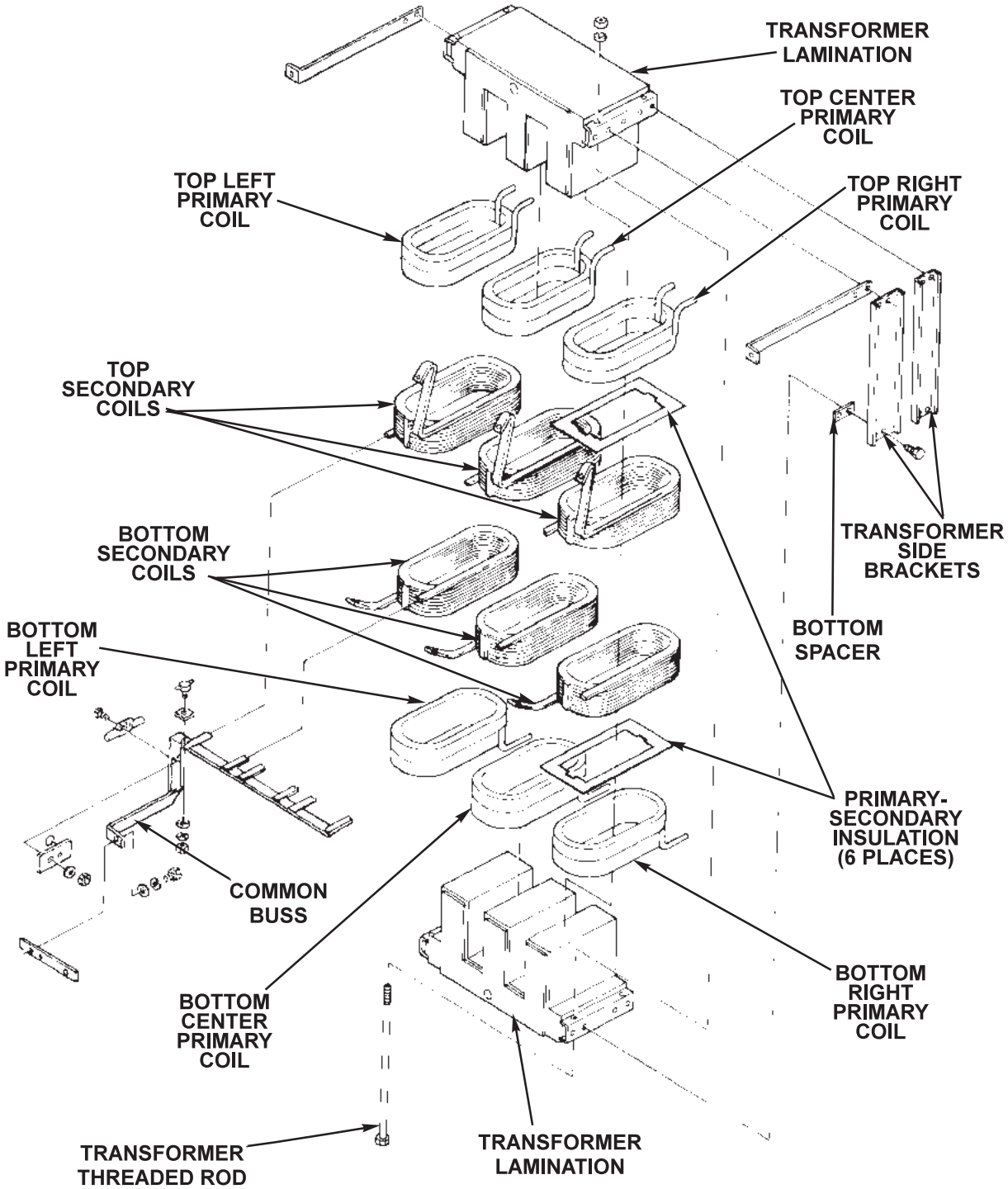
MAIN TRANSFORMER REMOVAL AND INSTALLATION (continued)

FIGURE F.26 – MAIN TRANSFORMER DISASSEMBLY



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MAIN TRANSFORMER REMOVAL AND INSTALLATION (continued)

MAIN TRANSFORMER DISASSEMBLY

1. Perform **Removal and Reassembly of Lift Bale Procedure.**
2. Remove lead #271 from resistor R3 (located near the input contactor).
3. Separate the in-line connectors from leads #211 and #212. ***See Figure F.21***.
4. Remove lead #256 from the choke thermostat.
5. Remove lead #220 from the reed switch (3CR).
6. Cut any necessary cable ties or restraints and clear the leads necessary for the removal of the top transformer iron.
7. Using a 3/8" socket wrench, remove two screws mounting the input contactor bracket to the case back assembly. With leads attached, carefully pull assembly up and out of the way. Set assembly aside.
8. Using a 1/2" socket wrench, move 16 screws (8 on each side) from the transformer side brackets. Taking note of placement, remove the four brackets and two bottom spacers. ***See Figure F.26***.
9. Using a 3/4" wrench, remove the six nuts and lock washers from the transformer threaded rods. It may be necessary to hold the threaded rods to keep them from turning.
10. Using a hoist, carefully lift the top iron from the assembly. Note the placement of shims and insulators.

NOTE: Some prying and jolting may be necessary to free the iron from the coils. Replace any coils that may be faulty. If any heavy aluminum secondary coils are to be replaced, identify and label all leads to the transformer. The leads will have to be cut and then TIG welded upon reassembly.

COIL REMOVAL AND REPLACEMENT

1. Label and disconnect leads to the coils that are being removed or replaced (see Wiring Diagram).
2. Refer to ***Figure F.26*** for proper coil locations (top, bottom, left, right, and center) of primary and secondary coils. If secondary coils are to be replaced, it will be necessary to cut the leads and TIG weld upon reassembly.
3. Remove the coils:
   a. Some prying and jolting may be necessary to free the coils from the iron.
   b. Note placement of insulation and wedges for reassembly (especially primary coil to lamination insulation and secondary to primary insulation).
4. Replace the coils:
   a. Be sure to replace all insulation and wedges that were removed (lamination to coils, and primary to secondary coils).
   b. Using a high temperature industrial epoxy, such as Lincoln E1603, glue the coils in place by applying the epoxy to the coil sides along the lamination, cell insulation, and wedges.
   c. Glue the secondary coils in place from the iron to the coil sides.
5. Re-TIG weld the secondary coil leads (if previously cut).
6. When reconnecting any aluminum leads, apply a thin layer of Dow Corning 340 Heat Sink Compound to mating surfaces.

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MAIN TRANSFORMER REMOVAL AND INSTALLATION (continued)

TRANSFORMER REASSEMBLY

1. Using a hoist, carefully lift the top iron onto the assembly. Lightly tap on the top of the iron.
2. Position the transformer threaded rods securing the transformer. Using a 3/4" wrench, secure the six nuts and lock washers. It may be necessary to hold the threaded rods to keep them from turning. Tighten nuts to 39 - 41 Ft.-Lbs.
3. The primary coils should be ground tested at 2700 VAC for one second. The secondary coils should be ground tested at 1500 VAC for one second. The primary to secondary insulation should be tested at 2700 VAC for one second.
4. Install the four brackets and two bottom spacers in the position noted at disassembly. Using a 1/2" socket wrench, secure in position with 16 screws (8 on each side) onto the transformer side brackets.
5. With leads still attached, carefully reposition the input contactor bracket onto the case back assembly. Using a 3/8" socket wrench, secure in position using two screws removed previously.
6. Attach lead #220 onto the reed switch (3CR).
7. Attach lead #256 onto the choke thermostat.
8. Reconnect lead #211 and #212 to the in-line connectors.
9. Attach lead #271 onto resistor R3.
10. Perform Lift Bail Installation Procedure.
11. Replace any cable ties or restraints which were cut to remove the top transformer iron.

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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
230/3/60	14.0	2.0
460/3/60	7.0	2.0
575/3/60	5.6	2.0

OPEN CIRCUIT VOLTAGES

Mode	Input Hertz	Open Circuit Volts
Variable Voltage	60	74/76 DC
Auxiliary Output (#31-#32)	60	122/124 AC

MAXIMUM ACCEPTABLE OUTPUT VOLTAGE - AT MINIMUM OUTPUT SETTINGS

Mode	Input Hertz	Load
Constant Voltage Innershield	60	140 Amps @ 14/18 VDC

MINIMUM ACCEPTABLE OUTPUT VOLTAGE AT MAXIMUM OUTPUT SETTINGS

Mode	Input Hertz	Load
Variable Voltage	60	1250 Amps @ 47/52 VDC
Constant Voltage Submerged Arc	60	1250 Amps @ 47/52 VDC
Constant Voltage Submerged Arc at 500 Amp Terminal	60	625 Amps @ 53/58 VDC

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NOTES

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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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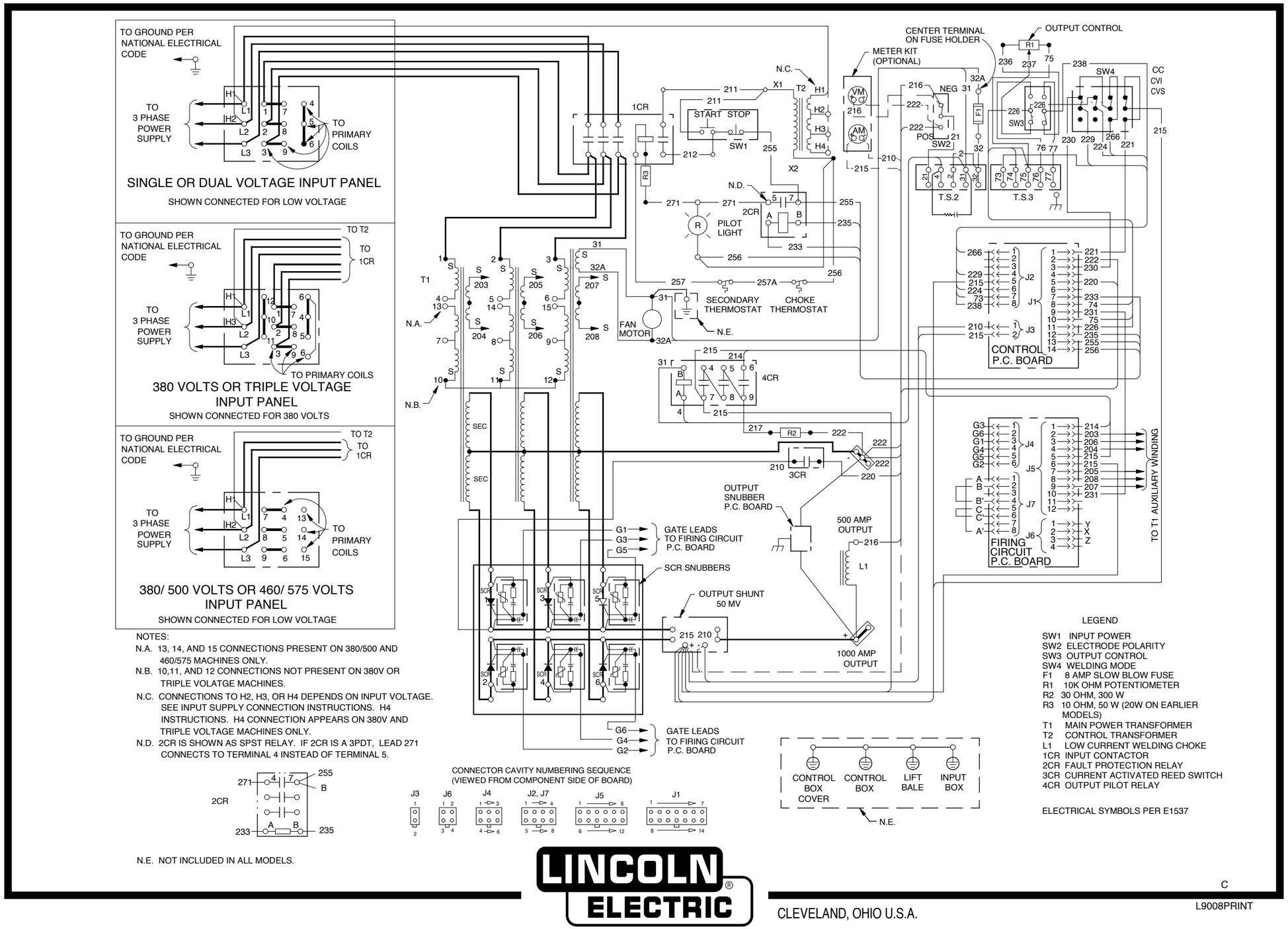
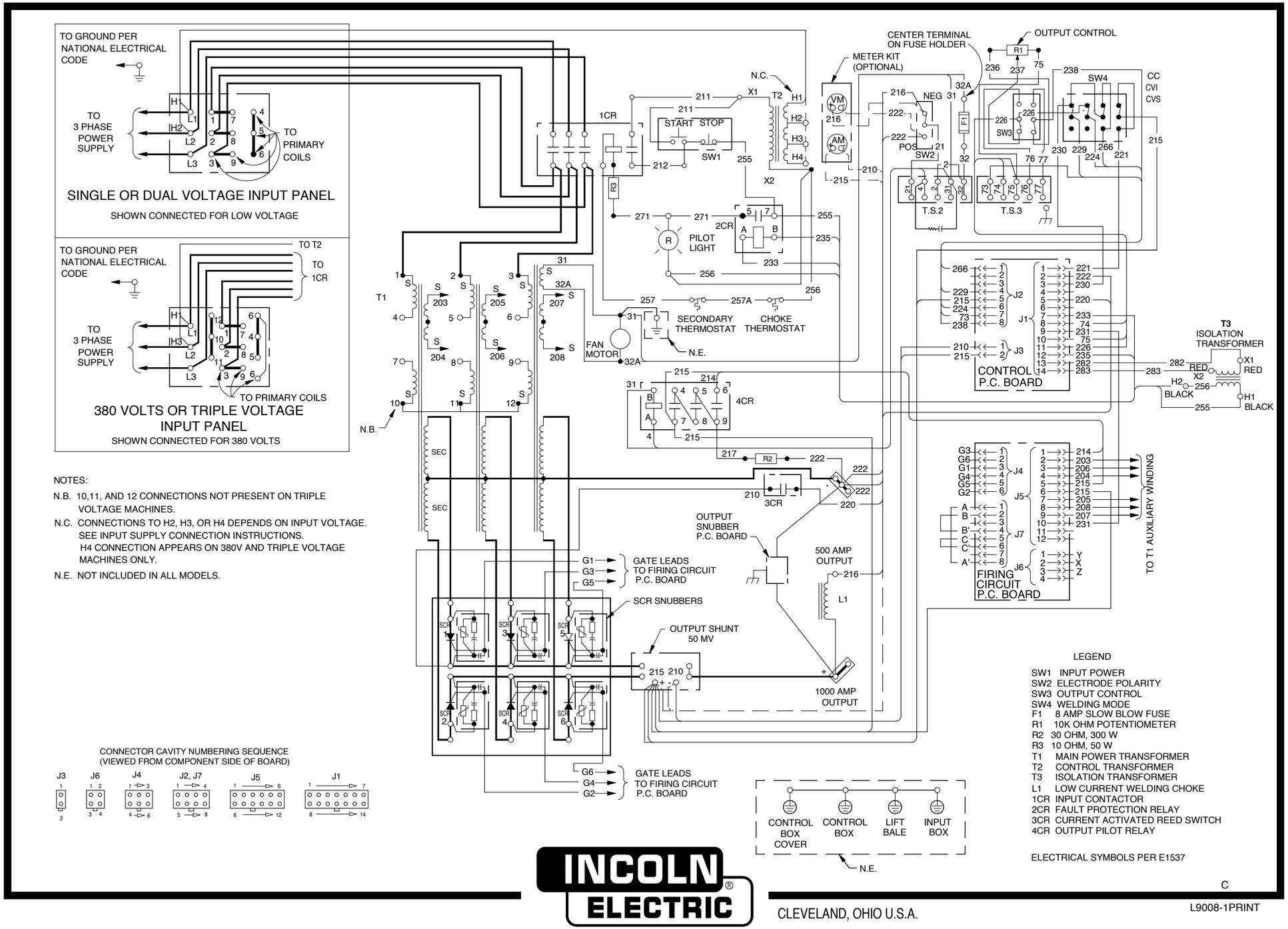
WIRING DIAGRAM - CODES 9922, 9924, 9925, 10293M, 11333 (L9008)



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.

WIRING DIAGRAM - ALL OTHER CODES (L9008-1)



CLEVELAND, OHIO U.S.A.

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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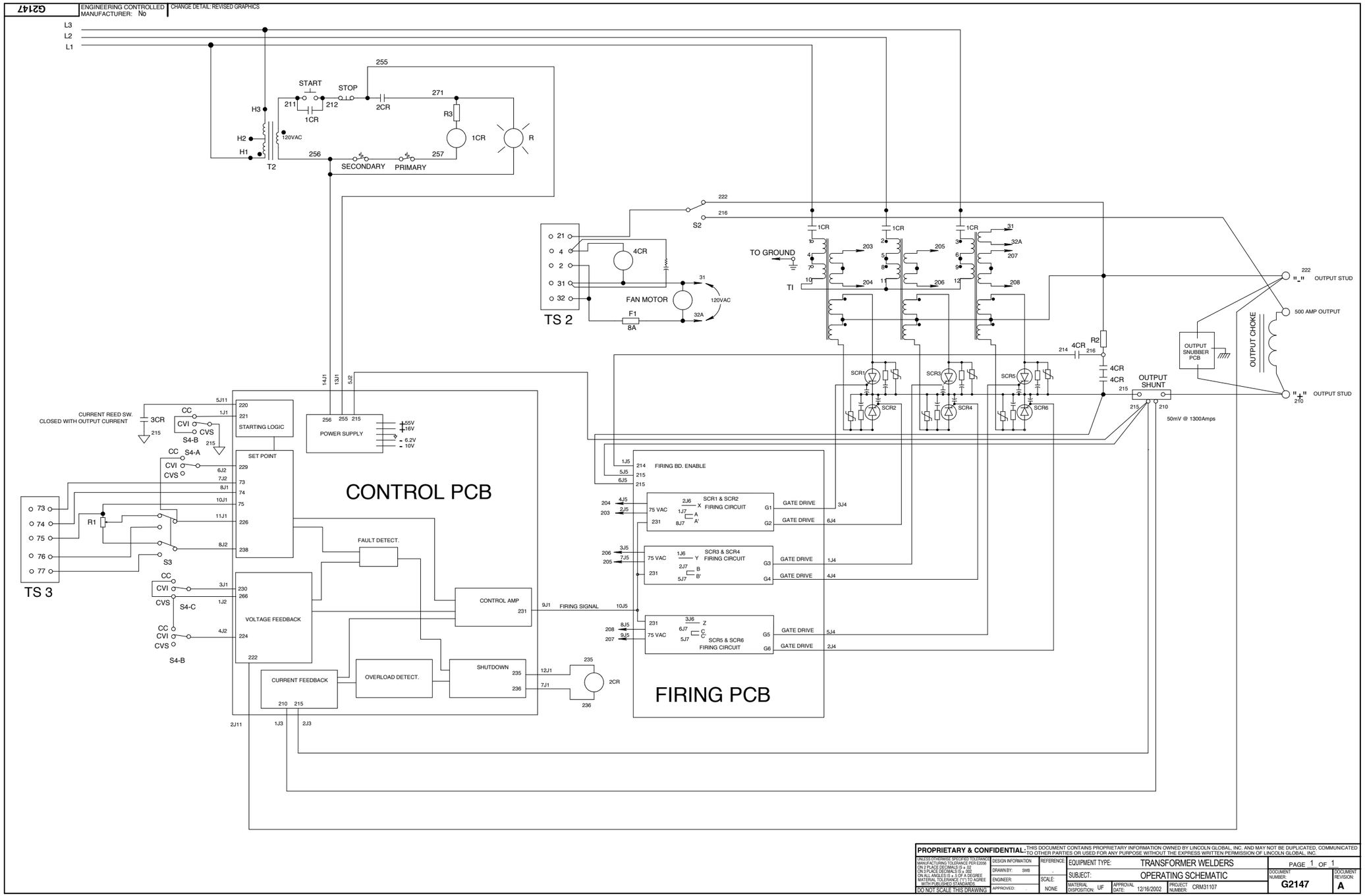
SCHEMATIC - COMPLETE MACHINE - CODES 9922, 9924, 9925, 10293M, 11333 (G2147)



UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056 ON 2 PLACE DECIMALS (9 x .02 ON 3 PLACE DECIMALS (6 x .002 ON ALL ANGLES (9 x .5 OF A DEGREE MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING	DESIGN INFORMATION	REFERENCE	EQUIPMENT TYPE: TRANSFORMER WELDERS	PAGE 1 OF 1	
	DRAWN BY: SWB		SUBJECT: OPERATING SCHEMATIC	DOCUMENT NUMBER: G2147	DOCUMENT REVISION: A
	ENGINEER:	SCALE: NONE	MATERIAL DISPOSITION: UF	APPROVAL DATE: 12/16/2002	PROJECT NUMBER: CRM31107
	APPROVED:				

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

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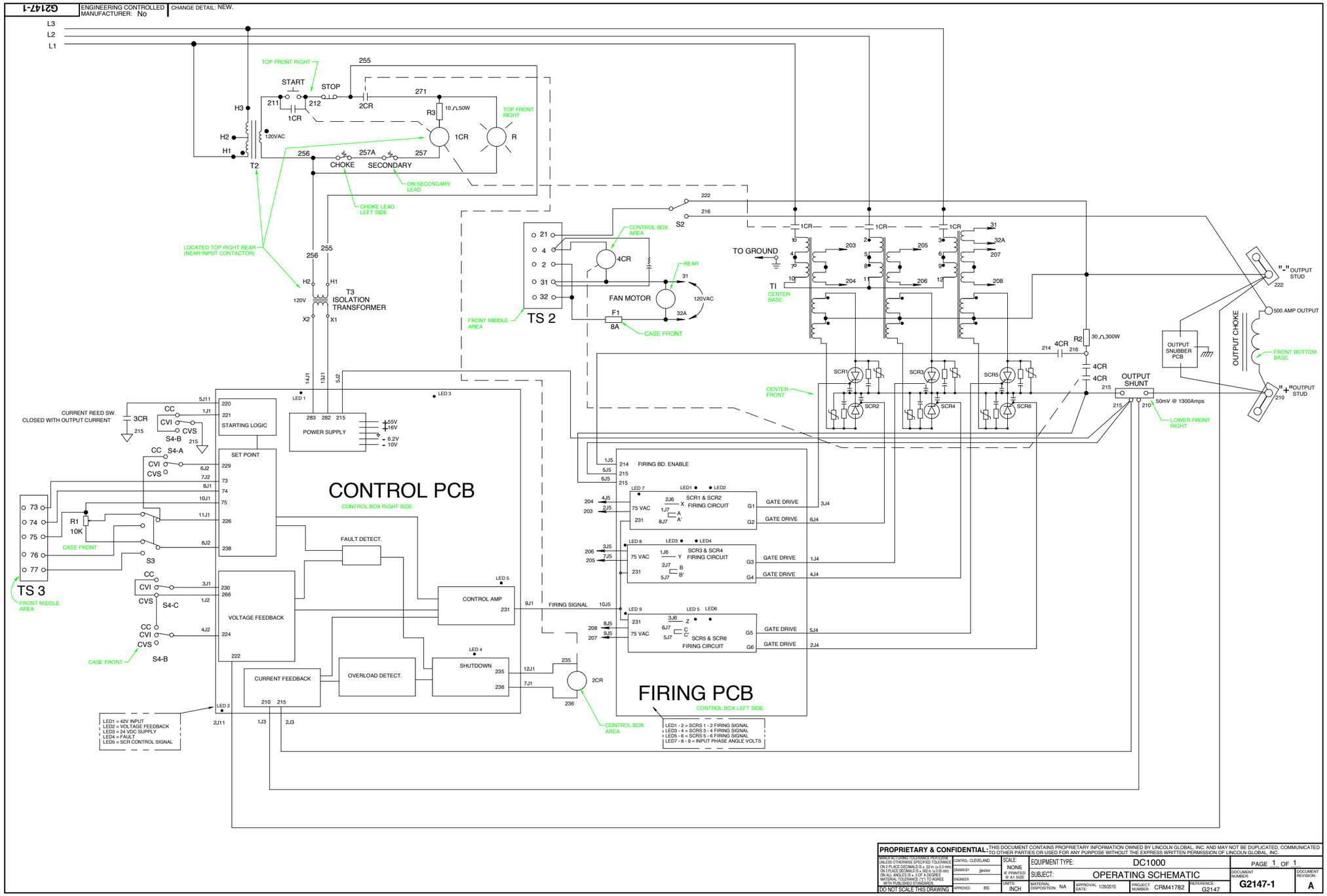
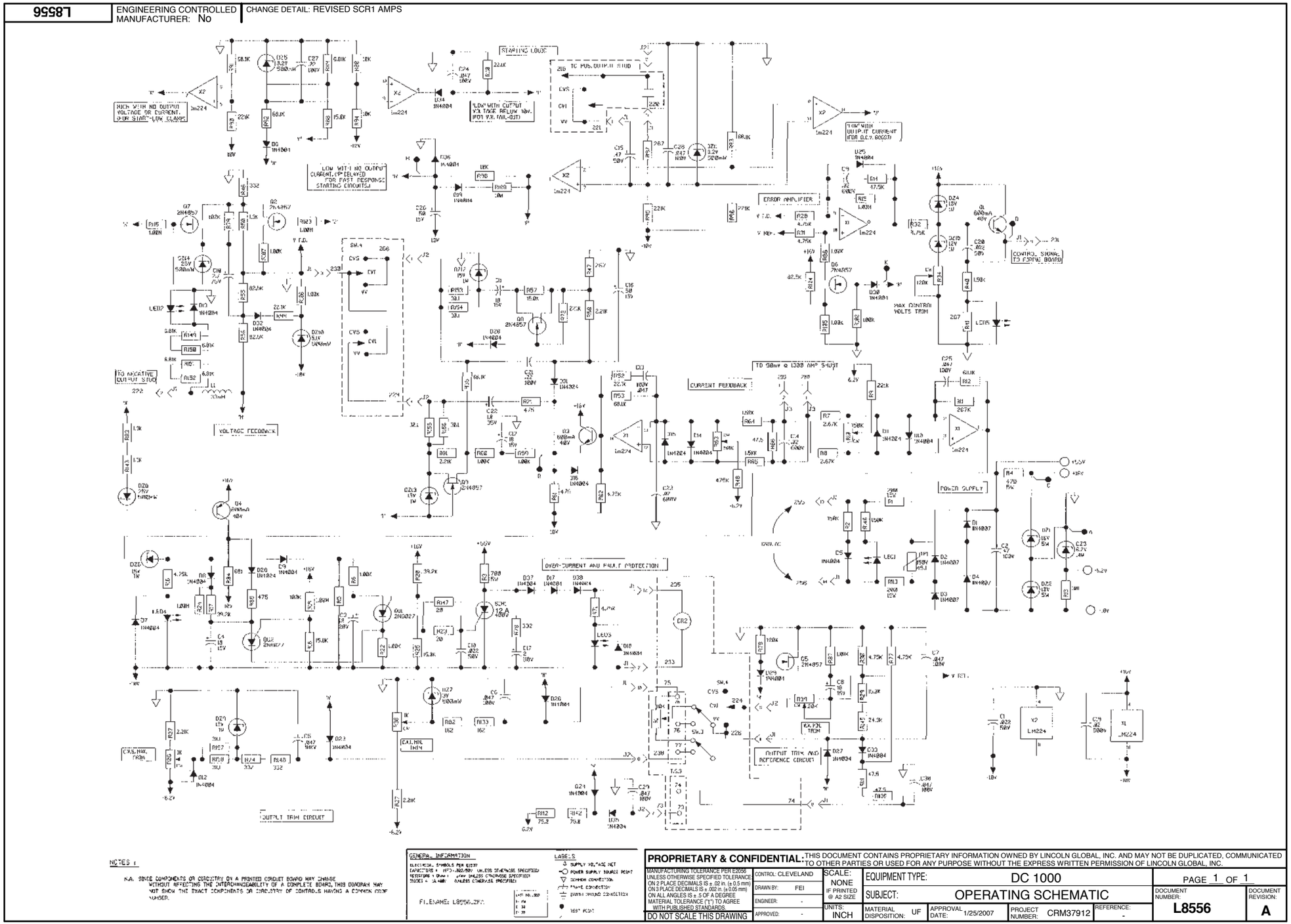
SCHEMATIC - COMPLETE MACHINE - ALL OTHER CODES (G2147-1)



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

SCHEMATIC CONTROL PC BOARD (L8556)

L8556 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED SCR1 AMPS



MANUFACTURING TOLERANCE PER E2056
UNLESS OTHERWISE SPECIFIED TOLERANCE
ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm)
ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm)
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL:	CLEVELAND
DRAWN BY:	FEI
ENGINEER:	-
APPROVED:	-
SCALE:	NONE
IF PRINTED @ A2 SIZE	
UNITS:	INCH
EQUIPMENT TYPE:	DC 1000
SUBJECT:	OPERATING SCHEMATIC
MATERIAL DISPOSITION:	UF
APPROVAL DATE:	1/25/2007
PROJECT NUMBER:	CRM37912
REFERENCE:	-
PAGE	1 OF 1
DOCUMENT NUMBER:	L8556
DOCUMENT REVISION:	A

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

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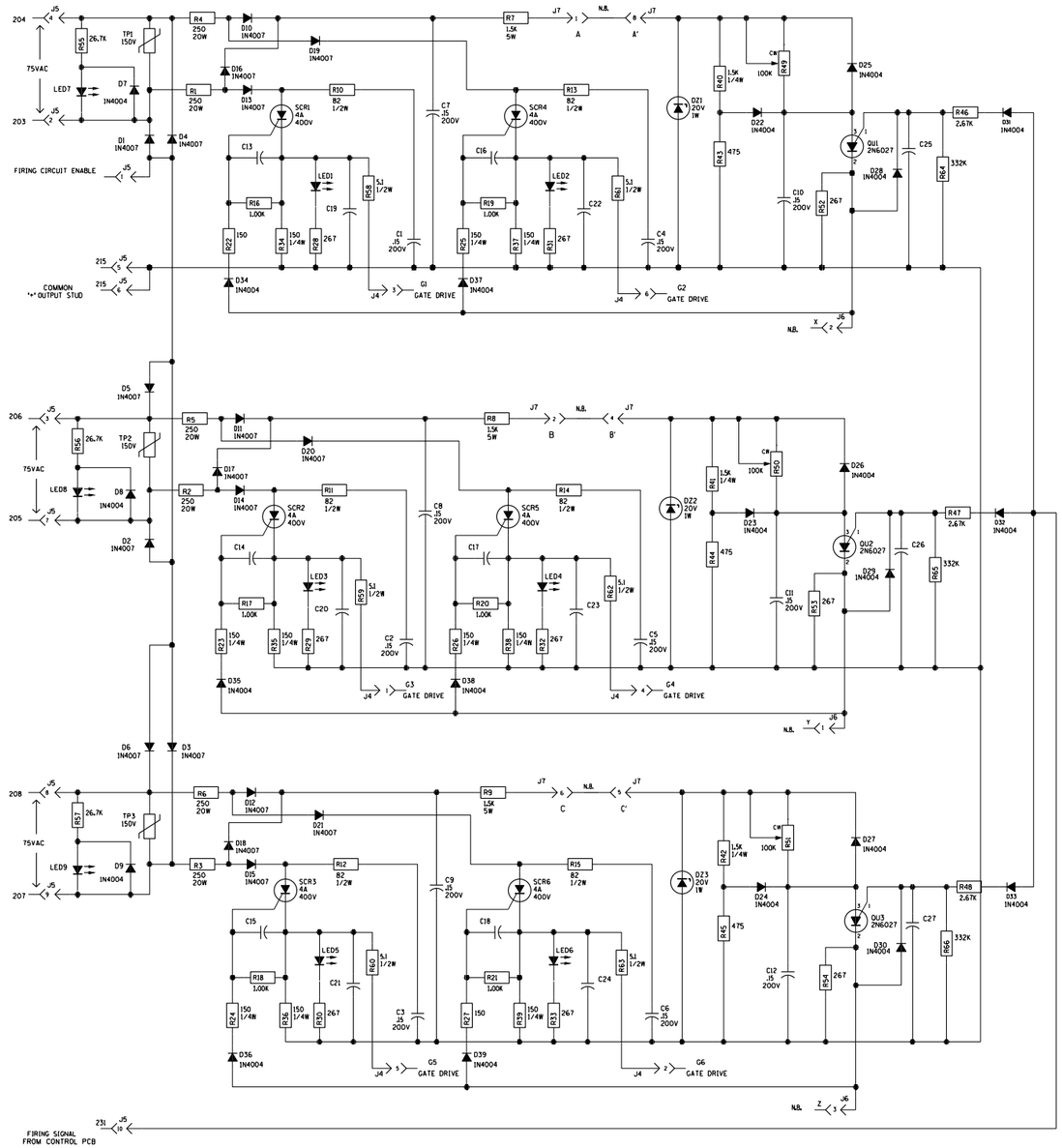
SCHEMATIC - FIRING PC BOARD L8337)



NOTES :

N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

N.B. J6 IS USED TO CONNECT THE FIRING PCBS IN TWO LIKE MACHINES TO PARALLEL THEIR OUTPUTS
J7 REMAINS IN THE MASTER FIRING PCB WHILE J7 IS REMOVED FROM THE SLAVE FIRING PCB

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD 1.022/50V UNLESS OTHERWISE SPECIFIED)
RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
DIODES = 1A, 400V (UNLESS OTHERWISE SPECIFIED)

LAST NO.USED
R 66
C 27
D 39

LABELS
- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION

FIRING BOARD SCHEMATIC
1-17-92B
L 8337

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

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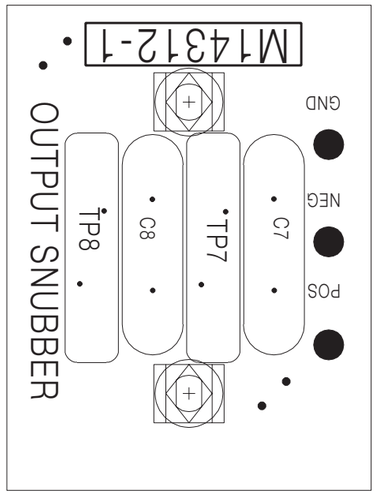
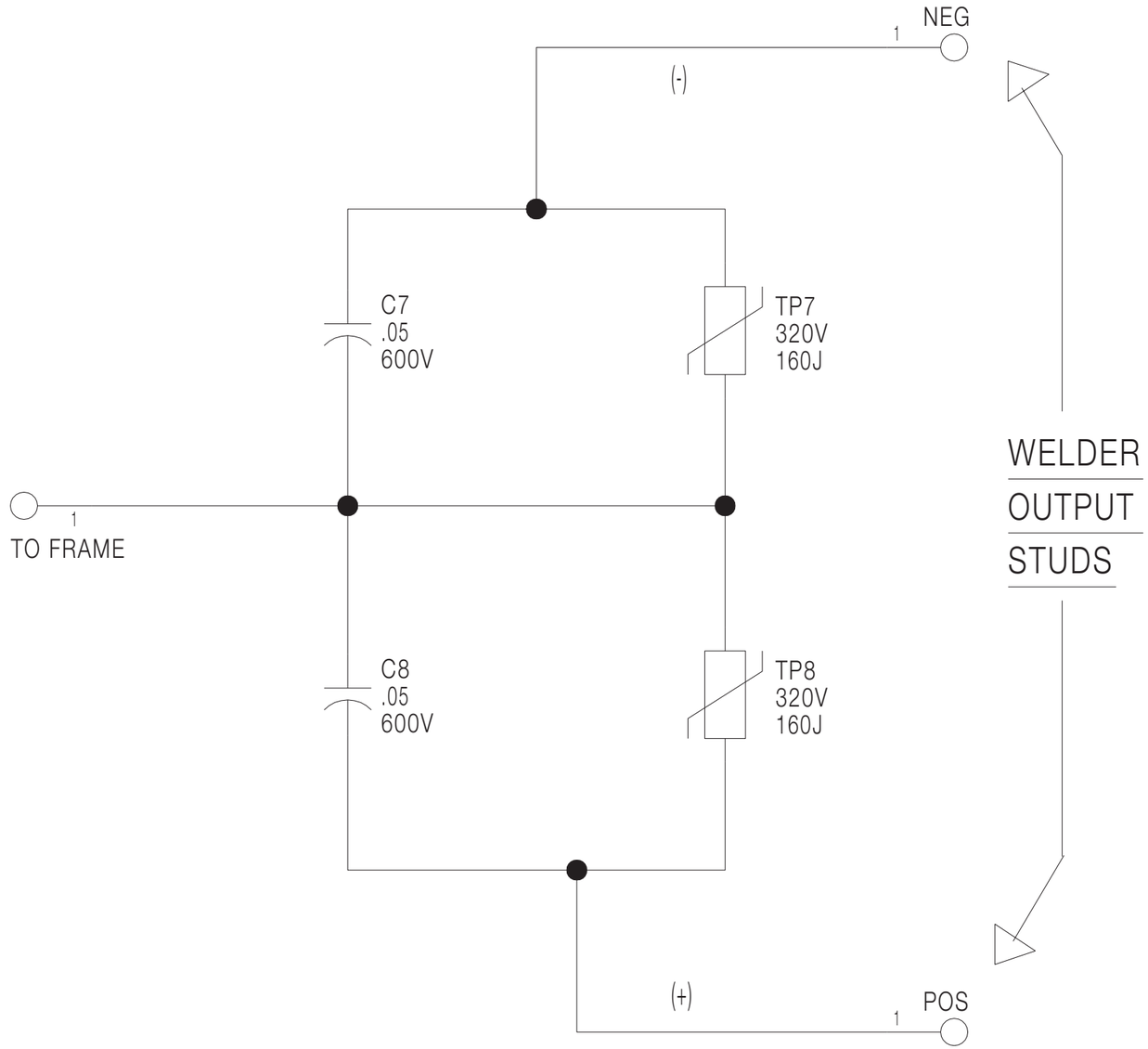
SCHEMATIC - OUTPUT SNUBBER PC BOARD (S19699)





CAPICITORS = MFD/VOLTS

A.N.S.I. ELECTRICAL SYMBOLS PER E1537

SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM, MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE.

DC-1000
OUTPUT SNUBBER SCHEMATIC
2-19-93G S 19699

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