

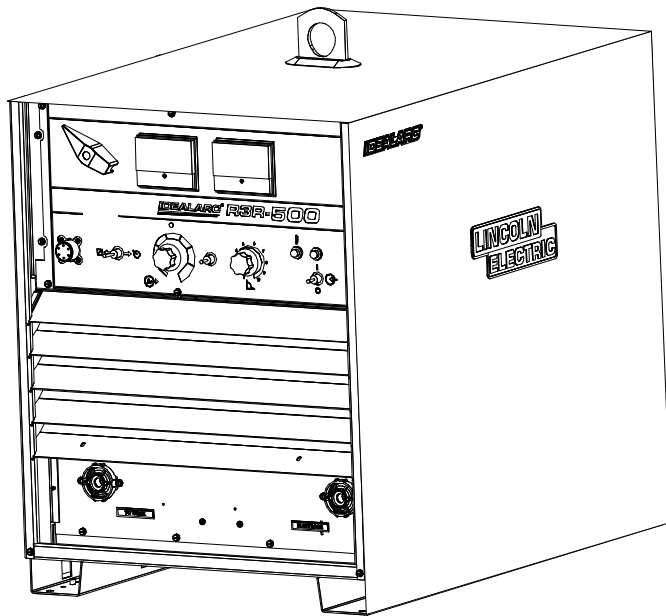


**NOTE:** This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

## ***IDEALARC® R3R-300, -400, -500, -375-I, -500-I, and -600-I***

For use with machines having Code Numbers: **9535; 9536; 9538; 9539; 9541; 9542; 9693; 9694; 9695; 9696; 9700; 9701; 9702; 9703; 9707; 9708; 9709; 9710; 9868; 9869; 9870; 9871; 9872; 9873; 9877; 9878; 9879; 9880; 9882; 9883; 9888; 9889; 9890; 9891; 9892; 9893; 10052; 10053; 10285; 10286; 10287; 10288; 10289; 10290; 11341;**

# ***SERVICE MANUAL***



## ⚠ 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.

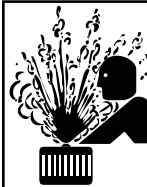
1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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.



### 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 Z87.1 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.**

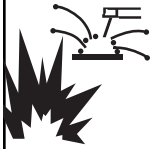
5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically 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.



## 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-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY powered equipment.

- 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.

## PRÉCAUTIONS DE SÛRETÉ

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

### Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
  - a. Les circuits à l'électrode et à la pièce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
  - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
  - c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
  - d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
  - e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
  - f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s'appliquent aussi au pistolet de soudage.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas où on reçoit 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 latéraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.
7. Quand on ne soude pas, poser la pince à un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (gas fortement toxique) ou autres produits irritants.
11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

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

1. Relier à la terre le châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

## Electromagnetic Compatibility (EMC)

### Conformance

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

### Introduction

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

### Installation and Use

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

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

### Assessment of Area

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

- a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;
- b) radio and television transmitters and receivers;
- c) computer and other control equipment;
- d) safety critical equipment, e.g., guarding of industrial equipment;
- e) the health of the people around, e.g., the use of pacemakers and hearing aids;
- f) equipment used for calibration or measurement
- g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- h) the time of day that welding or other activities are to be carried out.

## Electromagnetic Compatibility (EMC)

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

### Methods of Reducing Emissions

#### Mains Supply

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

#### Maintenance of the Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's 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.<sup>1</sup>

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

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IDEALARC® R3R



# INSTALLATION

## TECHNICAL SPECIFICATIONS - IDEALARC® R3R-300, -375-I

### INPUT - THREE PHASE ONLY

**Standard Voltage**

230V  
460V

**Input Current @ Rated Output**

56A  
28A

### RATED OUTPUT

**Duty Cycle**

100%  
60%  
35%

**Amps**

230  
300  
375

**Volts at Rated Amps**

29  
32  
35

### OUTPUT

**Current Range**

45 to 375 Amps

**Maximum Open Circuit Voltage**

67 VDC

### RECOMMENDED INPUT WIRE AND FUSE SIZES AT 60% DUTY CYCLE

Input Voltage / Frequency  Volts/Hz	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Input Wire Size Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Ground Wire Size Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
230/60 460/60	80 40	56 28	8 (10 mm <sup>2</sup> ) 10 (6 mm <sup>2</sup> )	8 (10 mm <sup>2</sup> ) 10 (6 mm <sup>2</sup> )

### PHYSICAL DIMENSIONS

<b><u>Height</u></b>	<b><u>Width</u></b>	<b><u>Depth</u></b>	<b><u>Weight</u></b>
27.50 in. (700 mm)	22.25 in. (565 mm)	33.10 in. (840 mm)	350 lbs. (159 kg)

IDEALARC® R3R



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# INSTALLATION

## TECHNICAL SPECIFICATIONS - IDEALARC® R3R-400, -500-I

### INPUT - THREE PHASE ONLY

**Standard Voltage**

230V  
460V

**Input Current @ Rated Output**

74A  
37A

### RATED OUTPUT

**Duty Cycle**

100%  
60%  
35%

**Amps**

300  
400  
500

**Volts at Rated Amps**

32  
36  
40

### OUTPUT

**Current Range**

60 to 500 Amps

**Maximum Open Circuit Voltage**

67 VDC

### RECOMMENDED INPUT WIRE AND FUSE SIZES AT 60% DUTY CYCLE

Input Voltage / Frequency  Volts/Hz	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Input Wire Size Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Ground Wire Size Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
230/60 460/60	125 60	74 37	6 (16 mm <sup>2</sup> ) 10 (6 mm <sup>2</sup> )	6 (16 mm <sup>2</sup> ) 10 (6 mm <sup>2</sup> )

### PHYSICAL DIMENSIONS

<b><u>Height</u></b>	<b><u>Width</u></b>	<b><u>Depth</u></b>	<b><u>Weight</u></b>
27.50 in. (700 mm)	22.25 in. (565 mm)	33.10 in. (840 mm)	402 lbs. (182 kg)

IDEALARC® R3R



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# INSTALLATION

## TECHNICAL SPECIFICATIONS - IDEALARC® R3R-500, -600-I

### INPUT - THREE PHASE ONLY

**Standard Voltage**

230V  
460V

**Input Current @ Rated Output**

88A  
44A

### RATED OUTPUT

**Duty Cycle**

100%  
60%  
35%

**Amps**

375  
500  
600

**Volts at Rated Amps**

44  
40  
35

### OUTPUT

**Current Range**

75 to 625 Amps

**Maximum Open Circuit Voltage**

67 VDC

### RECOMMENDED INPUT WIRE AND FUSE SIZES AT 60% DUTY CYCLE

Input Voltage / Frequency  Volts/Hz	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Input Wire Size Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Ground Wire Size Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
230/60 460/60	150 70	88 44	4 (25 mm <sup>2</sup> ) 8 (10 mm <sup>2</sup> )	6 (16 mm <sup>2</sup> ) 8 (10 mm <sup>2</sup> )

### PHYSICAL DIMENSIONS

<b><u>Height</u></b>	<b><u>Width</u></b>	<b><u>Depth</u></b>	<b><u>Weight</u></b>
27.50 in. (700 mm)	22.25 in. (565 mm)	33.10 in. (840 mm)	446 lbs. (202 kg)

IDEALARC® R3R



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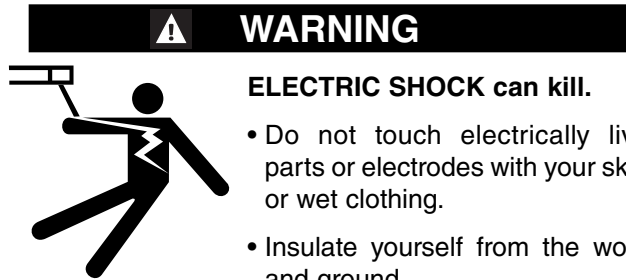
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# INSTALLATION

Read this entire installation section before you start installation.

## SAFETY PRECAUTIONS



### WARNING

**ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

Only qualified personnel should install, use, or service this equipment.

## SELECT SUITABLE LOCATION

Place the Idealarc® R3R in a dry location where clean cooling air can flow freely in through the front louvers and out through the rear louvers. Keep dust, dirt, and other foreign materials that can be drawn into the machine to a minimum. Failure to observe these precautions can lead to excessive operating temperatures and nuisance shut-downs.

## LIFTING

### WARNING



**FALLING EQUIPMENT can cause injury.**

- Do not lift this machine using the lift bail if it is equipped with a heavy accessory such as a trailer or a gas cylinder.
- Lift only with equipment of adequate lifting capacity.
- Be sure the machine is stable when lifting.
- Do not stack more than three high.
- Do not stack the R3R on top of any other machine.

A permanent lift bail is located at the top of the machine, positioned at the center of gravity for stable lifting. R3R weights are as follows:

R3R-300, -375-I	350 pounds (159 kilograms)
R3R-400, -500-I	402 pounds (182 kilograms)
R3R-500, -600-I	446 pounds (202 kilograms)

## TILTING

Place the machine on a secure, level surface. Any surfaces you place it on other than the ground must be firm, non-skid, and structurally sound.

## STACKING

Idealarc® R3Rs may be stacked three high. The bottom machine must be on a stable, hard, level surface capable of supporting the weight of up to three machines (1350 pounds/1608 kilograms). Be sure that the two pins in the roof of the bottom machine fit into the holes in the base of the machine above. The lift bail is positioned so that it fits without interference under the base of the second machine.

Do not stack heavier machines on top of lighter machines. For example, do not place an R3R-500 on top of an R3R-400 or an R3R-400 on top of an R3R-300.

IDEALARC® R3R



# INSTALLATION

## INPUT CONNECTIONS

### ⚠ WARNING

#### ELECTRIC SHOCK can kill.

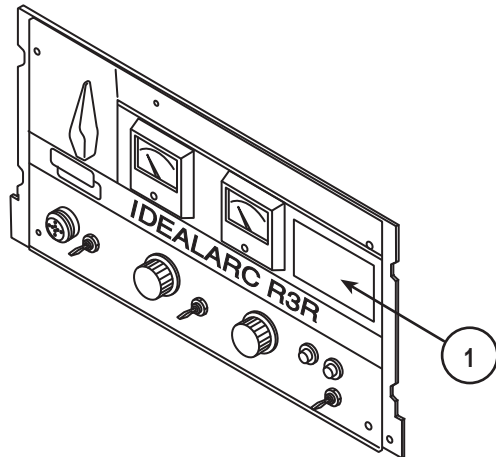


- Have a qualified electrician install and service this equipment.
- Turn the input power off at the fuse box before working on this equipment.
- Do not touch electrically hot parts.

- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate, located on the case front control panel. See Figure A.1. Also see appropriate **Technical Specifications** page for input and ground wire requirements.

FIGURE A.1 – RATING PLATE LOCATION



1. RATING PLATE

Input supply line ground lead entry is through a hole located at the top of the case rear panel. A removable door covers the input connection box, which contains the input contactor (CR1) and reconnect panel assembly for multiple voltage machines.

## GROUND CONNECTION

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

## INPUT SUPPLY CONNECTIONS

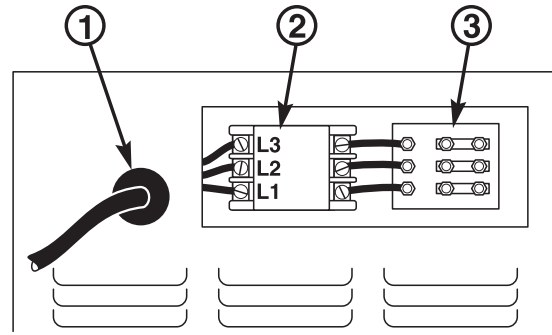
Input power is connected to the three line terminals on the input contactor. See **Figure A.2**. Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate.

IDEALARC® R3R



# INSTALLATION

FIGURE A.2 – INPUT POWER SUPPLY CONNECTIONS



1. INPUT SUPPLY LINE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

Have a qualified electrician connect the input power leads to the L1, L2, and L3 terminals of the input contactor. Follow all national and local electrical codes. Use a three-phase line. Refer to the connection diagram located on the inside of the access panel cover for proper input voltage connection. Also see **Figure A.3**.

## INPUT WIRE AND FUSE SIZE

Fuse the input circuit with super lag fuses or delay type circuit breakers as recommended on the **Technical Specifications** page. Choose an input and grounding wire size according to local or national codes; also see the appropriate **Technical Specifications** page. Using fuses or circuit breakers smaller than recommended may result in “nuisance” shut-offs from welder inrush currents, even if you are not welding at high currents.

# INSTALLATION

## RECONNECT PROCEDURE

Multiple input voltage welders are shipped connected for the highest voltage listed on the machine's rating plate. Before installing the welder, be sure the reconnect panel is connected for the proper voltage.

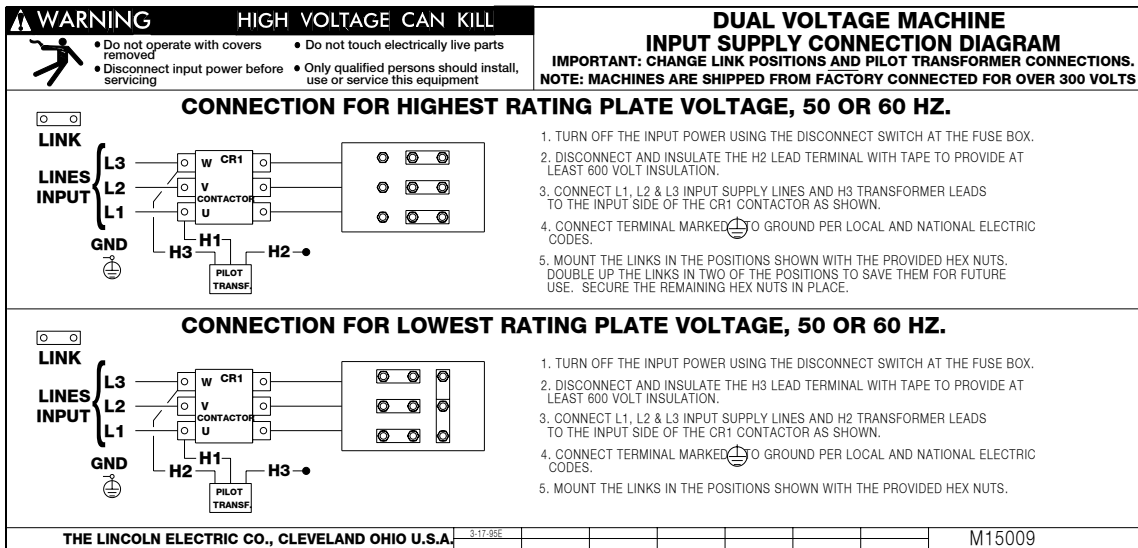
To reconnect a multiple voltage machine to a different voltage, remove input power. Follow the input connection diagram, located on the inside access panel cover, appropriate for your machine's input voltage. These same connection diagrams are shown below.

For 208, 208/230 & 230/460 volts AC - see Figure A.3.

### ⚠ CAUTION

Failure to follow these instructions can cause immediate failure of components in the welder.

FIGURE A.3 - INPUT CONNECTION DIAGRAM FOR 208, 208/230 and 230/460 VOLTS AC, 50/60 HZ



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# INSTALLATION

## OUTPUT CONNECTIONS (STICK, TIG, AIR/CARBON ARC CUTTING)

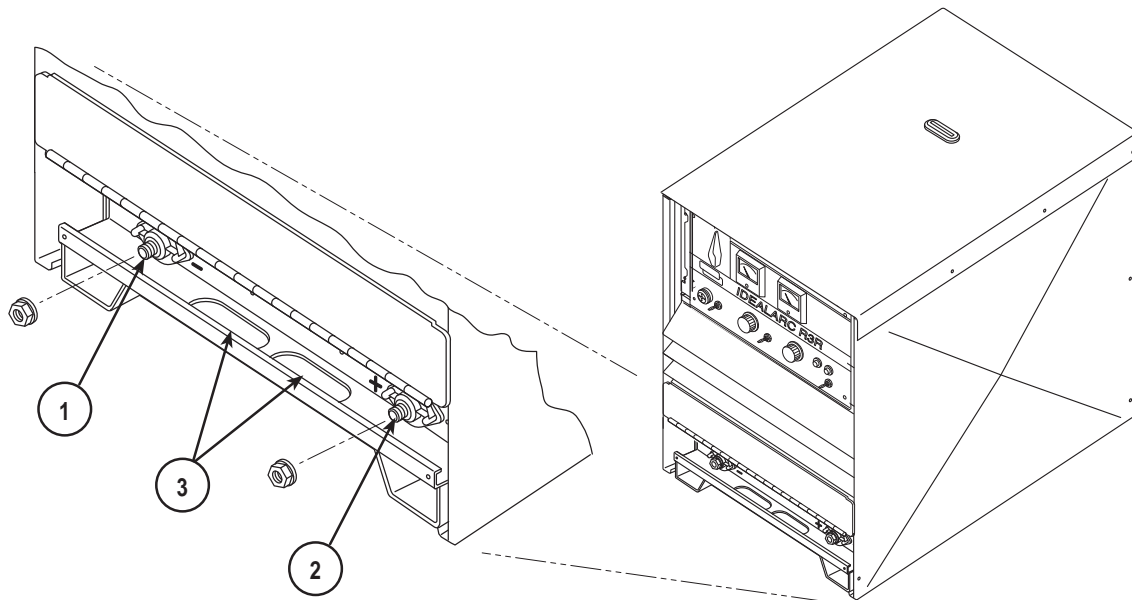
The output (welding) cables are connected to the output terminals marked “+” and “-”. See Table A.1 for recommended cable sizes for the combined lengths of electrode and work cables. The output terminals are located at the lower right and lower left corners of the front panel. Strain relief for the cables is provided by routing them through the rectangular holes in the base before connecting them to the output terminals. See Figure A.4.

NOTE: If the welder comes equipped with the polarity switch option, the output terminals are labeled “electrode” and “to work.”

### **⚠ WARNING**

The output terminals are energized at all times.

FIGURE A.4 - OUTPUT TERMINAL CONNECTIONS



1. NEGATIVE (-) WELDING CABLE CONNECTION
2. POSITIVE (+) WELDING CABLE CONNECTION
3. CABLE STRAIN RELIEF HOLES

TABLE A.1 - CABLE SIZES FOR COMBINED LENGTHS OF COPPER ELECTRODE AND WORK CABLES

Machine Size	Up to 100 ft (30 m)	100 - 150 ft (30 - 46 m)	150 - 200 ft (46 - 61 m)	200 - 250 ft (67 - 76 m)
<b>300 Amp (60% Duty Cycle)</b>	1/0 54 mm <sup>2</sup>	1/0 54 mm <sup>2</sup>	2/0 68 mm <sup>2</sup>	3/0 86 mm <sup>2</sup>
<b>400 Amp (60% Duty Cycle)</b>	2/0 68 mm <sup>2</sup>	2/0 68 mm <sup>2</sup>	3/0 86 mm <sup>2</sup>	4/0 108 mm <sup>2</sup>
<b>500 Amp (60% Duty Cycle)</b>	2/0 68 mm <sup>2</sup>	3/0 86 mm <sup>2</sup>	3/0 86 mm <sup>2</sup>	4/0 108 mm <sup>2</sup>

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## OPERATING INSTRUCTIONS

Read and understand this entire section of operating instructions before operating the machine.

## SAFETY INSTRUCTIONS

### **WARNING**



#### **ELECTRIC SHOCK can kill.**

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.



#### **FUMES AND GASES can be dangerous.**

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



#### **WELDING SPARKS can cause fire or explosion.**

- Keep flammable material away.
- Do not weld on containers that have held combustibles.



#### **ARC RAYS can burn.**

- Wear eye, ear, and body protection.

**Observe additional Safety Guidelines detailed in the beginning of this manual.**

# OPERATION

## GENERAL DESCRIPTION

The Idealarc® R3R is an SCR controlled constant current DC output power source for welding and cutting. The R3R-300 uses a single range potentiometer control. The R3R-400 and R3R-500 have separate low and high range controls. The welder's unique combination of 3 phase transformer, SCR/Diode bridge rectifier, arc control choke, and solid state control system deliver outstanding arc characteristics. For stick welding, an Arc Force Control enables the Idealarc®-R3R to create a soft welding arc for critical applications or a forceful driving arc for heavy duty applications.

## RECOMMENDED PROCESSES

The Idealarc® R3R is recommended for stick and DC TIG welding and air/carbon arc gouging.

## DESIGN FEATURES AND ADVANTAGES

- Input line voltage compensation keeps output constant for fluctuations of  $\pm 10\%$ .
- Hinged front control panel provides easy access to printed circuit boards and other control circuitry.
- Fully enclosed fan motor with permanently lubricated, sealed ball bearings needs no maintenance.
- Fully recessed control panel protects controls and minimizes accidental contact.
- Recessed output terminals reduces chance of accidental contact.
- Low profile case permits installation under a workbench.
- Removable rear access panel provides easy access to input contactor and input lead connections.
- Removable case sides provide easy access for service or inspection, even when machines are stacked.
- Dripproof enclosure design permits outdoor operation.
- Double-dipped transformer, SCR bridge, and choke resist corrosion.

## WELDING CAPABILITY

The Idealarc® R3R has the following duty cycle ratings. If the duty cycle is exceeded, a thermal protector will shut off the machine output until it cools to normal operating temperature. The amber thermal protection indicator light will turn on until the machine cools.

60% Duty Cycle*	Amps	Volts
R3R-300	300	32
R3R-400	400	36
R3R-500	500	40

\*Based on a 10 minute time period. For example, a 60% duty cycle means 6 minutes on and 4 minutes off.

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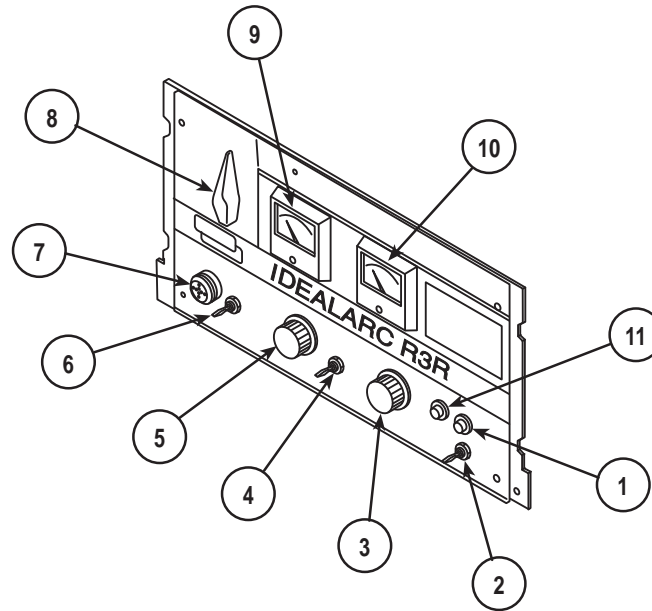


# OPERATION

## CONTROLS AND SETTINGS

All operator controls and settings are located on the case front assembly. See Figure B.1 for their locations.

FIGURE B.1 – CASE FRONT CONTROLS



- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Power Source Pilot Light</li> <li>2. ON/OFF Power Toggle Switch</li> <li>3. Arc Force Control</li> <li>4. Current Range Selector Switch (not on R3R-300)</li> <li>5. Output Control Potentiometer</li> <li>6. Output Control Switch (with R3R or Remote positions)</li> </ol> | <ol style="list-style-type: none"> <li>7. Remote Control Connections (6-pin amphenol or terminal strip)</li> <li>8. Polarity Switch (optional)</li> <li>9. DC Ammeter (optional)</li> <li>10. DC Voltmeter (optional)</li> <li>11. Thermal Protection Indicator Light</li> </ol> |
|---|--|

1. **POWER SOURCE PILOT LIGHT:** This light indicates that input power is applied to the R3R and that the on/off switch is in the ON position.
2. **ON/OFF POWER TOGGLE SWITCH:** Energizes or de-energizes the input contactor which is powered by the 115 volt auxiliary transformer. The switch turns the machine ON or OFF. Position "I" is ON; position "O" is OFF.
3. **ARC FORCE SELECTOR:** Allows you to select the ideal arc force according to the procedure and electrode being used for CC stick. It controls the amount of current added to the welding current when the electrode shorts to the work. At minimum setting, no extra short circuit current is added. The arc will be softer and have less spatter but may be more prone to sticking. At maximum setting, the arc will be more forceful and less prone to sticking but will produce more spatter. For TIG welding applications, this control should usually be set to minimum.
4. **CURRENT RANGE SELECTOR SWITCH (R3R-400 and R3R-500 only):** "A" position selects lower range current control. "B" position selects higher range current control.
5. **OUTPUT CONTROL SWITCH (R3R OR REMOTE POSITIONS):** Selects the mode of control. In the "R3R" position, control is by the machine control panel. In the "Remote" position, control is through an optional remote control device.
6. **OUTPUT CONTROL POTENTIOMETER:** Controls current.
7. **REMOTE CONTROL CONNECTION:** The 6-pin amphenol receptacle provides remote control connections. Machines below code 9500 use a terminal strip instead of the amphenol. A strain relief connector is provided for cable entry.

IDEALARC® R3R



# OPERATION

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8. **POLARITY SWITCH (optional):** Permits changing the electrode polarity of the output terminals between DC+ and DC-.
9. **DC AMMETER (optional):** Displays output current when welding.
10. **DC VOLTMETER (optional):** Displays output voltage.
11. **THERMAL PROTECTION INDICATOR LIGHT:**  
This amber light indicates that either of the two protective thermostats has opened. Output power is removed, but input power is still being applied to the machine.

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# OPERATION

## WELDING OPERATION

### OPERATING STEPS

#### LOCAL CONTROL

The following procedures are for using the Idealarc® R3R in the local (“R3R”) control mode of operation. For remote control of the machine, see the REMOTE CONTROL section.

Before operating the machine, make sure you have all materials needed to complete the job. Be sure you are familiar with and have taken all possible safety precautions before starting work. It is important that you follow these operating steps each time you use the machine.

1. Turn on the main AC input power to the machine.
2. Set the ELECTRODE POLARITY switch to the appropriate position (optional if equipped).
3. Set the OUTPUT CONTROL switch to “R3R.”
4. Set the ARC FORCE CONTROL to midrange, 5-6, for CC stick or TIG welding. Adjust for best characteristics as necessary.
5. Set the ON/OFF POWER toggle switch to the ON position (1).
  - The white power source pilot light glows.
  - The fan starts.
6. Set the CURRENT RANGE SELECTOR switch to the appropriate position (“A” for higher range, “B” for lower range).
7. Set OUTPUT CONTROL potentiometer to desired current.
8. Make the weld.

#### REMOTE CONTROL

The toggle switch on the control panel labeled “Output Control Remote” gives you the option of controlling the machine output from a remote location. In the “Remote” position a remote control device such as a K857 must be connected to the Idealarc® R3R. Refer to the **Accessories** section for available remote control information.

#### POCKET AMPTROL (Optional)

The pocket amptrol option provides a remote current control for the R3R welders. This “wireless” control requires no control cable connection to the welder. Use it as follows:

- a. On the R3R-400 and -500 the welder CURRENT CONTROL switch must be in the “Remote” position and the CURRENT RANGE SELECTOR switch in the “B” range. The R3R-300 does not have a CURRENT RANGE SELECTOR switch. With the CURRENT CONTROL switch in the “Remote” position, the OUTPUT CONTROL potentiometer on the welder is removed from the circuit and its setting has no effect on the output. With the CURRENT RANGE SELECTOR switch in the “B” range position, the pocket amptrol provides total control from minimum to maximum output of the welder.
- b. Turn the welder POWER switch ON.
- c. Insert one end of the probe into the electrode holder and hold the other end on the work for approximately five seconds.
- d. To change current, change the probe dial setting and repeat the five second procedure of placing the probe between electrode and work.

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

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# ACCESSORIES

## OPTIONS/ACCESSORIES

### FACTORY INSTALLED OPTIONS

#### POLARITY SWITCH

Permits changing polarity at the machine output terminals.

#### METERS

Ammeter and Voltmeter.

#### POCKET AMPTROL

Provides a wireless remote current control for R3R welders. See the *Operation* section for details.

### FIELD INSTALLED OPTIONS

The following options/accessories are available for your Idealarc® R3R from your local Lincoln Distributor.

**Remote Current Control (K857)** - Portable current control provides the same dial range as the current control on the welder. Consists of a 6-pin Amphenol connector which plugs into the remote control Amphenol.

**Accessory Kits (For R3R-300 and R3R-400)** - Consists of electrode and work cables, headshield, electrode holder and work clamp.

**R3R-300 - K703**

**R3R-400 - K704**

**Undercarriage (K817P)** - A mounting frame with wheels for hand moving.

**Undercarriage (K841)** - Platform undercarriage with mountings for two gas cylinders at rear of welder.

### TIG WELDING OPTIONS

**TIG Module (K930-2)** - Portable, high frequency unit with gas valve for TIG welding. Rated at 300 amps/60% duty cycle. (Request publication E3.205)

**Water Valve Kit (K844-1)** - For use with a water-cooled TIG torch. Controlled by the preflow and afterflow timers. Installs inside the TIG module.

**Amptrol™** - Provides 25 ft. (7.6m) of remote current control for TIG welding. (6 pin MS-type plug connection).

**Foot Amptrol - K870**

**Hand Amptrol - K963-1**

**Hand Amptrol - K963-2**

**Contact Kit (K938-1)** - For use with the TIG Module.

**Docking Kit (K939-1)** - Secures TIG Module on top of R3R machines, or any flat surface at least 10 in x 15 in (254mm x 381mm). Mounts using strong grip adhesive pad or fasteners. Includes latch and provisions for a user-supplied padlock.

**Control Cable (K936-3)** - Connects the TIG Module to the R3R machine (9 to 6 plus 115V plug).

**Control Cable Extensions** - Allows the TIG Module to be operated at distances up to 200 ft. (61m) from the power source. Two lengths are available: 22.5ft.(6.9m) or 45ft. (13.7m).

**22.5 ft. - K937-22.5**

**45 ft. - K937-45**

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# MAINTENANCE

## SAFETY PRECAUTIONS

### ⚠ WARNING



#### ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this maintenance.
  - Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

## ROUTINE AND PERIODIC MAINTENANCE

Perform the following daily:

1. Check that no combustible materials are around the machine or in the welding or cutting area.
2. Remove any debris, dust, dirt, or materials that could block cooling air flow to the machine.
3. Inspect the electrode cables for any slits or punctures in the cable jacket. Also check for any other condition that could affect the proper operation of the machine.

Perform periodically:

1. In extremely dusty conditions, dirt may clog the cooling air channels, causing the machine to run hot. Blow out the machine at regular intervals with low pressure air. Clean the following parts. See **Figure D.1**.
  - Main transformer and choke
  - SCR/diode bridge
  - Control PC board
  - Electrode and work cable connections
  - Fan assembly

**NOTE:** The fan motor has sealed bearings that require no service.

- Remote control terminal strip TS1 (in machines below code 9500).

**NOTE:** Keeping remote control terminal strip TS1 clean is especially important in damp locations.

2. Pocket Amptrol Maintenance - Clean and maintain the optional Pocket Amptrol (if equipped). Keep the probe tip in good condition. It requires sharp edges to penetrate heavy oxide coatings on the work piece. A blunted tip could result in different welding currents for a given dial setting.

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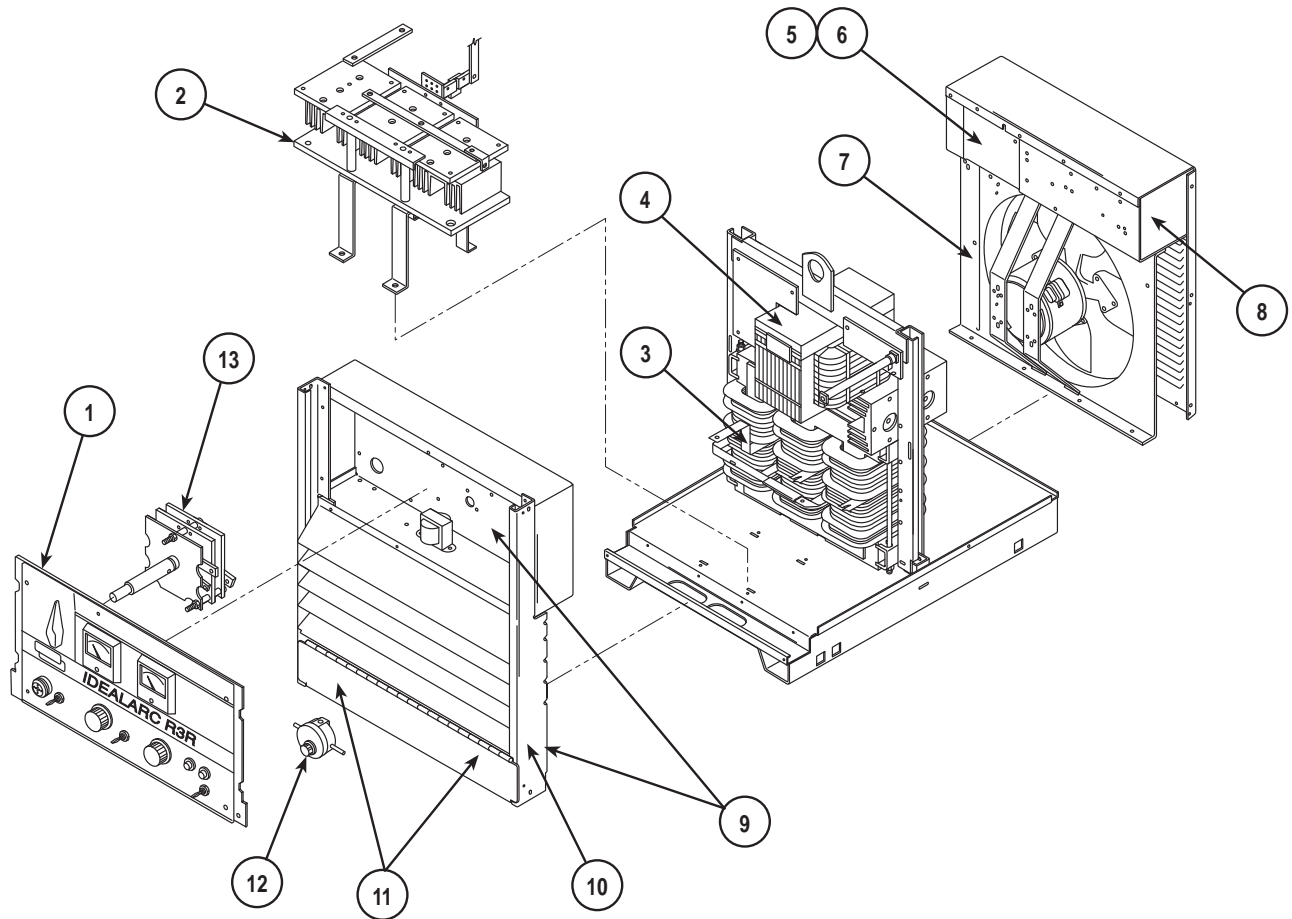
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# MAINTENANCE

## FIGURE D.1 – GENERAL COMPONENT LOCATIONS

1. CONTROL PANEL
2. SCR/DIODE BRIDGE
3. MAIN TRANSFORMER
4. CHOKE
5. RECONNECT PANEL (LOCATION)
6. INPUT CONTACTOR (LOCATION)
7. FAN ASSEMBLY
8. CONTROL TRANSFORMER (LOCATION)
9. PC BOARDS (LOCATION)
10. CASE FRONT
11. OUPUT TERMINALS  
(LOCATION BENEATH HINGED PANEL)
12. POCKET AMPPTROL (OPTIONAL)
13. POLARITY SWITCH (OPTIONAL)



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**LINCOLN**  
ELECTRIC

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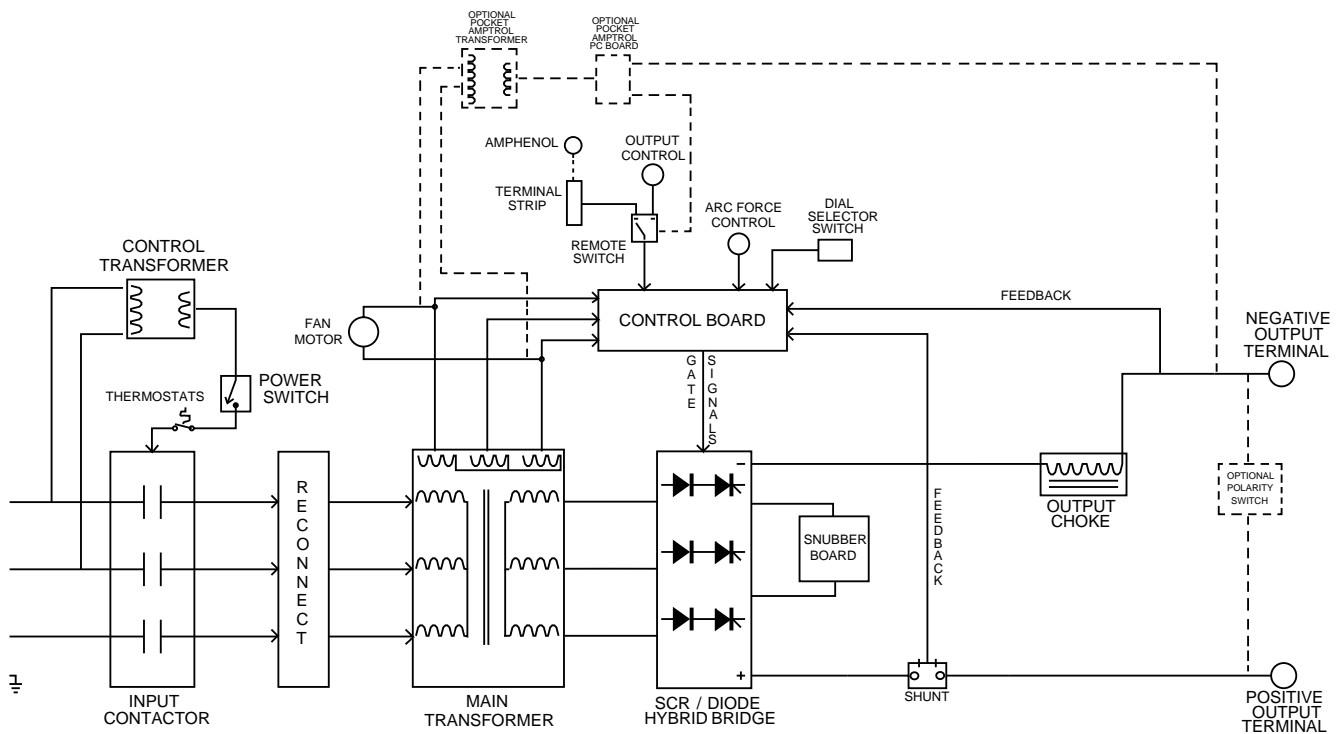


FIGURE E.1 – IDEALARC® R3R BLOCK LOGIC DIAGRAM

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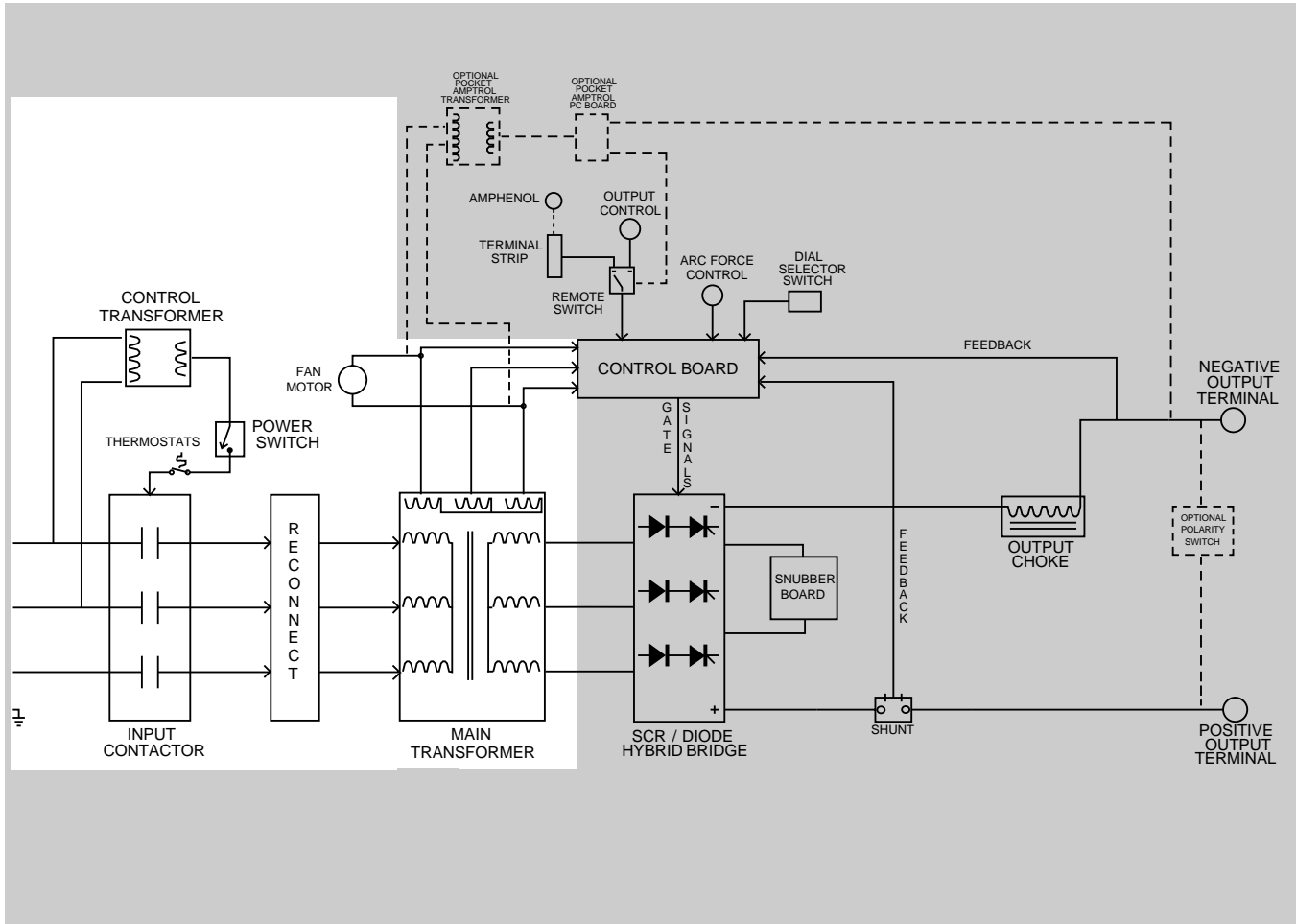
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# THEORY OF OPERATION

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



## GENERAL DESCRIPTION

The Idealarc® R3R welder is a three-phase transformer rectifier type constant current power source designed for DC manual welding and air carbon arc cutting. Its power system is SCR controlled with solid state electronic circuitry. Minimum to maximum output is obtained with a single potentiometer control.

## INPUT LINE VOLTAGE, CONTACTOR AND MAIN TRANSFORMER

The desired three-phase input power is connected to the R3R through an input contactor, located in the input box at the rear of the machine. Two phases of the input line are also connected to the primary of the control transformer. The secondary of the control transformer supplies 120VAC power, via the power switch and thermostats, to activate the input contactor.

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 lower voltage, higher current output. The finishes or “neutrals” of the main secondary coils are connected together, and the three starts of the secondary windings are connected to the rectifier bridge assembly. In addition, three 66VAC phase angle windings are housed in the main transformer assembly. These windings provide power and “timing” for the control board. Two of these coils provide 120VAC for the fan motor.

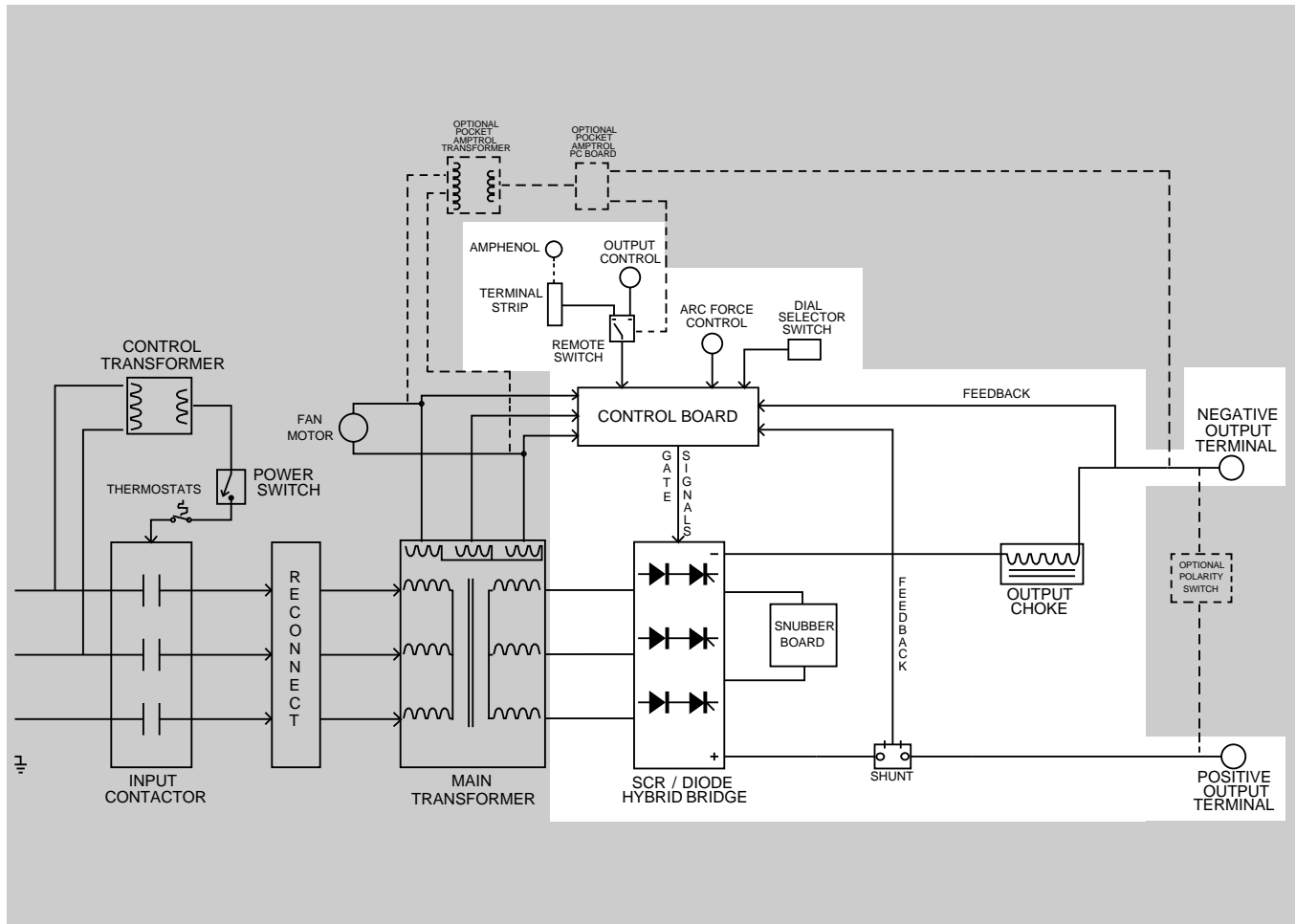
**NOTE:** Unshaded areas of Block Logic Diagram are the subject of discussion.

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



## OUTPUT RECTIFICATION, CONTROL, AND FEEDBACK

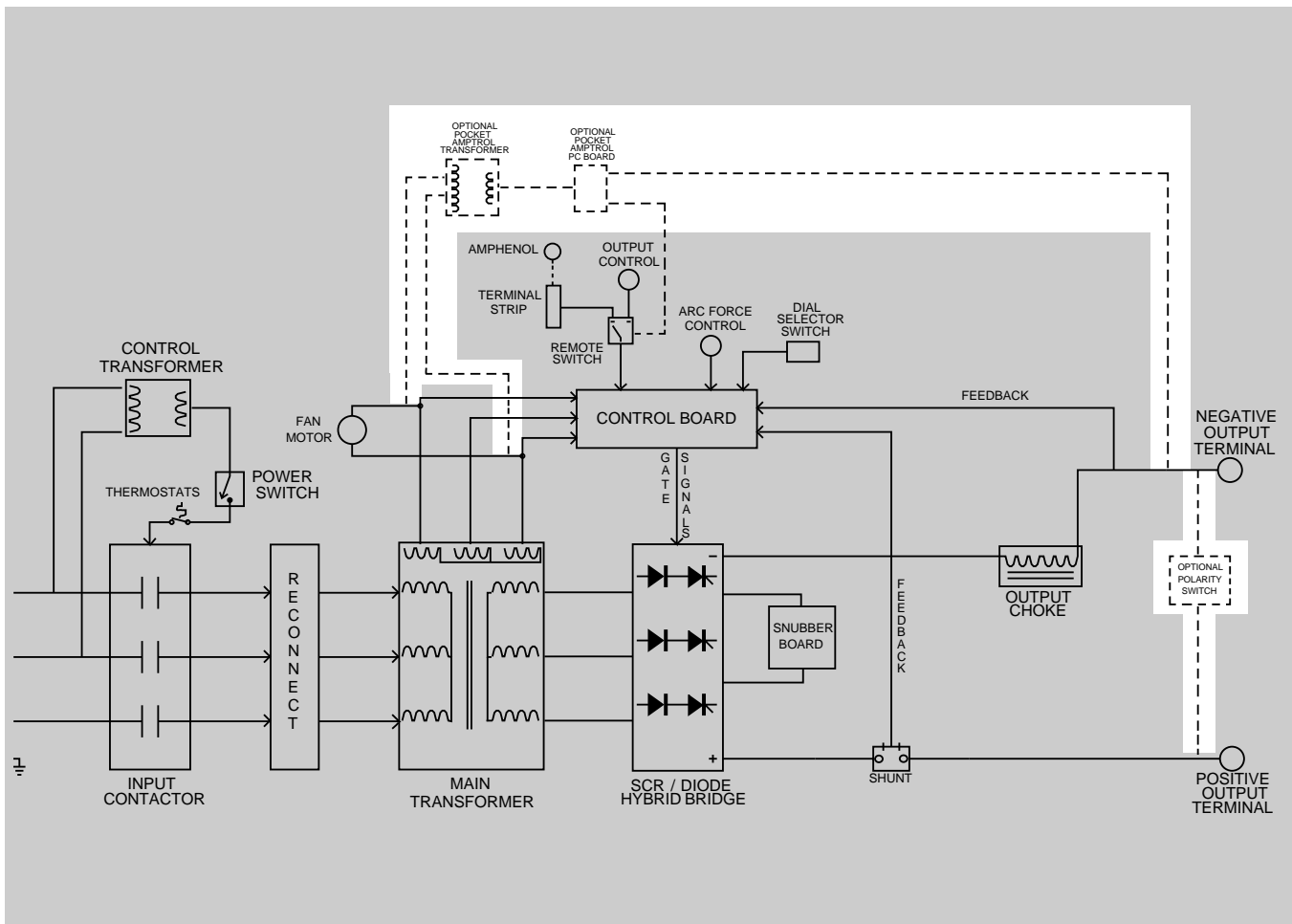
The three-phase AC output from the main transformer secondary is rectified and controlled through the SCR/diode bridge. Output current and voltage is sensed at the shunt and output terminals. This feedback information is processed in the control board. The control board compares the commands from Arc Force Control, the Dial Selector switch, and the Output Control (or remote control) with the feedback information and sends the appropriate gate firing signals to the SCR/diode bridge. This creates a DC voltage at the output of the bridge assembly. This DC voltage is applied through the output choke to the output terminals. The output choke, which is in series with the negative output terminal, stores energy and provides current filtering for the constant current welding arc.

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

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FIGURE E.4 – OPTIONAL POLARITY SWITCH AND POCKET AMPCTRL CIRCUITS



## OPTIONAL POLARITY SWITCH AND POCKET AMPCTRL CIRCUITS

The polarity switch permits changing the arc polarity at the output terminals of the R3R machine. This switch should not be changed while welding.

The Pocket Amptrol option provides the operator with “wireless” remote current control capabilities. The circuit is powered by the optional amptrol transformer, which has a 115VAC primary winding and a 24VAC tapped secondary winding. The control board receives command information from the voltage sensing network located on the positive output lead. This information is processed on the Pocket Amptrol PC board, and the current control signal is sent to the board.

## PROTECTIVE DEVICES AND CIRCUITS

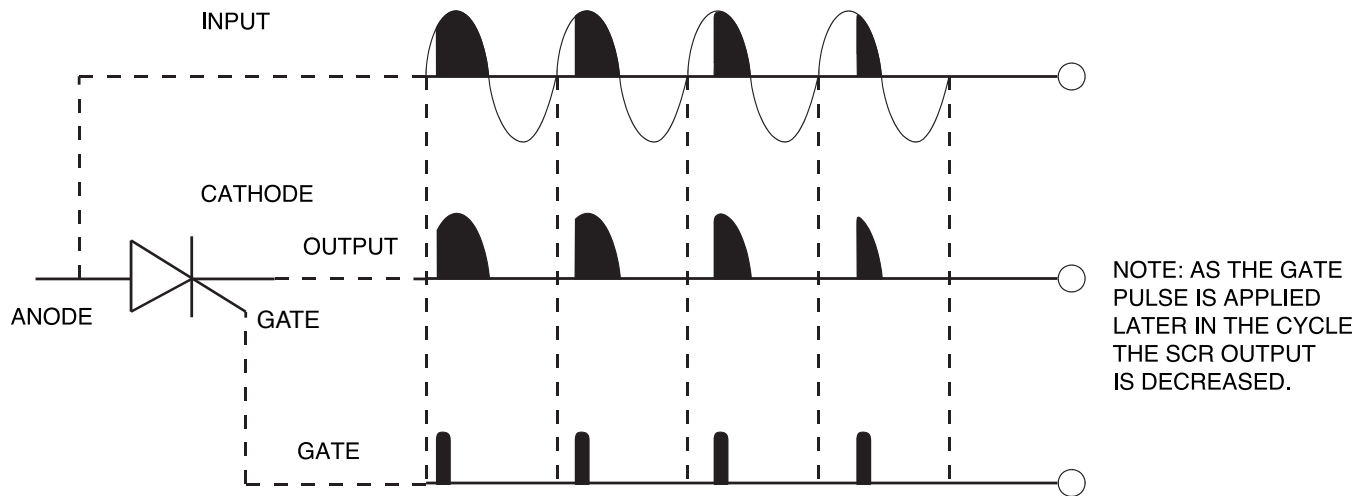
Two thermostats protect the R3R from excessive operating temperatures and overload conditions. Excess operating temperatures may be caused by insufficient cooling air or by operating the machine beyond the duty cycle and output rating. One thermostat is mounted on one of the main transformer secondary leads. The other is mounted on the choke assembly. These two thermostats are connected in series with the input contactor coil. If either of the thermostats opens, the input contactor will be de-energized and the main transformer will be removed from the input line. The amber High Temperature Light will turn on and the machine will remain inoperative until the thermostats cool and reset.

The R3R power sources are also protected against output current overloads. This overload protection circuit, located on the control board, will reduce the welding current to a safe level if the machine is overloaded for two or three seconds.

If the control leads are accidentally grounded or shorted to the case of the machine, the welding output will be low and no damage should occur to the control board circuitry.

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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 0.6V. Once the SCR has fired, it is not necessary to continue the flow of gate current. As long as current continues to flow from anode to cathode, the SCR will remain on. When the anode to cathode current drops below a minimum value, called holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave. If the SCR is turned on early in the positive half cycle, the conduction time is longer, resulting in greater SCR output. If the gate firing occurs later in the cycle, the conduction time is less, resulting in lower SCR output.

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**NOTE:** This manual is based primarily on the model R3R 500. Where tests or other procedures differ significantly for models R3R 300 and R3R 400, those differences are noted.

# TROUBLESHOOTING & REPAIR

## HOW TO USE TROUBLESHOOTING GUIDE

### WARNING

Service and repair should be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician 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 two main categories: Output 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. PERFORM COMPONENT TESTS.** 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 referred to 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 test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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## PC BOARD TROUBLESHOOTING PROCEDURES

**WARNING**

**ELECTRIC SHOCK  
can kill.**

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

**CAUTION**

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

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

**PC board can be damaged by static electricity.**

- 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.

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	<ol style="list-style-type: none"> <li>1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Contact the Lincoln Electric Service Department, 1-888-935-3877.</li> </ol>
Machine is dead – no output – no fan – no pilot light.	<ol style="list-style-type: none"> <li>1. Make sure that the input power switch is in the “ON” position.</li> <li>2. Check the three-phase input voltage at the machine. Input voltage must match the rating plate and the reconnect panel.</li> <li>3. Check for blown or missing fuses in the input lines.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the input power switch (S1) for proper operation. See the Wiring Diagram.</li> <li>2. Check the leads associated with the power switch (S1) and the control transformer (T2) for loose or faulty connections. See the Wiring Diagram.</li> <li>3. Perform the <b>Control Transformer Test</b>.</li> </ol>
The machine is dead - not output - no fan - the pilot light is on. The amber temperature light is NOT on.	<ol style="list-style-type: none"> <li>1. Check the three-phase voltage at the machine. Input voltage must match the rating plate and the reconnect panel.</li> <li>2. Check for blown or missing fuses in the input lines.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the proper <b>Input Contactor Test</b>.</li> <li>2. Check the associated leads for loose or faulty connections between the input contactor (CR1), the reconnect panel and the main transformer. See the Wiring Diagram.</li> <li>3. Perform the <b>Main Transformer Test</b>.</li> </ol>

**⚠ 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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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
The machine is dead – no output – no fan. The input contactor does not operate. The amber thermal protection light is on. The pilot light is on.	1. If the amber thermal protection light is on, the primary or secondary thermostat is open. Allow the machine to cool. Check the fan motor for proper operation. Make sure all case openings are free for proper circulation of air. Operate the machine at rated current and duty cycle.	1. Check the leads and connections between the thermostats, the input contactor (1CR) and the power switch (SW1). See the Wiring Diagram. 2. One of the (normally closed) thermostats may be faulty.
The input contactor (CR1) chatters.	1. Make certain the three-phase input voltage matches the rating plate and the reconnect panel.	1. Perform the proper <b>Input Contactor Test</b> .
The machine has high welding output and no control.	1. If the remote control is being used, set the output control switch (SW2) to the Machine or Local position and control the weld output with the machine Output Control (R1). If the problem is resolved, check the remote control unit and associated cable leads. If the Pocket Amptrol option is being used, the Pocket Amptrol circuit may be faulty.	1. Check the Output Control Switch (SW2) and the Dial Selector Switch (SW3) and associated wiring. See the Wiring Diagram. 2. Check the feedback leads #205, #206, #204 and #225 for loose or faulty connections. 3. Perform the <b>SCR/Diode Rectifier Bridge Test</b> . 4. If the Pocket Amptrol is not functioning properly, perform the <b>Pocket Amptrol Circuit Test</b> . 5. The control board may be faulty. Replace.

**⚠ CAUTION**

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

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# TROUBLESHOOTING & REPAIR

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The machine has minimum (or very low) welding output and no control.</p>	<ol style="list-style-type: none"> <li>1. Make certain the three-phase input voltage is correct and matches the rating plate and the reconnect panel.</li> <li>2. Make certain the Dial Control Switch (SW3) is in the correct position. (Not present on R3R 300).</li> <li>3. If the remote control is being used, set the Output Control Switch (SW2) to the Machine or Local position and control the weld output with the machine Output Control (R1). If the problem is resolved, check the remote control unit and associated cable leads. If the Pocket Amptrol option is being used, the Pocket Amptrol circuit may be faulty.</li> <li>4. Make sure the remote control leads (#75, #76, #77) are not grounded or shorted to the positive or negative welding output.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the Output Control (R1) and associated wiring. See the Wiring Diagram.</li> <li>2. Check the Output Control Switch (S2) and associated wiring. See the Wiring Diagram.</li> <li>3. Perform the <b>Main Transformer Test</b>.</li> <li>4. Perform the <b>SCR/Diode Rectifier Bridge Test</b>.</li> <li>5. If the Pocket Amptrol is not functioning properly, perform the <b>Pocket Amptrol Circuit Test</b>.</li> <li>6. The control board may be faulty. Replace.</li> </ol>
<p>The input contactor operates - the fan runs - the pilot light is on - but the machine has no welding output. The open circuit voltage is not present at the output terminals.</p>	<ol style="list-style-type: none"> <li>1. Make certain the output control switch (SW2) is in the Machine or Local position. If the problem is resolved, check the remote control and associated circuitry. See the Wiring Diagram.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for loose or faulty connections on the heavy current carrying leads between the output terminals, the shunt, the choke and the SRC/Diode Bridge. See the Wiring Diagram.</li> <li>2. Perform the <b>SCR/Diode Rectifier Bridge Test</b>.</li> <li>3. Perform the <b>Main Transformer Test</b>.</li> <li>4. The control board may be faulty. Replace.</li> </ol>

**⚠ 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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## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The machine does not have maximum output.</p>	<ol style="list-style-type: none"> <li>1. Make sure the correct three-phase input voltage is being applied to the machine.</li> <li>2. Make certain the Dial Control Switch (SW3) is in the correct position. (Not present on R3R 300).</li> <li>3. If the remote control is being used, set the Output Control Switch (SW2) to the Machine or Local position and control the weld output with the machine Output Control (R1). If the problem is resolved, check the remote control unit and associated cable leads. If the Pocket Amptrol option is being used, the Pocket Amptrol circuit may be faulty.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the Output Control (R1). Normal resistance is 10,000 ohms. Also check associated wiring for loose or faulty connections. See the Wiring Diagram.</li> <li>2. Check the Output Control Switch (S2) and associated wiring. See the Wiring Diagram.</li> <li>3. Perform the <b>Main Transformer Test</b>.</li> <li>4. Perform the <b>SCR/Diode Bridge Rectifier Test</b>.</li> <li>5. If the Pocket Amptrol is not functioning properly, perform the <b>Pocket Amptrol Circuit Test</b>.</li> <li>6. The control board may be faulty. Replace.</li> </ol>
<p>The machine will not shut off when the power switch is put in the OFF position.</p>	<ol style="list-style-type: none"> <li>1. Make sure the three-phase input lines are connected correctly to the R3R machine.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the Input Power Switch (S1) and associated leads. See the Wiring Diagram.</li> <li>2. Perform the proper <b>Input Contactor Test</b>.</li> </ol>

**⚠ 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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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The output terminals are always electrically "hot."	1. This is a normal condition. The open circuit voltage should be approximately 67VDC. The open circuit voltage may vary with the input line voltage.	
The machine welds but reduces to a low output under load and remains there until the load is removed and the arc re-started.	1. Operating the machine beyond the current rating will cause the overload protection circuit on the control board to phase-back the machine to a low output.	<ol style="list-style-type: none"> <li>1. Check the output shunt for loose or faulty connections.</li> <li>2. The output shunt may be faulty. Replace.</li> <li>3. The control board may be faulty. Replace.</li> </ol>
The machine shuts off even when not under load or makes excessive noise like it is loaded.	1. Make sure the fan motor and blades are operating properly.	<ol style="list-style-type: none"> <li>1. Perform the <b>SCR/Diode Rectifier Bridge Test.</b></li> <li>2. Perform the <b>Main Transformer Test.</b></li> <li>3. Check the latching resistor R3. Normal resistance is 40 ohms.</li> </ol>

⚠ 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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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>WELDING PROBLEMS</b>		
<p>Poor arc characteristics.</p>	<ol style="list-style-type: none"> <li>1. Make sure the correct weld procedures are being used. (Electrode, Polarity, etc.)</li> <li>2. Check the welding cables for loose or faulty connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>SCR/Diode Rectifier Bridge Test</b>.</li> <li>2. Perform the <b>Main Transformer Test</b>.</li> <li>3. The control board may be faulty. Replace.</li> </ol>
<p>The welding arc is variable and sluggish.</p>	<ol style="list-style-type: none"> <li>1. Check the input voltage at the R3R, making sure the correct voltage and all three phases are being applied to the machine.</li> <li>2. Make sure the welding process is correct for the machine settings.</li> <li>3. Check the welding cables for loose or faulty connections. Also make sure the cables are sized correctly for the welding current.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>SCR/Diode Rectifier Bridge Test</b>.</li> <li>2. Perform the <b>Main Transformer Test</b>.</li> <li>3. The control board may be faulty. Replace.</li> </ol>

**⚠ 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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# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR TEST (FOR MODELS EQUIPPED WITH AC COIL ON INPUT CONTACTOR)

### **WARNING**

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

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

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### DESCRIPTION

This test will help determine if the input contactor is receiving the correct AC coil voltage and if the contacts are functioning correctly.

### MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)  
5/16" Nut driver  
IDEALARC® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)  
External 120VAC supply

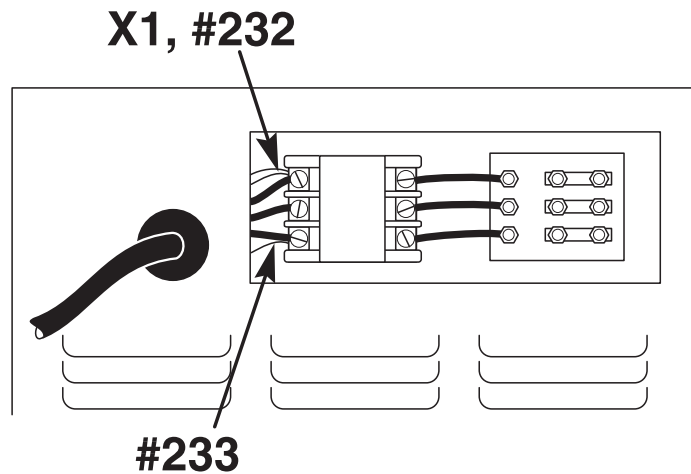
This procedure takes approximately 20 minutes to perform.

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## INPUT CONTACTOR TEST (continued)

FIGURE F.1 – AC COIL INPUT CONTACTOR CONNECTIONS



## TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and the reconnect panel cover.
3. Locate the two leads connected to the input contactor coil, #233 and X1 #232 (top). See Figure F.1 for location.
4. Connect an AC voltmeter to the leads.
5. Apply the correct voltage to the machine and turn the power switch (S1) ON.
6. Check for 120VAC at the contactor coil leads.

If the 120VAC is NOT present, with the power switch (S1) on, check the power switch (S1), thermostat, and associated circuitry. See the **Wiring Diagram**. Also perform the **Control Transformer (T2) Voltage Test**.

If the 120VAC is present and the contactor does NOT activate, then the input contactor is faulty. Replace the input contactor.

**⚠ WARNING**

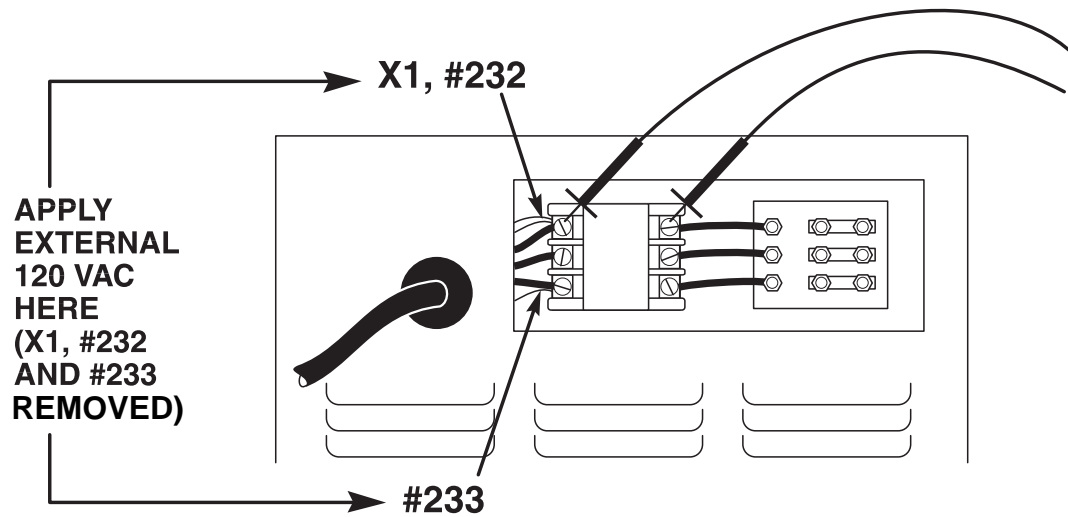
**Electric Shock can kill.**



- With the input power on, there are high voltages inside the machine. Do not reach into the machine or touch any internal part of the machine while the power is on.

## INPUT CONTACTOR TEST (continued)

FIGURE F.2 – AC COIL INPUT CONTACTOR TEST POINT LOCATIONS



### TEST FOR CONTACTOR CONTINUITY

1. Disconnect the main input supply power to the machine.
2. Remove the three leads connected to the input contactor coil, #233 and X1/#232. See Figure F.2 for location.
3. Using the external 120VAC supply, apply 120VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace the input contactor.
4. With the contactor activated, check the continuity across the contacts. (Zero ohms or very low resistance is normal.) See Figure F.2. If the resistance is high, the input contactor is faulty. Replace the input contactor.
5. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty. Replace the input contactor.

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# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR TEST (FOR R3R 300 EQUIPPED WITH DC COIL ON INPUT CONTACTOR)

### **WARNING**

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

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

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### DESCRIPTION

This test will help determine if the input contactor is receiving the correct DC coil voltage and if the contacts are functioning correctly.

### MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)  
5/16" Nut driver  
IDEALARC® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)  
External 120VDC supply

This procedure takes approximately 20 minutes to perform.

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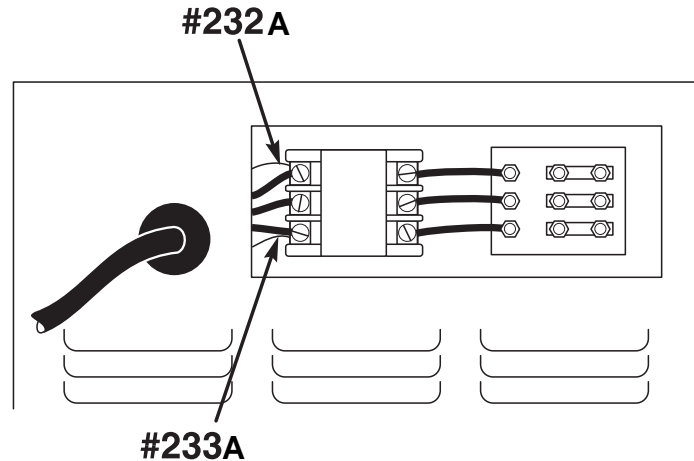


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# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR TEST *(continued)*

FIGURE F.3 – DC COIL INPUT CONTACTOR CONNECTIONS



### TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16" nutdriver, remove the case top and the reconnect panel cover.
3. Locate the two leads connected to the input contactor coil, #233A and #232A. See Figure F.3.
4. Connect a DC voltmeter to the leads.
5. Apply the correct voltage to the machine and turn the power switch (S1) ON.
6. Check for approximately 120VDC at the contactor coil leads. If the 120VDC IS present at the contactor coil, the input contactor should activate. If it does not, the input contactor may be faulty. Check or replace.

If the 120VDC is NOT present, check for 120VAC at leads #233 and #232 at diode bridge D8. See the Wiring Diagram. If the AC voltage IS present but the DC voltage is low or not present, the diode bridge may be faulty. Check or replace.

If the 120VAC is NOT present at leads #232 and #233, with the power switch (S1) on, check the power switch, thermostats, and associated circuitry. See the Wiring Diagram.

### **⚠ WARNING**

#### Electric Shock can kill.

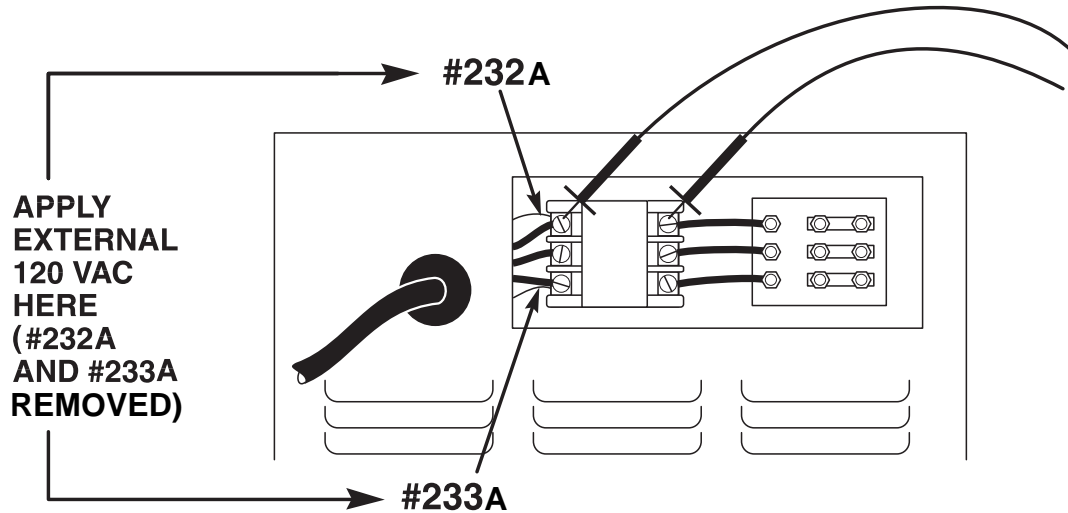


- With the input power on, there are high voltages inside the machine. Do not reach into the machine or touch any internal part of the machine while the power is on.

# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR TEST (continued)

FIGURE F.4 – DC COIL INPUT CONTACTOR TEST POINT LOCATIONS



### TEST FOR CONTACT CONTINUITY

1. Disconnect the main input supply power to the R3R machine.
2. Remove the two leads connected to the input contactor coil, #232A and #233A.
3. Using the external 120VDC supply, apply 120VDC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace the input contactor.
4. With the contactor activated, check the continuity across the contacts. (Zero ohms or very low resistance is normal). See Figure F.4. If the resistance is high, the input contactor is faulty. Replace.
5. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty. Replace the input contactor.

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# TROUBLESHOOTING & REPAIR

## CONTROL TRANSFORMER (T2) VOLTAGE TEST

### **WARNING**

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

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

### **DESCRIPTION**

This test will determine if the correct voltage is being applied to the primary of the control transformer and induced on the secondary winding of the control transformer.

### **MATERIALS NEEDED**

Volt/Ohmmeter (Multimeter)  
5/16" Nut driver  
IDEALARC® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)

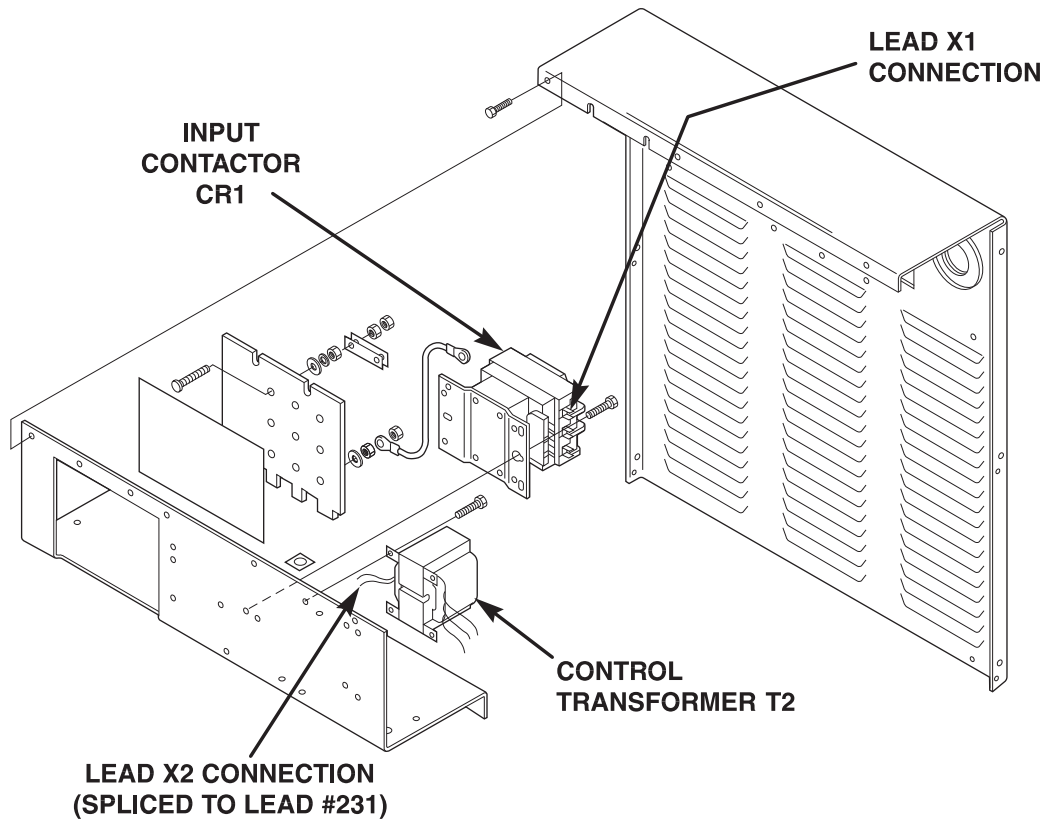
This procedure takes approximately 17 minutes to perform.

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## CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

FIGURE F.5 – CONTROL TRANSFORMER AND LEAD LOCATIONS



### TEST PROCEDURE

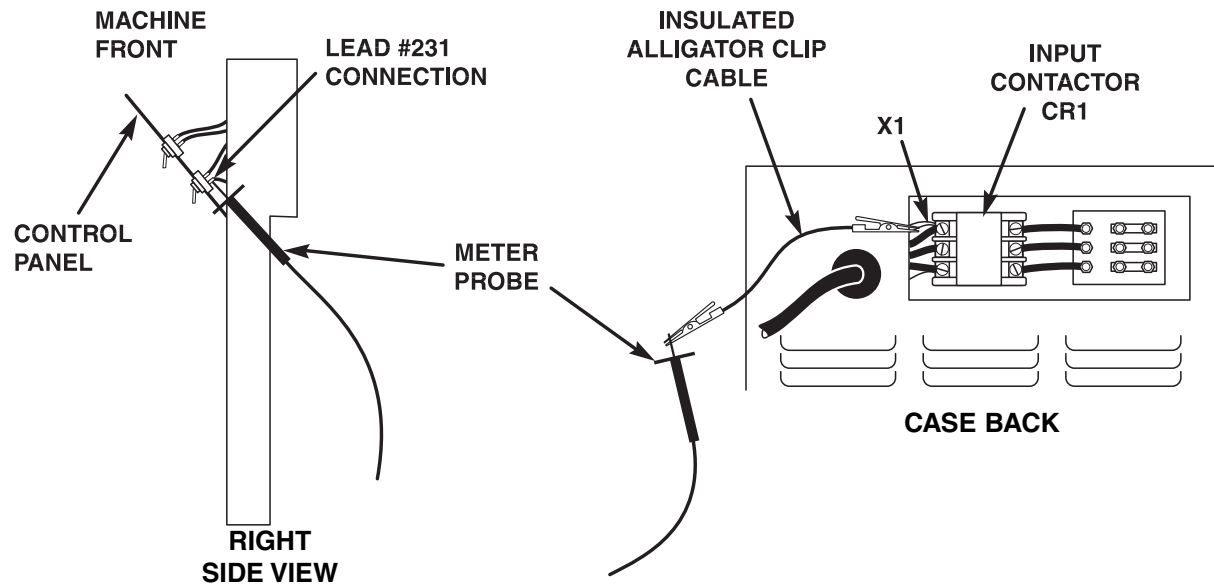
1. Disconnect the main input supply power to the machine.
2. With the 5/16" nut driver, remove the top, case sides, and lower the front control panel.
3. Locate the control transformer (T2) on the left side of the input box (facing the back of the machine). See Figure F.5.
4. Locate the control transformer primary leads (H1, H2, H3, etc.). See the Wiring Diagram.
5. Locate control transformer leads X1 (top) and X2.
  - a. Lead X1 is connected to the input contactor (CR1) coil located on the input side of the contactor. See Figure F.5.
  - b. Lead X2 is spliced into lead #231. See the Wiring Diagram. Lead #231 is connected to the power switch (S1). (Tilt the front panel forward to access the power switch and Lead #231 connection. **See Figure F.6.**)

**NOTE:** Unused leads should be taped.

- a. Inspect for broken or incorrect connections.

## CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

FIGURE F.6 – CONTROL TRANSFORMER X1 AND X2 TEST CONNECTIONS



6. Test for 115VAC between leads X1 and #231.
 

**NOTE:** If the main AC input supply voltage varies, the control transformer voltage will vary by the same percentage.

  - a. Connect one end of an insulated alligator clip to the X1 connection at the input contactor (CR1) coil. See Figure F.6.
  - b. Connect the other end of the alligator clip to one of the meter probes. Be sure that neither the alligator clip nor the meter probe touches any metal surfaces.
  - c. Connect the other meter probe to the #231 connection at the power switch. See Figure F.6.
  - d. Apply input power to the R3R.
7. Read the meter for 115VAC.
  - a. If 115VAC is present, the control transformer is functioning properly.
  - b. If 115VAC is NOT present, go to Step 8.
8. If 115VAC is not present between leads X1 and #231, check the spliced connection between #231 and X2. Test for correct main input supply power to the control transformer primary windings (H1, H2, H3, etc.). Check the main input supply power hookup to the machine. See the Wiring Diagram.
  - a. If the correct main input supply power to the control transformer primary windings is present AND the secondary voltage is not correct, the control transformer may be faulty. Replace.

# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER (T1) VOLTAGE TEST

### WARNING

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

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

### DESCRIPTION

This test will determine if the correct voltages are being applied to the primary windings of the Main Transformer (T1) and induced on the secondary winding, auxiliary windings, and phase angle windings.

### MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)  
5/16" Nut driver  
IDEALARC® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)

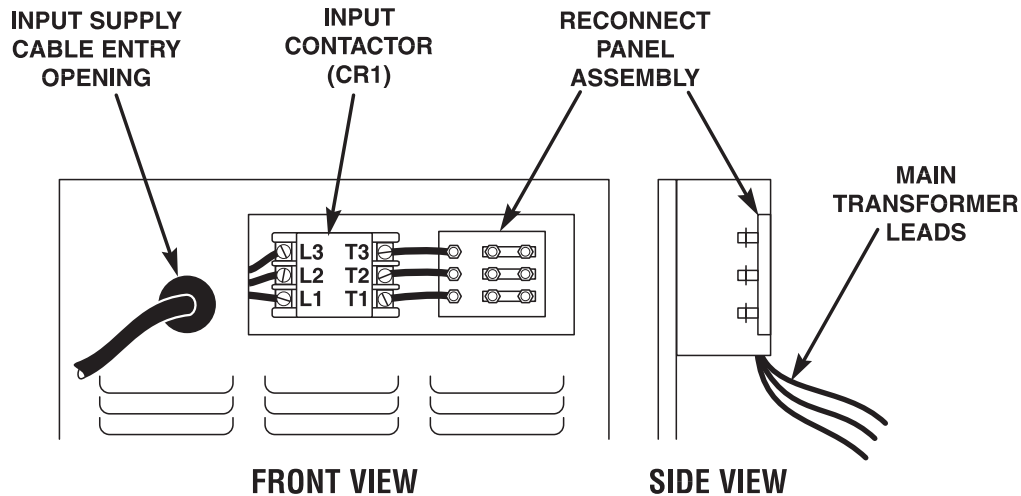
This procedure takes approximately 25 minutes to perform.

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## MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.7 – INPUT CONTACTOR, RECONNECT PANEL, AND PRIMARY LEADS TO MAIN TRANSFORMER LOCATIONS



### TEST PROCEDURE

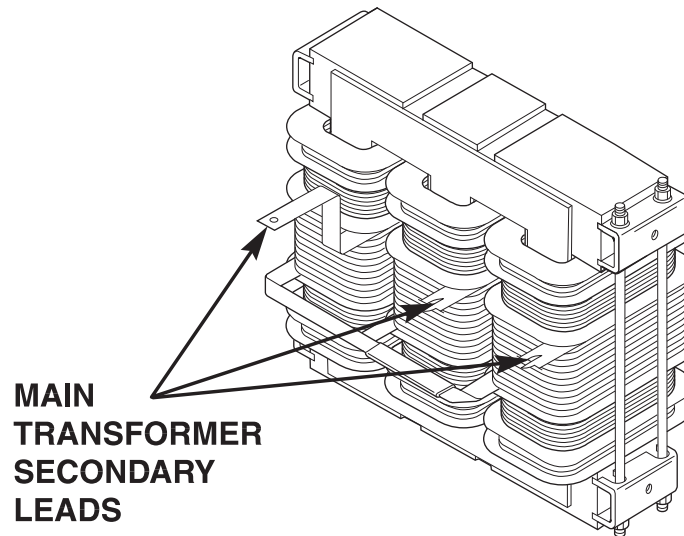
1. Set the ON/OFF power switch to OFF.
2. Disconnect main input supply power from the machine.
3. With the 5/16" nut driver, remove the case top and sides and the reconnect panel cover.
4. Inspect the input contactor, reconnect panel, and primary leads to the main transformer for loose or faulty connections. See Figure F.7.
  - a. Confirm that the reconnect panel is connected properly for the three-phase main input supply power supplied to the machine. See the reconnect panel connection diagram located on the inside of the input box assembly access door.
5. Connect main input supply power to the machine.
6. Set the ON/OFF power switch to ON.
  - a. Make sure the input contactor (CR1) energizes and the fan runs.
7. Test with an AC voltmeter for proper main input supply voltage to the line side of the input contactor (CR1). See the Wiring Diagram.
  - a. L1 to L2.
  - b. L2 to L3.
  - c. L1 to L3.



# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.8 – MAIN SECONDARY LEAD TEST POINTS



8. Read the meter.
  - a. If proper voltage is present for all three phases, proper main input supply voltage is being supplied.
  - b. If proper voltage is not present in any or all of the three phases, check input fuses and leads.
9. Test with an AC voltmeter for proper main input supply voltage from the output side of the input contactor (CR1). See the Wiring Diagram and **Figure F.7**.
  - a. T1 to T2.
  - b. T2 to T3.
  - c. T1 to T3.
10. Read the meter.
  - a. If the proper voltage is present for all three phases, the input contactor is working properly.
  - b. If the proper voltage is not present for any or all of the three phases, the input contactor may be faulty. See appropriate Input Contactor Test.
11. Test with an AC voltmeter for approximately 50VAC across each of the three main secondary start leads located at the SCR/Diode Rectifier Bridge. Remove the red insulating paint to achieve good contact if necessary. The transformer voltages will vary with the input line voltages. See Figure F.8. See the Wiring Diagram.
  - a. If one or more of the above voltage tests are incorrect, check for loose or faulty connections.
  - b. If the connections are good, then the main transformer may be faulty. Replace the main transformer.

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# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

### PHASE ANGLE WINDING TEST

12. Test with an AC voltmeter for approximately 66VAC at each phase winding. Test leads #201, #202, #203, and #204 per **Table F.1**.

For control board #G2206, see **Figure F.9** for lead locations.

For control board #G1575, see **Figure F.10** for lead locations.

**NOTE:** If the main input supply voltage varies, the main transformer voltages will vary proportionately.

- a. If the voltage is low, remove the plug or leads and recheck the voltage for 66VAC. If the reading is normal, the control board may be faulty. Replace the control board.
- b. If one or more of the voltage tests are incorrect, check for loose or faulty wiring.
- c. If the wiring is good, then the main transformer may be faulty. Replace the main transformer.

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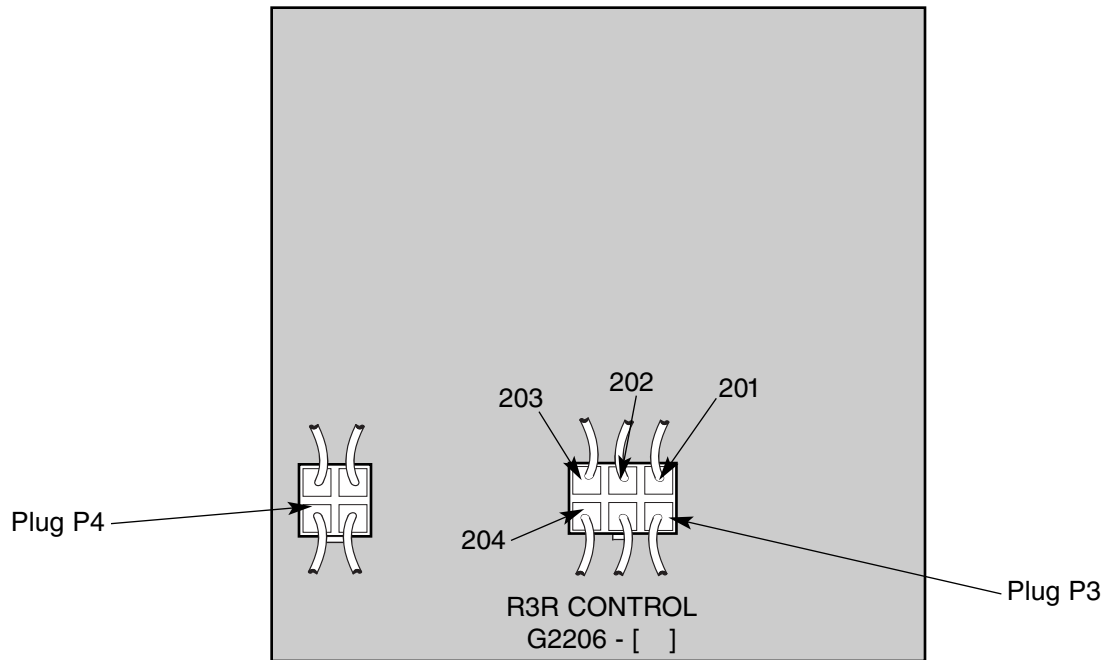
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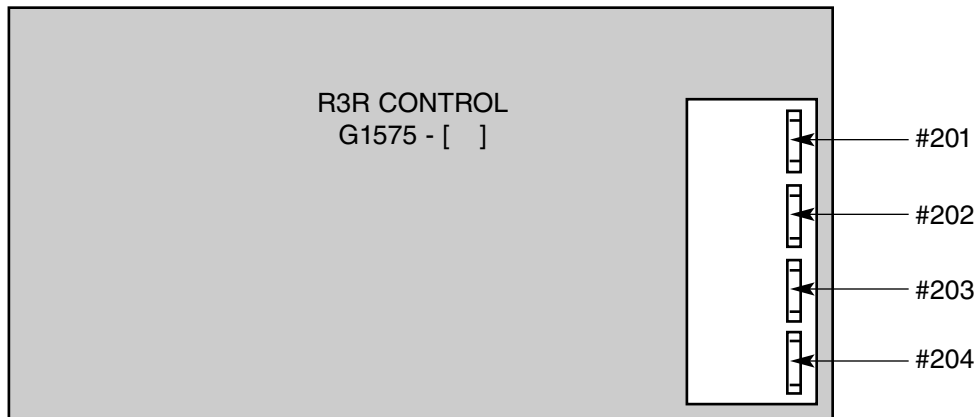
# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

**FIGURE F.9 – CONTROL BOARD G2206 - [ ] TEST POINTS**



**FIGURE F.10 – CONTROL BOARD G1575 - [ ] TEST POINTS**



**TABLE F.1 – PHASE ANGLE WINDING VOLTAGES**

From Lead #	To Lead #	Expected VAC
201	204	66 VAC
202	204	66 VAC
203	204	66 VAC

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Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## STATIC SCR/DIODE RECTIFIER BRIDGE TEST

### WARNING

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

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

### DESCRIPTION

This test will help determine if an SCR or diode is shorted or "leaky." See the Machine Waveform Section of this manual for normal and abnormal output waveforms.

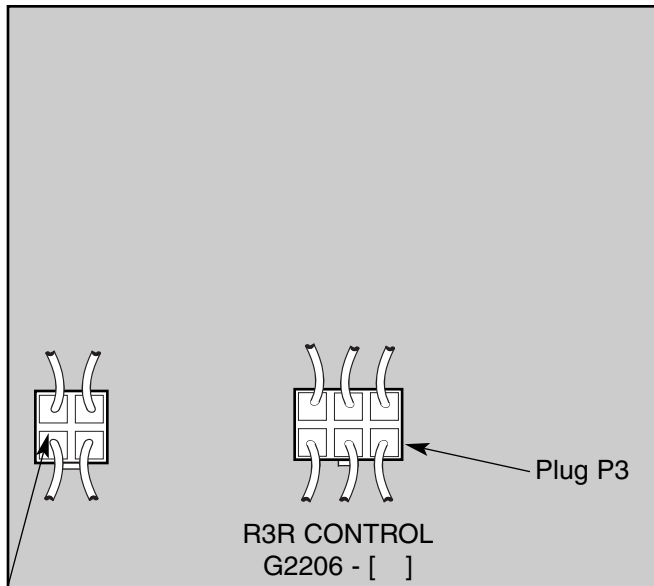
### MATERIALS NEEDED

- Analog Volt/Ohmmeter (Multimeter)
- 5/16" Nut driver
- Idealarc® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)

This procedure takes approximately 20 minutes to perform.

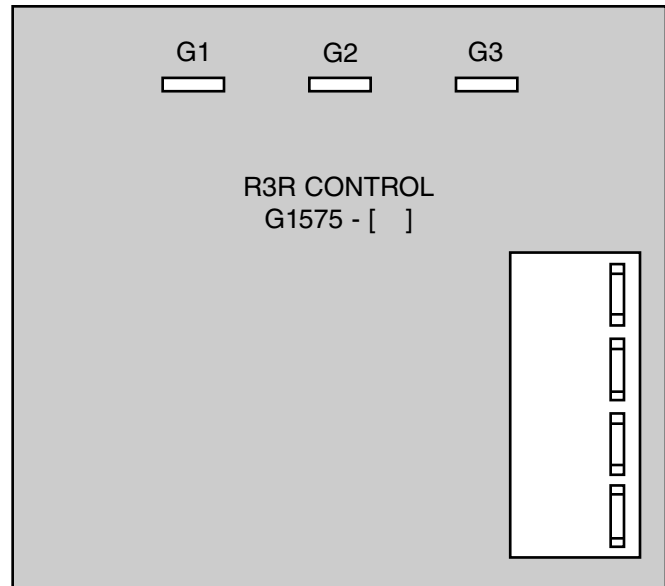
## STATIC SCR/DIODE RECTIFIER BRIDGE TEST (continued)

FIGURE F.11 – CONTROL BOARD  
G2206 PLUG P4 LOCATION



Plug P4 (Removed)

FIGURE F.12 – CONTROL BOARD  
G1575 LEAD LOCATIONS



### TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides and lower the front panel.
3. Disconnect the welding cables from the welding output terminals.
4. Disconnect molex plug P4 from control board G2206. See Figure F.11. If the machine has control board G1575, disconnect the individual gate leads G1, G2, G3, and also lead #204. See Figure F.12.
5. Locate and remove molex plug P5 from snubber board M15370. **See Figure F.13.** If the machine has snubber board M14215, label and disconnect Lead #204 from the output shunt. **Be sure to disconnect the #204 lead that runs between the snubber board and the output shunt.**
6. Locate and remove lead #204 from resistor R3 (40 ohms, 50 watts). See **Figure F.14.** On R3 reassembly, resolder this lead.

# TROUBLESHOOTING & REPAIR

## STATIC SCR/DIODE RECTIFIER BRIDGE TEST *(continued)*

FIGURE F.13 – SNUBBER BOARD M15370 PLUG P5 LOCATION

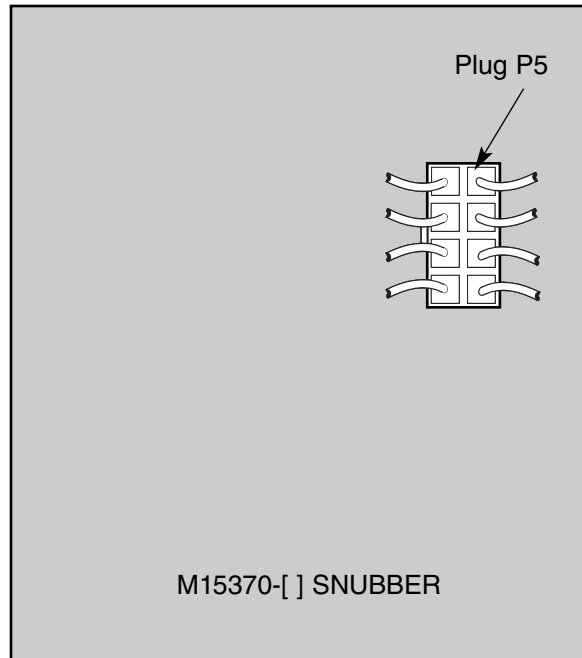
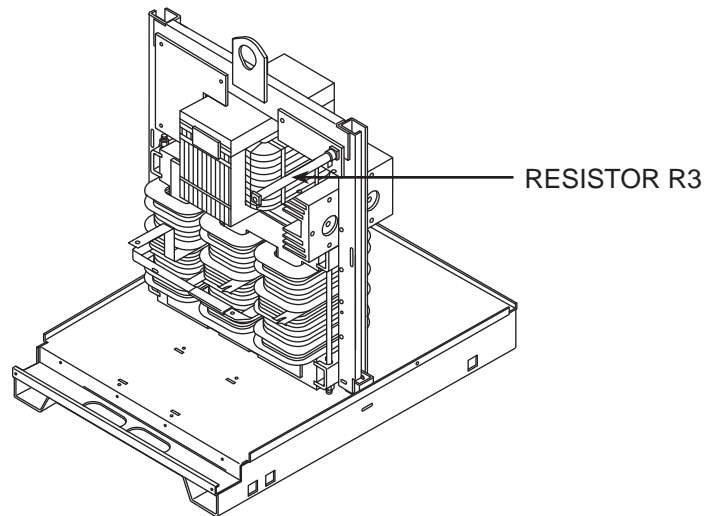


FIGURE F.14 – RESISTOR R3 LOCATION



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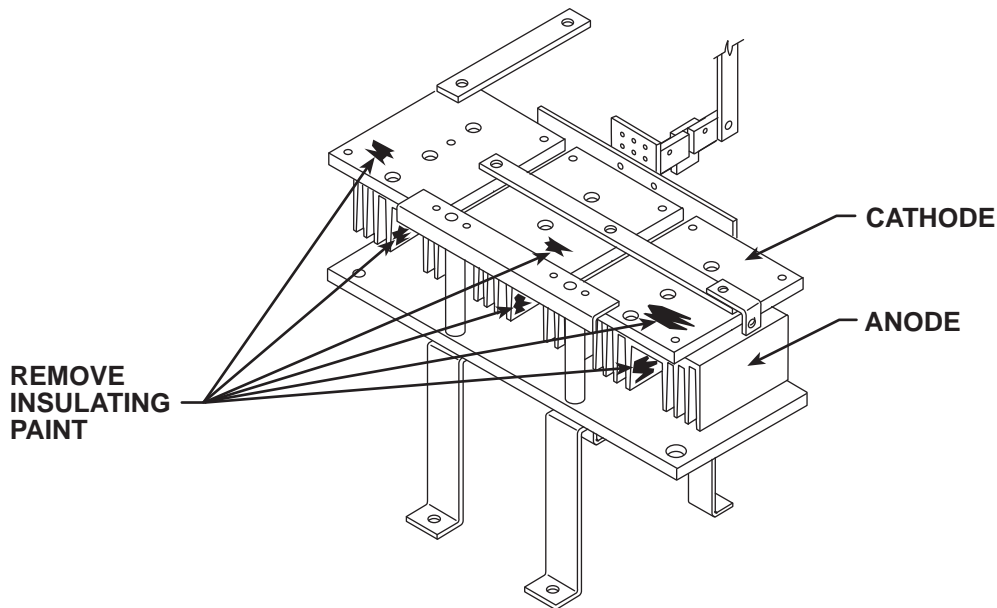
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## STATIC SCR/DIODE RECTIFIER BRIDGE TEST *(continued)*

FIGURE F.15 – HEAT SINK AND SCR TEST POINTS



7. Remove the red insulating paint from the heat sink test points. See Figure F.15.
 

**NOTE:** Do not disassemble the heat sink.
8. Measure the resistance from the anode to the cathode of SCR 1 using an analog volt/ohmmeter (multimeter) set at R x 1000 scale. See Figure F.15.
  - a. Reverse the meter leads and measure the resistance from the cathode to the anode of SCR 1. See Figure F.15.
  - b. If a low resistance is measured in either meter polarity, SCR1 is faulty. Replace SCR 1.
9. Test the resistance of SCR 2 and SCR 3 using the same procedure described in Step 8.
10. Measure the resistance of diode D1 from anode (+probe) to cathode (-probe) using an analog ohmmeter set at R x 1000 scale. The resistance should be low. See Figure F.15.
  - a. Reverse the meter leads and measure the resistance from cathode (+probe) to anode (-probe) of diode D1. The resistance should be high. See Figure F.15.
  - b. If a low resistance is measured in both meter polarities, diode D1 is shorted. Replace diode D1.
  - c. If a high resistance is measured in both meter polarities, diode D1 is open. Replace diode D1.
11. Test diodes D2, D3 and D4 for proper operation using the same procedure described in Step 10.
12. Reconnect all leads and molex plugs. Resolder lead #204 at resistor R3.
13. If this test did not identify the problem or to further test the SCRs, go to the **Active SCR Test**.

# TROUBLESHOOTING & REPAIR

## ACTIVE SCR TEST



### WARNING

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

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

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### DESCRIPTION

This test will help determine if the device can be gated ON and conduct current from anode to cathode.

### MATERIALS NEEDED

- An SCR tester as specified in this procedure.
- 5/16" Nut driver
- Idealarc® R3R Wiring Diagrams (See the Electrical Diagrams section of this manual.)

This procedure takes approximately 30 minutes to perform.

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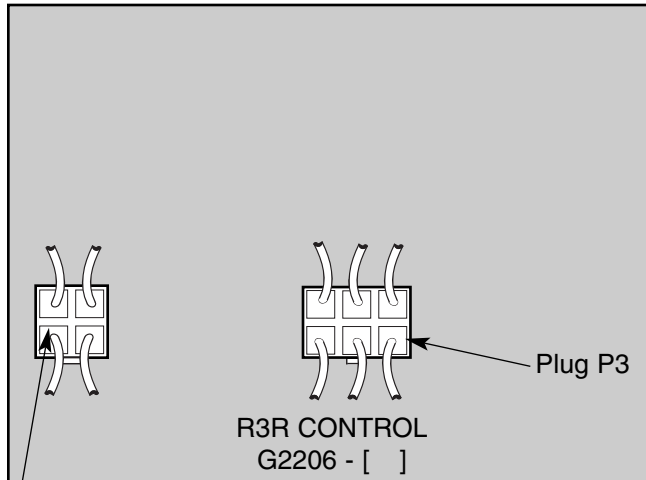




# TROUBLESHOOTING & REPAIR

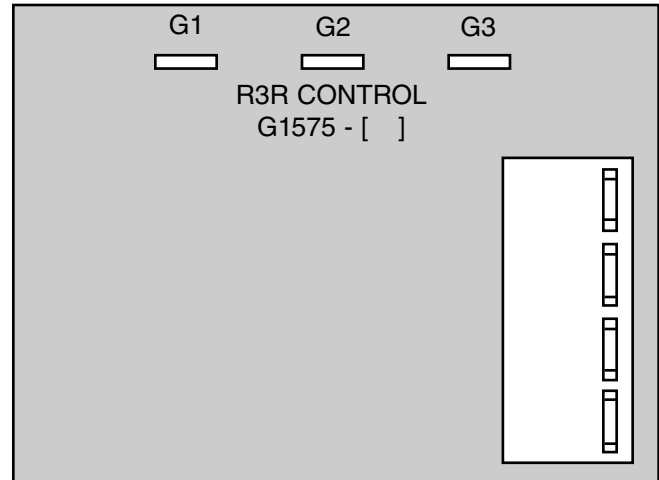
## ACTIVE SCR TEST (continued)

**FIGURE F.16 – CONTROL BOARD PLUG P1 AND P3 LOCATIONS**

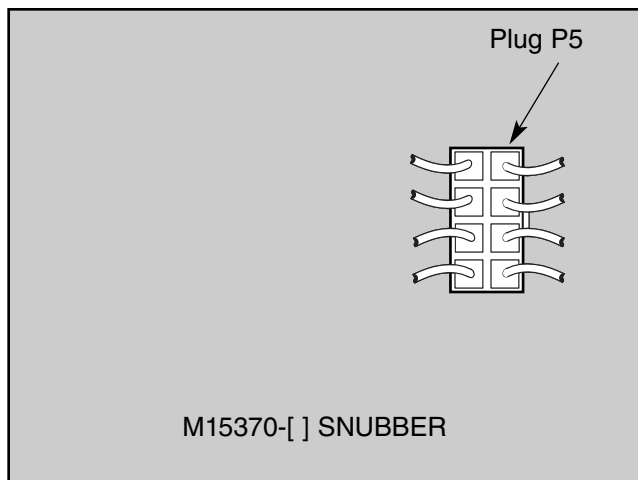


Plug P4 (Removed)

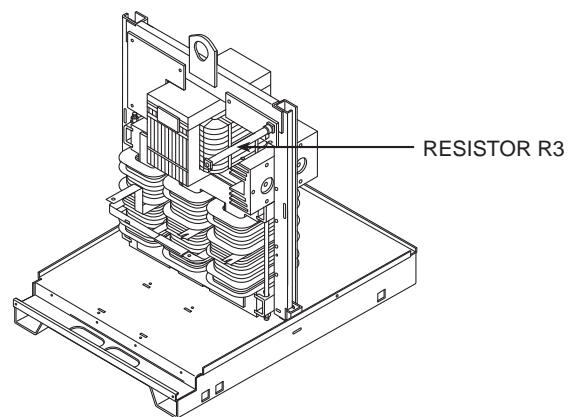
**FIGURE F.17 – CONTROL BOARD G1575 LEAD LOCATIONS**



**FIGURE F.18 – SNUBBER BOARD PLUG P5 LOCATION**



**FIGURE F.19 – RESISTOR R3 LOCATION**



### TEST PROCEDURE

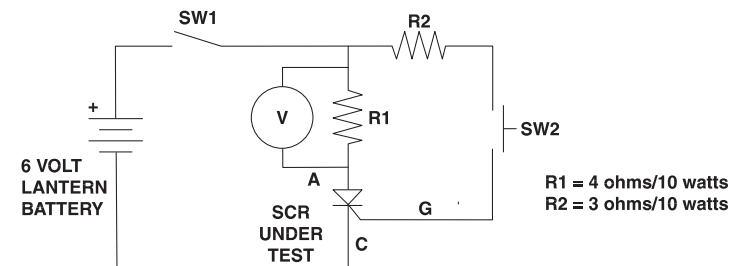
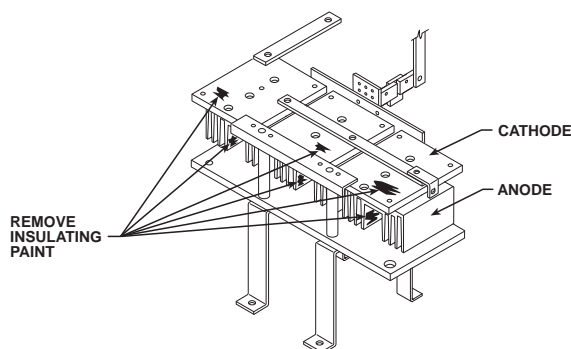
1. Disconnect the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides. Remove the screws holding the front panel and lower the panel.
3. Disconnect the welding cables from the welding output terminals.
4. Locate and remove molex plug P4 from control board G2206. See Figure F.16.  
  
If the machine has control board G1575, disconnect the individual gate leads G1, G2, and G3 and also lead #204. See Figure F.17.
5. Locate and remove molex plug P5 from snubber board M15370. See Figure F.18. If the machine has snubber board M14215, it will be necessary to label and disconnect lead #204 from the output shunt. **Be sure to disconnect the #204 lead that runs between the snubber board and the output shunt.**
6. Locate and remove lead #204 from resistor R3 (40 ohms, 50 Watts). See Figure F.19.

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## ACTIVE SCR TEST (continued)

FIGURE F.20 – SCR TESTER CIRCUIT AND SCR CONNECTIONS



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.

7. Remove the red insulating paint from the heat sink test points. See Figure F.20.
 

**NOTE:** Do not disassemble the heat sinks.
8. Construct the circuit shown in Figure F.20. One 6-volt lantern battery can be used., Set voltmeter scale low, at approximately 0-5 volts or 0-10 volts.
9. Test the voltage level of the battery. Short leads (A) and (C). Close switch SW-1. Battery voltage should be 4.5 volts or higher. If lower, replace the battery.
10. Connect the tester to the SCR 1 as shown in Figure F.20.
  - a. Connect tester lead (A) to the anode.
  - b. Connect tester lead (C) to the cathode.
  - c. Connect tester lead (G) to the gate.

**NOTE:** Gate leads can be accessed at molex plug P4 (Control board G2206) or terminals (Control board G1575). See **Figures F.16** and **F.17**.
11. Close switch SW-1.
 

NOTE: Switch SW-2 should be open.
12. Read meter for zero voltage.
  - a. If the voltage reading is higher than zero, the SCR is shorted.
13. Close or keep closed switch SW-1.
14. Close switch SW-2 for 2 seconds. Release and read meter.
  - a. If the voltage is 3-6 volts while the switch is closed and after the switch is open, the SCR is functioning.
  - b. If the voltage is 3-6 volts only when the switch is closed or if there is no voltage when the switch is closed, the SCR is defective.

**NOTE:** Be sure the battery is functioning properly. A low battery can affect the results of the test. Repeat Battery Test Procedure in Step 9 if needed.
15. Open switch SW-1.
16. Reconnect the tester leads. See Figure F.20.
  - a. Connect tester lead (A) to the cathode.
  - b. Connect tester lead (C) to the anode.
  - c. Disconnect test lead (G) from the gate.
17. Close switch SW-1.
18. Read meter for zero voltage.
  - a. If the voltage is zero, the SCR is functioning.
  - b. If the voltage is higher than zero, the SCR is shorted.
19. Perform the Active Test Procedure outlined in Steps 10-18 for SCRs 2 and 3.
20. Replace all SCR assemblies that do not pass the above tests.
21. Replace all molex plugs or leads previously removed. Resolder lead #204 to resistor R3.

# TROUBLESHOOTING & REPAIR

## POCKET AMPTROL CIRCUIT TEST



### WARNING

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

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

### DESCRIPTION

This test will help determine if the Pocket Amptrol and associated circuitry is functioning correctly.

### MATERIALS NEEDED

Volt/ohmmeter  
5/16" Nut driver  
Jumper wires  
Pocket Amptrol Simplified Drawing

This procedure takes approximately 18 minutes to perform.

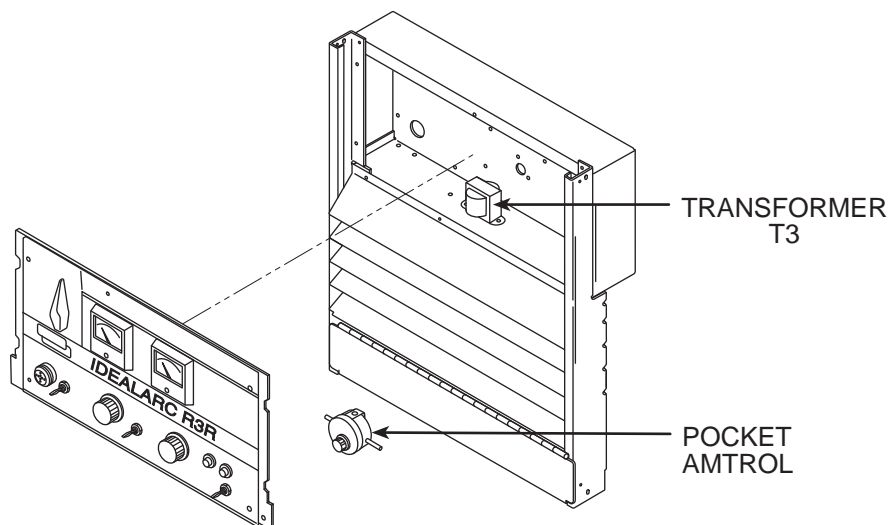
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# TROUBLESHOOTING & REPAIR

## POCKET AMPTROL CIRCUIT TEST (continued)

FIGURE F.21 – T3 TRANSFORMER AND LEADS (POCKET AMPTROL)



### TEST PROCEDURE

1. Remove input power to the R3R machine.
2. Using the ohmmeter, check the resistance from one probe to the other probe at the Pocket Amptrol. Normal resistance is 700 ohms when the dial is at the "1" position. When the dial is rotated toward the "10" position, the resistance from probe to probe should decrease to approximately 200 ohms.

If the measured resistance is not correct, the Pocket Amptrol may be faulty.

3. Using the 5/16" nut driver, lower the front panel and locate the Pocket Amptrol transformer T3 inside the control box compartment. See Figure F.21.

**NOTE:** If the machine is equipped with a polarity switch, the switch handle will have to be removed using a 1/8" Allen type wrench.

4. Apply the correct input power to the machine.
5. Check the T3 primary voltage at leads #201A to 203A. See Figure F.21. Normal voltage is approximately 120VAC. If the primary voltage is missing or low, check the leads and associated connections.
6. Check the T3 secondary voltages at plug P7 located on the Pocket Amptrol board. See **Figure F.22**.

Check pin 1 (green lead) to pin 2 (yellow lead). Normal is approximately 12VAC.

Check pin 3 (green lead) to pin 2 (yellow lead). Normal is approximately 12VAC.

If the correct primary voltage is applied to the T3 transformer and either of the secondary voltages are missing or low, the T3 transformer may be faulty.

7. Turn off the R3R machine.

### WARNING

Electric Shock can kill.



- With the input power on, there are high voltages inside the machine. Do not reach into the machine or touch any internal part of the machine while the power is on.

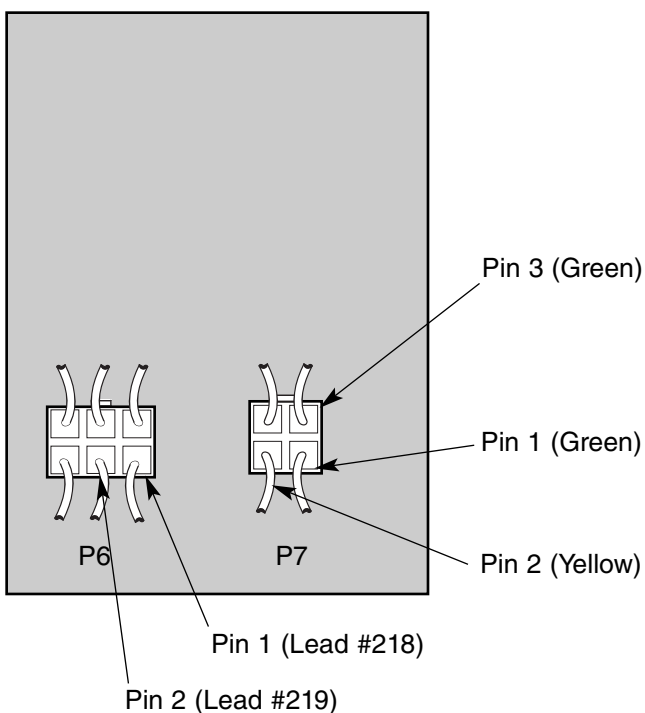
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ELECTRIC

# TROUBLESHOOTING & REPAIR

## POCKET AMPPTROL CIRCUIT TEST (continued)

FIGURE F.22 – POCKET AMPPTROL BOARD PLUG P6 AND P7 LOCATION



8. Connect the Pocket Amptrol unit from the work to the electrode welding output terminals. Jumper wires may be necessary.

### **⚠ WARNING**

**Electric Shock can kill.**



- With the input power on, there are high voltages inside the machine. Do not reach into the machine or touch any internal part of the machine while the power is on.

9. Turn on the R3 machine.
10. Check for the following voltages at plug P6 pin 1(+) (lead #218) to pin 2(-) (lead #219). Plug 6 is located on the Pocket Amptrol board. See Figure F.22.
- a. With the Pocket Amptrol in position “1,” the voltage should be approximately 40.8mV.

- b. With the Pocket Amptrol in position “10,” the voltage should be approximately 138.9mV.

If the correct AC voltages are applied to the PC board and the correct DC mV is sensed at plug P6 pins 1 and 2, the Pocket Amptrol circuit should function properly. If it does NOT, check the leads between the plug P6 (leads #75, #76 and #77) (see **Figure F.24**) and the local remote switch (SW2). See the Wiring Diagram. If the leads are OK, the PC board may be faulty.

If the correct AC voltages are applied to the PC board and the DC mV are not correct, check the sensing resistor (R4). See **Figure F.23** and the Wiring Diagram. Normal resistance is 0.4 ohms.

If the resistance at R4 is normal (0.4 ohms) the Pocket Amptrol board may be faulty.

# TROUBLESHOOTING & REPAIR

## POCKET AMPTROL CIRCUIT TEST (continued)

FIGURE F.23 – SENSING RESISTOR R4

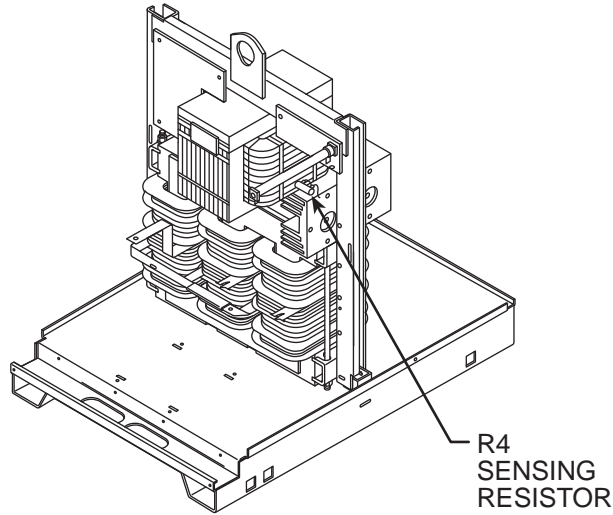
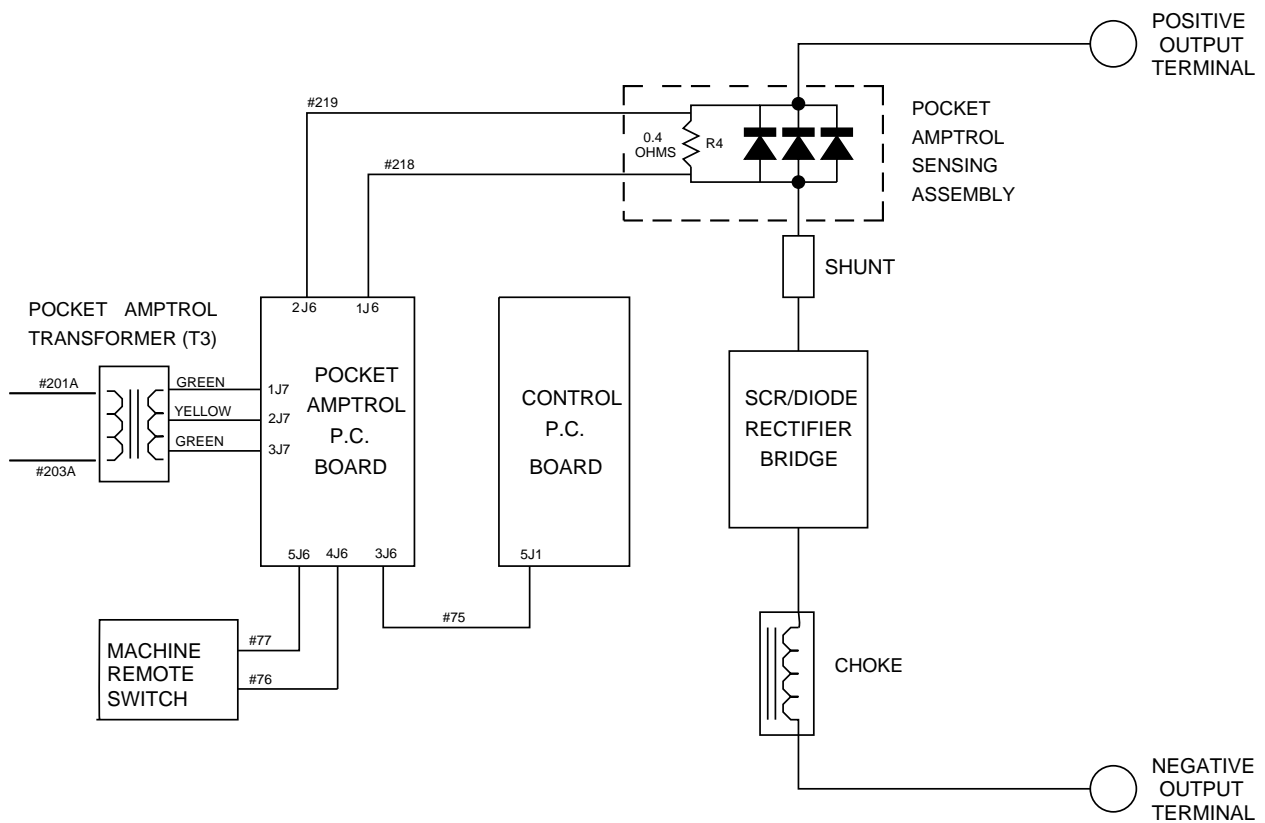


FIGURE F.24 – POCKET AMPTROL SIMPLIFIED DRAWING



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Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC





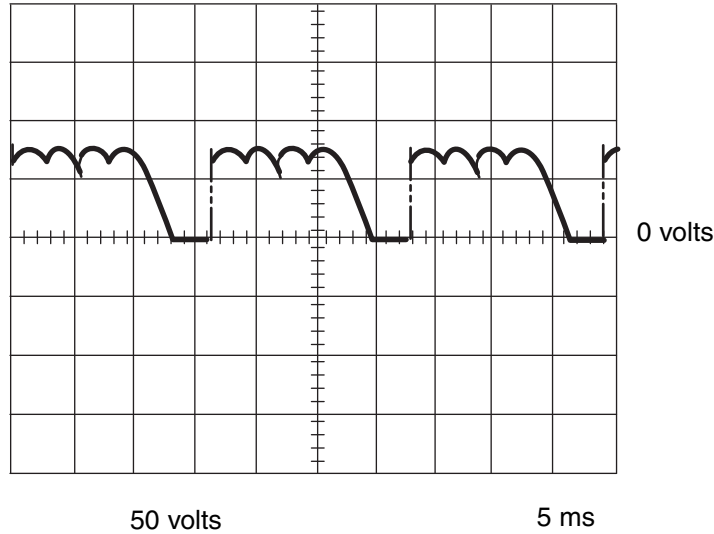




# TROUBLESHOOTING & REPAIR

## ABNORMAL OUTPUT VOLTAGE WAVEFORM

### ONE OUTPUT SCR NOT FUNCTIONING



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 5 milliseconds in time. The machine was loaded with a resistance grid bank.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative terminal. (R3R 500 machine)

### SCOPE SETTINGS

Volts/Div .....	50V/Div.
Horizontal Sweep .....	5 ms/Div.
Coupling.....	DC
Trigger .....	Internal

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT

### **WARNING**

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

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

### **DESCRIPTION**

The following procedure will aid the technician in inspecting, cleaning, and replacing the input contactor.

### **MATERIALS NEEDED**

- Phillips head screwdriver
- 5/16" socket wrench
- Flat heat screw driver
- Low pressure air source
- 7/16" Socket wrench

The contactor cleaning procedure takes approximately 15 minutes to perform.

The replacement procedure takes approximately 25 minutes to perform.

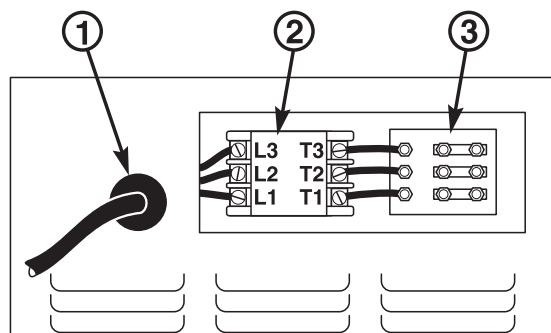
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# TROUBLESHOOTING & REPAIR

## INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT *(continued)*

FIGURE F.25 – INPUT CONTACTOR CLEANING AND REMOVAL



1. INPUT SUPPLY LINE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

### CLEANING PROCEDURE

1. Remove the main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.25.
3. Remove the input contactor cover plate using a phillips head screwdriver.

### **⚠ WARNING**



Do not apply input power to the machine with the input contactor cover plate removed.

4. Blow out any dirt or dust in or around the contacts with a low pressure air stream.
5. Inspect the contacts for signs of excessive wear, pitting, or contacts fused (stuck) together.
  - a. If any of these conditions are present, replace the input contactor assembly.
6. Replace the input contactor cover plate.

### CONTACTOR REPLACEMENT PROCEDURE

1. Disconnect main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.25.
3. Disconnect the main input supply power leads L1, L2, and L3 to the input contactor.

Remove the control transformer primary leads H1, H2 or H3 (dependent on input voltage) from L1 and L3 terminals on the input side of the contactor.

4. Disconnect the output leads T1, T2, and T3 from the input contactor.
5. Identify and label the leads connected to the input contactor coil. See the Wiring Diagram.
6. Disconnect the leads from the input contactor coil (leads X1, #232 and #233). See the Wiring Diagram.
7. Remove the three self-tapping mounting screws using a 5/16" socket wrench. See Figure F.25.
8. Remove the input contactor.
9. Insert the replacement input contactor and install it following the procedures in reverse order.

**NOTE:** Be sure to reconnect all leads correctly.

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# TROUBLESHOOTING & REPAIR

## FAN MOTOR AND BLADE REMOVAL AND REPLACEMENT

### **WARNING**

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

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

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### DESCRIPTION

The following procedure will aid the technician in gaining access to the fan blade and fan motor for maintenance or replacement.

### MATERIALS NEEDED

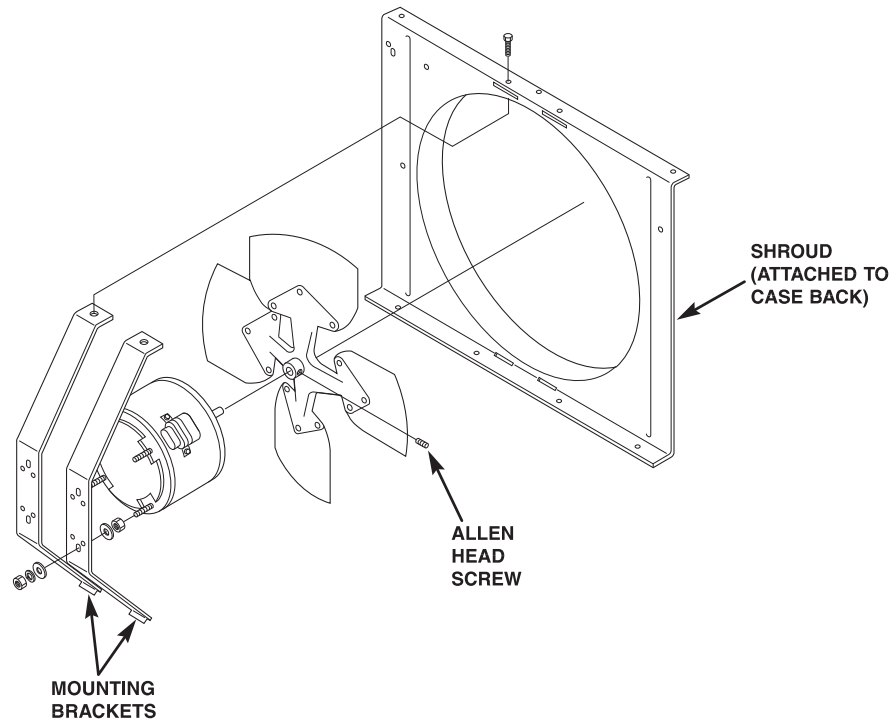
5/16" Nut driver  
3/8" Wrench  
Allen head type wrench

This procedure takes approximately 30 minutes to perform.

# TROUBLESHOOTING & REPAIR

## FAN MOTOR AND BLADE REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.26 – FAN MOTOR MOUNTING DETAILS



### PROCEDURE

1. Remove the main input supply power to the machine.
2. Using the 5/16" nut driver, remove the case top and sides.
3. The fan blade can be removed using the Allen head wrench.
 

**NOTE:** You may need to loosen the machine case back to gain clearance to remove the fan. See Figure F.26.
4. If the fan motor is to be removed, the leads to the motor must be disconnected. This will require cutting the wires or "breaking the splice."
5. Remove the four mounting nuts and associated flat and lock washers that hold the motor to the mounting bracket. See Figure F.26.
6. Carefully remove the fan motor.
7. To replace the fan motor, mount the motor to its mounting bracket using the four nuts and associated flat and lock washers.
8. Resplice any motor leads cut for removal. Soldering the wires is recommended.
9. Reattach the fan blade, if it was removed earlier, using the Allen head wrench to tighten it to the motor shaft.
10. Install the case top and sides.

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# TROUBLESHOOTING & REPAIR

## SCR/DIODE RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT

### **WARNING**

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

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

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### DESCRIPTION

The following procedure will aid the technician in the removal and replacement of the SCR/diode assembly.

### MATERIALS NEEDED

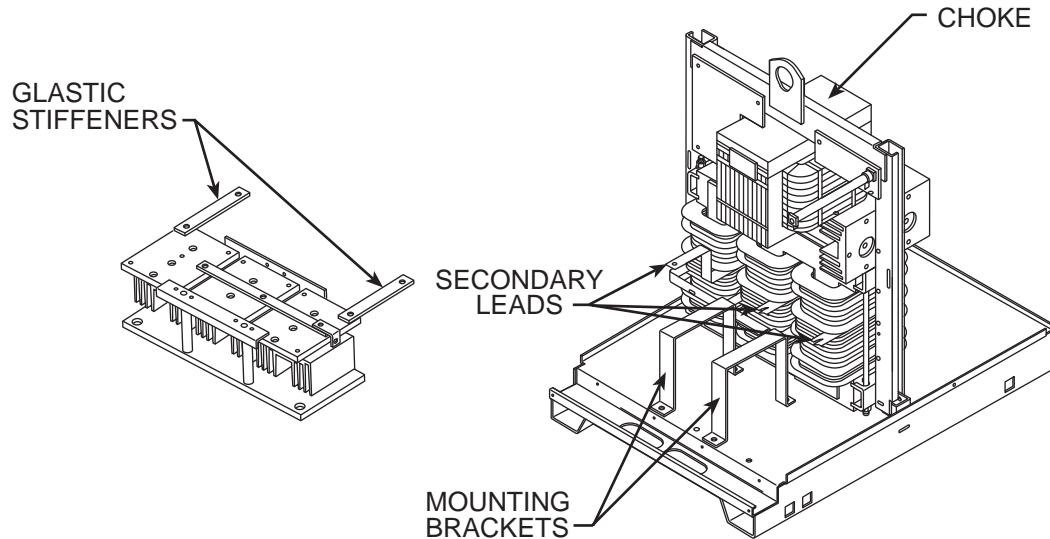
- 5/16" Nut driver
- 7/16" Wrench
- 1/2" Wrench
- 9/16" Wrench
- 3/8" Wrench
- Slot head screw driver
- 1/2" Socket and extension

This procedure takes approximately 35 minutes to perform.

# TROUBLESHOOTING & REPAIR

## SCR/DIODE RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.27 – SCR/DIODE ASSEMBLY DETAILS



### PROCEDURE

1. Remove the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides. Lower the front control panel.
3. Using the 5/16" wrench, remove the six screws mounting the front assembly to the machine's base. Carefully "inch" the front forward to make room for the removal of the SCR/diode bridge assembly.
4. Remove the two screws holding the air deflector (R3R 500 only) to the front panel. Remove the air deflector.
5. Remove the glastic stiffeners (one on each side-left and right). See Figure F.27.
6. Remove the choke from the left side of the negative heat sink plate. See Figure F.27.
7. Remove the two #220 leads from the right side of the negative heat sink plate.
8. Remove the positive lead and shunt from the positive heat sink plate. See Figure F.27.
9. Remove the gate leads from the control board (either plug J4 or individual gate leads).
10. Remove the three heavy aluminum secondary leads and snubber leads from the SCR finned heat sinks. (Note lead placement for reassembly.)
11. Remove the four nuts and associated washers that hold the SCR/diode assembly to the mounting brackets.
12. Carefully lift and remove the SCR/diode heat sink assembly from the machine. Clear any necessary leads that might hinder removal.



## TROUBLESHOOTING

### SCR/DIODE RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

#### REASSEMBLY

13. For reassembly, carefully place the SCR/ diode assembly into position on the mounting brackets.
14. Replace and tighten the four nuts and lockwashers that hold the SCR/diode assembly to the mounting brackets.
15. Reattach the three heavy aluminum secondary leads and snubber leads to the SCR finned heat sinks. Apply a thin coating of Dow Corning 340 heat sink compound to connection points.
16. Attach plug J4 (or individual gate leads) to the control board.
17. Attach the positive lead and shunt to the positive heat sink plate.
18. Attach the two #220 leads to the right side of the negative heat sink plate.
19. Connect the choke switch lead to the left side of the negative heat sink plate. See **Figure F.27**.
20. Install the glastic stiffeners to the left and right sides. See **Figure F.27**.
21. Attach the air deflector to the front panel (R3R 500). See **Figure F.27**.
22. Check all lead placements and secure.
23. Attach the front assembly to the machine's base.
24. Install the front control panel and case top and sides.

# TROUBLESHOOTING & REPAIR

## SCR REMOVAL AND REPLACEMENT

### WARNING

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

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

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### DESCRIPTION

The following procedure will aid the technician in removing the SCRs from the output rectifier heat sink for maintenance or replacement.

### MATERIALS NEEDED

NO.000 Fine Steel Wool  
Penetrox A-13 (Lincoln E2529) or Penetrox A  
7/16" Open end wrench  
Allen head type wrenches

This procedure takes approximately 25 minutes to perform.

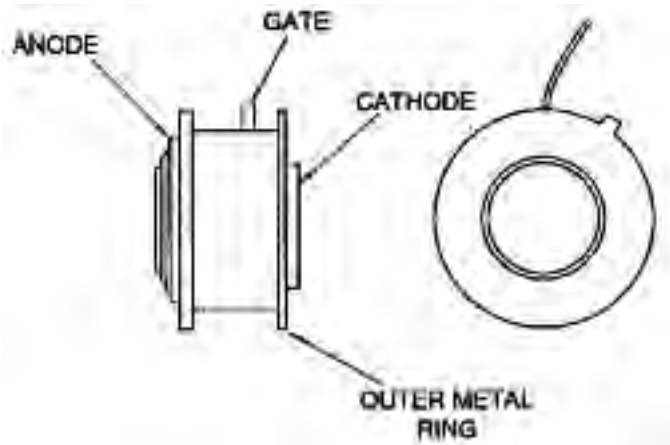
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# TROUBLESHOOTING & REPAIR

## SCR REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.28 – SCR DETAILS



### SPECIAL INSTRUCTIONS

NOTE: Before disassembling the existing rectifier, note toward which heat sink the outer metal ring of the power SCR is mounted. Also, note the positioning of the gate lead of the SCR. Failure to reinstall the new SCR in the same orientation as the original may result in subsequent damage to the new SCR and other components of the welder. See Figure F.28.

#### ⚠ CAUTION

The unclamping and clamping procedure outlined below is critical for the prevention of internal SCR damage. Failure to follow this procedure may result in subsequent damage of the SCR. Handle all SCRs with care.

### PROCEDURE

1. Remove the main input supply power to the machine.
2. Perform the **SCR/Diode Rectifier Assembly Removal** procedure.
3. Using the 7/16" wrench, remove the NEGATIVE heat sink plate. Diode D4 pigtail will have to be removed from the positive heat sink plate. This will give access to the SCR clamping hardware. When reassembling, be sure all insulators are in place. The heat sink plate should be electrically insulated from the mounting thru-bolts.
4. Alternately loosen nuts 1/2 turn each until heat sinks are loose. Remove nuts and leaf spring. IT IS RECOMMENDED THAT NEW HARDWARE, LEAF SPRING AND HOUSING BE USED FOR REASSEMBLY.
5. Remove the old SCR.
6. Clean the area on the heat sink around the SCR mounting surface, using a putty knife or similar tool. DO NOT SCRATCH THE SCR MOUNTING SURFACE.
7. Polish each heat sink's mounting surface using NO. 000 fine steel wool. Wipe surface clean with a lint-free cloth or paper towel.
8. Inspect the mounting surfaces of each new SCR.
  - a. Remove all burrs and wipe clean. Do not use steel wool or any abrasive cleanser on the SCR mounting surfaces.
9. Apply a thin (0.001" to 0.003") layer of PENETROX A-13 (Lincoln Electric #E2529) or PENETROX A, heat sink compound, to each heat sink's SCR mounting surface.
  - a. Care must be used to prevent foreign material contamination of the SCR to heat sink junction.
10. Place the new SCR between the heat sinks. Be sure that the outer metal ring of the SCR is facing toward the same heat sink as the old SCR's metal ring. Be sure that the roll pin of the heat sink engages the "hole" in the SCR. The SCR contact surfaces must sit flat against both heat sink surfaces.

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## SCR REMOVAL AND REPLACEMENT (continued)

FIGURE F.29 – 1/2" WIDE LEAF SPRING

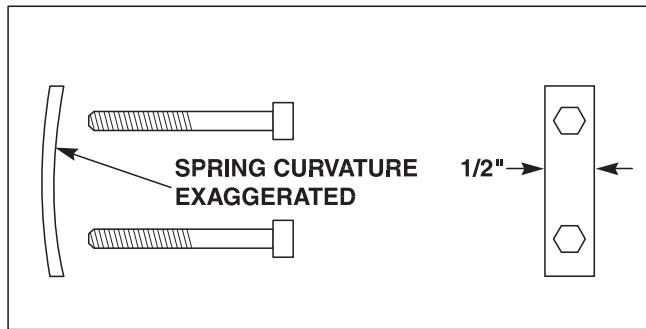
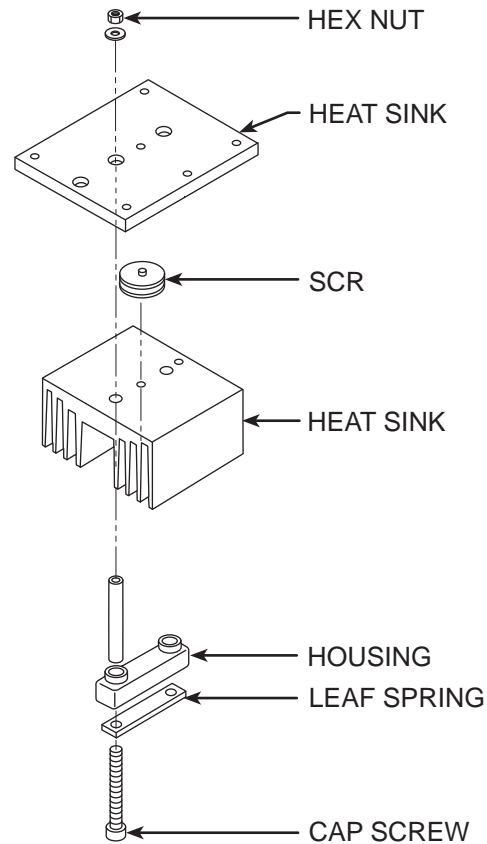


FIGURE F.30 – CLAMP ASSEMBLY



- Go to the procedure below that matches your machine's cap screws. NOTE WHICH THREAD IS ON YOUR CAP SCREWS BEFORE PROCEEDING TO THE ASSEMBLY PROCEDURE. Two different designs of leaf springs and housings have been used to clamp the SCR to the rectifier. The two different designs can be identified by the size of the leaf spring. One design uses a 1/2 inch wide leaf spring, and the other uses a 5/8 inch wide spring. The different designs require different assembly and clamping procedures. The assembly procedure will be different depending upon the thread on the cap screws. A 1/4-28 thread requires a different tightening procedure than a 1/4-20 thread.

### PROCEDURE FOR THE 1/2 INCH WIDE SPRING

- Place a piece of sleeving around each cap screw.
- Insert cap screws through the leaf spring. Orient the leaf spring so that its ends are curved upward toward the cap screw heads. See Figure F.29. Pressing on the cap screw heads should produce a "rocking" motion of the spring in its housing. If the spring does NOT rock, it is installed upside down. Remove the spring and turn it over. Check for "rocking" motion. See Figure F.29.
- Insert cap screws and leaf spring into the plastic housing.
- Insert clamp assembly through heat sinks. Install nuts. Tighten clamp nuts equally on cap screws until finger tight. (See Figure F.30. Heat sinks may not be exactly as pictured.)
- Reinspect the SCR for proper seating.

# TROUBLESHOOTING & REPAIR

## SCR REMOVAL AND REPLACEMENT (*continued*)

### CLAMPING PROCEDURE FOR 1/4-28 CAP SCREWS

**NOTE:** This procedure can only be used with 1/4-28 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/2 turn.
6. Tighten first cap screw 1/4 turn. Stop.
7. Assembly now has the proper clamping force.
8. Perform the **Active SCR Test**.

### CLAMPING PROCEDURE FOR 1/4-20 CAP SCREWS

**NOTE:** This procedure can only be used with 1/4-20 cap screws.

Do not use cap screws with any other type thread or new SCR will be damaged.

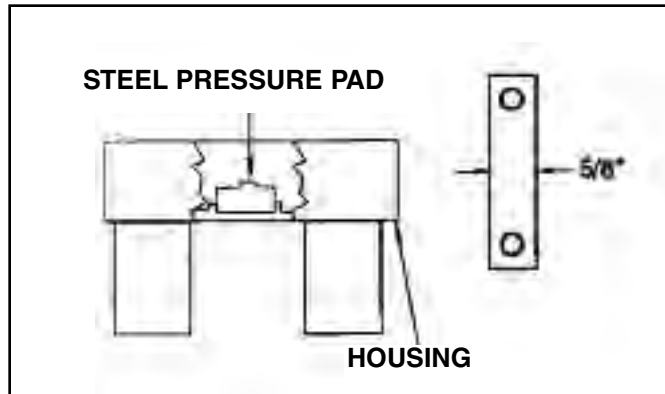
Do not over tighten cap screws. The leaf spring will apply the required clamping force to the SCR.

1. Do not turn the nuts. While holding the nuts stationary, turn the cap screws only with the following procedure.
2. Tighten first cap screw 1/4 turn.
3. Tighten second cap screw 1/2 turn.
4. Tighten first cap screw 1/2 turn.
5. Tighten second cap screw 1/4 turn. STOP.
6. Assembly now has the proper clamping force.
7. Perform the **Active SCR Test**.

# TROUBLESHOOTING & REPAIR

## SCR REMOVAL AND REPLACEMENT *(continued)*

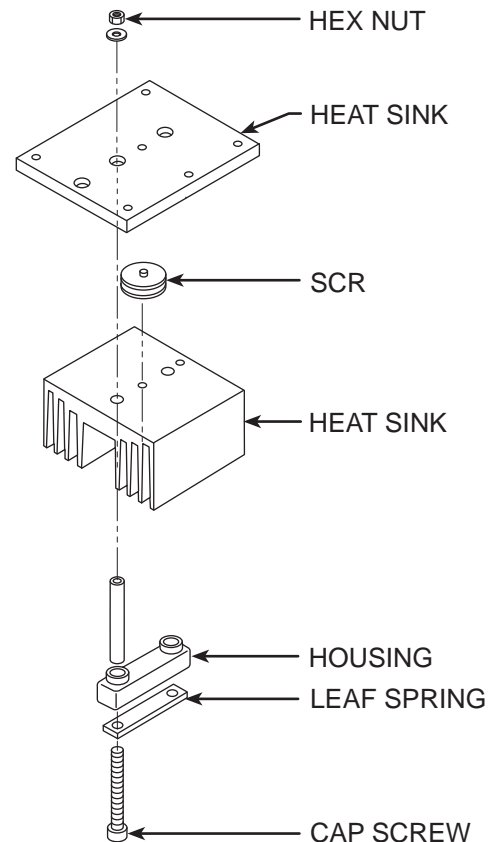
FIGURE F.31 – HOUSING AND PRESSURE PAD FOR 5/8" WIDE LEAF SPRING



### PROCEDURE FOR THE 5/8 INCH WIDE SPRING

1. Place a piece of sleeving around each cap screw.
2. Insert cap screws through the leaf spring. The leaf spring is flat so the orientation of the leaf spring does not matter.
3. Place the steel pressure pad in the housing with the 1/8 inch wide standoff facing up. See Figure F.31.
4. Insert cap screws and leaf spring into plastic housing being sure that the steel pressure pad remains in position. Pressing on the cap screw heads should produce a rocking action of the spring in its housing.
5. Insert the clamp assembly through the heat sinks. Install nuts. Tighten the clamp nuts equally on the cap screws until finger tight. Be sure that the leaf spring is not cocked in the housing. See Figure F.32. Heat sinks may not be exactly as pictured.
6. Reinspect the SCR for proper seating.

FIGURE F.32 – CLAMP ASSEMBLY





# TROUBLESHOOTING & REPAIR

## MOUNTING OF STUD TYPE DIODES TO ALUMINUM HEAT SINKS

### **WARNING**

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

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

### **DESCRIPTION**

The following procedure will aid the technician in mounting stud type diodes to the aluminum heat sinks on the R3R.

### **MATERIALS NEEDED**

- 5/16" Nut driver
- 1/2" Open end wrench
- Lincoln E1868 (Dow Corning 340) Heat Sink Compound
- "Slip" type torque wrench
- No. 000 fine steel wool

This procedure takes approximately 20 minutes  
per diode to perform.

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# TROUBLESHOOTING & REPAIR

## MOUNTING OF STUD TYPE DIODES TO ALUMINUM HEAT SINKS *(continued)*

### PROCEDURE

1. Remove the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides.
3. Loosen the appropriate diode nut and remove the diode that is to be replaced.
4. Clean the area on the heat sink around the diode mounting surface using a putty knife or similar tool. **DO NOT SCRATCH THE DIODE MOUNTING SURFACE.**
5. Polish each heat sink's mounting surface using No. 000 fine steel wool. Wipe the surface clean with a lint-free cloth or paper towel.
6. Inspect the mounting surfaces of each new diode. Remove all burrs and wipe clean. Do not use steel wool or any abrasive cleanser on the diode mounting surface.
7. Apply a thin (0.003" to 0.007") uniform layer of E1868 (Dow Corning 340) heat sink compound to the heat sink mounting surface.
  - a. Do not apply compound to the diode stud or mounting threads.
  - b. The diode threads must be clean and free of defects so that the nut can be finger tightened before applying torque. A "slip" type torque wrench must be used to tighten the diode nut.
8. Tighten the diode nuts to the specifications in the following table.
  - a. Start the nuts for diodes with steel studs by hand and then torque them according to the following table.
  - b. Run the nuts for diodes with copper studs on all the way by hand then torque them according to the following table.
  - c. Turn the nuts a minimum of 1/2 turn more while torquing.
9. Install the case top and sides.

DIODE STUD SIZE	FOOT- POUNDS	INCH- POUNDS
3/4-16	25-27	300-324
3/8-24	10±.5	125+0/-5
1/4-28		22-25

# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER REMOVAL AND REPLACEMENT

### **WARNING**

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

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

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### DESCRIPTION

The following procedure will aid the technician in removing the main transformer for maintenance or replacement.

### MATERIALS NEEDED

- 5/16" Nut driver
- 9/16" Socket wrench
- 9/16" Box end wrench
- 1/2" Socket wrench
- 1/2" Box end wrench
- 3/8" Nut driver or socket wrench
- 9/16" Deep well socket wrench

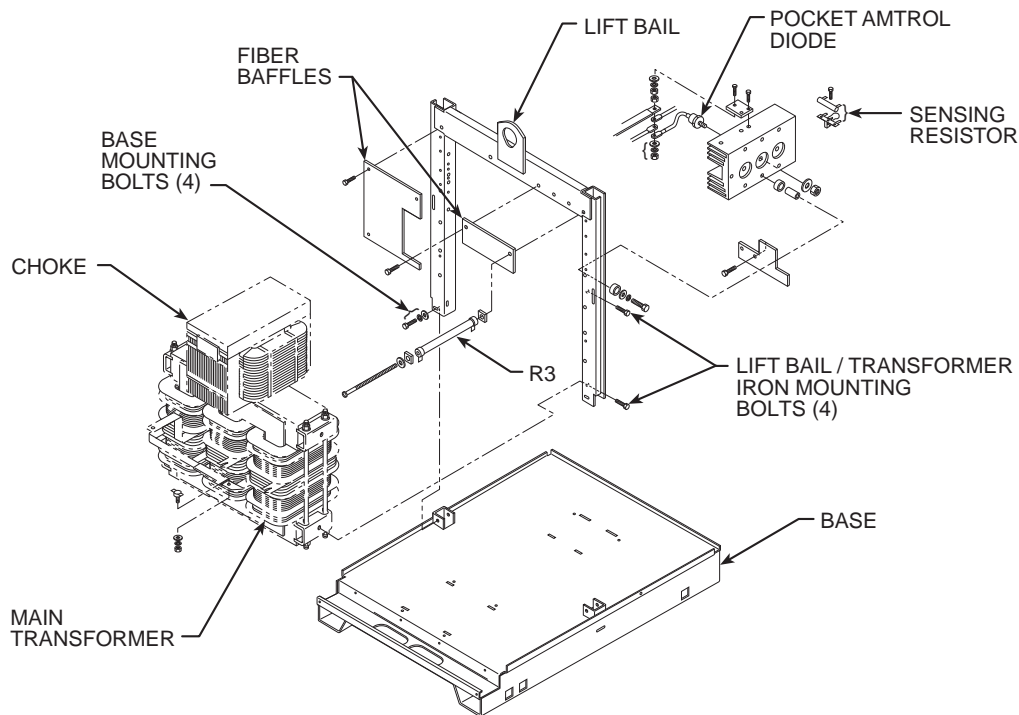
This procedure takes approximately 3 to 5 hours depending on which coils are being replaced.

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## MAIN TRANSFORMER REMOVAL & REPLACEMENT (continued)

### FIGURE F.33 – LIFT BAIL REMOVAL



### REMOVAL OF LIFT BAIL

1. Remove the main input supply power to the machine.
2. With the 5/16" nut driver, remove the case top and sides.
3. Remove the two fiber baffles from the left and right sides of the choke. See Figure F.33.
4. If the optional Pocket Amptrol diodes are installed, label and disconnect the necessary leads for removal of the lift bail. One lead is on the shunt, and one lead is on the optional polarity switch. Label and cut leads #218 and #219 from the sensing resistor. See the Wiring Diagram. These leads will have to be resoldered upon reassembly.
5. Remove resistor R3 (40 ohms, 100 watts).
6. Using the 9/16" socket wrench, remove the four bolts (left and right) mounting the lift bail to the transformer top and bottom irons.
7. Using the 9/16" socket wrench, remove the four bolts, flat washers, and lock washers mounting the lift bail assembly to the base of the machine.
8. Remove the lift bail by lifting straight up and clear from the machine. Clear any remaining leads necessary for lift bail removal.

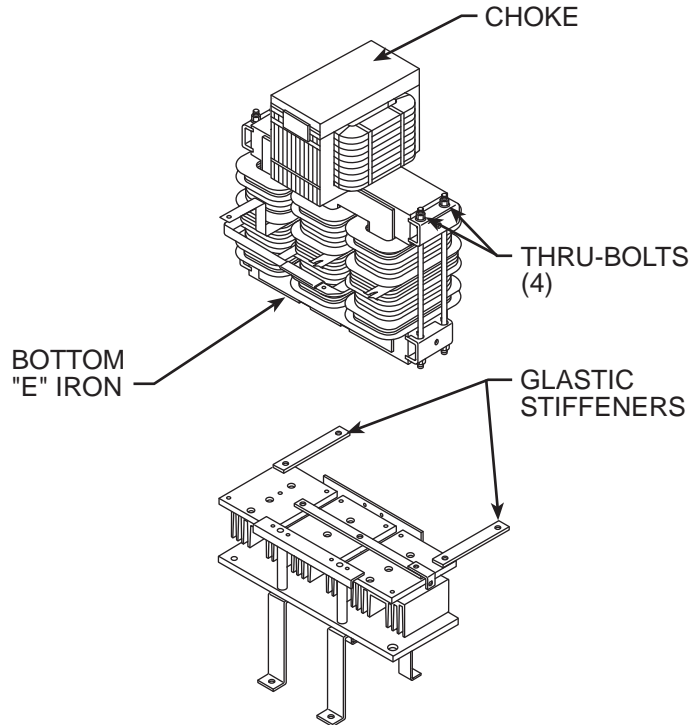
### **⚠ WARNING**

The transformer and choke assembly is now loose and free to slide or "tip" on the base of the machine.

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

## MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

FIGURE F.34 – CHOKE REMOVAL

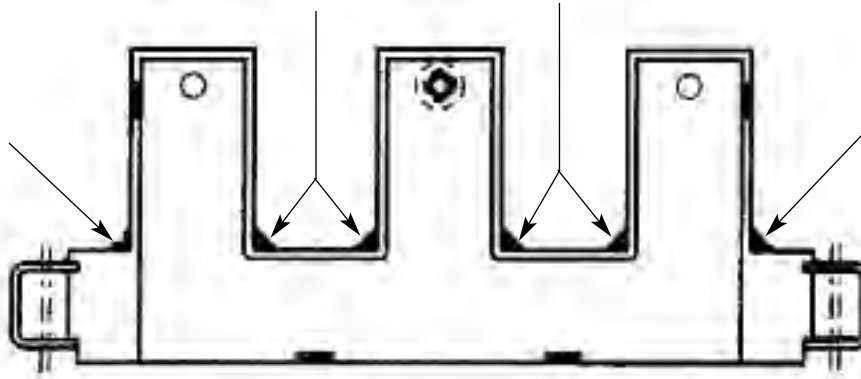


### REMOVAL OF CHOKE AND TOP IRON ASSEMBLY

1. Remove the two (left and right) glastic stiffeners connecting the negative rectifier plate and choke assembly to the main transformer thru-bolts. See Figure F.34.
  2. Remove the top choke lead from the polarity selector switch or the negative output terminal.
  3. Remove the bottom choke lead from the negative rectifier plate.
  4. Label and cut the choke thermostat leads.
  5. Using the 9/16" deep well socket wrench, remove the four thru-bolts that clamp the top "E" iron and choke assembly to the bottom "E" iron. NOTE: for easier reassembly, clean the threads.
  6. Using a hoist, carefully lift the choke and top iron assembly out and clear of the transformer coils.
- NOTE:** The coils may be "stuck" to the top iron and may require some careful prying to dislodge them. Depending upon which coil(s) are to be replaced, it may be advantageous to remove some of the "stuck" coils with the top iron.
7. The leads from the coils that are to be removed and/or replaced must be disconnected. See the Wiring Diagram.
- When aluminum leads are re-connected, apply a thin layer of Dow Corning 340 Heat Sink Compound to mating surfaces.

**MAIN TRANSFORMER REMOVAL & REPLACEMENT** *(continued)*

FIGURE F.35 – EPOXY MIX APPLICATION AREAS

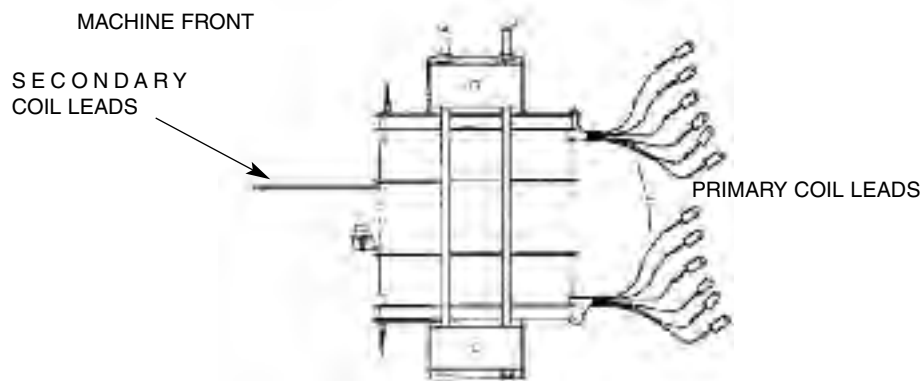
**REASSEMBLY OF TRANSFORMER COILS**

NOTE: The following procedure describes a complete replacement of all primary and secondary transformer coils. Adapt the procedure for the specific coils you may be replacing.

1. Apply a coating of Lincoln Electric E2547 Epoxy Mix along both sides of the bottom iron (lamination) assembly in the areas where the coil sides will be mounted. Coat the areas no closer than .38 inches from the top edge of the iron. See Figure F.35, arrows. Be sure that none of the epoxy drips onto the top of the iron assembly where it will meet the top assembly.

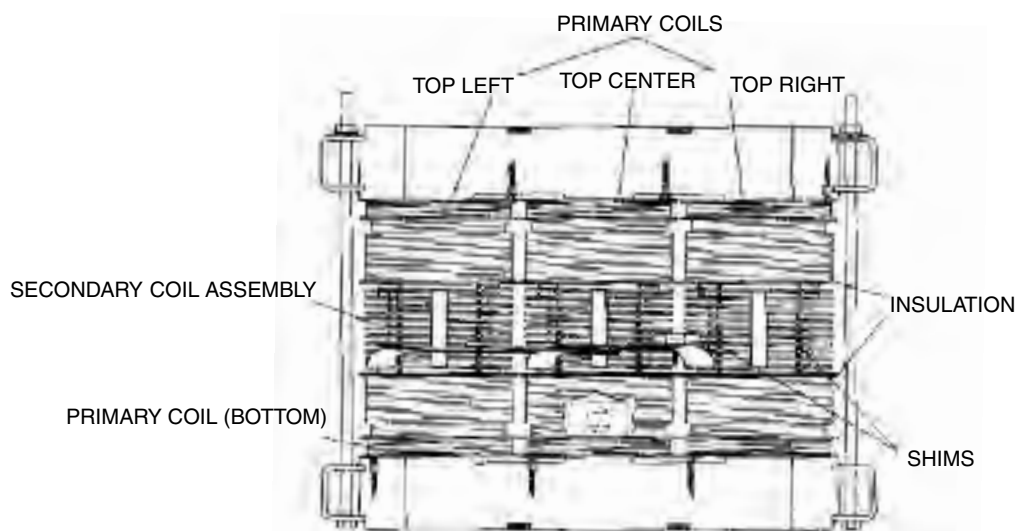
## MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

### FIGURE F.36 – COIL LEAD PLACEMENT



- Install the bottom primary coils, one on each of the three legs of the bottom iron assembly. The coils must be in correct position (left, center, right). Place the coils so that the leads come out at the back of the machine. See Figure F.36 for proper positioning.
- Place insulation (Lincoln Electric part number S20728) on top of each of the three primary coils. The longer side of the insulation should be placed toward the front of the machine. See Figure F.37 for the location of this insulation
- Place the three secondary coils on top of the insulation installed in Step 4. The leads should come out at the front of the machine with the short leads on top. See F.36 for proper positioning.
- Insert shims (Lincoln Electric part number CI001250 or CI000317) between the secondary coil sides and the iron assembly on either side of the legs. See Figure F.37.
- Place insulation (Lincoln Electric part number S20728) on top of each of the three secondary coils. The longer side of the insulation should be placed toward the front of the machine, where the secondary start and finish leads come out. See Figure F.37.
- Install the three top primary coils, noting which is right, left, and center. Leads should come out at the back of the machine. See **Figure F.29** for proper positioning. The coils must be in correct position (left, center, right).
- Install the top iron (lamination) and choke assembly. With the 9/16" deep well socket wrench, reassemble the four thru-bolts that clamp the top "E" iron to the bottom "E" iron. Lightly tap on the top of the iron with a hammer before tightening. Tighten the nuts and thru bolts to 19-25 lb-ft.

### FIGURE F.37 – COIL INSULATION



IDEALARC® R3R





# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER REMOVAL & REPLACEMENT *(continued)*

### REASSEMBLING THE MAIN TRANSFORMER INTO THE MACHINE

**NOTE:** The following procedure assumes you have completely reassembled the transformer coils as described in the procedure above. The lower iron has remained in place in the machine. See **Figures F.36** and **F.37**.

1. Resolder the choke thermostat lead.
2. Attach the bottom choke lead to the negative rectifier plate.
3. Attach the top choke lead to the polarity selector switch or the negative output terminal.

### REASSEMBLE THE LIFT BAIL

1. Carefully position the lift bail onto the machine base. Using the 9/16" socket wrench, attach the lift bail to the base of the machine with four bolts, flat washers, and lock washers.
2. Using the 9/16" socket wrench, attach the lift bail to the transformer top and bottom irons with four bolts.
3. Install resistor R3 (40 ohms, 100 watts).
4. If the optional Pocket Amptrol diodes are installed, resolder the leads to the shunt and the optional polarity switch. Resolder leads #218 and #219 to the sensing resistor.
5. Attach the fiber baffles to the left and right sides of the choke.
6. Reattach any transformer coil connections that were previously removed.
7. Install the machine case top and sides.



# TROUBLESHOOTING & REPAIR

## RETEST AFTER REPAIR (R3R 300, -375-I)

Retest a machine:

- If it is rejected under test for any reason that requires you to remove any mechanical part which could affect the machine's electrical characteristics. OR
- If you repair or replace any electrical components.

### INPUT IDLE AMPS AND WATTS

Input Volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
200/3/60	8.1	0.92
208/3/60	7.8	0.92
230/3/60	7.0	0.92
400/3/60	4.0	0.92
440/3/60	3.7	0.92
460/3/60	3.5	0.92
480/3/60	3.4	0.92
575/3/60	2.8	0.92
200/3/50	14.4	1.0
220/3/50	13.0	1.0
380/3/50	7.5	1.0
400/3/50	7.2	1.0
415/3/50	6.9	1.0
425/3/50	6.7	1.0
440/3/50	6.5	1.0
500/3/50	5.7	1.0
550/3/50	5.2	1.0

### OPEN CIRCUIT VOLTAGES

Test Points	Input Hertz	Open Circuit Volts
Welding Output Terminals	60	63/68VDC
Welding Output Terminals	50	61/65VDC

### WELDING OUTPUT LOAD TEST

Output Control Settings	Amps	Volts
Current Control at Minimum	40	20VDC (Maximum)
Current Control at Maximum	375	39 to 45 VDC

# TROUBLESHOOTING & REPAIR

## RETEST AFTER REPAIR (R3R 400, -500-I)

Retest a machine:

- If it is rejected under test for any reason that requires you to remove any mechanical part which could affect the machine's electrical characteristics. OR
- If you repair or replace any electrical components.

### INPUT IDLE AMPS AND WATTS

Input Volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
200/3/60	9.5	1.04
208/3/60	9.2	1.04
230/3/60	8.3	1.04
380/3/60	5.0	1.04
440/3/60	4.3	1.04
460/3/60	4.1	1.04
550/3/60	3.4	1.04
575/3/60	3.3	1.04
200/3/50	18.6	1.15
220/3/50	17.0	1.15
230/3/50	16.3	1.15
380/3/50	9.8	1.15
400/3/50	9.3	1.15
415/3/50	9.0	1.15
440/3/50	8.5	1.15
500/3/50	7.5	1.15
550/3/50	6.8	1.15

### OPEN CIRCUIT VOLTAGES

Test Points	Input Hertz	Open Circuit Volts
Welding Output Terminals	60	63/69VDC
Welding Output Terminals	50	61/66VDC

### WELDING OUTPUT LOAD TEST

Output Control Settings	Amps	Volts
Dial Selector at "A" Minimum	40	20VDC (Maximum)
Dial Selector at "B" Maximum	500	43 to 47 VDC

# TROUBLESHOOTING & REPAIR

## RETEST AFTER REPAIR (R3R 500, -600-I)

Retest a machine:

- If it is rejected under test for any reason that requires you to remove any mechanical part which could affect the machine's electrical characteristics. OR
- If you repair or replace any electrical components.

### INPUT IDLE AMPS AND WATTS

Input Volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
200/3/60	10.9	1.2
208/3/60	10.5	1.2
230/3/60	9.5	1.2
415/3/60	5.3	1.2
440/3/60	5.0	1.2
460/3/60	4.8	1.2
550/3/60	4.0	1.2
575/3/60	3.8	1.2
200/3/50	19.8	1.2
220/3/50	18.0	1.2
230/3/50	17.2	1.2
380/3/50	10.4	1.2
400/3/50	9.9	1.2
415/3/50	9.5	1.2
440/3/50	9.0	1.2
500/3/50	7.9	1.2
550/3/50	7.2	1.2

### OPEN CIRCUIT VOLTAGES

Test Points	Input Hertz	Open Circuit Volts
Welding Output Terminals	60	64/72VDC
Welding Output Terminals	50	61/69VDC

### WELDING OUTPUT LOAD TEST

Output Control Settings	Amps	Volts
Dial Selector at "A" Minimum	60	20VDC (Maximum)
Dial Selector at "B" Maximum	625	44 to 49 VDC

Return to Section TOC  
Return to Master TOC

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Return to Section TOC  
Return to Master TOC

IDEALARC® R3R



Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

**Electrical Diagrams** .....G-1

    Wiring Diagram (Codes 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542) (L8434) .....G-2

    Wiring Diagram (Code 9692) (L8435) .....G-3

    Wiring Diagram (Codes 9697, 9704, 9705, 9707, 9708, 9709, 9710) (L8069) .....G-4

    Wiring Diagram (Codes 9706,& 9887) (L8184) .....G-5

    Wiring Diagram (Codes 9874, 9876, 9878, 9879, 9880,9884, 9884, 9886, 9888, 9889, 9890, 9891, 10052, 10053, 10285, 10286, 10288, 11341, 11342 & 11344) (L9376) .....G-6

    Wiring Diagram (Code 10471) (L10781) .....G-7

    Wiring Diagram (Codes 10857, 10881) (L11869) .....G-8

    Wiring Diagram (Codes 11043, 11044, 11045, 11046) (L11869-1) .....G-9

    Schematic - R3R-300 Complete Machine (G2171) .....G-10

    Schematic - R3R-400, -500 Complete Machine (G2170) PG1 .....G-11

    Schematic - R3R-400, -500 Complete Machine (G2170) PG2 .....G-12

    Schematic - Pocket Amptrol (L6661) .....G-13

    Schematic - Snubber PC Board (S19687) .....G-14

**\* 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.

WIRING DIAGRAM - (CODES 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542) (L8434)

Return to Section TOC

Return to Section TOC

Return to Section TOC

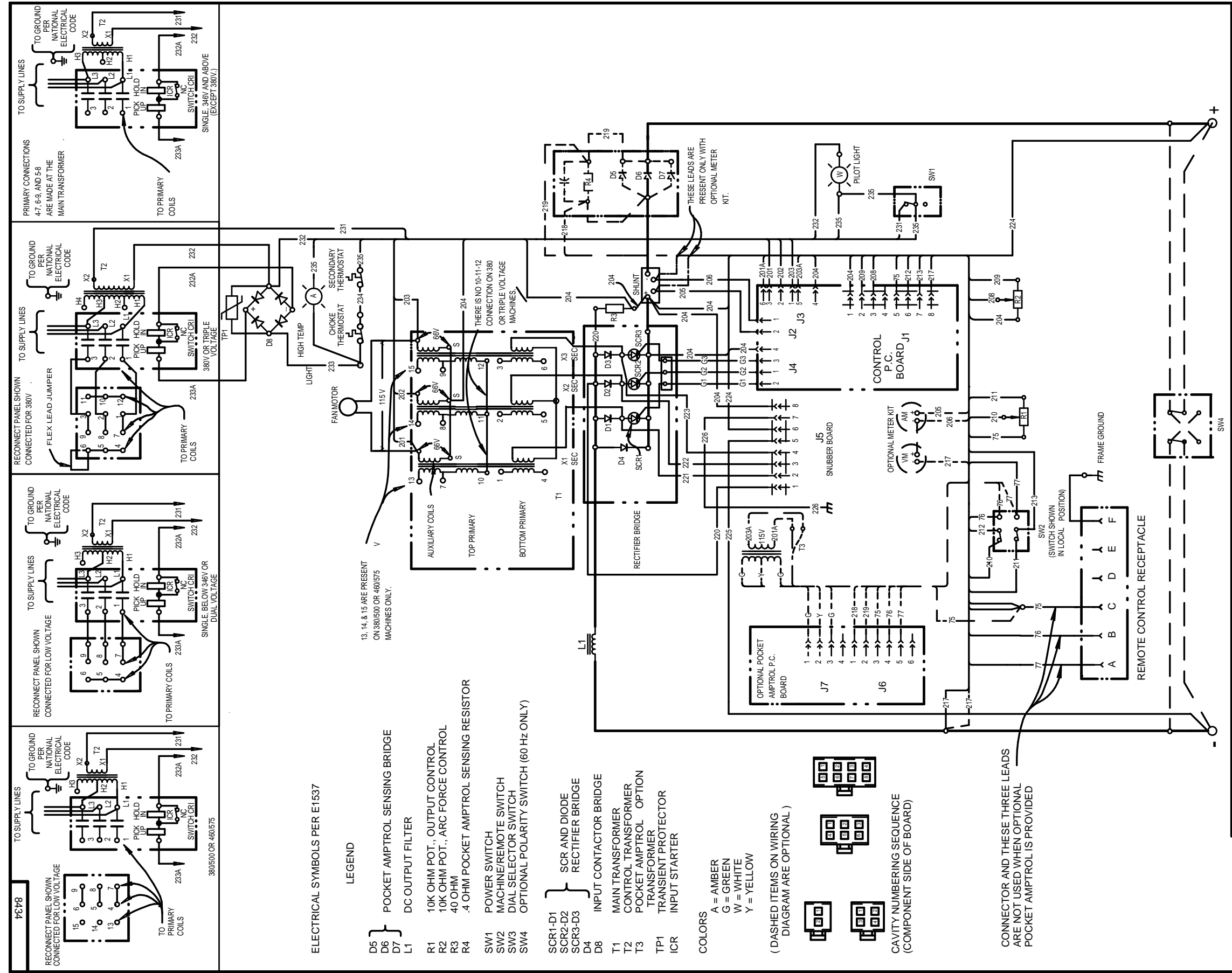
Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



ELECTRICAL SYMBOLS PER E1537

LEGEND

- D5 } POCKET AMPTR. SENSING BRIDGE
- D6 } DC OUTPUT FILTER
- D7 } 10K OHM POT., OUTPUT CONTROL
- L1 } 10K OHM POT., ARC FORCE CONTROL
- R1 } 40 OHM
- R2 } .4 OHM POCKET AMPTR. SENSING RESISTOR
- R3 } POWER SWITCH
- R4 } MACHINE/REMOTE SWITCH
- SW1 } DIAL SELECTOR SWITCH
- SW2 } OPTIONAL POLARITY SWITCH (60 Hz ONLY)
- SW3 } SCR AND DIODE RECTIFIER BRIDGE
- SW4 } INPUT CONTACTOR BRIDGE
- SCR1-D1 } MAIN TRANSFORMER
- SCR2-D2 } CONTROL TRANSFORMER
- SCR3-D3 } POCKET AMPTR. OPTION TRANSFORMER
- D4 } TRANSIENT PROTECTOR
- D8 } INPUT STARTER

- COLORS
- A = AMBER
  - G = GREEN
  - W = WHITE
  - Y = YELLOW

( DASHED ITEMS ON WIRING DIAGRAM ARE OPTIONAL )



CAVITY NUMBERING SEQUENCE (COMPONENT SIDE OF BOARD)

CONNECTOR AND THESE THREE LEADS ARE NOT USED WHEN OPTIONAL POCKET AMPTR. IS PROVIDED

UNLESS OTHERWISE SPECIFIED TOLERANCES SHALL BE: ON HOLE SIZES PER E266 3-50% ON 3 PLACE DECIMALS IS .005 ON 2 PLACE DECIMALS IS .015 ON ALL ANGLES IS 30° A DEGREE WITH UNLESS OTHERWISE SPECIFIED MAINTAIN PUBLISHED STANDARDS.

THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO, U.S.A.

EQUIP. TYPE IDEALARC R3R 300, R3R 375-1

SUBJECT WIRING DIAGRAM

SCALE NONE

REF. L8434

DATE 2-68

CHK

DR. A.B.

SUPP. STG.

SIT. NO. 8434

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.

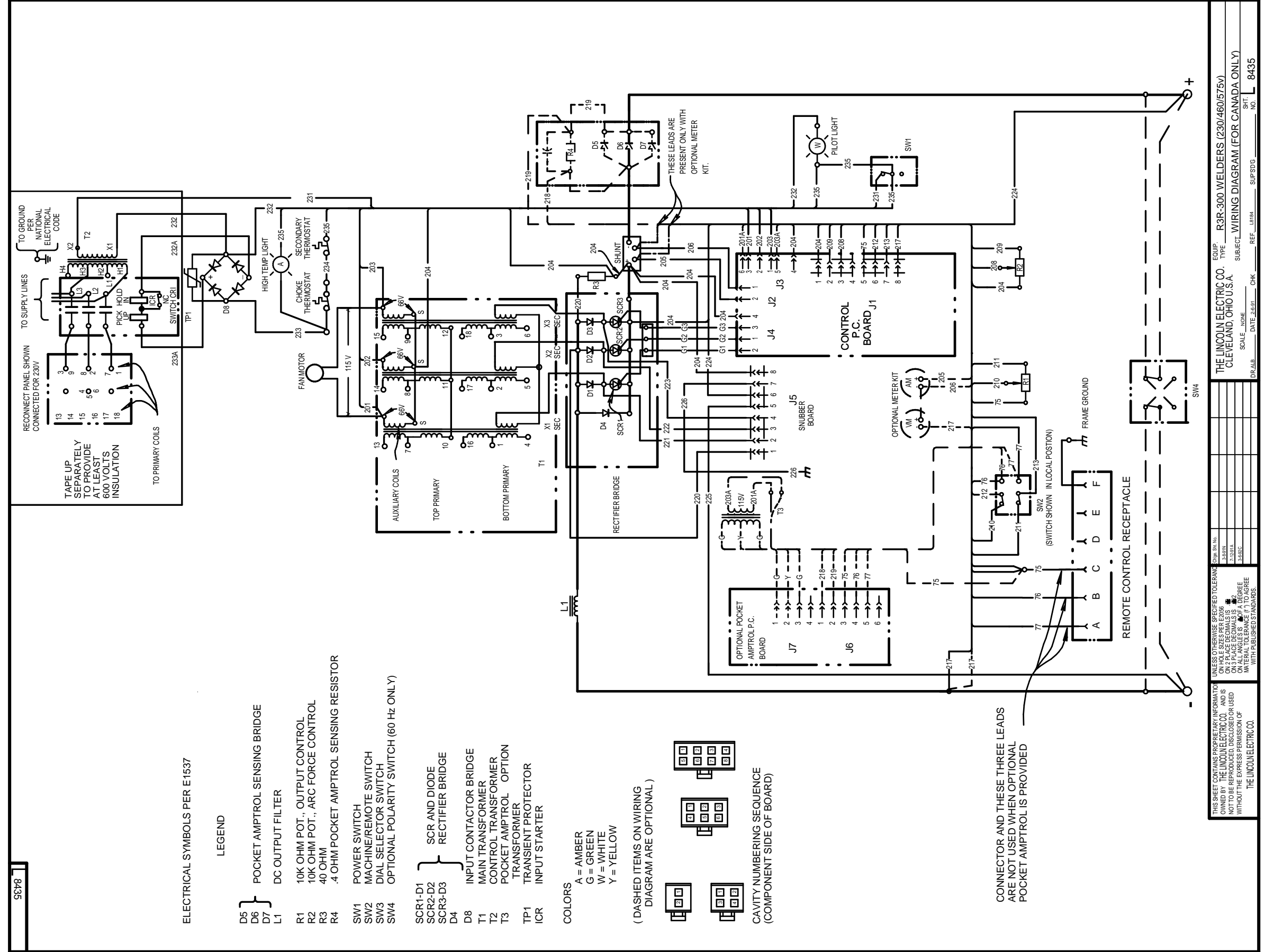
WIRING DIAGRAM - (CODE 9692) (L8435)

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC



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 - (CODES 9697, 9704, 9705, 9707, 9708, 9709, 9710) (L8069)

Return to Section TOC

Return to Section TOC

Return to Section TOC

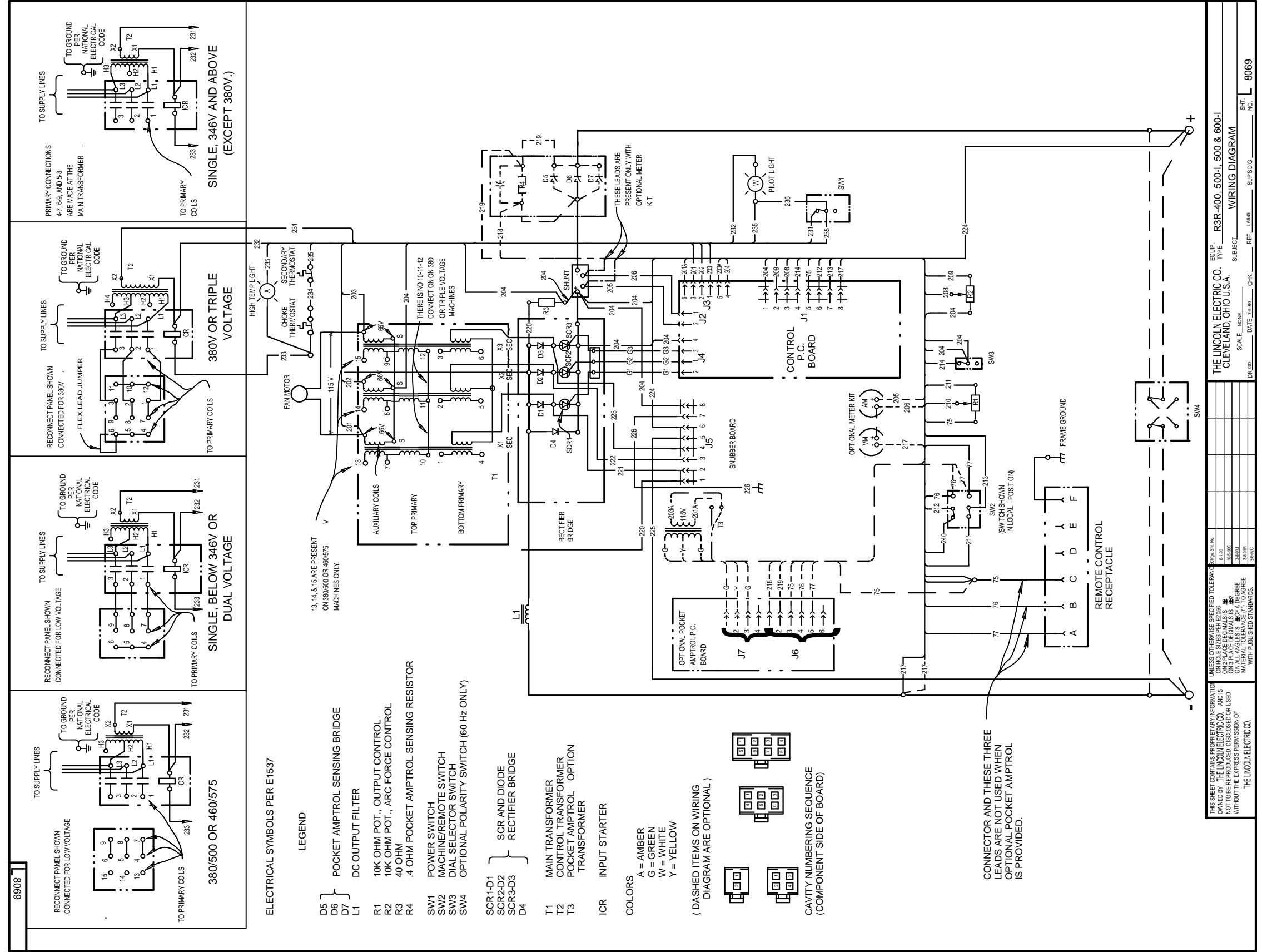
Return to Section TOC

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Return to Master TOC

Return to Master TOC

Return to Master TOC



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.

THIS SHEET CONTAINS PROPRIETARY INFORMATION OWNED BY THE LINCOLN ELECTRIC CO. AND IS NOT TO BE REPRODUCED, DISCLOSED OR USED WITHOUT THE EXPRESS PERMISSION OF THE LINCOLN ELECTRIC CO.	
DATE: 05-89	CHK: CHK
PR. CD.:	SCALE: NONE
SUBJECT: WIRING DIAGRAM	
EQUIP. TYPE: R3R-400, 500-I, 500 & 600-I	
REF. L8069	SUP. SDG. NO. 8069



WIRING DIAGRAM - (CODES 9706,& 9887) (L8184)

Return to Section TOC

Return to Master TOC

Return to Section TOC

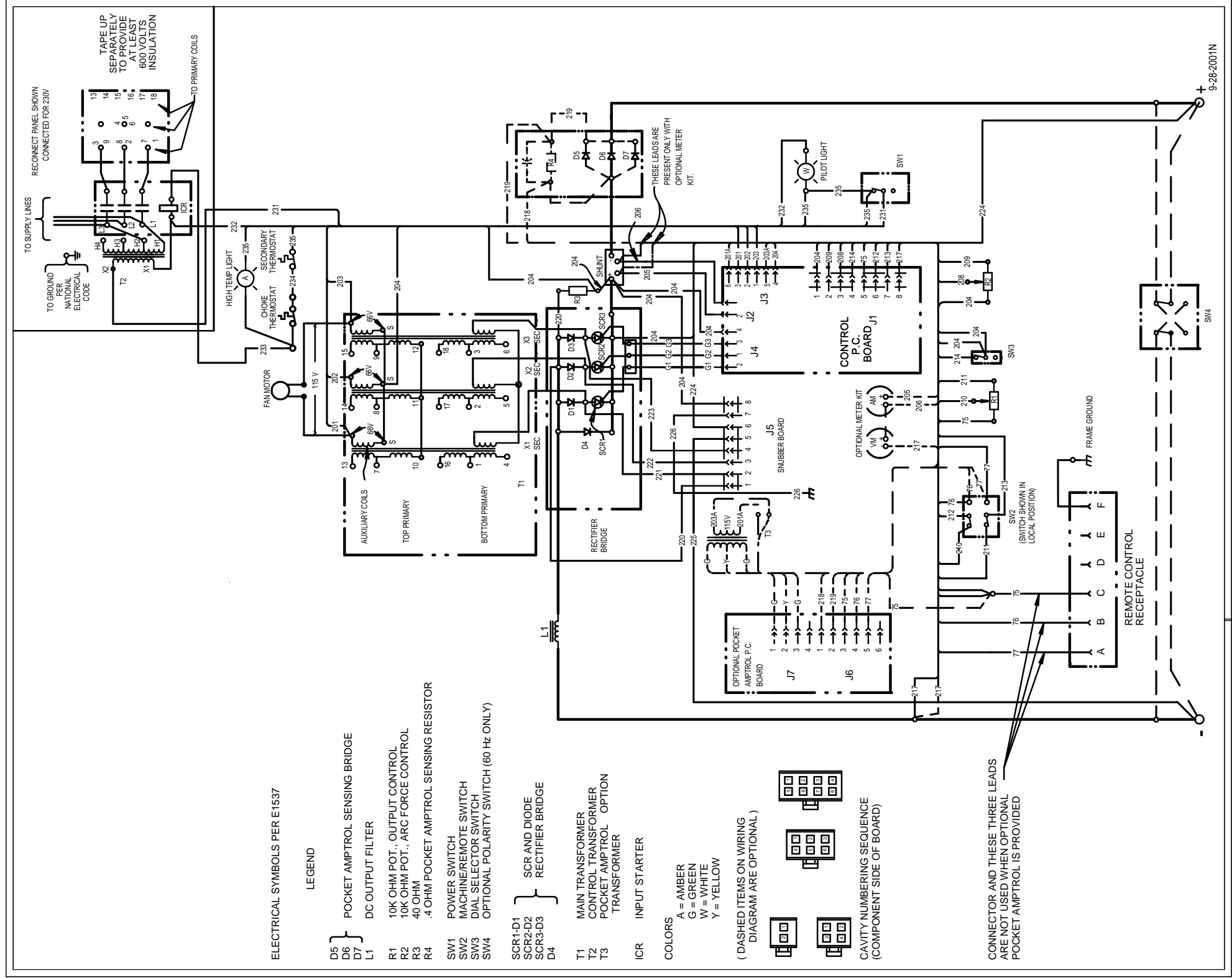
Return to Master TOC

Return to Section TOC

Return to Master TOC

8184

IDEALARC R3R WIRING DIAGRAM (230/460/575 V) (FOR CANADA ONLY)



- ELECTRICAL SYMBOLS PER E1537
- LEGEND
- D5 } POCKET AMPTRON SENSING BRIDGE
  - D6 } DC OUTPUT FILTER
  - D7 } 10K OHM POT., OUTPUT CONTROL
  - L1 } 10K OHM POT., ARC FORCE CONTROL
  - R1 } 40 OHM
  - R2 } .4 OHM POCKET AMPTRON SENSING RESISTOR
  - R3 } POWER SWITCH
  - R4 } MACHINE/REMOTE SWITCH
  - SW1 } DIAL SELECTOR SWITCH
  - SW2 } OPTIONAL POLARITY SWITCH (60 HZ ONLY)
  - SW3 } SCR AND DIODE RECTIFIER BRIDGE
  - SW4 } SCR AND DIODE RECTIFIER BRIDGE
  - T1 } MAIN TRANSFORMER
  - T2 } CONTROL TRANSFORMER
  - T3 } POCKET AMPTRON OPTION TRANSFORMER
  - ICR } INPUT STARTER
- COLORS
- A = AMBER
  - G = GREEN
  - W = WHITE
  - Y = YELLOW
- ( DASHED ITEMS ON WIRING DIAGRAM ARE OPTIONAL )
- OPTIONAL POCKET AMPTRON P.C. BOARD
- OPTIONAL METER KIT (AM)
- CONNECTOR AND THESE THREE LEADS ARE NOT USED WHEN OPTIONAL POCKET AMPTRON IS PROVIDED

CLEVELAND, OHIO U.S.A.

L8184

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UNLESS OTHERWISE SPECIFIED TOLERANCES SHALL BE:

FINISH	AS SHOWN
ANGLE	13.3°
DIAMETER	±0.0005
HOLE SIZE	±0.0005
POSITION	±0.005
RADIUS	±0.0005
RECTANGULAR	±0.0005
THICKNESS	±0.0005
WIDTH	±0.0005

DATE: 12-21-98

CHK: J.P.

REF: L8099

SUPD/G: \_\_\_\_\_

SHT. NO.: 8184

IDEALARC R3R WELDERS (230/460/575 V)

WIRING DIAGRAM (FOR CANADA ONLY)

THE LINCOLN ELECTRIC CO. 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.





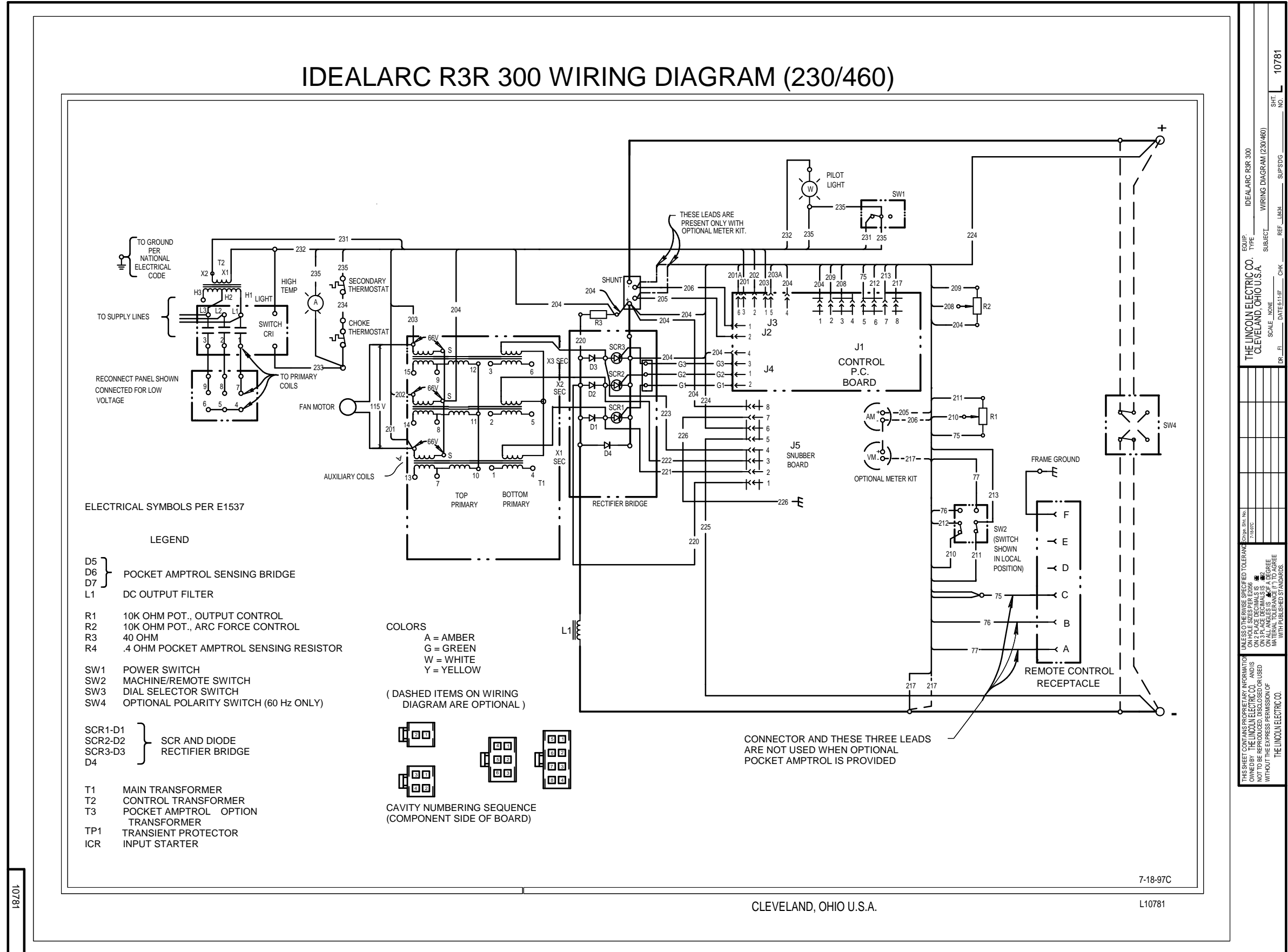
WIRING DIAGRAM - (CODE 10471) (L10781)

Return to Section TOC  
Return to Master TOC

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Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



EQUIP. TYPE IDEALARC R3R 300  
SUBJECT WIRING DIAGRAM (230/460)

THE LINCOLN ELECTRIC CO.  
CLEVELAND, OHIO U.S.A.

SCALE NONE  
DATE 11-97 CHK NO. 10781  
DR. LMBH SUP/SDG

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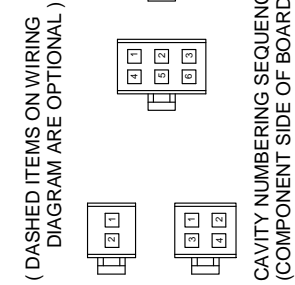
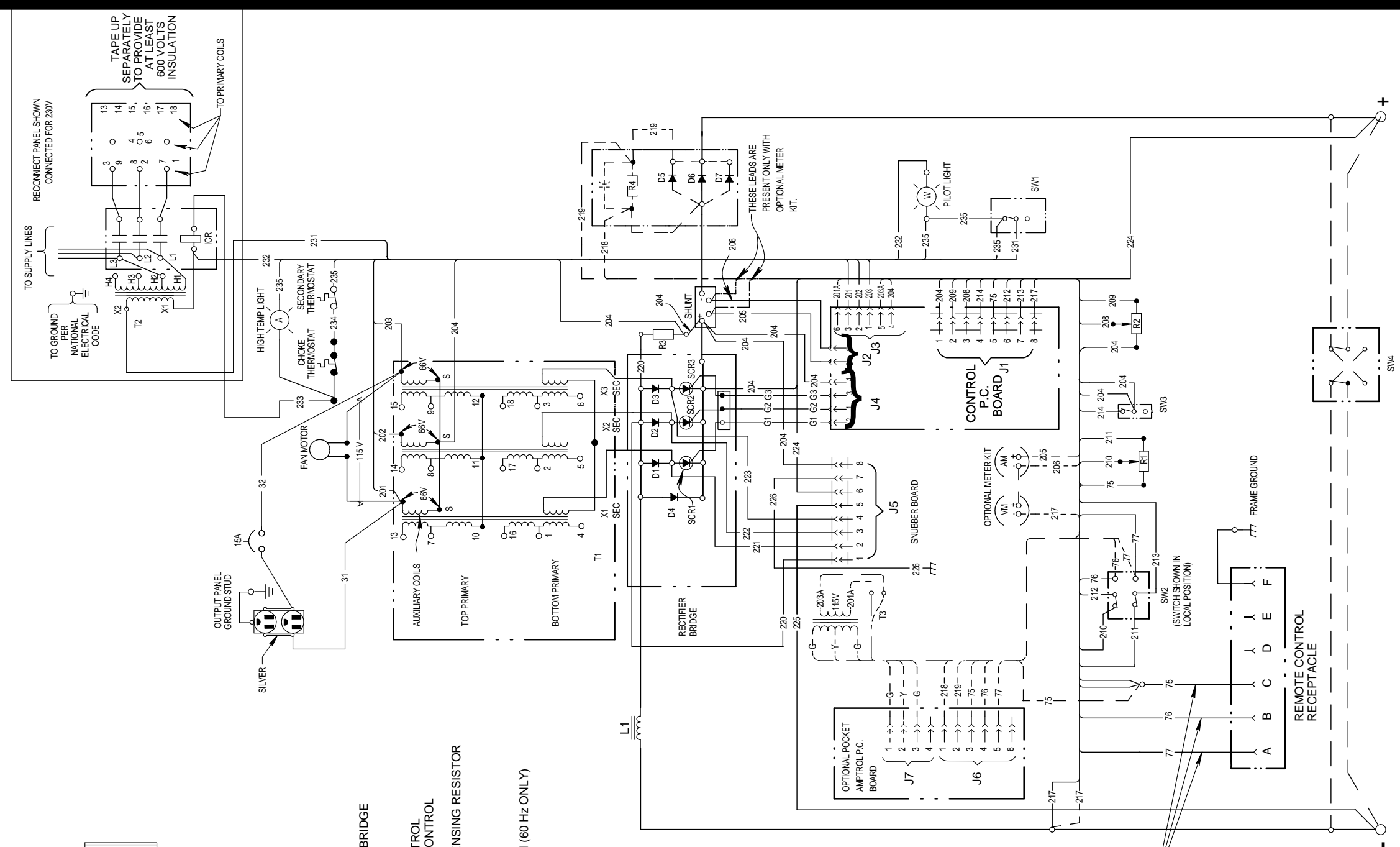
UNLESS OTHERWISE SPECIFIED TOLERANCE IS AS FOLLOWS: DIMENSIONS IN PARENTHESIS ARE PREFERRED DIMENSIONS. DIMENSIONS IN SQUARE DECIMALS ARE PERMITTED UNLESS OTHERWISE SPECIFIED. MATERIAL TOLERANCE IS TO AGREE WITH PUBLISHED STANDARDS.

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 (CODES 10857, 10881) (L11869)

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

IDEALARC R3R WIRING DIAGRAM (230/460/575 V) (FOR CANADA ONLY)



ELECTRICAL SYMBOLS PER E1537

LEGEND

- D5 } POCKET AMP-TROL SENSING BRIDGE
  - D6 } DC OUTPUT FILTER
  - D7 } 10K OHM POT., OUTPUT CONTROL
  - L1 } 10K OHM POT., ARC FORCE CONTROL
  - R1 } 40 OHM
  - R2 } .4 OHM POCKET AMP-TROL SENSING RESISTOR
  - R3 } POWER SWITCH
  - R4 } MACHINE/REMOTE SWITCH
  - SW1 } DIAL SELECTOR SWITCH
  - SW2 } OPTIONAL POLARITY SWITCH (60 HZ ONLY)
  - SW3 } SCR AND DIODE RECTIFIER BRIDGE
  - SW4 } SCR AND DIODE RECTIFIER BRIDGE
  - T1 } MAIN TRANSFORMER
  - T2 } CONTROL TRANSFORMER
  - T3 } POCKET AMP-TROL OPTION TRANSFORMER
  - ICR } INPUT STARTER
- COLORS  
 A = AMBER  
 G = GREEN  
 W = WHITE  
 Y = YELLOW

CONNECTOR AND THESE THREE LEADS ARE NOT USED WHEN OPTIONAL POCKET AMP-TROL IS PROVIDED

2-8-2002D

L11869

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 (CODES 11043, 11044, 11045, 11046) (L11869-1)

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

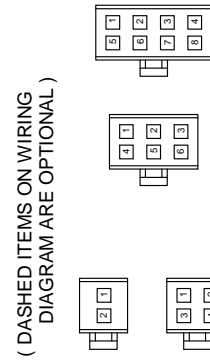
Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

IDEALARC R3R WIRING DIAGRAM (230/460/575 V)

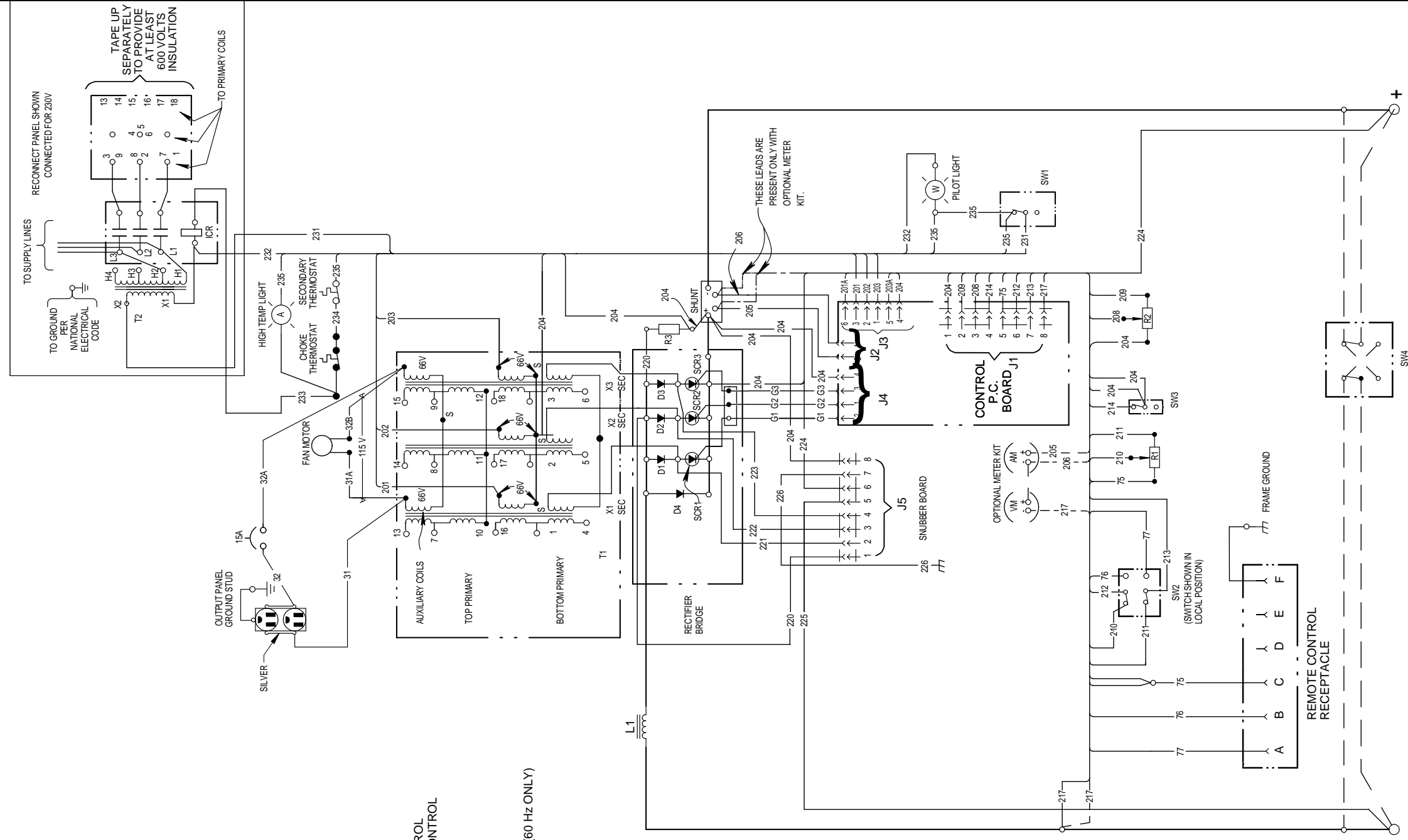


CAVITY NUMBERING SEQUENCE (COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537

- LEGEND**
- L1 DC OUTPUT FILTER
  - R1 10K OHM POT., OUTPUT CONTROL
  - R2 10K OHM POT., ARC FORCE CONTROL
  - R3 40 OHM
  - SW1 POWER SWITCH
  - SW2 MACHINE/REMOTE SWITCH
  - SW3 DIAL SELECTOR SWITCH
  - SW4 OPTIONAL POLARITY SWITCH (60 HZ ONLY)
  - SCR1-D1 SCR AND DIODE
  - SCR2-D2 RECTIFIER BRIDGE
  - SCR3-D3
  - D4
  - T1 MAIN TRANSFORMER
  - T2 CONTROL TRANSFORMER
  - ICR INPUT STARTER

**COLORS**  
A = AMBER  
G = GREEN  
W = WHITE  
Y = YELLOW



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.



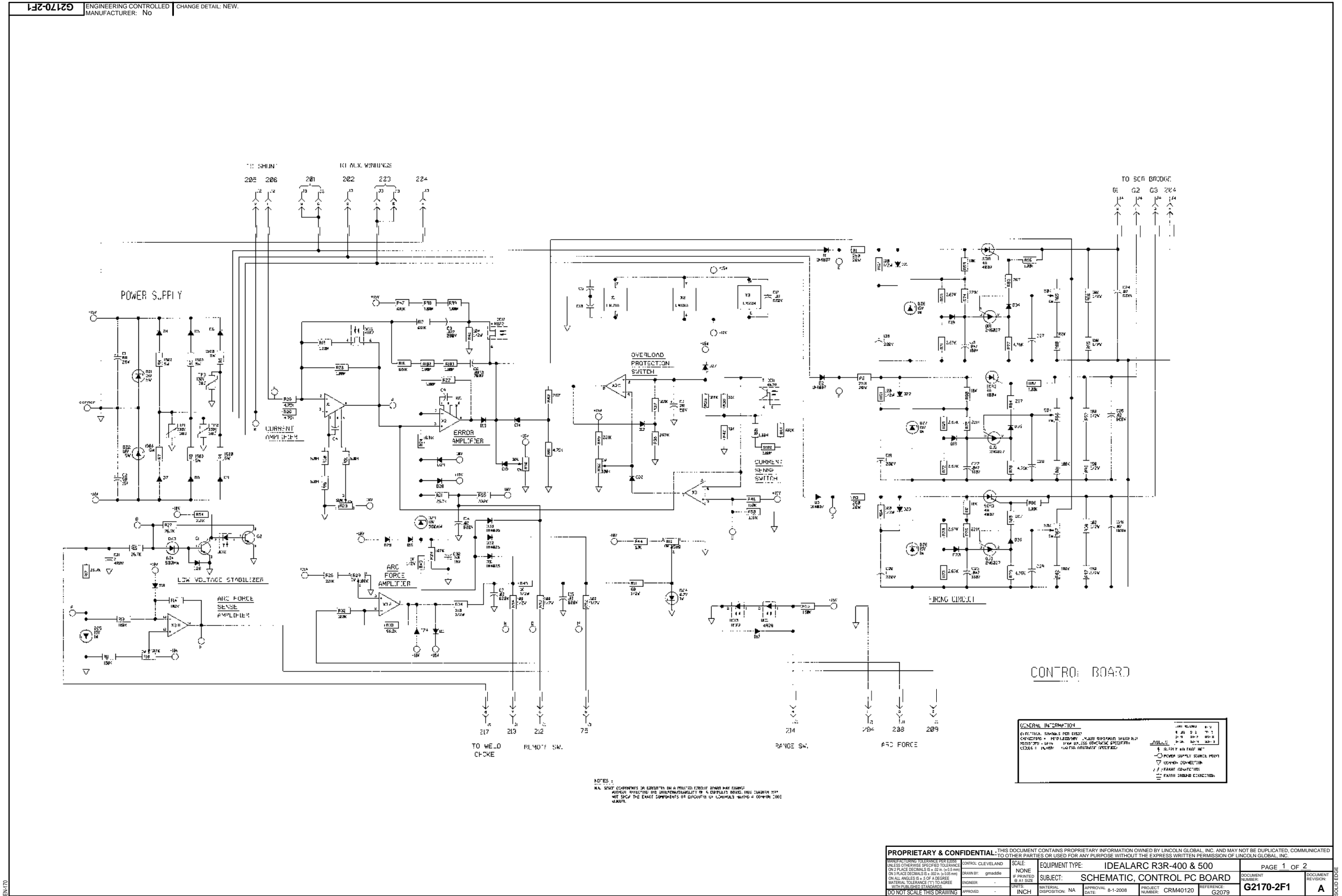
SCHEMATIC - R3R-400, -500 COMPLETE MACHINE (G2170) PG1

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



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



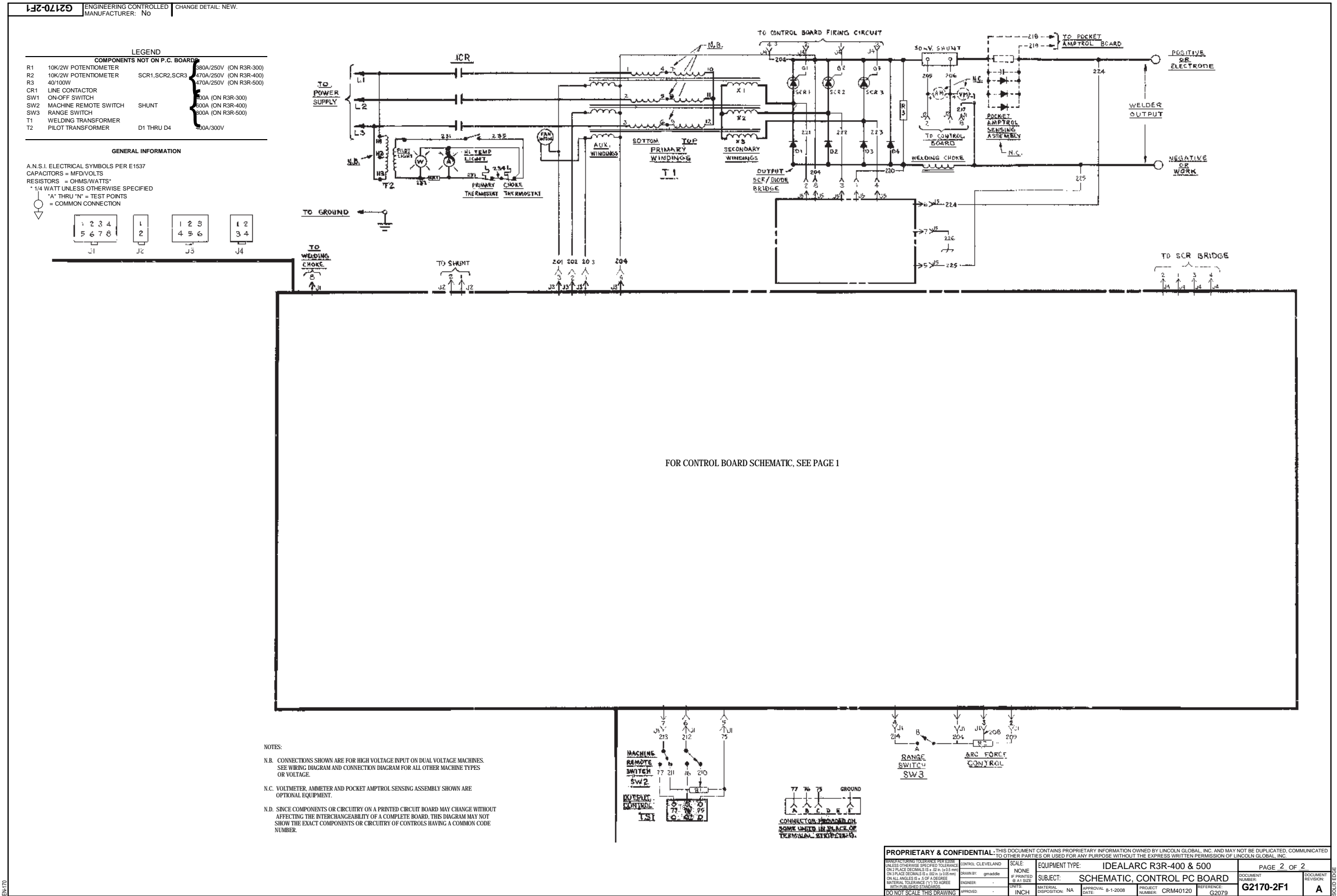
SCHEMATIC - R3R-400, -500 COMPLETE MACHINE (G2170) PG2

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



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



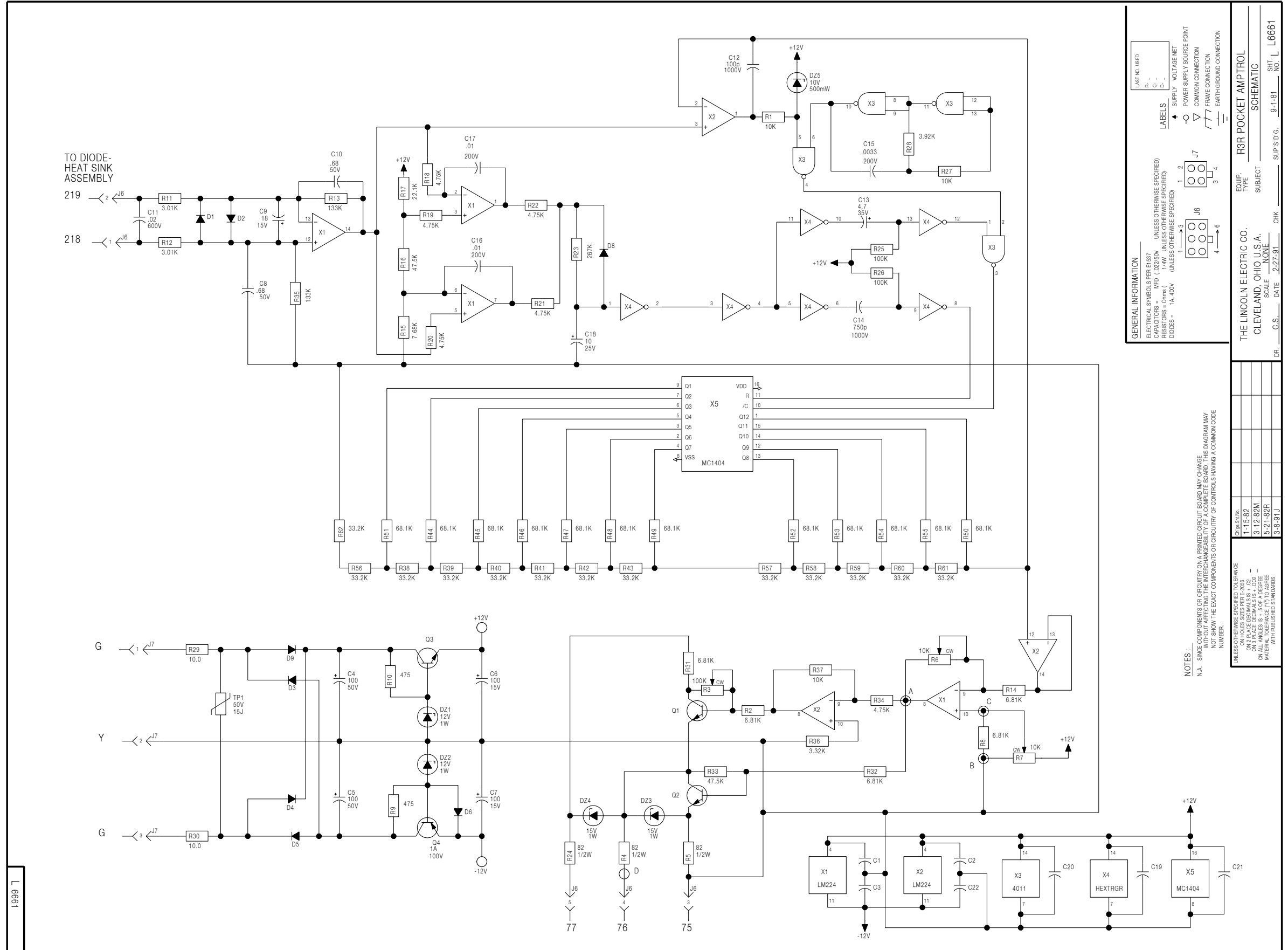
SCHEMATIC - POCKET AMPTROL (L6661)

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



L 6661

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

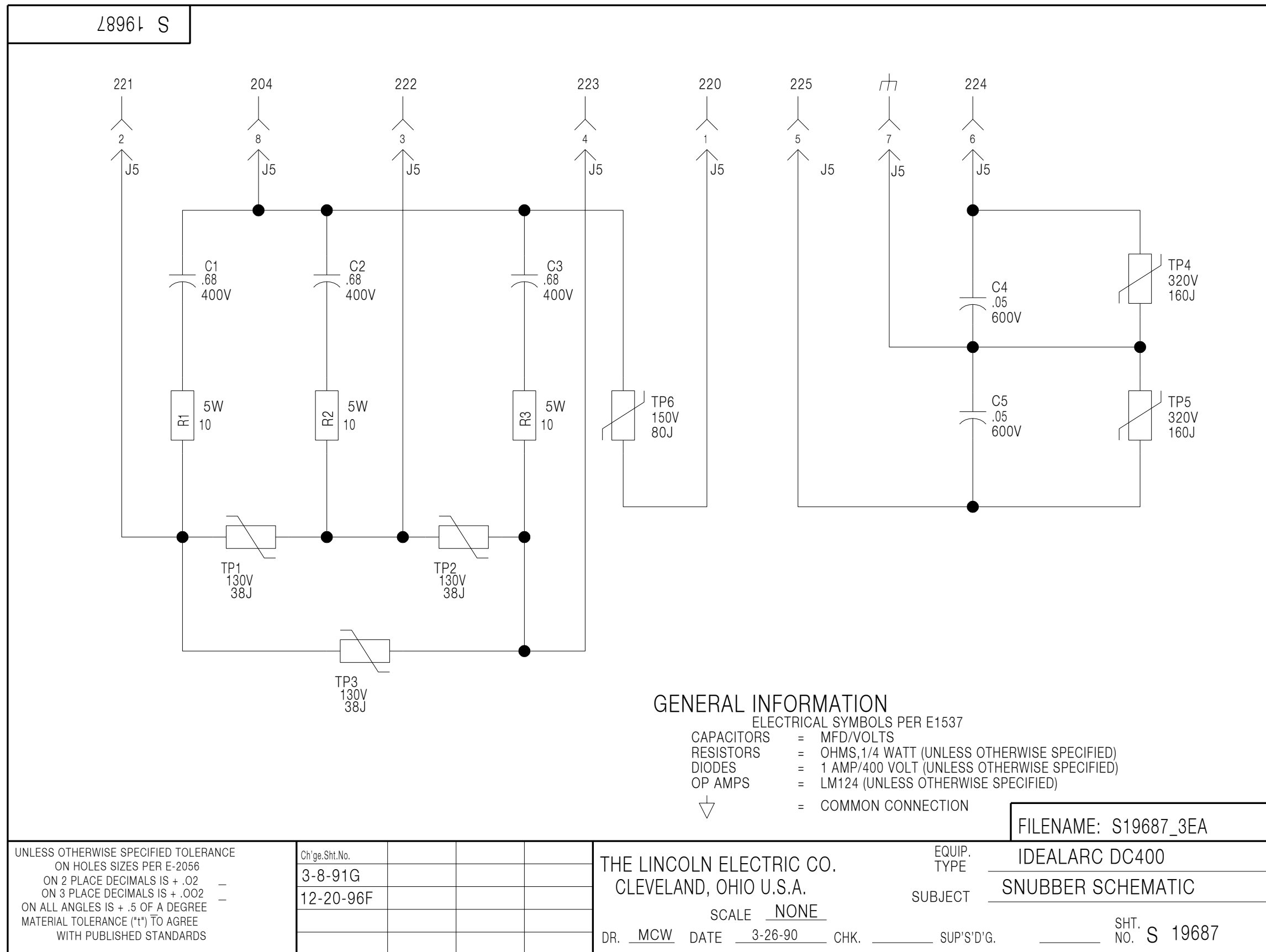
SCHEMATIC - SNUBBER PC BOARD (S19687)

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



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