RETURN TO MAIN INDEX

SVM101-A

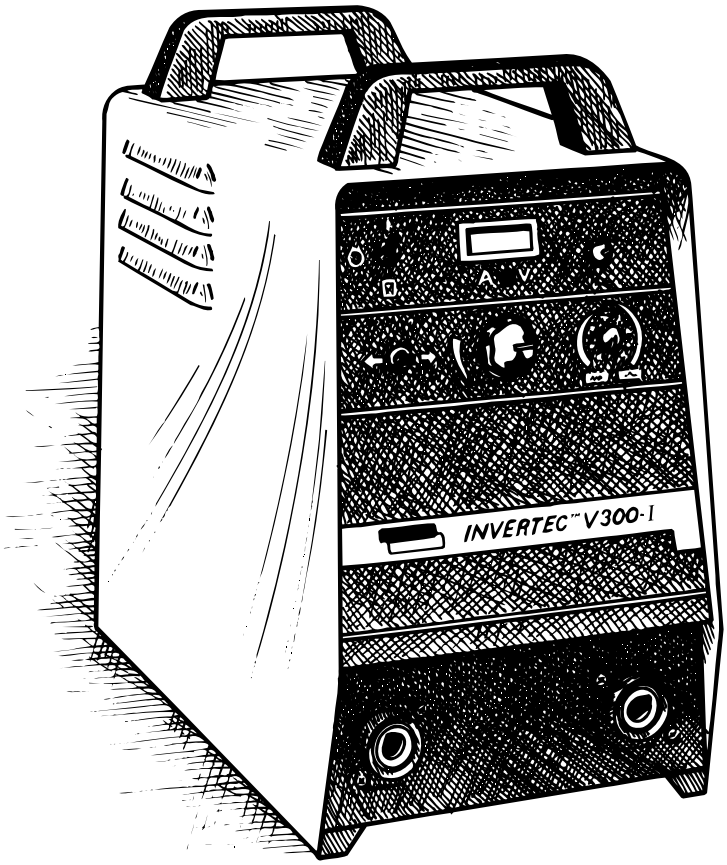
December 1995

INVERTEC V300-I

For use with machines Code Numbers **9826**
9827
10036
10037
10132
10133

Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT. And, most importantly, think before you act and be careful.



SERVICE MANUAL

World's Leader in Welding and Cutting Products

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SAFETY

WARNING

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.

ELECTRIC SHOCK can kill.

1.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

1.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.**

1.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

1.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.

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

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

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

1.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.

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

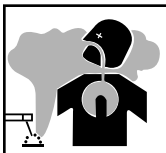
1.j. Also see Items 4.c. and 6.

ARC RAYS can burn.

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

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

2.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

3.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

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

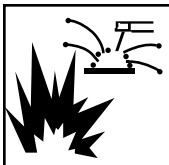
3.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

3.d. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

3.e. Also see item 7b.

Apr. ‘93

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



WELDING SPARKS can cause fire or explosion.

4.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

4.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.

4.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.

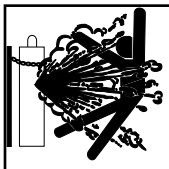
4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe 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).

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

4.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.

4.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.

4.h. Also see item 7c.



CYLINDER may explode if damaged.

5.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

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

5.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.

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

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

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

5.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

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

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

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

Mar. ‘93

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

FOR ENGINE powered equipment.

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

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

7.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.

7.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.

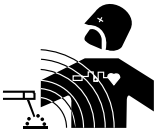
7.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

7.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.

7.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.

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

ELECTRIC AND MAGNETIC FIELDS may be dangerous



8.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

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

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

8d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

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

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

8.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.

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

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

Mar. '93

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

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

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

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Mar. '93

RETURN TO MAIN INDEX

MASTER TABLE OF CONTENTS FOR ALL SECTIONS

TABLE OF CONTENTS
- INSTALLATION SECTION -

INSTALLATION

INPUT

THREE PHASE

Standard Voltage	Input Current at Rated Output	Code Number
200/230/280-415/440 50/60	43/39/25-25/22	9826, 9827, 10036, 10037, 10132, 10133

SINGLE PHASE

Standard Voltage	Input Current at Rated Output	Code Number
200/230/380-415/440 50/60	53/47/32-32/29	9826, 9827, 10036, 10037, 10132, 10133

RATED OUTPUT

THREE PHASE

Duty Cycle	Amps	Volts at Rated Amperes
60% Duty Cycle	300	32
100% Duty Cycle	250	30

SINGLE PHASE

Duty Cycle	Amps	Volts at Rated Amperes
60% Duty Cycle	200	28
100% Duty Cycle	165	26.5

OUTPUT

THREE PHASE

Welding Current Range	Constant Open Circuit Voltage	Auxiliary Power
5-300 Amps	60-70 VDC	42 VAC, 5.5 Amps 24 VAC, 1 Amp *115 VAC, 2 Amps *Not on all codes

SINGLE PHASE

Welding Current Range	Constant Open Circuit Voltage	Auxiliary Power
5-200 Amps	60-70 VDC	42 VAC, 5.5 Amps 24 VAC, 1 Amp *115 VAC, 2 Amps *Not on all codes

RECOMMENDED INPUT WIRE AND FUSE SIZES

THREE PHASE

Input Voltage Frequency(1)	Fuse (Superlag) or Breaker Size	Input Ampere Rating on Nameplate	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
200/50-60	60	43	6 (16mm²)	10 (6mm²)
220/50-60	60	39	8 (10mm²)	10 (6mm²)
380/50-60	35	25	10 (6mm²)	10 (6mm²)
415/50-60	35	25	10 (6mm²)	10 (6mm²)
440/50-60	35	22	10 (6mm²)	10 (6mm²)

SINGLE PHASE

Input Voltage Frequency(1)	Fuse (Superlag) or Breaker Size	Input Ampere Rating on Nameplate	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
200/50-60	80	53	6 (16mm²)	10 (6mm²)
220/50-60	70	47	6 (16mm²)	10 (6mm²)
380/50-60	50	32	8 (10mm²)	10 (6mm²)
415/50-60	50	32	8 (10mm²)	10 (6mm²)
440/50-60	50	29	10 (6mm²)	10 (6mm²)

PHYSICAL DIMENSIONS

Height	Width	Depth	Weight
18.7 in.	10.8 in.	22.2 in.	64 lbs.
475 mm	274 mm	564 mm	29 Kg

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

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

Read entire installation section before starting installation.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**
- **Always connect the V300-I grounding terminal (located on the bottom of the input connection box) to a good electrical earth ground.**

SELECT SUITABLE LOCATION

NOTE: The Invertec V300-I is capable of operating in harsh environments. However, it is important to use the machine in appropriate locations to assure reliable operation and long life. Failure to follow these precautions can result in excessive operating temperatures causing nuisance shutdown of the machine.

1. Verify the machine will be located in an area where

   - free circulation of air into the sides and out the front and bottom of the machine will not be restricted.
   - dust and dirt is kept to a minimum.
   - it will remain dry, sheltered from rain and snow.
   - it will not be placed on wet ground or in puddles.

STACKING

V300-I's cannot be stacked.

TILTING

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

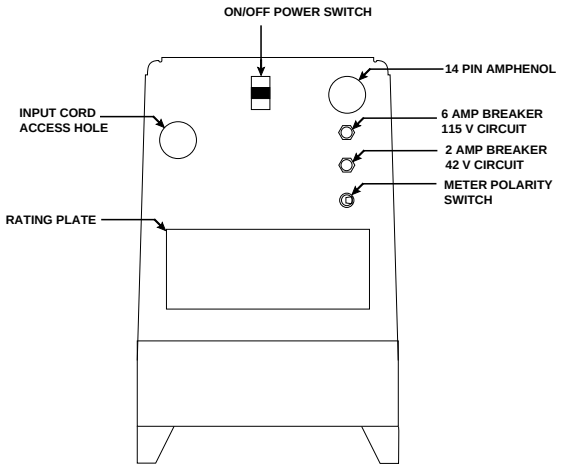
HIGH FREQUENCY PRECAUTIONS

If possible, locate the V300-I away from radio controlled machinery. The normal operation of the V300-I may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

INPUT CONNECTIONS

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate. See Figure A.1 for the location of the rating plate.

FIGURE A.1 — RATING PLATE LOCATION



⚠ WARNING

Only a qualified electrician should connect the input leads to the V300-I. Connections should be made in accordance with all local and national electrical codes and the connection diagram located on the inside of the reconnect/input access door of the machine. Failure to do so may result in bodily injury or death.

⚠ CAUTION

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

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

GROUND CONNECTIONS

Connect terminal on Case Back marked ⏚ to earth ground per National Electrical Code.

INSTALL INPUT POWER CORD CONNECTOR

NOTE: The Invertec V300-I is supplied with one cord connector. The cord connector provides a strain relief for the input power cord as it passes through the right rear access hole. The cord connector is designed for a cord diameter of .310 – 1.070 in. (7.9 – 27.2mm).

1. Strip away outer jacket of cord and trim insulating fillers. Insert conductors through cord connector. The jacketed portion of cord must go through cord connector.

2. Tighten both connector screws.

INPUT POWER CONNECTIONS

Connect AC power supply lines to Power Line Switch S1.

- Single-phase operation — Connect supply lines to the upper and lower terminals of Power Line Switch. Torque to (3.0 Nm) 27.5 in.-lbs. Upper terminal is labeled “U”, and lower terminal is labeled “W”.

- Three-phase operation — Connect 3 phase supply lines to Power Line Switch terminals labeled “U”, “V” and “W”. Torque to (3.0 Nm) 27.5 in.-lbs.

NOTE: Input voltage must be within 10% of rated value.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to Technical Specifications Sheet at beginning of this chapter for proper fuse sizes and input cable sizes.

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

- Install proper fuse in fuse holder in reconnect panel. See Specifications at beginning of this chapter.

INPUT VOLTAGE RECONNECT PROCEDURE

NOTE: The invertec V300-I should be connected only by a qualified electrician. Installation should be made in accordance with all local and national electrical codes and the information detailed in this manual.

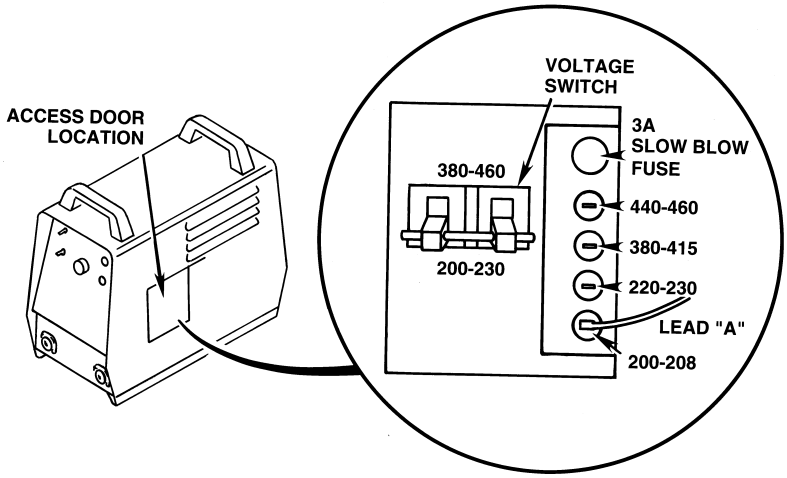
1. To connect 200/220/380-415/440 AC MULTIPLE voltage machines, follow procedures shown below and refer to Figure A.2.

2. To connect 575 VAC single-voltage machine, no internal reconnection for other input voltages is possible. The 575 VAC machine can only be connected to 575 VAC.

NOTE: Turn main power to machine OFF before performing reconnect procedure. Failure to do so will result in damage to the machine. DO NOT switch the reconnect bar with machine power ON.

To Operate at	Procedure
440 VAC	1. No setup is typically required. Machine is factory-connected to operate at 440 volts. Verify input voltage swith in 380-460V position. Verify lead “A” in 440-460V terminal.
200 or 220 VAC	1. Open reconnect panel access door on wrap-around. 2. Move input voltage switch to Voltage = 200-230V position. 3. Move lead “A” to terminal that matches input voltage: **Input** — **Use Terminal** 200 VAC — 200-208 VAC 220 VAC — 220-230 VAC
380, 415 or or 440 VAC	1. Open reconnect panel access door on wrap-around. 2. Move input voltage switch to Voltage = 380-460V position. 3. Move lead “A” to terminal that matches input voltage: **Input** — **Use Terminal** 380 VAC — 380-415V 415 VAC — 380-415V 440 VAC — 440-460V

FIGURE A.2 — RECONNECT PANEL



OUTPUT CONNECTIONS

Refer to Figure A.3 for location of Output Terminals and 14 pin Amphenol Receptacle.

FIGURE A.3 — OUTPUT CONNECTIONS

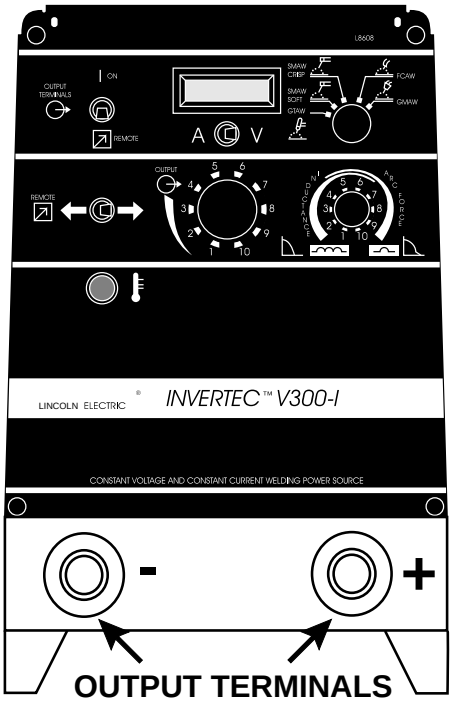


TABLE A.1
Cable Sizes for Combined Length of Electrode and Work Cable (Copper Cable Rated at 75°C).

Duty Cycle	Current	Length	
		Up to 200 Ft. (61M)	200-250 Ft. (61-76M)
100%	250	1/0 (50mm²)	1/0 (50mm²)
60%	300	1/0 (50mm²)	2/0 (70mm²)

WORK AND ELECTRODE CABLE CONNECTIONS

Size

Select output cable size based on Table A.1.

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

1. Remove 1 in. (25mm) of welding cable insulation.
2. Slide rubber boot onto cable end. Boot end may be trimmed to match cable diameter. Soap or other lubricant will help to slide boot over the cable.
3. Slide copper tube into brass plug.
4. Insert cable into copper tube.
5. Tighten set screw to collapse copper tube. Screw must apply pressure against welding cable. Top of set screw sill be well below the surface of the brass plug after tightening.
6. Slide rubber boot over brass plug. Rubber boot must be positioned to cover all electrical surfaces completely after plug is locked into receptacle.

AMPHENOL RECEPTACLE

The 14 Pin Amphenol is used to connect various options and accessories to the V300-I. Refer to the Accessory Section of this manual for available accessories and connection instructions.

TABLE OF CONTENTS
- OPERATION SECTION -

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

OPERATING INSTRUCTIONS

Read and understand entire Operation Section prior to operating machine.

GENERAL WARNINGS

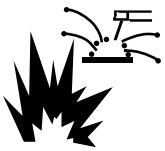
⚠ WARNING

ELECTRIC SHOCK can kill.

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

FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion

- Keep flammable material away.
- Do not weld on 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.

Return to Section TOC
Return to Master TOC

GENERAL DESCRIPTION

The Invertec V300-I is a 300-amp arc welding power source that utilizes single- or thee-phase input power to produce either constant voltage or constant current outputs. The V300-I is designed for 50/60 Hz supply systems. The welding response of the Invertec has been optimized for GMAW, SMAW, TIG and FCAW processes. It is designed to be used with the LN-25, LN-7 and LN-9 GMA Semiautomatic Wire Feeders.

RECOMMENDED PROCESSES AND EQUIPMENT

The Invertec V300-I is recommended for constant voltage welding processes like GMAW and FCAW, and constant current processes such as SMAW (stick) and GTAW (TIG). Additionally the V300-I will perform air carbon arc cutting. NOTE: Do not exceed the rated current and duty cycle when air carbon arc cutting.

OPERATIONAL FEATURES AND CONTROLS

The Invertec V300-I provides continuous total range output current or voltage adjustment, selectable welding modes and local or remote output control. Additionally, a digital meter displays either preset or actual output. Welding characteristics can be controlled via an arc force and inductance control.

WELDING CAPABILITY

The International V300-I Invertec is rated for 200 amps at a 60% duty cycle for single-phase input and 300 amps at a 60% duty cycle for three-phase unit.

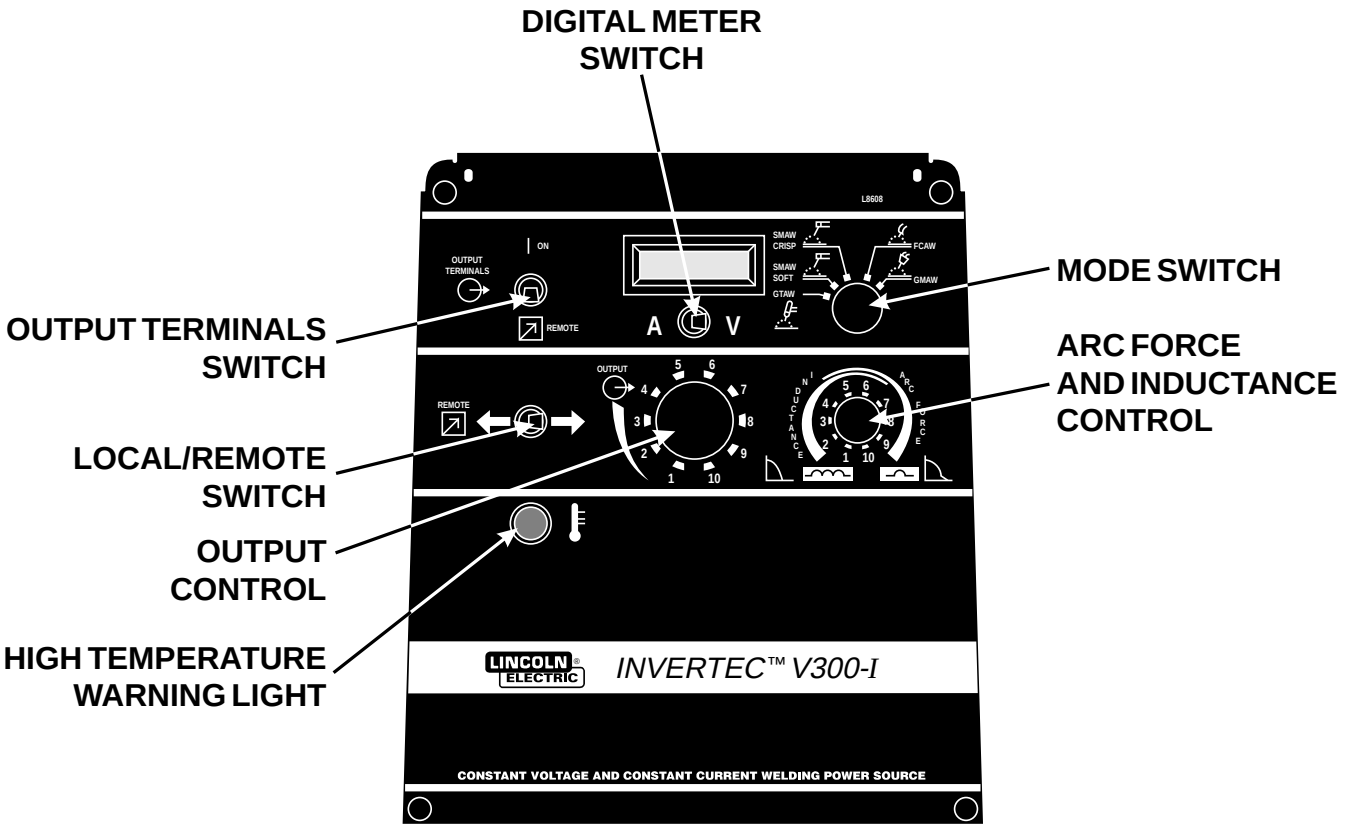
LIMITATIONS

The V300-I is not recommended for pipe thawing.

CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front or case back of the V300-I. Refer to Figure B.1and corresponding explanations.

FIGURE B.1 — CASE FRONT CONTROLS.



Return to Section TOC
Return to Master TOC

POWER SWITCH. The POWER SWITCH is located on the control panel at the rear of the machine. Move the switch lever to the ON position to energize the machine. This also activates the DIGITAL METER and the internal FAN.

OUTPUT CONTROL. This control is used to adjust the power output of the machine. When the machine is in the constant voltage mode, this control adjusts the output VOLTAGE. In the constant current mode, it adjusts the output CURRENT. One turn of the control knob covers the total output range. Power output can be adjusted under both load and no-load conditions.

LOCAL/REMOTE SWITCH. This switch determines where the power output adjustment can be made, at the machine or at a remote location. When the switch is set to LOCAL, the power adjustment can be made at the machine using the OUTPUT CONTROL. When this switch is set to REMOTE, the output adjustment can be made at the wire feeder or the optional REMOTE CONTROL.

DIGITAL METER SWITCH. The DIGITAL METER displays welding current or voltage, depending on the position of the DIGITAL METER SWITCH. When the switch is set at A (for amps), the display is welding current. When the switch is set at V (for volts), the display is welding voltage. When welding is not being-done, the display indicates the output control setting. During welding the display indicates the actual welding current or voltage.

MODE SWITCH. Use this switch to select the type of welding desired: GTAW, CC Soft, CC Crisp, CV FCAW, or CV GMAW. The following settings are recommended:

- **GTAW** — Optimized for both scratch start and Hi-Freq™ kit use.
- **CC Soft** — Best for EXX18[1] thru EXX28 stick electrodes.
- **CC Crisp** — Use this mode for stick welding with EXX10 thru EXX14 electrodes. Non-welding applications, such as resistive heating or output tests with resistive loads, should be done in this mode with Arc Force Control set to minimum.
- **CV FCAW** — This setting has been optimized for Innershield® and Outershield® flux-cored electrodes.
- **CV GMAW** — Short circuit, globe and spray transfer solid wire and gas welding are done in this mode. Low end procedures, less than 16V, may operate better in the FCAW mode.

[1] XX refers to tensile strength of electrode (i.e., 60, 70, etc.).

OUTPUT TERMINALS SWITCH. This switch lets you determine how the machine welding terminals will be energized. Set the switch to the ON position when using processes or equipment that require energized machine terminals (stick, TIG, air-carbon arc cutting, or LN-25 with electrically "hot" gun tip). Set the switch to REMOTE (OFF) position when using LN-25 with K431 and K432 options, LN-9GMA or LN-7, which will allow the gun trigger to energize the welding terminals.

ARC FORCE & INDUCTANCE CONTROL. This control is used to adjust the ARC FORCE on constant current applications and tin INDUCTANCE (pinch effect) on constant voltage applications. The full adjustment range is 1 to 10 with 1 being very soft and 10 being very crisp. When adjusting arc force, the low settings will produce a soft arc and the high settings will produce a more forceful, or driving, arc. The high settings will produce higher spatter levels. When the control is used for FCAW, the maximum setting is generally preferred. With GMAW, the upper half of the range (6 to 10) is preferred with CO_2 or high content CO_2 mixed. The lower half of the range (1 to 5) is preferred for inert gas mixes.

Method	Process	Normal Setting	Recommended Adjustment Range[1]
CC SMAW 1	EXX18 thru EXX28 stick	5	1 (gentle, may stick) to 9 (forceful, more spatter)
CC SMAW 2	EXX10 thru EXX14 stick	6	3 to 10
	Air Carbon Arc Cutting	1	NONE
CV FCAW	Innershield® or Outershield®	10	NONE
	Air Carbon Arc Cutting	1	NONE
CV GMAW	CO_2 or 25% CO_2 or similar gas mixes	7.5	5 to 10[2]
	98% Ar, 2% O_2 or 90% Ar, 7.5% He, 2.5% CO_2 and other predominantly inert gases	5	1 to 10

[1] Full range is 1 to 10; 1 is very soft; 10 is very crisp.
[2] 1 = lowest pinch, highest inductance, and least spatter.
10 = highest pinch, lowest inductance, and most spatter.

METER POLARITY SWITCH. The switch is located on the control panel at the rear of the machine. It provides a work-sensing connection (not the work lead) for wire feeder voltmeters. As shown in Figure B.1a, if the electrode polarity is negative (–), push the switch to the left. If the electrode polarity is positive (+), push the switch to the right. This switch does not change welding polarity.

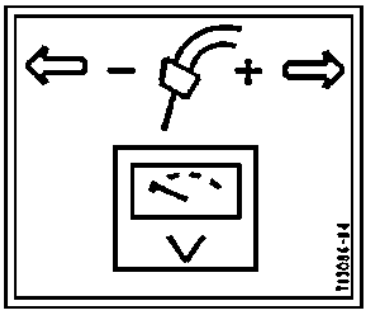


FIGURE B.1a

WELDING OPERATION

Familiarize yourself with the Controls and Display Section before attempting operation of the V300-I.

⚠ WARNING

If stick welding, TIG, or air carbon arc cutting is to be done on the Invertec along with semiautomatic welding, then all control, electrode and work leads to the wire feed equipment must be disconnected from the Invertec before connecting the Invertec for stick, TIG or air carbon arc cutting.

CONSTANT VOLTAGE PROCESSES

Gas Metal Arc Welding (GMAW)
GMAW welding may be performed with the Invertec using the Lincoln Electric LN-9 GMA, LN-25 or LN-7 Wire Feeders. An appropriate GMAW gun and cable assembly and a regulated supply of shielding gas are required.

Innershield®/Outershield® (FCAW)
Semiautomatic flux-cored wire processes may be done with the Invertec using the Lincoln Electric LN-25 or LN-7 Wire Feeders. An appropriate gun and cable assembly is required.

NOTE: Code 9827, 10037 and 10132 (European) can not operate an LN-9 GMA or LN-7 since these require a 110 VAC auxiliary.

CONSTANT CURRENT PROCESSES

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

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

NOTE:

1. Air carbon arc cutting may be performed using either Constant Voltage modes or Constant Current modes; however, the cutting action will be smoother with Constant voltage modes. Best performance will be at settings of 250 amps and below.

2. The electrode protection circuit in the Invertec will limit the current to approximately 325 amps.

TIG Welding
The Invertec which is capable of scratch TIG welding, can be mated with the K900-1 DC TIG starter. An electrode cable, work cable, TIG torch, and gas supply are required. Refer to Accessories section of this manual.

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
Return to Section TOC
Return to Master TOC

AUXILIARY POWER

Three AC auxiliary power supplies are included in the Invertec V300-I: 24 VAC, 42 VAC and 115 VAC.

The 24 VAC supply is rated at 1 amp and provides power for the LN-25 wire feeder. Protection is provided by a self-resetting current limited.

The 42 VAC supply is rated at 5.5 amps and provides power for other wire feeders. Protection is provided by a 6-amp circuit breaker with a reset button located on the rear control handle.

The 115 VAC supply is rated at 2 amps and provides power for the LN-7 wire feeder. Protection is provided by a 2.5-amp circuit breaker with a reset button located on the rear control panel.

The 24, 42 and 115 VAC supplies must not be loaded at the same time.

NOTE: 110/115 VAC is not available on Codes 9827, 10037 and 10133.

OVERLOAD PROTECTION

The machine is electrically protected from producing high output currents. Should the output current exceed 340-360A, an electronic protection circuit will reduce the current (“Fold Back”) to approximately 150A. The machine will continue to produce this low current until the protection circuit is reset. Reset occurs when the output load is removed.

THERMAL PROTECTION

Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostat will prevent output voltage or current. The meter will remain energized during this time.

TABLE OF CONTENTS
- ACCESSORIES SECTION -

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

OPTIONS / ACCESSORIES

CABLE PLUGS

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

Cable Plug Kit for 2.0-3/0 cable (K852-95).

NOTE: Two K852-70 plugs are included with the V300-I.

K864 REMOTE CONTROL ADAPTER

Plugs into the 14-pin receptacle on the rear panel of the Invertec. Adapter splits remote control circuitry to a 6-pin receptacle and to a 14-pin receptacle. Adapter permits remote output control of Invertec by means of K857 Remote Control, K812 Hand Amptrol or K870 Foot Amptrol. Allows remote while using LN-7 K480-7 control cable.

K867 UNIVERSAL ADAPTER PLUG

Consisting of a 14-pin plug connected to labeled wires, the adapter allows user connection of any suitable accessory or wire feeder to the remote control, contactor, and auxiliary power circuitry of the Invertec.

K876 REMOTE CONTROL ADAPTER

For operating an LN-25 wire feeder. The adapter connects to the 14-pin receptacle of Invertec power sources and to the 6-pin connector of the LN-25 K432 remote control cable.

K900-1 DC TIG STARTER

Solid state GTAW starting unit. Rated 300, 60%.

Return to Section TOC
Return to Master TOC

CONNECTING A LN-25 WIRE FEEDER

1. Turn Invertec power switch OFF.

2. Connect electrode cable to output terminal of polarity required by electrode.

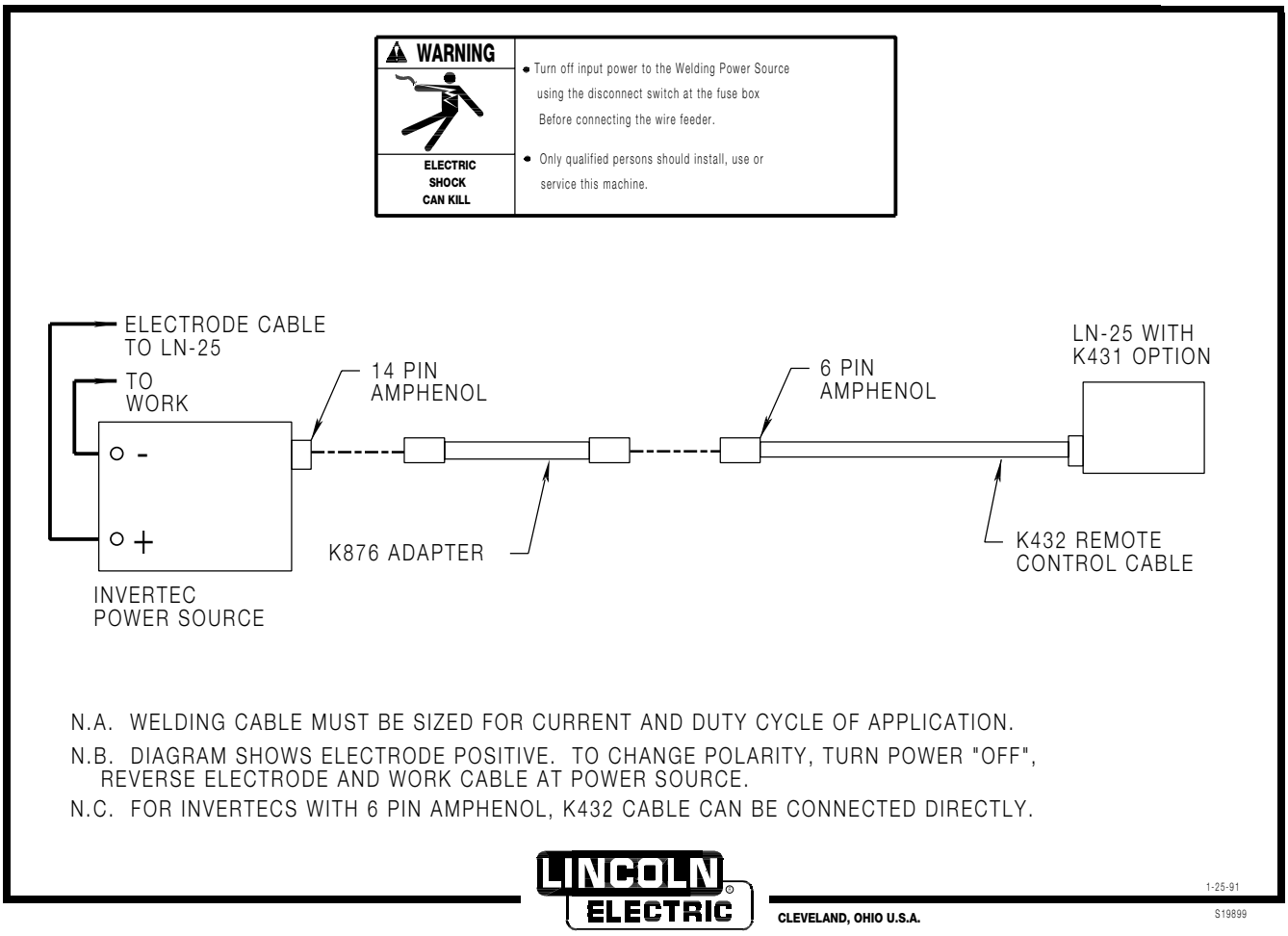
3. Connect work lead to other terminal.

NOTE: LN-25 with remote control options K431 and K432: Use K876 adapter with K432 cable or modify K432 cable with K867 universal adapter plug. See connection diagrams S19899 and S19309 or S19405.

4. Place local/remote switch in “Remote” position if output control is desired at wire feeder rather than at Invertec. (LN-25 must have K431 and K432 options for remote output control operation.)

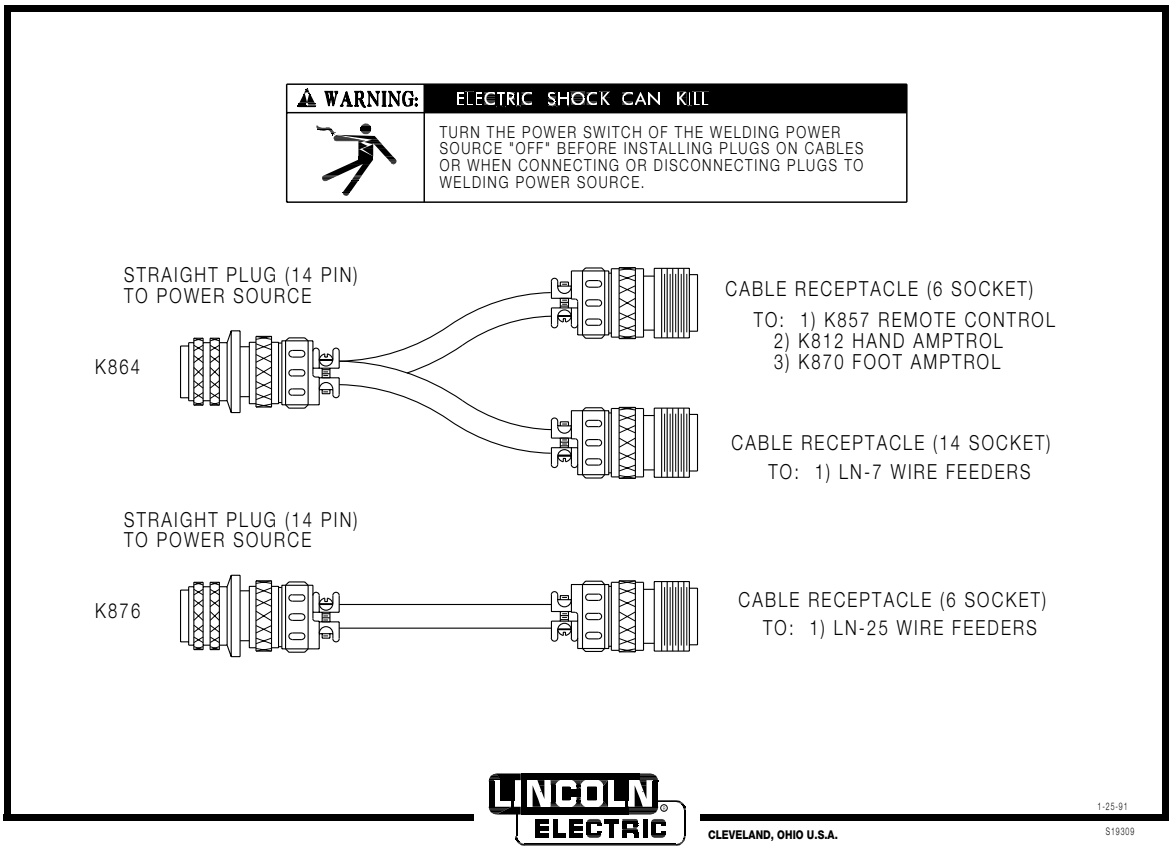
K876 ADAPTER TO LN-25 - CONNECTION DIAGRAM

S19899



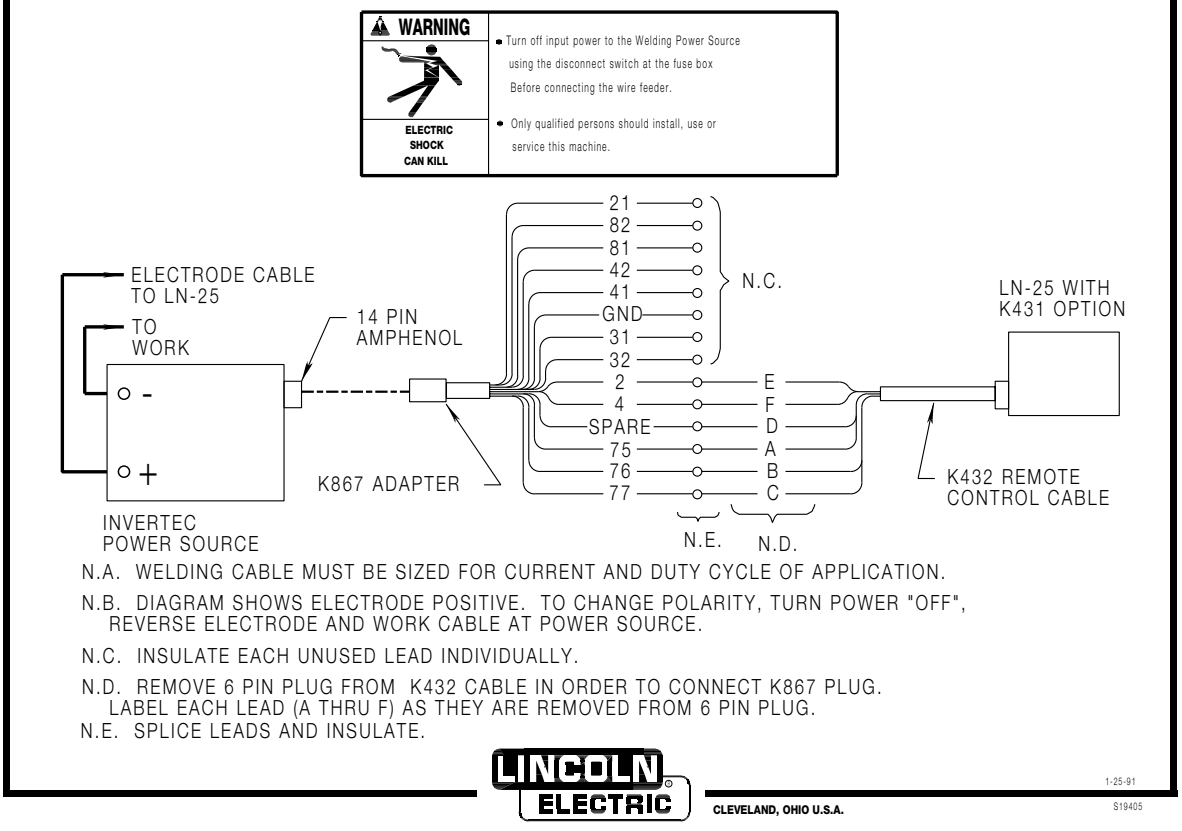
K864 & K876 REMOTE CONTROL ADAPTERS

S19309



K867 PLUG TO LN-25 - CONNECTION DIAGRAM

S19405



Return to Section TOC
Return to Master TOC

CONNECTING A LN-7 WIRE FEEDER

1. Turn Invertec power switch OFF.

2. Connect K480 control cable from LN-7 to Invertec control cable connector. The control cable connector is located at the rear of the Invertec.

3. Connect electrode cable to output terminal of polarity required by electrode.

4. Connect work lead to other terminal.

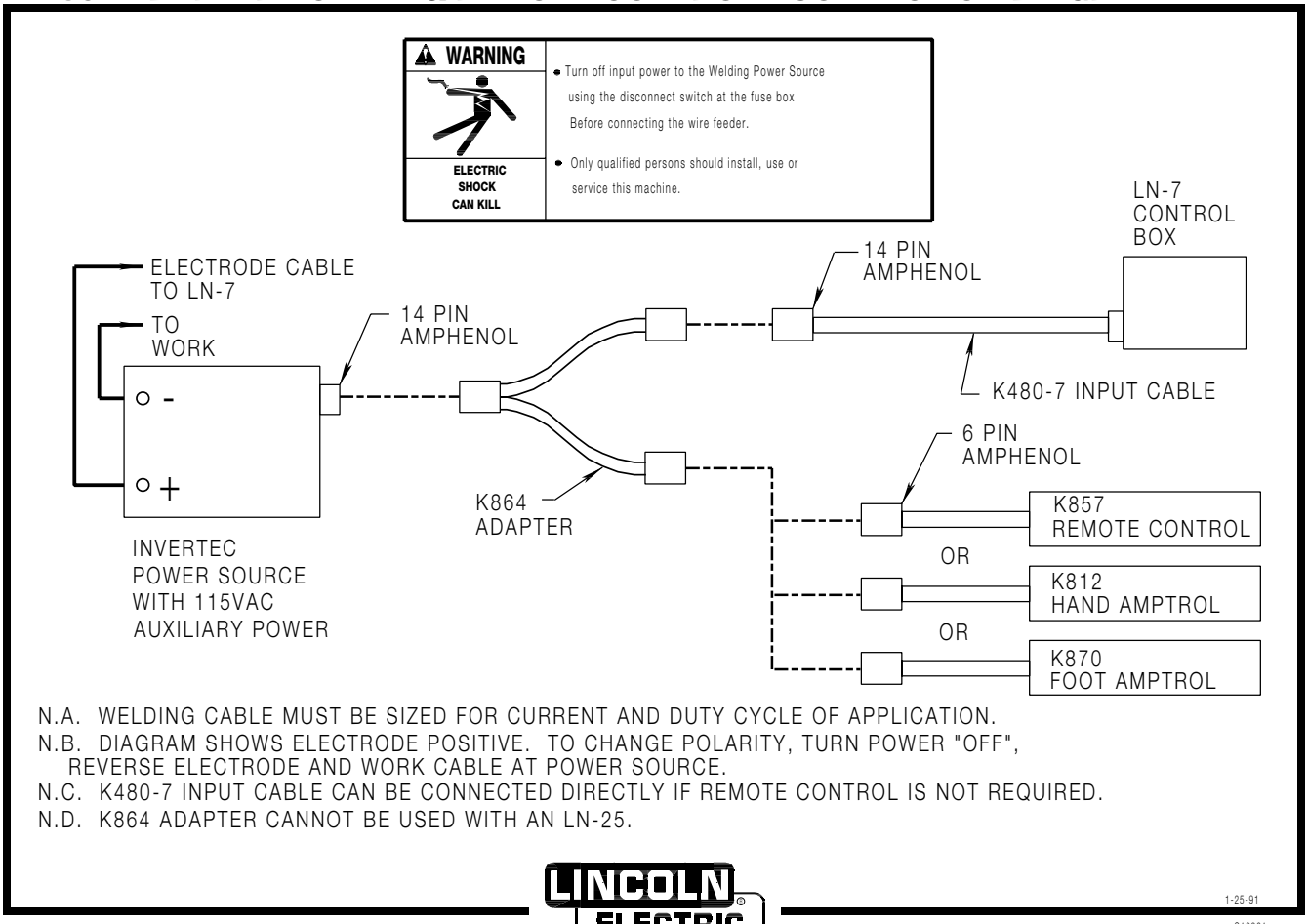
5. Place local/remote switch in “Local” position to allow output control at the Invertec. (K864 remote control adapter and K857 remote control are required for remote output control.) See connection diagram S19901.

6. Set meter polarity switch on rear of the Invertec to coincide with wire feeder polarity used. The wire feeder will not display welding voltage.

NOTE: If K480 is not available, see connection diagram S19404 for modification of K291 or K404 LN-7 input cable with K867 universal adapter plug.

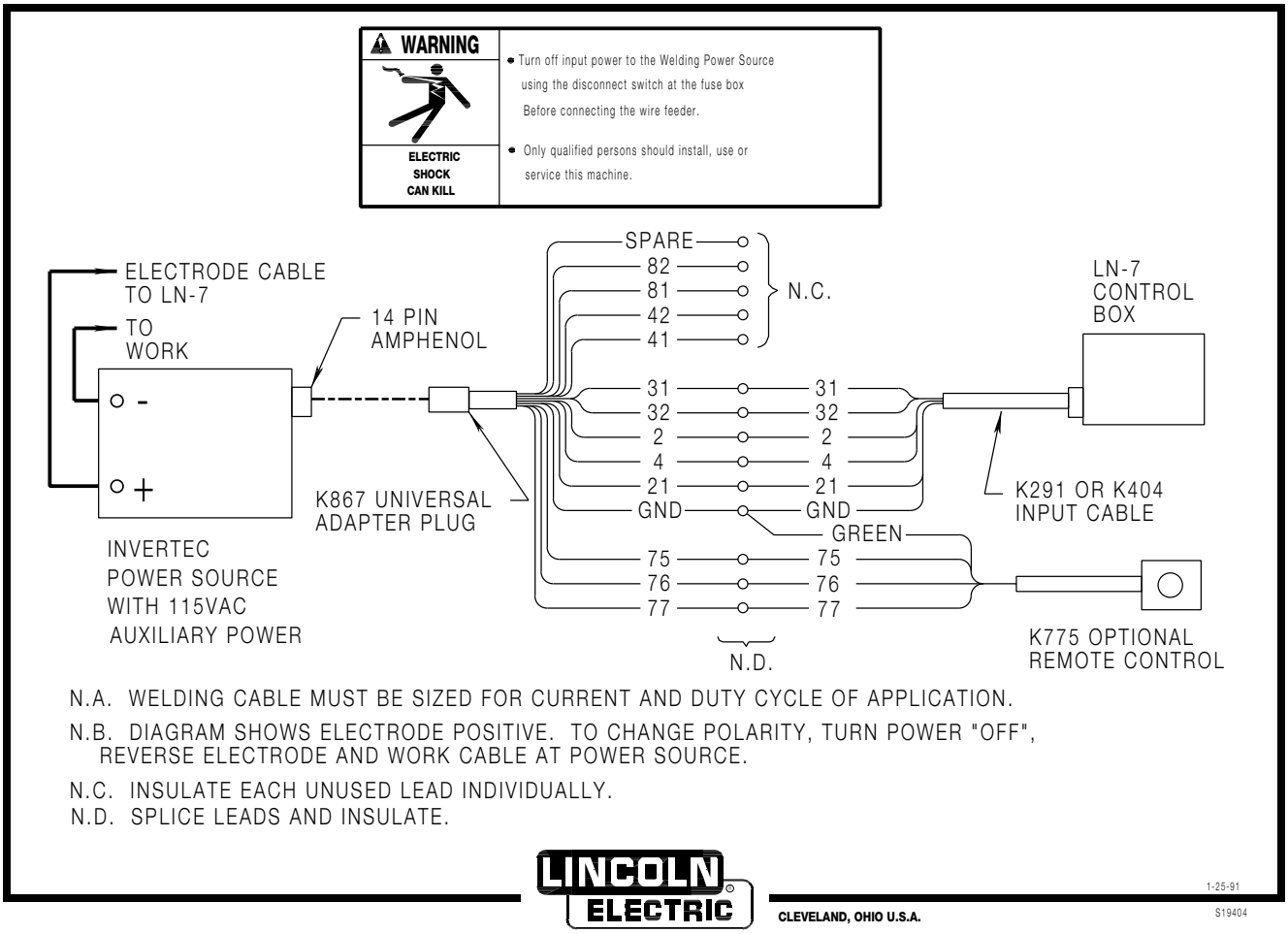
S19901

K864 ADAPTER TO LN-7 & REMOTE CONTROL - CONNECTION DIAGRAM



S19404

K867 PLUG TO LN-7 - CONNECTION DIAGRAM



N.A. WELDING CABLE MUST BE SIZED FOR CURRENT AND DUTY CYCLE OF APPLICATION.

N.B. DIAGRAM SHOWS ELECTRODE POSITIVE. TO CHANGE POLARITY, TURN POWER "OFF", REVERSE ELECTRODE AND WORK CABLE AT POWER SOURCE.

N.C. INSULATE EACH UNUSED LEAD INDIVIDUALLY.

N.D. SPLICE LEADS AND INSULATE.

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S19404

CONNECTING A LN-9 GMA

(Applies only to machines with 115V auxiliary)

1. Turn Invertec power switch OFF.

2. Connect K596 control cable assembly from LN-9 GMA to Invertec control cable connector. The control cable connector is located at rear of the Invertec.

3. Connect electrode cable to output terminal of polarity required by electrode. Connect work lead to other terminal.

4. Place local/remote switch in “Remote” position to allow output control at the LN-9 GMA.

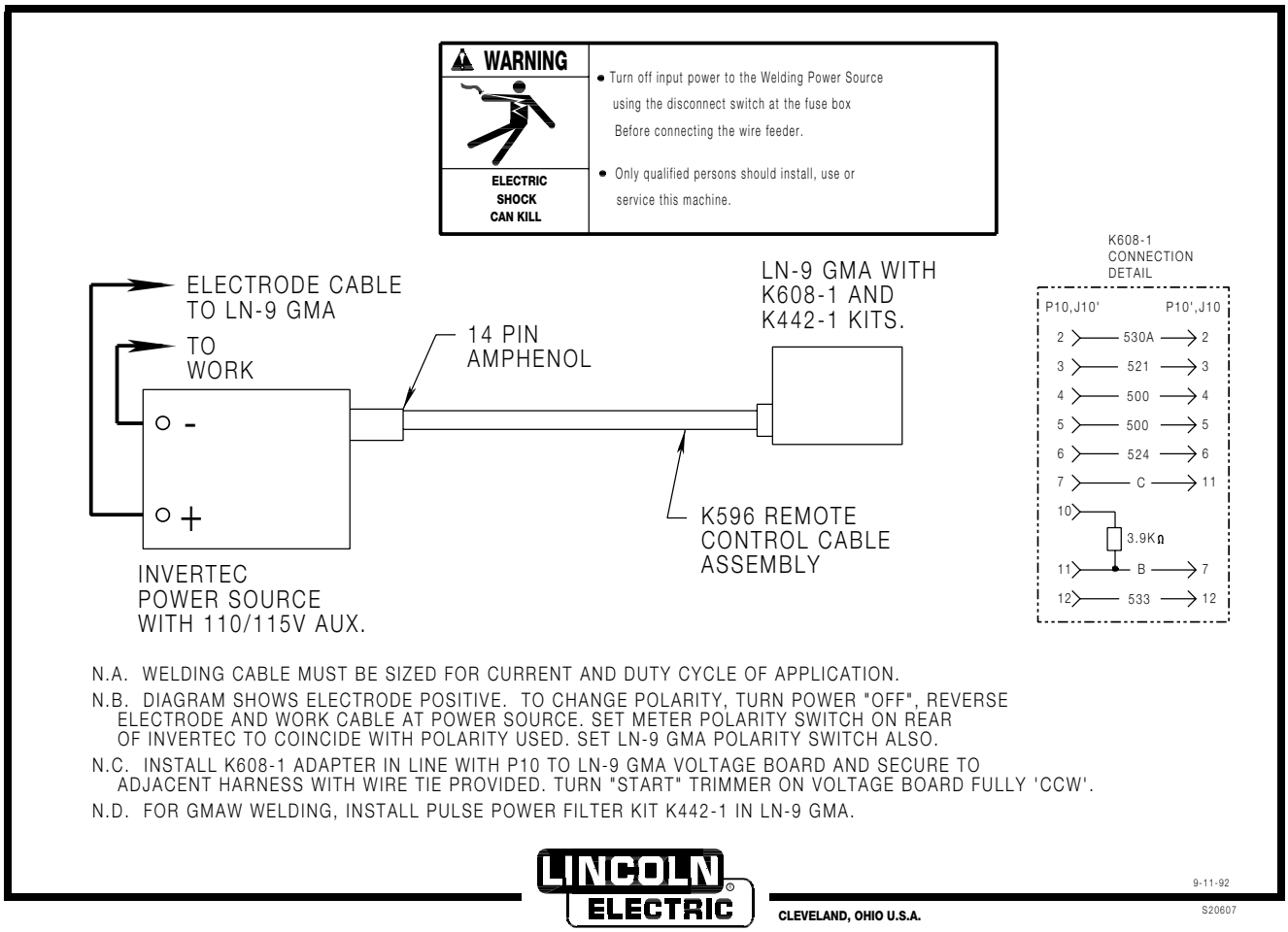
5. Set meter polarity switch on rear of the Invertec to coincide with wire feeder polarity used. The wire feeder will now display the welding voltage.

NOTE: K608-1 adapter is required in LN-9 GMA for LN-9 type control. K608-1 is installed in line with P10 connection at the LN-9 GMA voltage board. See connection diagram S20607.

K442-1 pulse power filter board is also required for GMAW but should be disconnected for FCAW.

If K596 is not available, see connection diagram S20608 for modification of K196 LN-9 GMA input cable with K867 universal adapter plug.

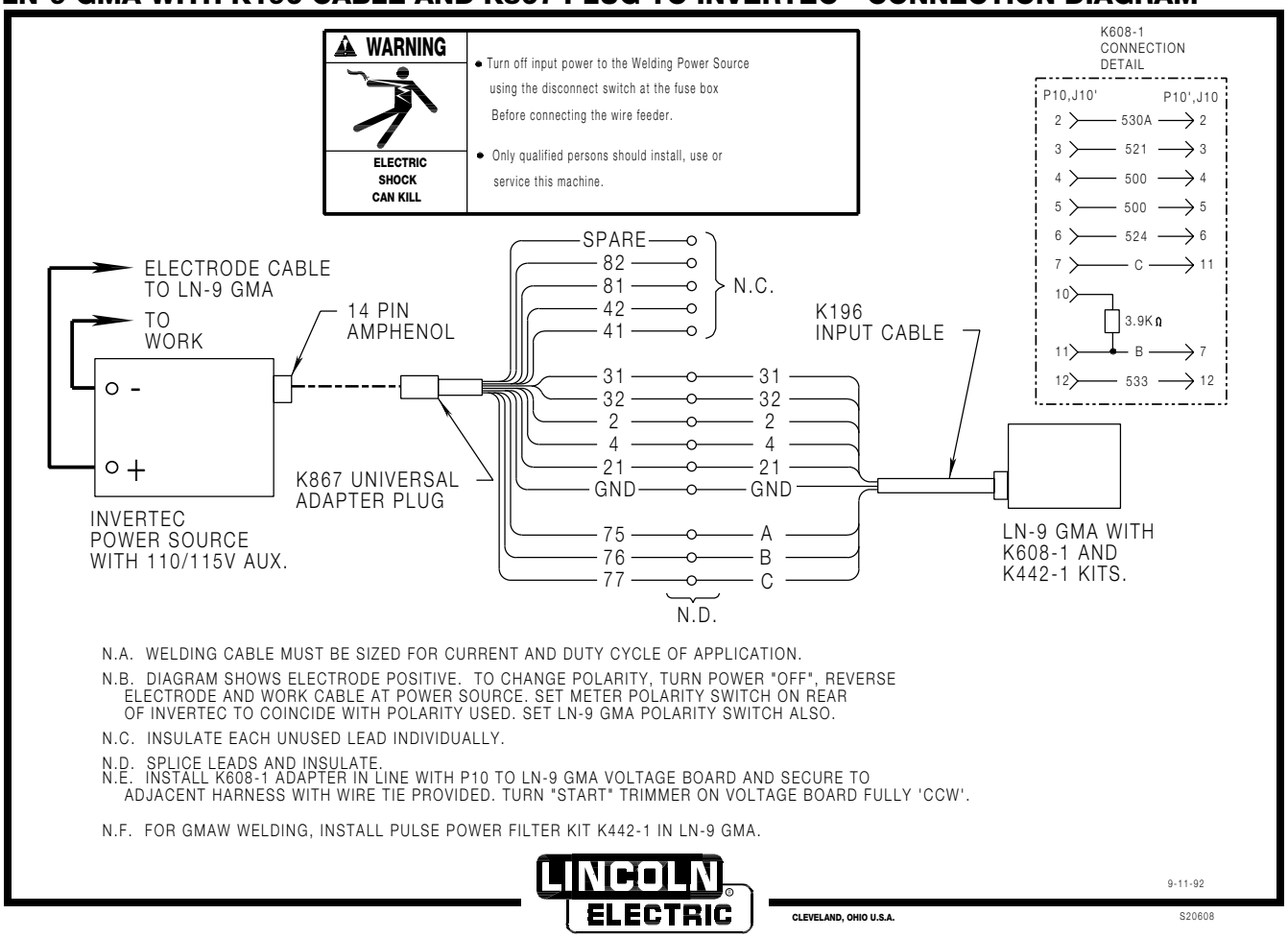
LN-9 GMA WITH K596 CABLE TO INVERTEC - CONNECTION DIAGRAM S20607



Return to Section TOC
Return to Master TOC

LN-9 GMA WITH K196 CABLE AND K867 PLUG TO INVERTEC - CONNECTION DIAGRAM

S20608



N.A. WELDING CABLE MUST BE SIZED FOR CURRENT AND DUTY CYCLE OF APPLICATION.

N.B. DIAGRAM SHOWS ELECTRODE POSITIVE. TO CHANGE POLARITY, TURN POWER "OFF", REVERSE ELECTRODE AND WORK CABLE AT POWER SOURCE. SET METER POLARITY SWITCH ON REAR OF INVERTEC TO COINCIDE WITH POLARITY USED. SET LN-9 GMA POLARITY SWITCH ALSO.

N.C. INSULATE EACH UNUSED LEAD INDIVIDUALLY.

N.D. SPLICE LEADS AND INSULATE.

N.E. INSTALL K608-1 ADAPTER IN LINE WITH P10 TO LN-9 GMA VOLTAGE BOARD AND SECURE TO ADJACENT HARNESS WITH WIRE TIE PROVIDED. TURN "START" TRIMMER ON VOLTAGE BOARD FULLY 'CCW'.

N.F. FOR GMAW WELDING, INSTALL PULSE POWER FILTER KIT K442-1 IN LN-9 GMA.

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CLEVELAND, OHIO U.S.A.

9-11-92

S20608

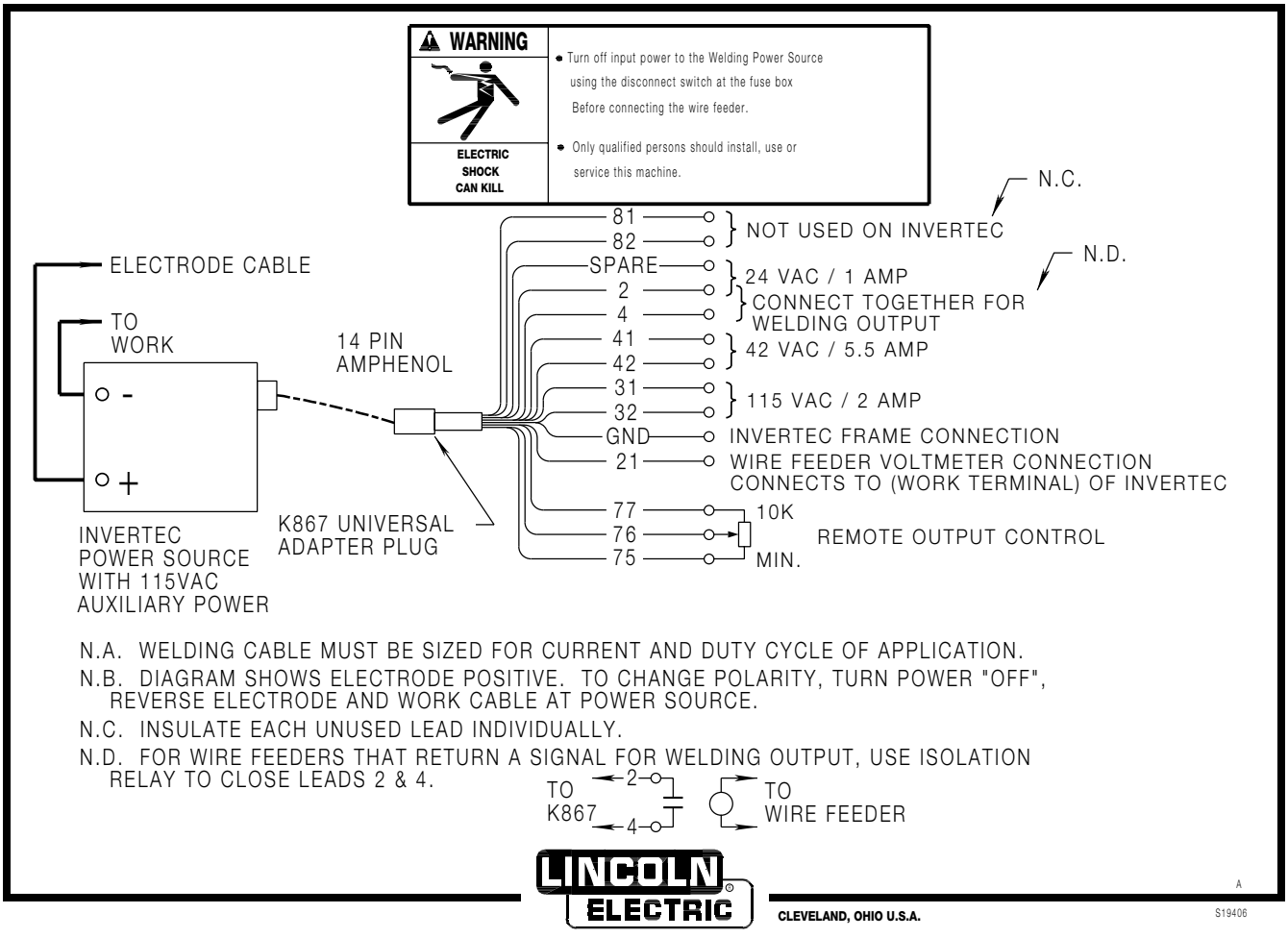
Return to Section TOC
Return to Master TOC

CONNECTING OTHER WIRE FEEDERS

NOTE: Wire feeders other than LN-7, LN-25 and LN-9 GMA can be used provided the auxiliary power supply capacity of the Invertec is not exceeded. K867 universal adapter plug is required. See connection diagram S19406 for more information.

K867 UNIVERSAL ADAPTER / INVERTEC - CONNECTION DIAGRAM

S19406

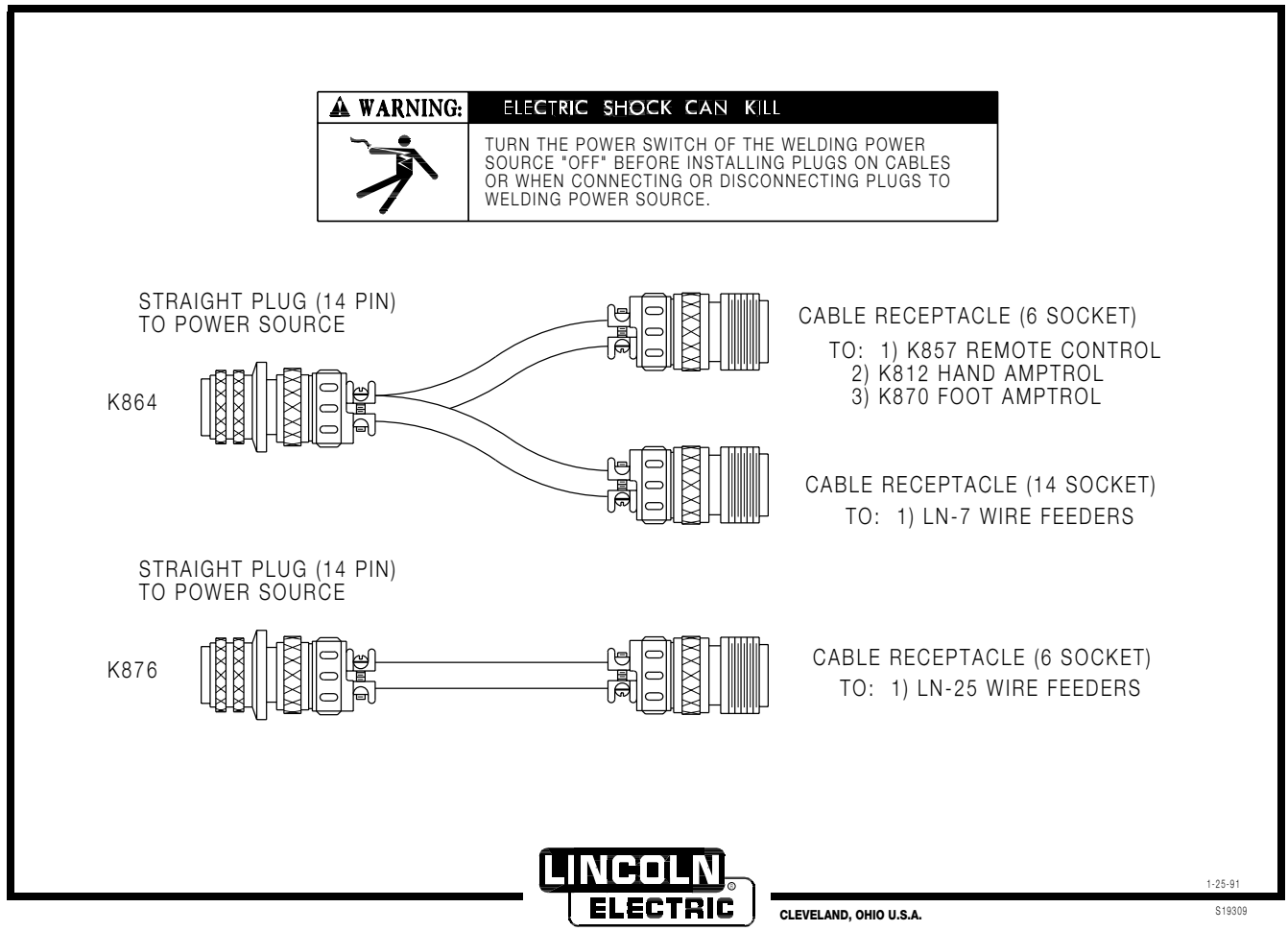


CONNECTING INVERTEC REMOTE CONTROLS

Remote control K857, hand Amptrol K812, and foot Amptrol K870 require K864 remote control adapter. See connection diagram S19309.

K864 & K876 REMOTE CONTROL ADAPTERS

S19309



NOTES

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

Return to Section TOC
Return to Master TOC

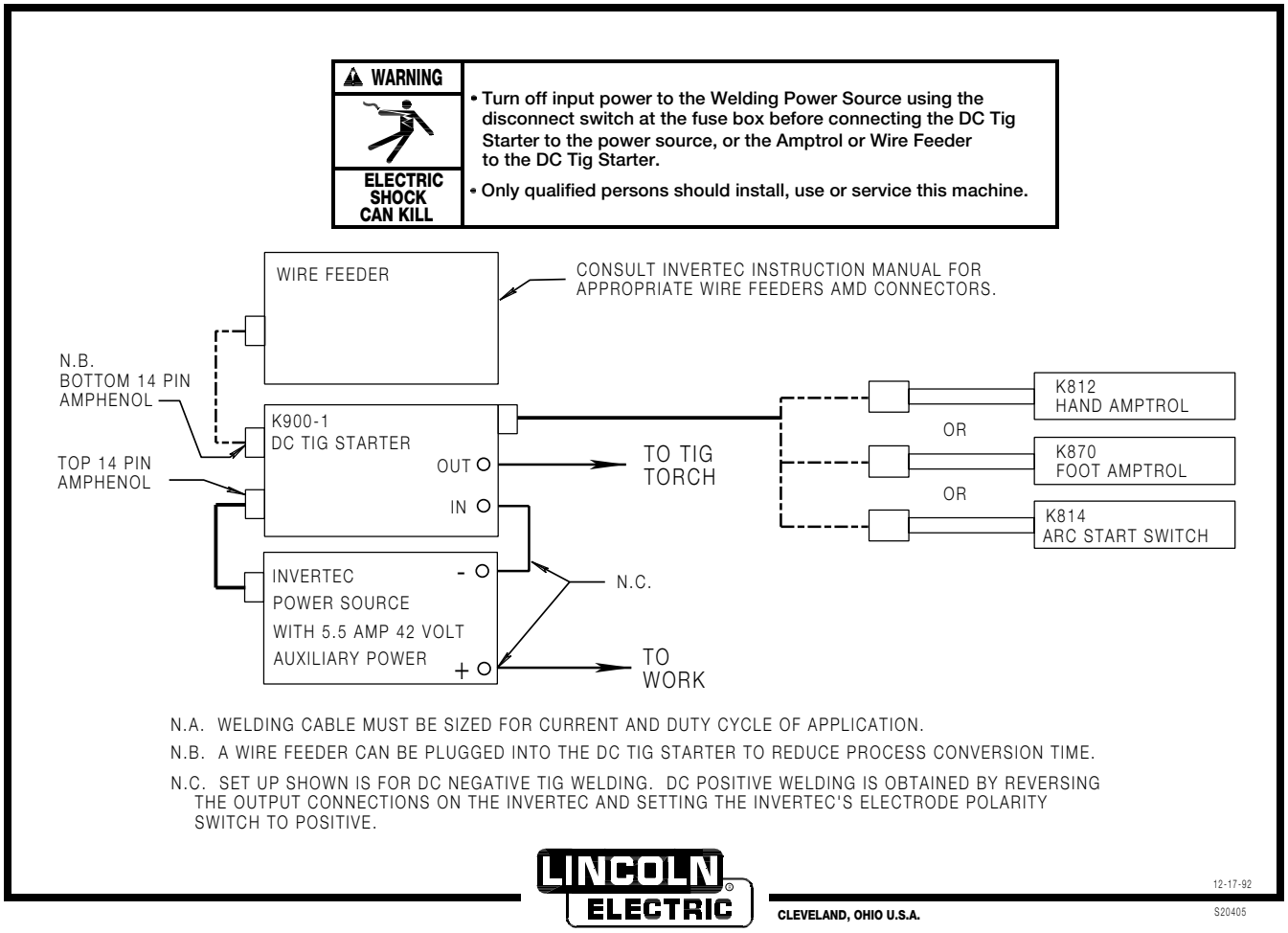
CONNECTING A K900-1 DC TIG STARTER

1. To secure the DC TIG starter kit to the bottom of the Invertec and for more detailed instructions, refer to K900-1 manual.

NOTE: This versatile kit was made to mate with the Invertec. A control cable assembly is supplied with the kit to connect the kit to an Inverted. The cable can be connected, either end, at the DC TIG starter kit and at the Invertec by attaching to the 14-pin amphenols on the backs of each unit. Refer to S20405 connection diagram. A negative output cable assembly is also supplied with the DC TIG starter kit to connect the kit with the Invertec's negative output terminal.

All Magnum one- and two-piece water-cooled torches with 7/8" left-hand threads and gas-cooled torches with 7/8" and 5/16" right-hand threads can be connected to the starter kit.

K900-1 DC TIG STARTER - CONNECTION DIAGRAM S20405



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

CONNECTING TWO V300-I'S FOR PARALLEL OPERATING

NOTE: The Invertecs can be operated in parallel in both constant current (CC) and constant voltage (CV) modes. For best results, currents of each machine should be reasonably well shared. As an example, with two machines set up in parallel for a 400-amp procedure, each machine should be set to deliver approximately 200 amps, not 300 amps from one and 100 amps from the other. This will minimize nuisance feedback conditions. In general, more than two machines in parallel will not be effective due to voltage requirements of procedures in that power range.

1. Set machine outputs by starting with output control knob and arc force/pinch control knob and arc force/pinch control knob in identical positions. If running in a CC mode, adjust outputs and arc forces to maintain current sharing while establishing proper output current. In CV modes, output voltage should be set while keeping both output control knobs in identical positions. Then switch machine meters to amps and adjust one of the output control knobs for current balance. Check the voltage, and if readjustment is necessary, repeat the current balancing step. Pinch settings should also be kept identical on machines.

TABLE OF CONTENTS
- MAINTENANCE SECTION -

⚠ WARNING

ELECTRIC SHOCK can kill.

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

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

⚠ WARNING

Failure to follow this capacitor discharge procedure can result in electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

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

2. Remove 14 5/16” hex head screws from side and top of machine (6 screws on each side and 2 screws on top) and remove wrap-around machine cover.

3. Be careful not to make contact with the capacitor terminals that are located in the center of the Switch Boards.

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

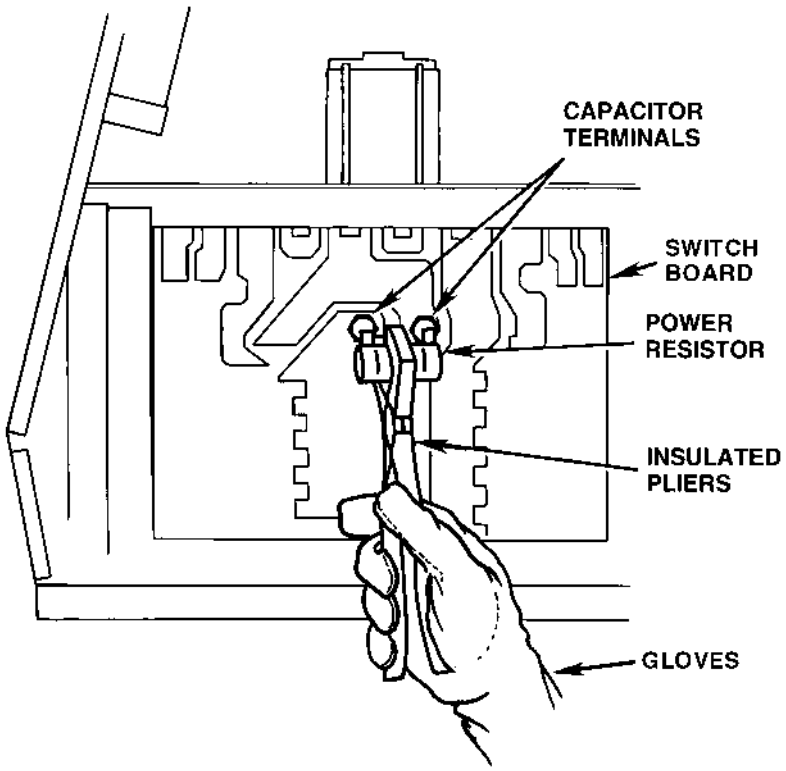
5. Locate the two capacitor terminals (large hex head cap screws) shown in Figure D.1.

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

7. Repeat discharge procedure for capacitor on other side of machine. If you are working on a 575 VAC machine, repeat discharge procedure for second capacitor on each side of machine.

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

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



Return to Section TOC
Return to Master TOC

PREVENTIVE MAINTENANCE

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

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

3. Clean the inside of the machine with a low pressure airstream. Be sure to clean the following components thoroughly. See Figure D.2 for location of these components.

   - Power Switch, Driver, Protection, and Control printed circuit boards
   - Power Switch
   - Main Transformer
   - Input Rectifier
   - Heat Sink Fins
   - Input Filter Capacitors
   - Output Terminalss

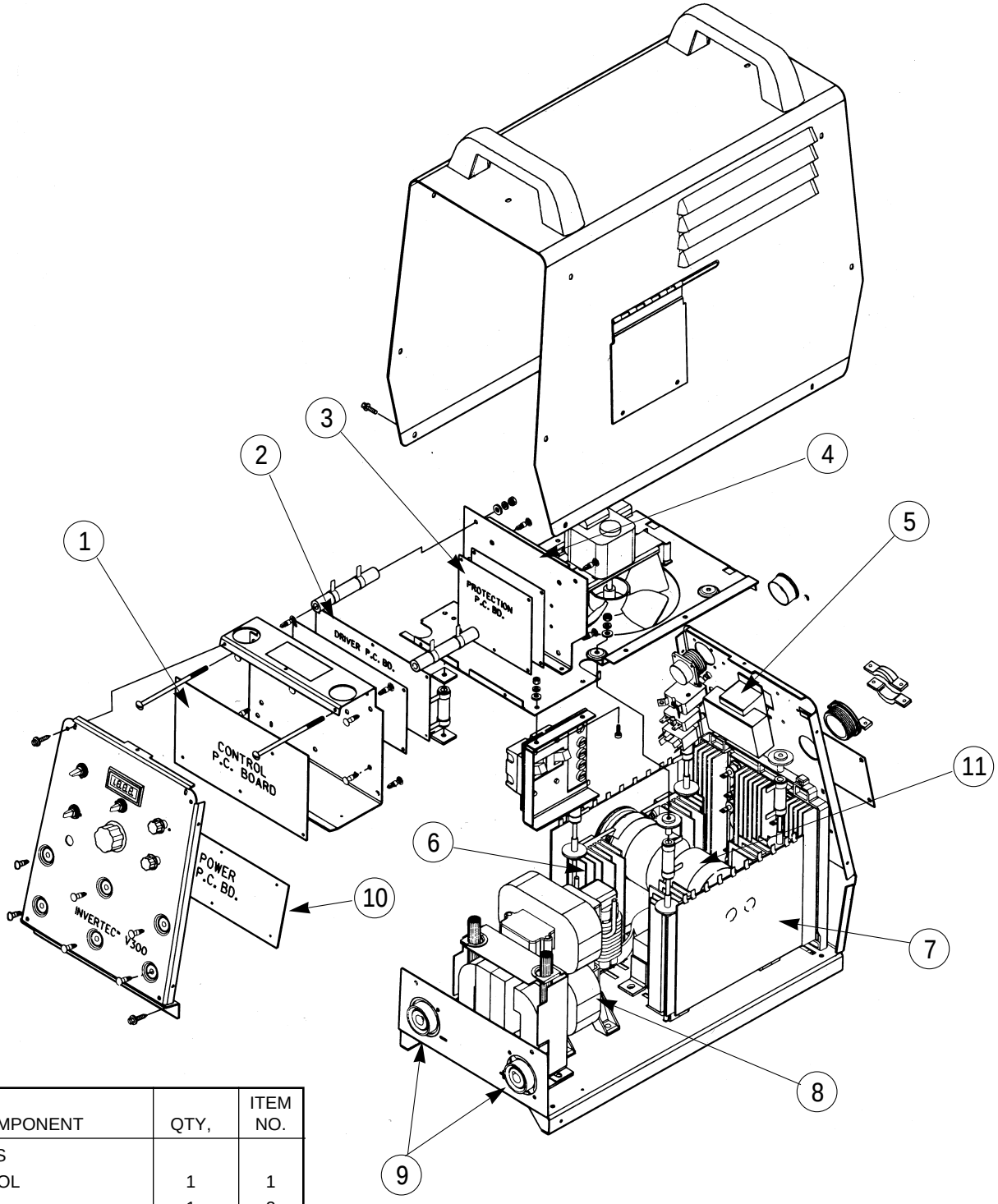
4. Examine capacitors for leakage or oozing. Replace if needed.

5. Examine wrap-around cover for dents or breakage. Repair as needed. Cover must be kept in good condition to assure high voltage parts are protected and correct spacings are maintained.

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

7. Replace machine cover and screws.

FIGURE D.2 — LOCATION OF MAINTENANCE COMPONENTS.



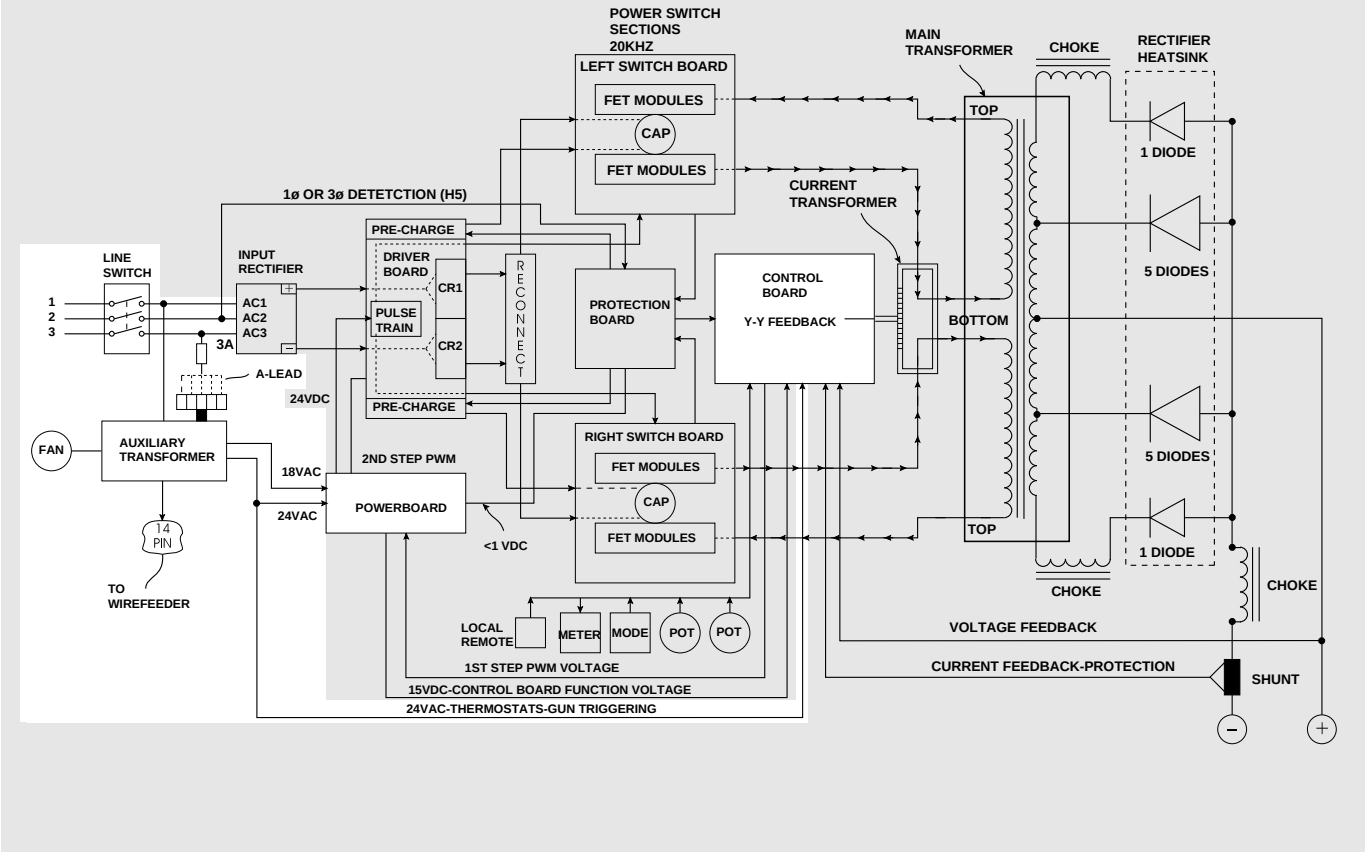
COMPONENT	QTY,	ITEM NO.
PC BOARDS		
CONTROL	1	1
DRIVER	1	2
PROTECTION	1	3
SWITCH	2	7
POWER	1	10
INPUT RECTIFIER	1	4
POWER SWITCH	1	5
HEAT SINK FINS	2	6
MAIN TRANSFORMER	1	8
OUTPUT STUDS	1	9
INPUT FILTER CAPACITORS	2	11

TABLE OF CONTENTS
- THEORY OF OPERATION SECTION -

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

POWER SUPPLY OPERATION

FIGURE E.1 — INPUT POWER CIRCUITS.



INPUT LINE VOLTAGE

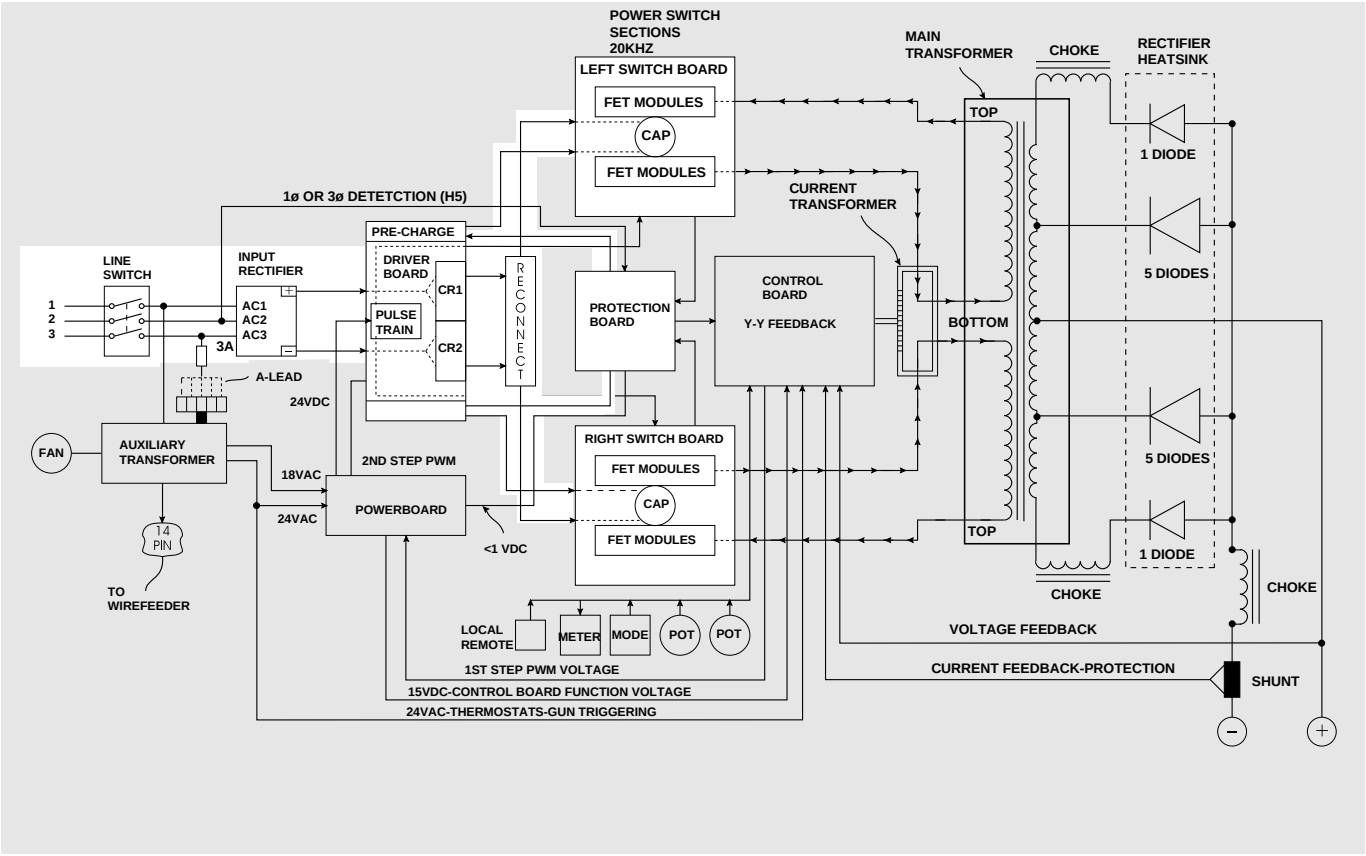
The single-phase or three-phase input power of 200, 220, 380, 415, or 440 volts AC is connected through a line switch on the rear panel.

A reconnect panel allows the user to switch to low or high voltage and connect the auxiliary transformer for the appropriate input voltage.

The auxiliary transformer develops the appropriate AC voltages to operate the Cooling Fan, the PC boards, and a wire feeder (if connected). See Figure E.1.

NOTE: Unshaded areas of block logic diagram are the subject of discussion.

FIGURE E.2 — PRECHARGE CIRCUITS.



PRECHARGE

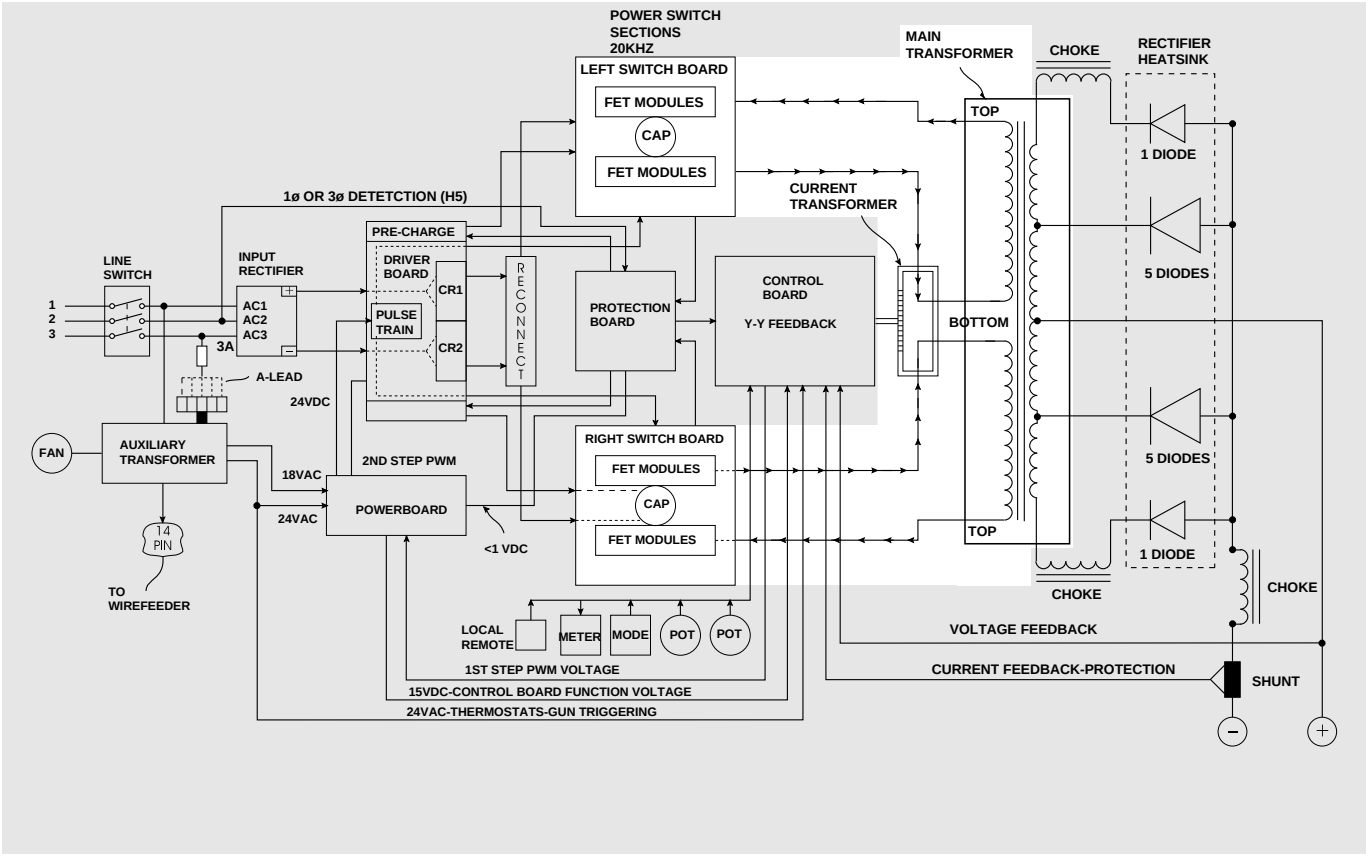
The input line voltage is rectified and the DC voltage applied to the Driver Board. The Driver Board contains precharging circuitry for the safe charging of the input filter capacitors. Once the capacitors are precharged, the input relays are energized, connecting full input power to the input filter capacitors. The Protection Board monitors the capacitors for voltage balance and/or overvoltage and will de-energize the input relays and precharge circuitry if either occurs. The machine output will also be disabled. See Figure E.-2.

SWITCH BOARD

When the filter capacitors are fully charged, they act as power supplies for the Switch Boards. The Switch Boards contain the Field Effect Transistors (FETs) which, when switched on, supply the main transformer primary windings with DC current flow. See FET operation discussion and diagrams Figures E.5 and E-6.

NOTE: Unshaded areas of block logic diagram are the subject of discussion.

FIGURE E.3 — SWITCH BOARD CIRCUITS.



MAIN TRANSFORMER

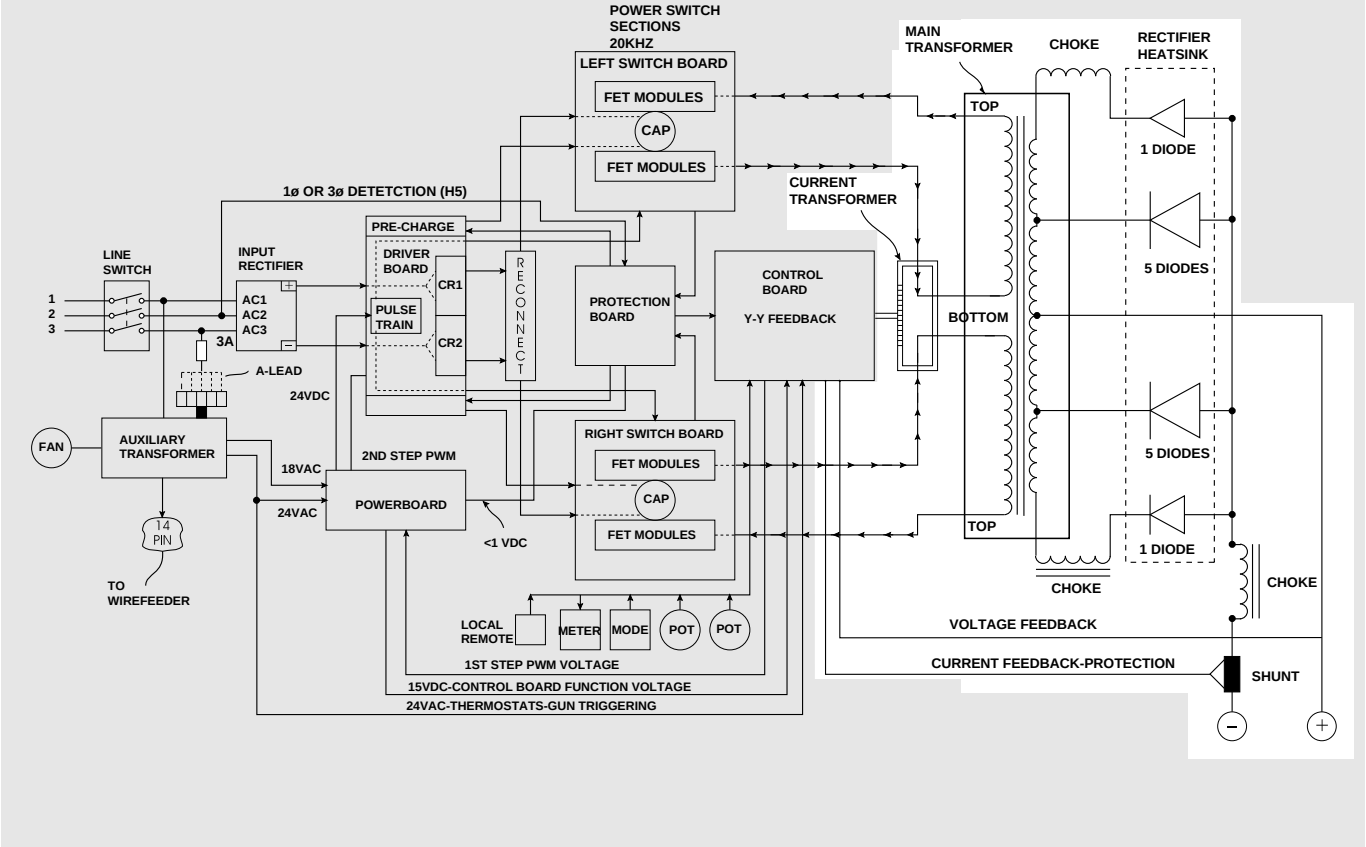
Each Switch Board assembly works as a switch pair. Each board feeds a separate, oppositely wound primary winding of the main transformer. The opposite directions of current flow through the main transformer primary and the offset timing of the Switch Boards induce an AC square wave output signal at the secondary of the main transformer.

The DC current flow through each primary winding is redirected or “clamped” back to each respective power capacitor when the FETs are turned off. This is needed due to the inductance of the transformer primary windings. The cross coupling of the primaries along with the clamping action of the diode serve to maintain capacitor balance when connected in the series (higher voltage) input configuration.

The firing of both Switch Board pairs occurs during halves of the 50 microsecond intervals, creating a constant 20 KHZ output.

NOTE: Unshaded areas of block logic diagram are the subject of discussion.

FIGURE E.4— OUTPUT CIRCUITS.



OUTPUT RECTIFICATION AND WELDING CONTROL

The AC output from the main transformer secondary is rectified to a DC output. Output voltage and current (feedback) signals are taken at the output terminals and fed to the Control Board. The Control Board also monitors the panel controls to determine which weld process is being employed and how the output should be controlled to optimize welding results. The Control Board controls the FET switching through pulse width modulation circuitry. See FET discussions Figures E.5 and E.6.

Excessive output current, the thermal protection signal, and the overvoltage signal are monitored by the Control Board for the trigger disable function.

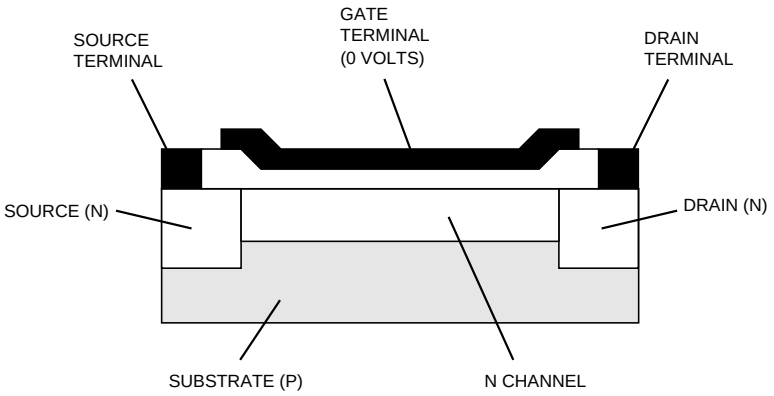
GENERAL DESIGN CONSIDERATIONS

FET semiconductors are well suited for operating at high frequencies. This is the primary reason that Lincoln's Invertec design uses FETs instead of Silicone Controlled Rectifiers (SCRs) or bipolar transistors for power switching. This high-frequency switching is not detectable to the human ear. Annoying switching sounds that are typical to lower frequency inverter power supplies are not present in the Lincoln high frequency inverter design. Unlike conventional transformers, this design is small, lightweight, and capable of operating at high frequencies without overheating. Future designs will also use newer high-speed IGBTs in place of FETs.

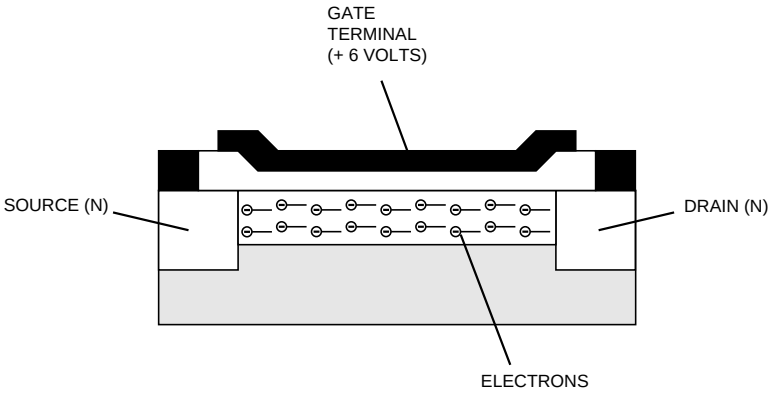
NOTE: Unshaded areas of block logic diagram are the subject of discussion.

FIELD EFFECT TRANSISTOR (FET) OPERATION

FIGURE E.5 — FIELD EFFECT TRANSISTOR OPERATION.



A. PASSIVE



B. ACTIVE

An FET is a type of transistor. FETs are semiconductors well suited for high-frequency switching.

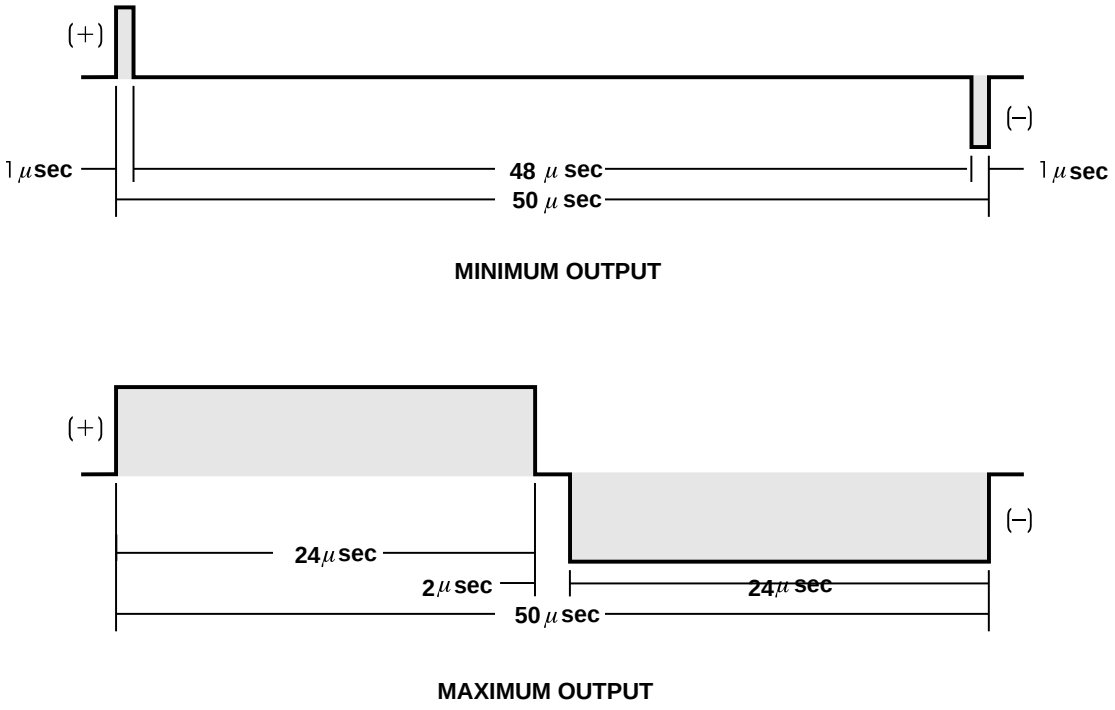
Drawing A above shows an FET in a passive mode. There is no gate signal, zero volts relative to the source and, therefore, no current flow. The drain terminal of the FET may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to downstream components connected to the source. The circuit is turned off like a light switch in the OFF position.

Drawing B above shows the FET in an active mode. When the gate signal, a positive DC voltage relative to the source, is applied to the gate terminal of the FET, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the FET to conduct and henceforth supply current to downstream components. Current will flow through the conducting FET to downstream components as long as the gate signal is present. This is similar to turning on a light switch.

Return to Section TOC
Return to Master TOC

PULSE WIDTH MODULATION

FIGURE E.6 — TYPICAL FET OUTPUTS.



The term PULSE WIDTH MODULATION is used to describe how much time is devoted to conduction in the positive and negative portions of the cycle. Changing the pulse width is known as MODULATION. Pulse Width Modulation (PWM) is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

MINIMUM OUTPUT

By controlling the duration of the gate signal, the FET is turned on and off for different durations during a cycle. The top drawing above shows the minimum output signal possible over a 50-microsecond time period.

The positive portion of the signal represents one FET group[1] conducting for 1 microsecond. The negative portion is the other FET group[1]. The dwell time (off time) is 48 microseconds (both FET groups off). Since only 2 microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 24 microseconds each and allowing only 2 microseconds of dwell time (off time) during the 50-microsecond cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the bottom curve. The more dark area under the curve, the more power is present.

[1] A FET group consists of the sets of FET modules grouped onto one switch board.

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

PROTECTIVE CIRCUITS

Protective circuits are designed into the Invertec machine to sense trouble and shut down the machine before the trouble damages the internal machine components. Both overload and thermal protection circuits are included.

OVERLOAD PROTECTION

The machine is electrically protected from producing high output currents. Should the output current exceed 340 to 360 amps, an electronic protection circuit will reduce the current to approximately 150 amps. Lincoln Electric refers to this current reduction as “Fold Back.” The machine will continue to produce this low current until the protection circuit is reset. Reset occurs when the output load is removed.

A protection circuit is included to monitor the voltage across input filter capacitors. In the event that the capacitor voltage is too high, the protection circuit will prevent output. The protection circuit may prevent output, if any of these circumstances occur:

1. Capacitor conditioning is required (Required if machine has been off for prolonged periods of time.)
2. Line surges over 500 VAC
3. Internal Component damage
4. Improper connections

THERMAL PROTECTION

Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostat will prevent output voltage or current. The meter will remain on during this time.

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

TABLE OF CONTENTS
- TROUBLESHOOTING & REPAIR SECTION -

⚠ WARNING

ELECTRIC SHOCK can kill.

Never work on the inside of the machine without turning off the input power and discharging the input capacitors. You can receive a life-threatening electrical shock if you fail to do this. Only qualified technicians should perform installation, maintenance, and troubleshooting work on the machine.

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

How to Use Troubleshooting Guide

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped according to: 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 the needed test specifications and repair procedures are described in detail on the referenced pages. All the needed electrical test points, terminal strips, junctions, etc., can be found on the referenced electrical wiring diagrams and schematics. See Electrical Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353.

OSCILLOSCOPE WARNING

⚠ WARNING

Do not use oscilloscopes and other test equipment which are powered by 115 VAC. This equipment should not be used with inverter-type machines, such as Invertec V300-I. There are high voltages present, which are "floating" off case ground (floating ground). Connecting the ground lead of a test probe (which may be connected to the case of the test equipment) to a high voltage potential presents a shock hazard as well as the possibility of damage to the equipment in question.

Return to Section TOC
Return to Master TOC

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.)

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

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

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.

MATCHED PARTS

The following machine parts must be replaced in matched sets If, for example, Capacitor C1 is found to be defective, both Capacitors C1 and C2 must be replaced at the same time:

- Output Diodes: D1, D2, D3, D4, and D5.
- Output Diodes: D7, D8, D9, D10, and D11.
- Capacitor Bleeder Resistors: R1 and R9.
- Capacitors: C1 and C2.
- Capacitors: C1, C2, C14, and C15 (575 VAC models only).

TROUBLESHOOTING & REPAIR

Troubleshooting Guide — See Wiring Diagrams for location of specified components. See Schematic Diagram for troubleshooting of specific circuits.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	POSSIBLE AREAS OF MALFUNCTION(S)
OUTPUT PROBLEMS		
Major physical or electrical damage is observed when cover wrap-around is removed.	Contact Lincoln Electric Service Department (216-383-2531) or 1-800-833-9353 (WELD)	
Machine is dead — no output — no fan — no display.	Power Switch must in ON position. Check input voltage. If machine is set for single-phase operation, inspect to assure that WHITE and BLACK leads are connected properly and RED lead is not connected and is insulated. Check that input voltage set-up switch and jumper A (the recon-nect, auxiliary jumper) are in proper position for input voltage being used. Check continuity of 3-amp slow blow fuse located on reconnect panel.	1. Power Switch (S1). 2. Loose or broken wires between Power Switch and Input Rectifier (component D13). 3. Broken leads to primary of Auxiliary Transformer T1. 4. Open primary coil of Auxiliary Transformer T1.
No output but fan operates and the meter display is on.	Output Terminal Switch or Remote Trigger MUST be in ON position. Local/Remote Switch must be in LOCAL position unless remote control device is attached to remote receptacle. If machine has not been used for a long time and is connected for 380 VAC or higher, Capacitors may need “conditioning.” See Input Filter Capacitor Conditioning section.	1. See Output Pilot Circuit test. 2. See Thermal Protection AC Trigger Circuit test. 3. See Overvoltage Protection DC Trigger Circuit test. 4. See Static Capacitor Balance/ Dynamic Capacitor Balance tests. 5. See Switch PC Board test. 6. Broken or loose connections on high current-carrying parts of machine (i.e., choke, output bridges, output studes, main transformer.

⚠ 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 216-383-2531 or 1-800-833-9353.

Troubleshooting Guide — See Wiring Diagrams for location of specified components. See Schematic Diagram for troubleshooting of specific circuits.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	POSSIBLE AREAS OF MALFUNCTION(S)
OUTPUT PROBLEMS (continued)		
No output or reduced output the first time power is applied to machine.	Check input voltages, fuses, and input voltage reconnect procedures. See Installation section. If high input (380 VAC or higher) voltage is applied. Capacitors may need conditioning.	Check continuity of 3-amp slow blow fuse located on reconnect panel.
Output turns on momentarily, then switches off and repeats cycle.	Check input voltages and reconnection procedures. See Installation section. Check output terminal switch S4 and/or Remote Trigger Options (i.e., wire feeders, guns, cables, etc.).	1. See Thermal Protection AC Trigger Circuit test. 2. See Overvoltage Protection DC Trigger Circuit test. 3. See Static Capacitor Balance/Dynamic Capacitor Balance test. **NOTE:** This test is necessary only if machine is connected for 380 VAC or higher. 4. See Switch PC Board test. 5. See Snubber Resistor test.
Remote output control not functioning. Machine performs well on LOCAL control.	Test or replace Output Remote Control Device.	1. Test Local/Remote Switch S3 with ohmmeter. See schematic drawing in Electrical Diagram Section. 2. Check continuity of local/remote circuit. See schematic drawing in Electrical Diagram Section.

⚠ 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 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC

TROUBLESHOOTING & REPAIR

Troubleshooting Guide — See Wiring Diagrams for location of specified components. See Schematic Diagram for troubleshooting of specific circuits.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	POSSIBLE AREAS OF MALFUNCTION(S)
OUTPUT PROBLEMS (continued)		
No ouput. Main fuses open, indicating excessive current draw.	Inspect input leads for possible shorts or grounds or misconnections. Install new fuses and reapply power. If fuses open again, go to next column of this Guide.	Inspect interior of machine for physical signs of electrical and heat damage. Replace any damaged components after conducting the tests below: 1. Input Rectifier (component D13). Perform Input Rectifier test. 2. See Switch Board test. 3. See Static Capacitor Balance/Dynamic Capacitor Balance tests. 4. See Snubber Resistor test.
Machine does not produce more than 250 amps on meter (while welding) when connected to 3-phase supply.	Check input voltages, fuses, and input voltage reconnect procedures. See Installation section of this manual..	1. See Protection Board Output. Voltage test. 2. See Control Board test. 3. See Input Rectifier test (component D13).
Machine does not produce more than 250 amps on meter (while welding) while connected to single-phase supply.	Normal operation. Nothing is wrong.	No test necessary. This single-phase operation is determined by the Protection Board.
Machine operates okay at 230 VAC or lower. No output at 380 VAC or higher.	Check input voltage and input voltage reconnect procedures. See Installation section of this manual.	1. See Protection Board Output test. 2. See Static Capacitor Balance/Dynamic Capacitor Balance tests. 3. See Snubber Resistor test. 4. See Switch PC Board test.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353.

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 Guide — See Wiring Diagrams for location of specified components. See Schematic Diagram for troubleshooting of specific circuits.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	POSSIBLE AREAS OF MALFUNCTION(S)
OUTPUT PROBLEMS (continued)		
Meter reads low voltage (1-2 VDC), and output is extremely low or no output.	Local/Remote Switch must be in LOCAL position unless Remote Control device is attached to remote receptacle.	1. See Output Diodes test. 2. See Static Capacitor Balance/Dynamic Capacitor Balance tests. 3. See Switch Board test. 4. See Power Board test. 5. See Control Board test.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353.

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

Troubleshooting Guide — See Wiring Diagrams for location of specified components. See Schematic Diagram for troubleshooting of specific circuits.

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	POSSIBLE AREAS OF MALFUNCTION(S)
WELDING PERFORMANCE PROBLEMS		
Poor welding, weld settings drift, or output power is low.	Check welding procedures and weld cable connections. Check with machine on local control. Check input voltages and input voltage reconnect procedures. See Installation section of this manual.	1. Check Mode Switch S2 for damage and continuity. 2. Check for continuity between Mode Switch S2 and Control Board. See schematic drawing. 3. Check for loose or faulty connections in heavy current-carrying leads (i.e., choke, shunt, output bridge, and output studs). See wiring diagram. 4. Check overcurrent protection on Control Board. Refer to Overcurrent Protection Current Trigger Circuit tests. Also refer to Control Board test.
Poor stick electrode performance. Arc pops out.	Check output welding cables. Is electrode DRY? Try welding with another electrode from a different container. Make sure you have the correct electrode for your application.	1. Check for loose or burned connections at choke, shunt, and output studs. See wiring diagram. 2. Test and inspect D6, D12, L1 and L2. See schematic drawing.
Machine makes “squealing” noise while under load when welding. Output power is low (less than 20 VDC on meter @ 100 amps). Input voltage 230 VAC or lower.	Check input lines and connections. Check input voltage and reconnection procedures.	1. See Switch Board test. 2. See Snubber Resistor test.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric Service Department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353.

Return to Section TOC
Return to Master TOC

OUTPUT PILOT CIRCUIT TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure

TEST DESCRIPTION

The Output Pilot Circuit Test determines if the Fan Thermostat, Choke Thermostat, Transformer T1, and Output Terminal Switch S4 are functioning properly.

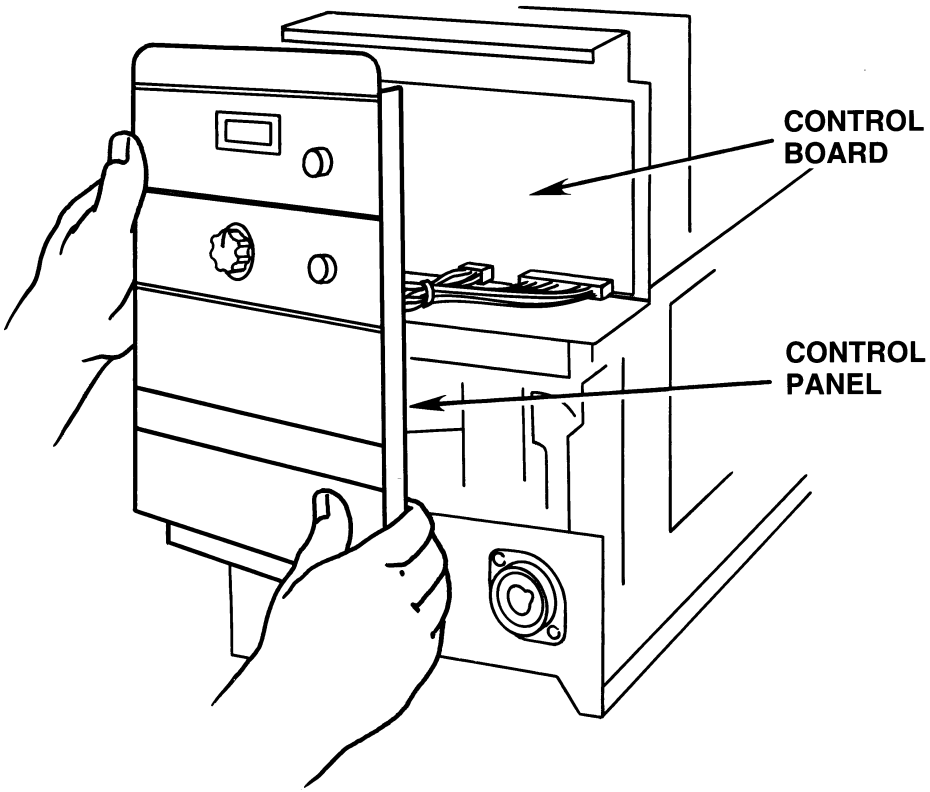
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams in Electrical Diagrams section of this manual.

TEST PROCEDURE

1. Turn main power OFF.
2. **Perform Input Filter Capacitor Discharge procedure detailed in Maintenance chapter**.
3. Remove the four screws that attach the Control Panel to the frame.

FIGURE F.1 — REMOVING CONTROL PANEL.



OUTPUT PILOT CIRCUIT TEST *(continued)*

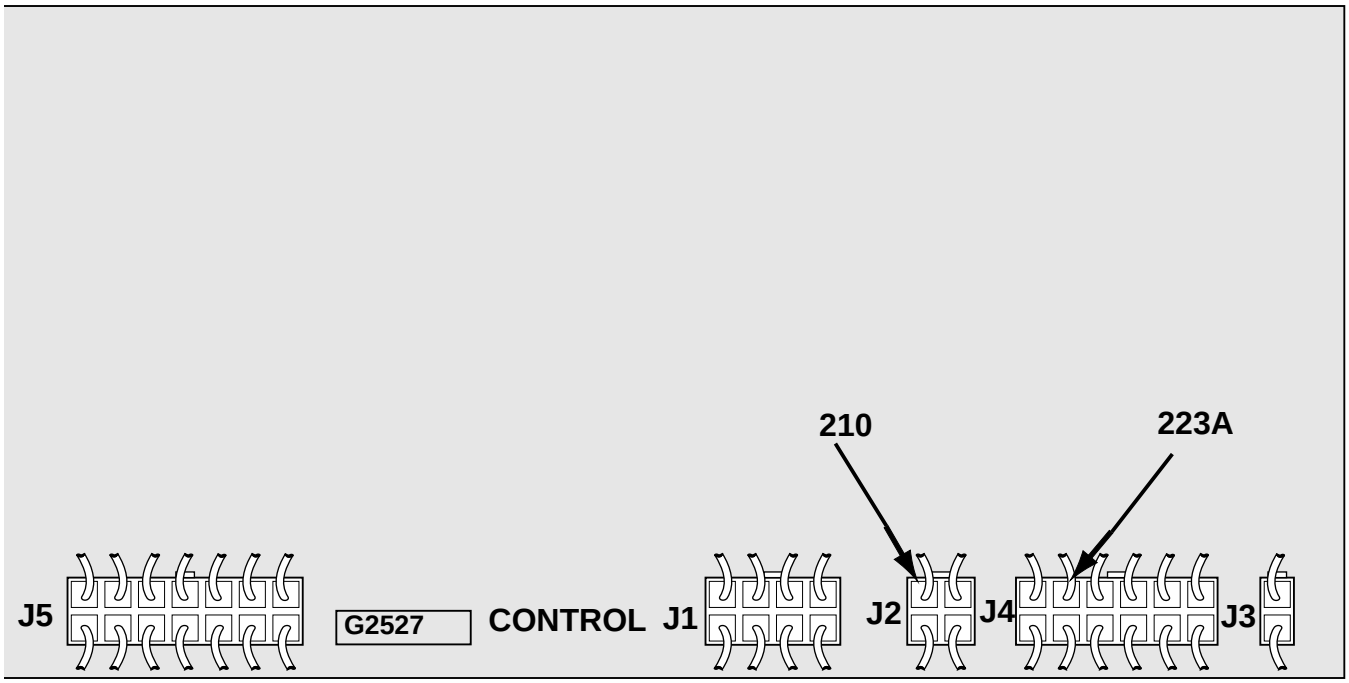


FIGURE F.2 — CONTROL BOARD TEST POINTS.

4. Position the Control Panel so you have access to the Control Board by pulling the Control Panel away from the machine and moving it to the left. Carefully let the Control Panel hang from the machine.

5. Move Terminal Output Switch S4 to the ON position.

6. Turn the main power ON.

7. Test for 24 VAC between leads 223A and 210.

   a. If 24 VAC is measured, test is OK for Fan Thermostat, Choke Thermostat, Transformer T1, and Output Terminal Switch S4. Go to step 8.

   b. If 0 VAC is measured, test is not OK. Test each of the following components: Fan Thermostat, Choke Thermostat, Transformer T1, and Output Terminal Switch S4.

OUTPUT PILOT CIRCUIT TEST *(continued)*

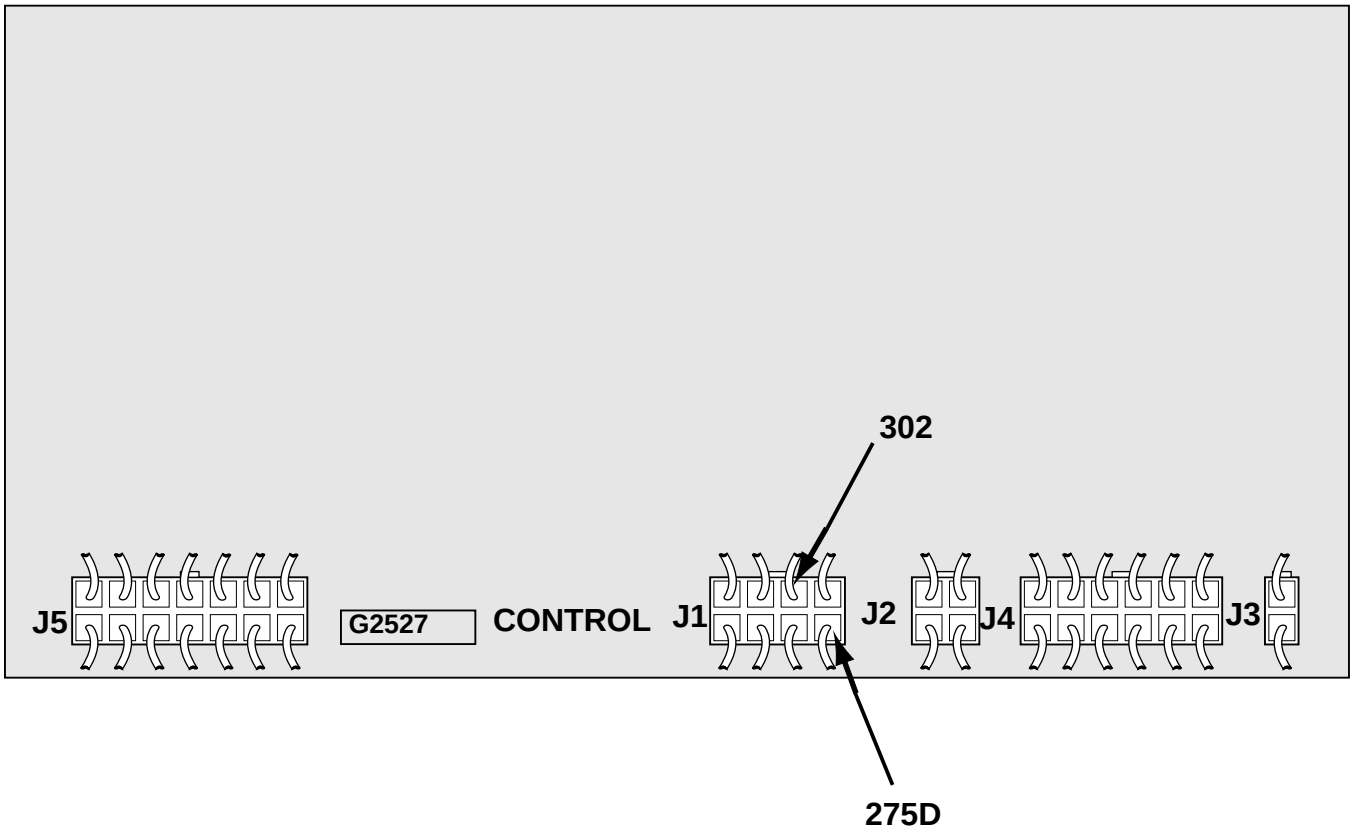


FIGURE F.3 — CONTROL BOARD TEST POINTS.

8. Test for 15 VDC between leads 302 (+) and 275D (–).

   a. If 15 VDC is measured, test is OK for 15 VDC Power Supply and Transformer T1. Go to Protection Board Output Test.

   b. If 0 VDC is measured, test is not OK. Test Power Board and Transformer T1.

PROTECTION BOARD OUTPUT TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capaciter discharge procedure.

TEST PROCEDURE

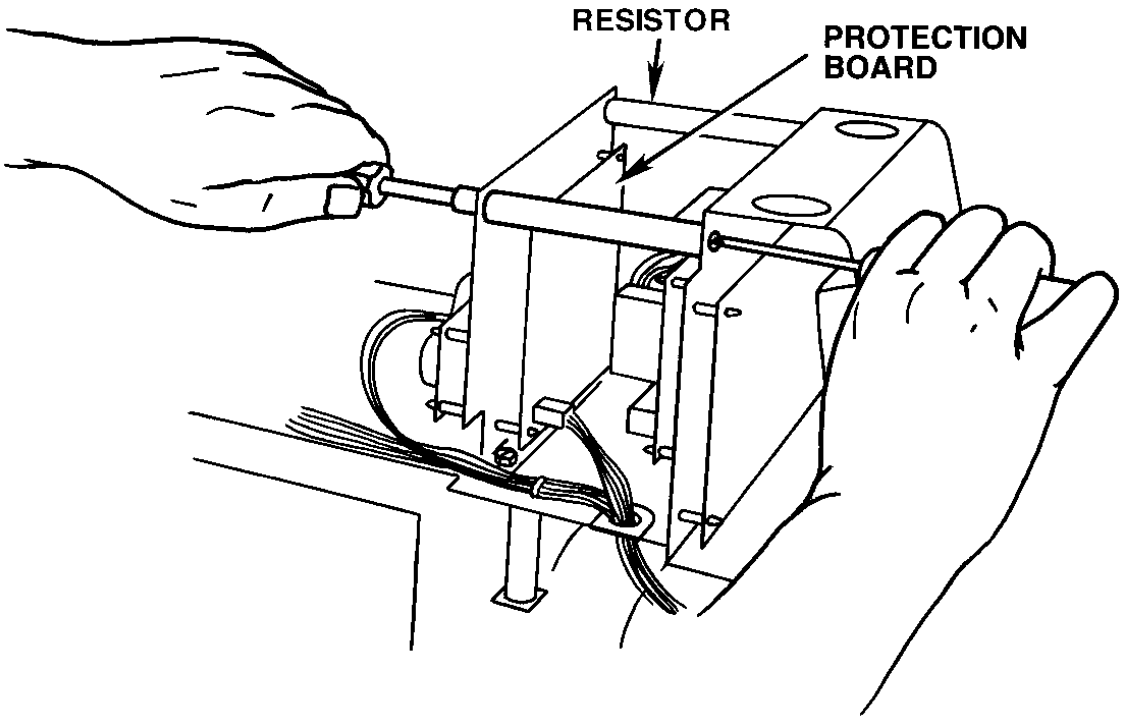
1. Turn main power OFF.

2. **Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.**

3. Remove the two through bolts that attach the Power/Drive Board bracket to Protection/Input Rectifier bracket. Each through bolt also supports a resistor.

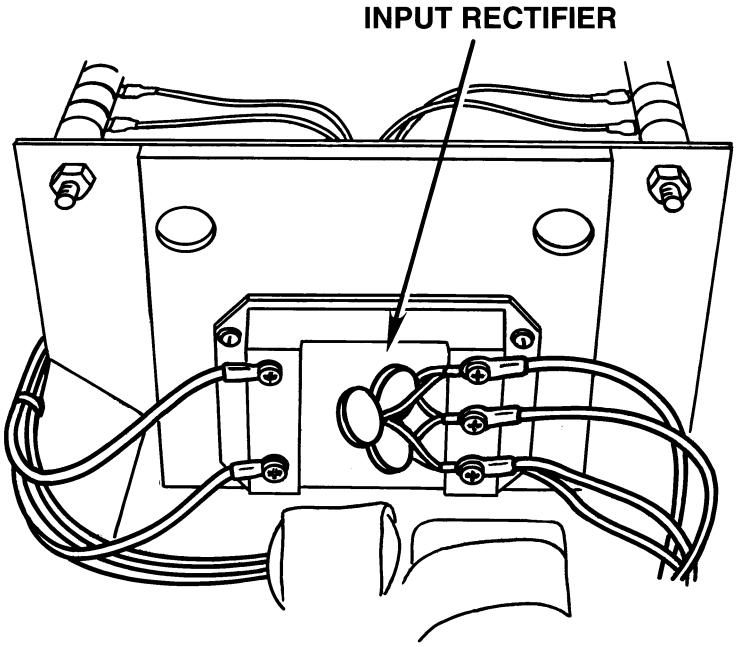
4. Slide the through bolts toward the Control Panel until the brackets are disconnected and resistors are loose. Be careful when loosening these through bolts, as they secure the two resistors. As the through bolts are removed, carefully place the resistors and the connected wires to the side.

FIGURE F.4 — REMOVING THROUGH BOLTS.



PROTECTION BOARD OUTPUT TEST *(continued)*

FIGURE F.5 — REMOVING BRACKET SCREWS.

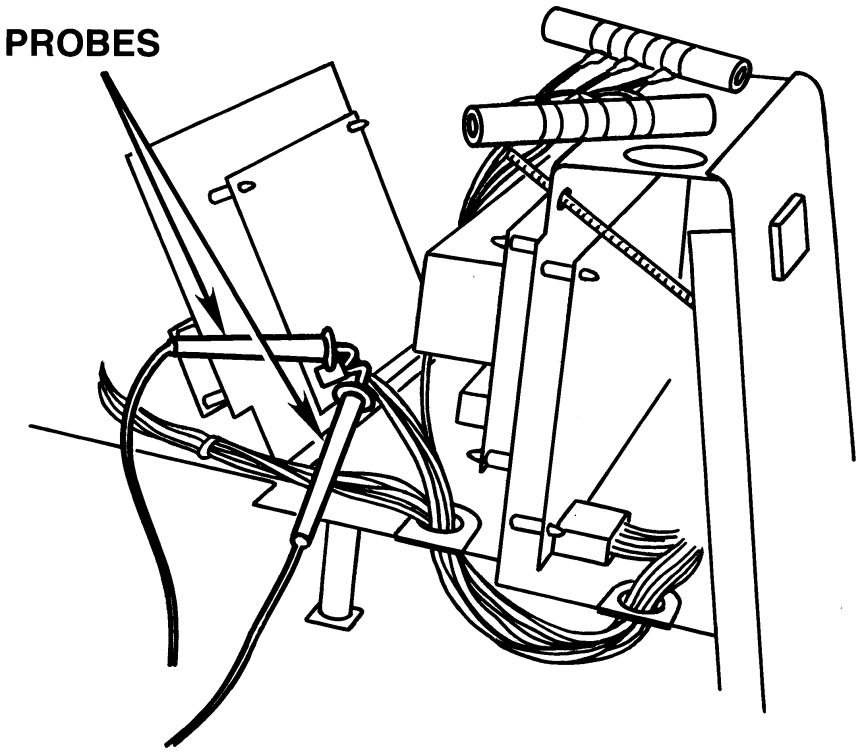


5. Remove the two screws attaching the Protection Board/Input Rectifier bracket to main assembly bracket.

6. Tilt the top of the Protection Board bracket toward the Power Panel to gain access to test points on the Protection Board.

PROTECTION BOARD OUTPUT TEST *(continued)*

FIGURE F.6 — INSERTING PROBES.



7. With power OFF, disconnect J8 and attach voltage probes into back of wire harness lead junction block (J8). See Figure F.7.

   Insert probes into back of the connection cavities for leads 313 (-) and 311 (+) of Protection Board. Make sure contact is made with conductor material.

   NOTE: Right-angle, thin-gauge probes are best for this test.

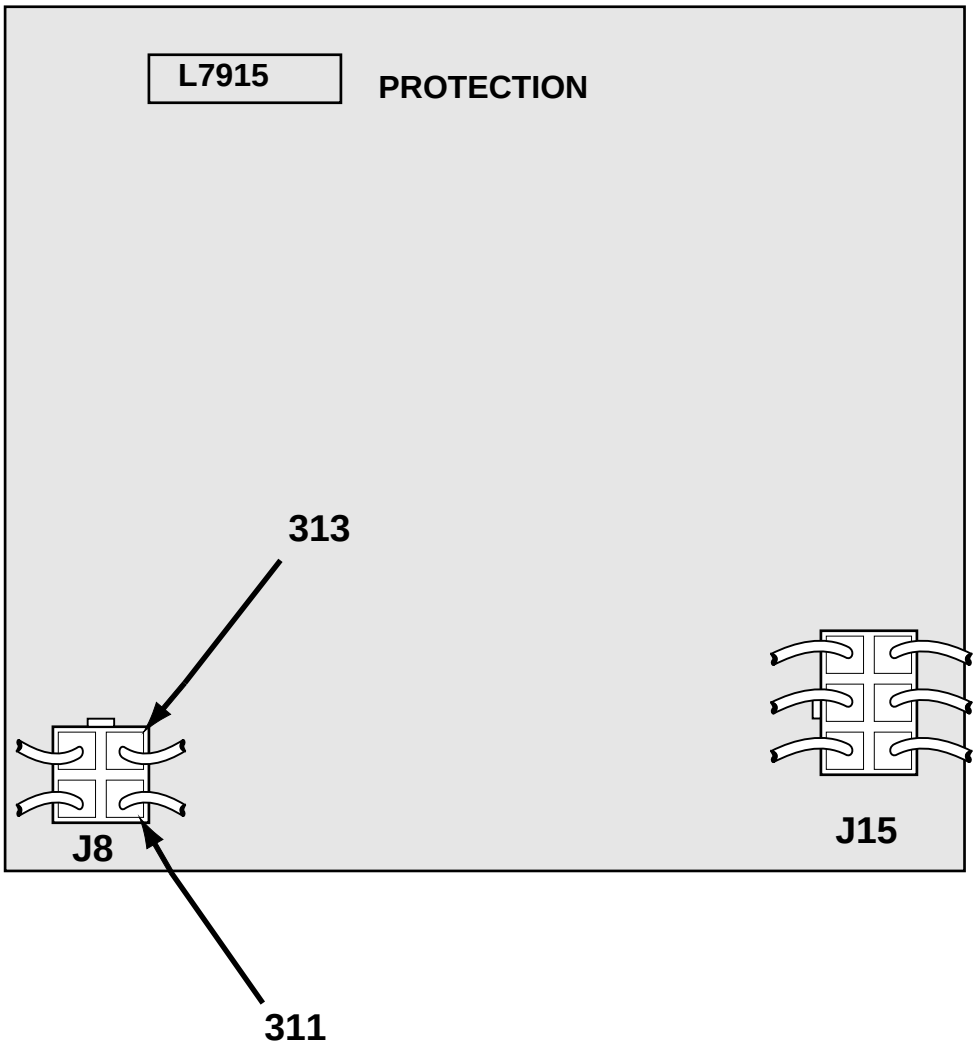
   With probes attached, plug the (J8) block into the PC board.

8. Turn main power ON.

9. Move Output Terminal Switch S4 to ON position on Control Panel.

PROTECTION BOARD OUTPUT TEST *(continued)*

FIGURE F.7 — INSERTING PROBES.



10. Test for less than 1 VDC between leads 313 (-) and 311 (+).

    a. If less than 1 VDC is measured, test is OK and Protection Board is functioning properly.
    b. If more than 5 VDC is measured, go to Static Capacitor Balance Test.

    NOTE:. During voltage test, be cautious to avoid positioning loose components to avoid shorts and damage to equipment.

11. Repeat steps 1 thru 8, but measure voltage between leads 306 (+) and 275 (-). If voltage is less than 1 VDC, Protection Board is OK. If voltage is greater than 14 VDC, Protection Board is faulty. See Figure F.28.

STATIC CAPACITOR BALANCE TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

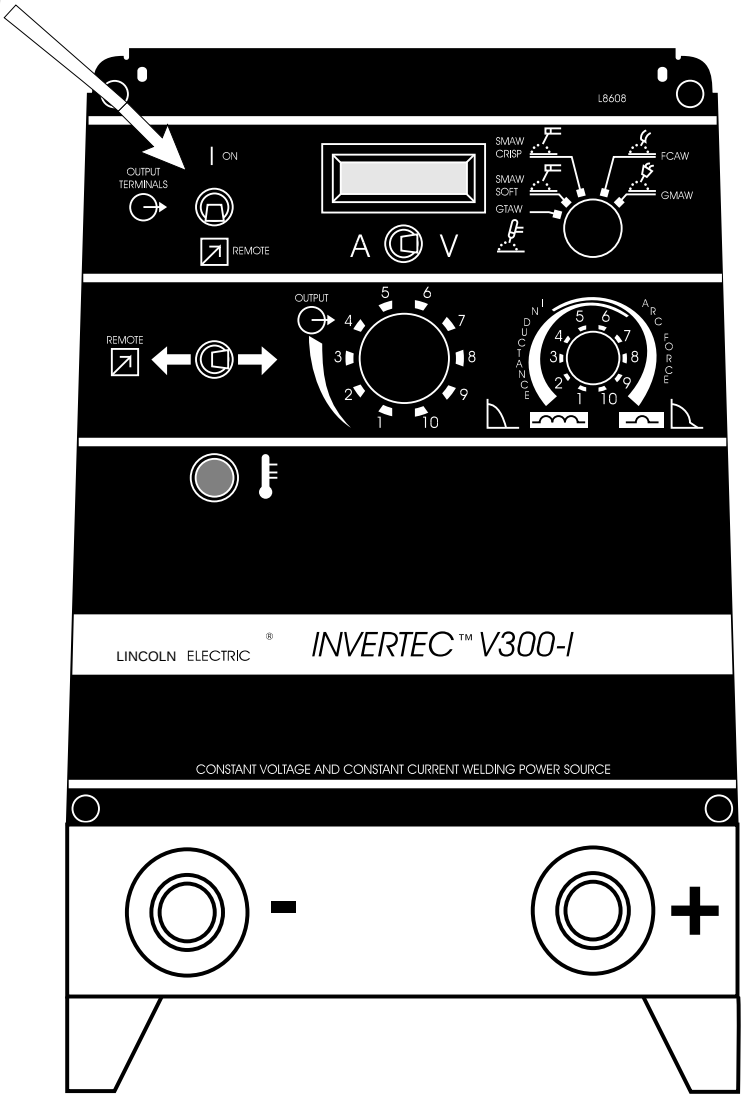
NOTE: This test should only be conducted when the machine reconnect switch and jumper are set for high voltage (above 380 VAC) and the proper line voltage is applied.

TEST PROCEDURE

1. Move Output Terminal Switch S4 to REMOTE (OFF) position.

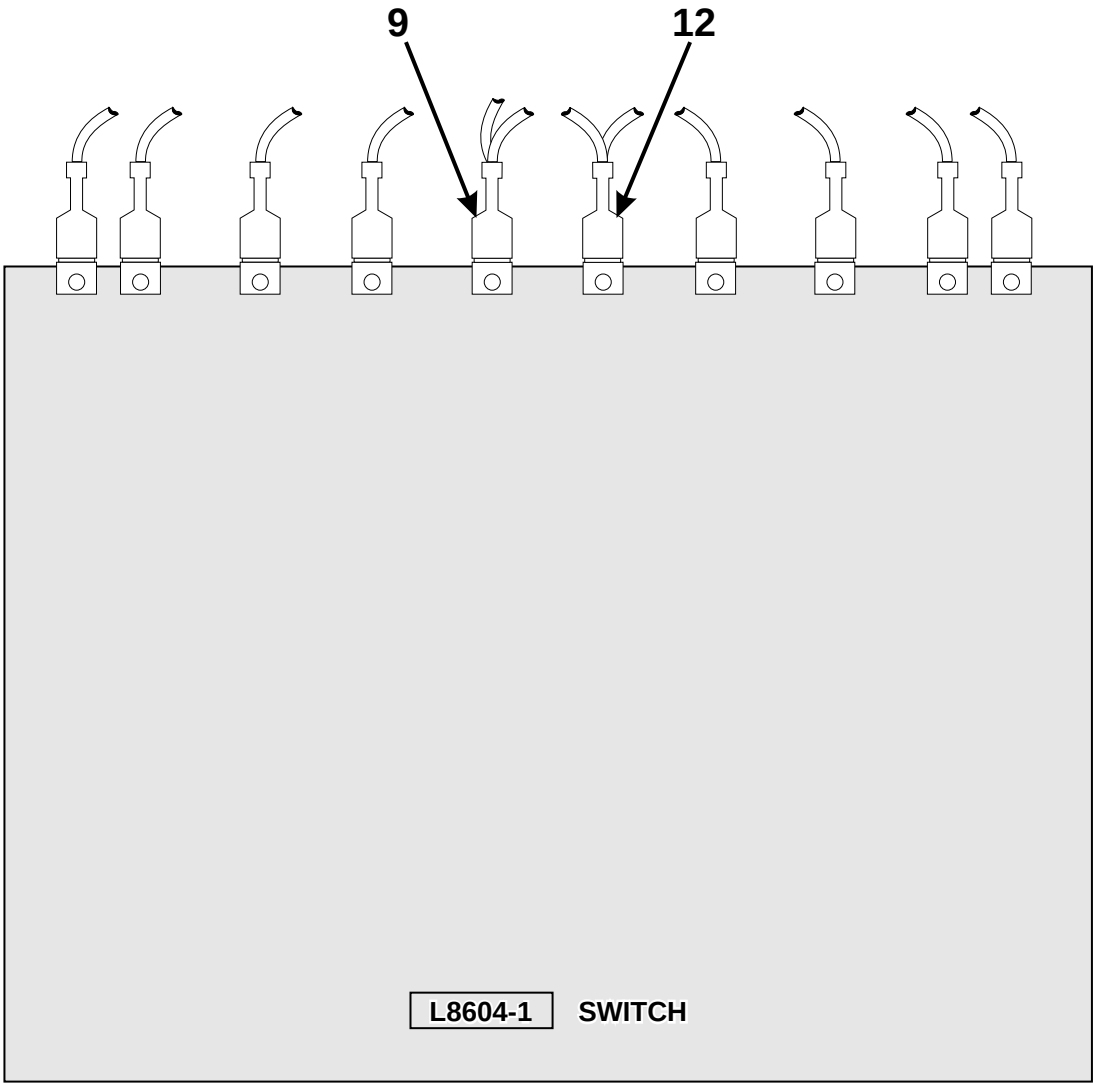
FIGURE F.8 — OUTPUT TERMINAL SWITCH IN OFF POSITION.

OUTPUT TERMINAL SWITCH S4
REMOTE (OFF)



STATIC CAPACITOR BALANCE TEST *(continued)*

FIGURE F.9 — SWITCH BOARD TEST POINTS.



2. Test VDC across terminals 9 and 12 of one Switch Board and repeat the test for the other Switch Board. See Table F.1 in this procedure for expected voltage readings.

   NOTE: For 575 VAC only, compare voltage across 9A and 13 and 13 and 12A; then 9B and 15 and 15 and 12B.

STATIC CAPACITOR BALANCE TEST *(continued)*

3. Record VDC measured for each Switch Board and determine the difference in VDC.

NOTE: The following measurements should result based on VAC input.

TABLE F.1 — EXPECTED VOLTAGE READINGS.

If VAC Input is:	VDC at terminals 9 and 12 should be approximately:
575VAC	407 VDC
460 VAC	325 VDC
440 VAC	311 VDC
415 VAC	293 VDC
380 VAC	269 VDC

a. If less than 25 VDC difference is measured between each Switch Board, then capacitive balance is OK.

- This indicates that Capacitors C1 and C2, Resistors R1 and R9 are functioning properly.
- (575 VAC only machines — Capacitors C1, C2, C14, and C15; Resistors R1 and R9.)

Replace Protection Board and go to Dynamic Capacitor Balance Test.

b. If more than 25 VDC difference is measured between each Switch Board, test each of the following components:

- Capacitors C1 and C2 and Resistors R1 and R9.
- (575 VAC only machines — Capacitors C1, C2, C14, and C15; and Resistors R1 and R9.)

DYNAMIC CAPACITOR BALANCE TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

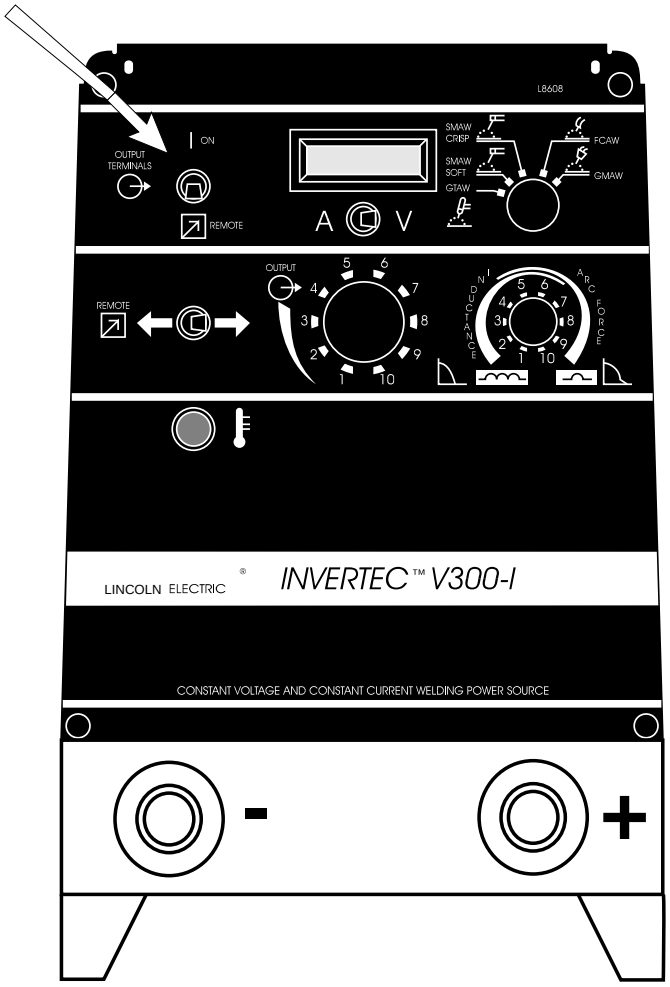
NOTE: This test should only be conducted when the machine reconnect switch and jumper are set for high voltage (above 380 VAC) and the proper line voltage is applied.

TEST PROCEDURE

1. Move Output Terminal Switch S4 to ON position.

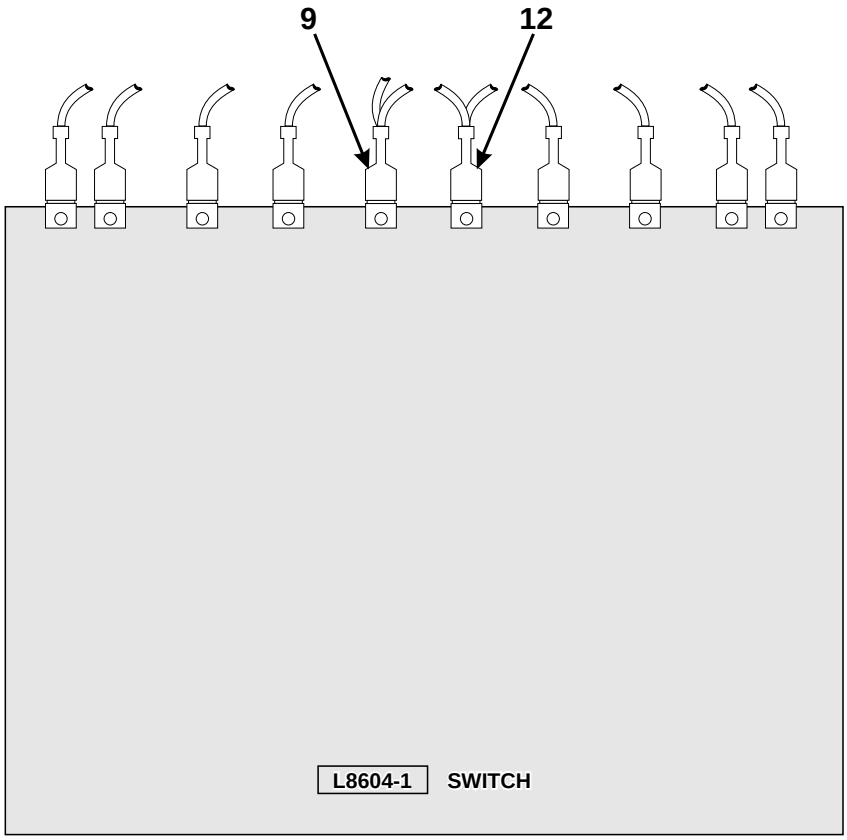
   Adjust the output control to the minimum setting. Place the mode control at the SMAW (soft) position.

FIGURE F.10 — OUTPUT TERMINAL SWITCH IN ON POSITION.



DYNAMIC CAPACITOR BALANCE TEST *(continued)*

FIGURE F.11 — SWITCH BOARD TEST POINTS.



2. Test VDC across terminals 9 and 12 of one Switch Board and repeat the test for the other Switch Board.

   NOTE: For 575 VAC ONLY, compare voltage across 9A and 13 and 13 and 12A; then 9B and 15 and 15 and 12B.

3. Record VDC measured for each Switch Board and determine the difference in VDC. (See Table F.2.)

   NOTE: The following measurements should result based on VAC input.

TABLE F.2 — EXPECTED VOLTAGE READINGS.

If VAC Input is:	VDC at terminals 9 and 12 should be approximately:
575VAC	407 VDC
460 VAC	325 VDC
440 VAC	311 VDC
415 VAC	293 VDC
380 VAC	269 VDC

   a. If less than 15 VDC difference is measured between each Switch Board, test is OK.

   b. If more than 15 VDC difference is measured between each Switch Board, Power Board or Switch Board is damaged. Test these PC boards and replace if needed.

Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capaciter discharge procedure.

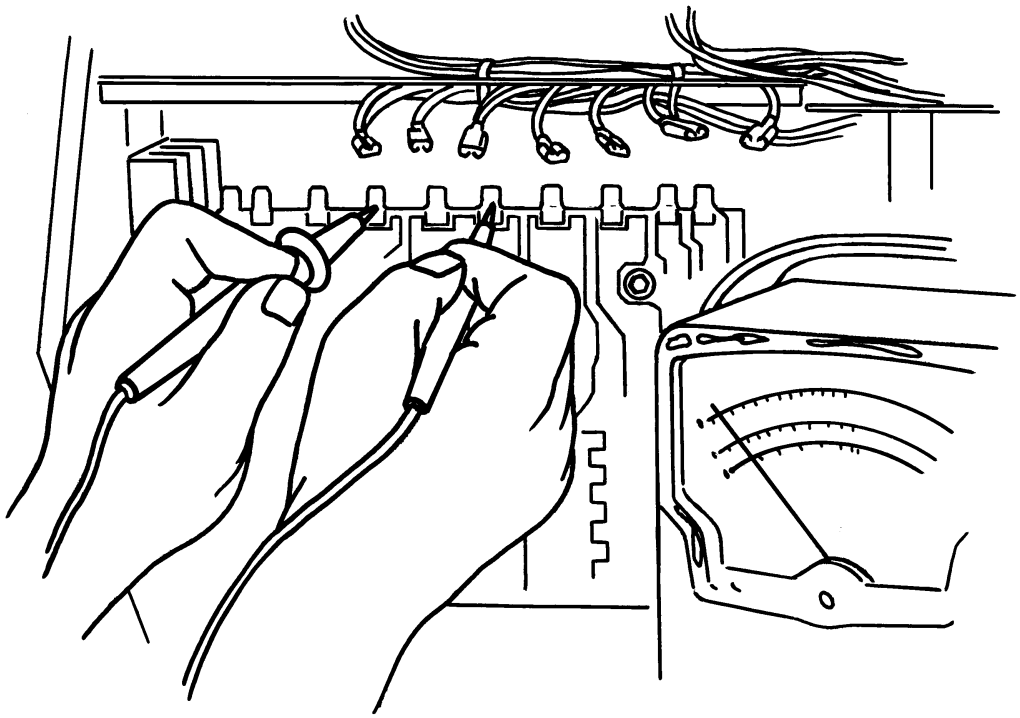
LOCATION. There are two Switch Boards. One is located on each side of the machine.

FUNCTION. The Switch Boards are designed to receive gate (turn-on) signals from the Driver Board (pulse transformer secondaries). The internal board circuitry processes the signals and outputs them to the FETs. The switch board circuitry contains snubber circuitry to protect the FETs. This protection is supplemented by off-board resistors. The Switch Board design accommodates the connection point(s) for the Capacitor(s), Main Transformer primary windings, Input Rectifier, and Reconnect Switches.

TEST DESCRIPTION. The Switch Board Test determines if the switch boards are operating properly. This Resistance Test is preferable to a Voltage Test with the machine energized because these boards can be damaged easily. In addition, it is dangerous to work on these boards with machine power ON.

SWITCH BOARD TEST *(continued)*

FIGURE F.12 — SWITCH BOARD RESISTANCE TEST.



TEST PROCEDURE

1. Disconnect power to the machine and discharge Capacitors as described on Maintenance section.

2. Disconnect all wiring harness leads (401/403, 1/8, 9, 12, 4/5, 402/404) from the PC board.

3. Fold the leads up so they do not interfere with the exposed PC board terminals. See Figure F.12.

4. Using an ohmmeter, perform the Resistance Tests detailed in Table F.3 and shown in Figure F.12. If any test fails, replace both Switch Boards. See Switch Board replacement procedure.

5. If the Switch Boards appear to be burned or overheated, or if the machine was supplied by a 380 VAC or higher voltage supply when the failure occurred, replace the Capacitors and the Switch Boards.

SWITCH BOARD TEST *(continued)*

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

TABLE F.3 — SWITCH BOARD RESISTANCE TEST.

Apply Positive Test Prove to Terminal	Apply Negative Test Probe to Terminal	Test Result	Conclusion	Repair Action	Next Procedure	Notes
1/8	12	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	
12	1/8	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
9	4/5	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	
4/5	9	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
1/8	9	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
9	1/8	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	
12	4/5	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
4/5	12	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	

NOTE: K ohm = ohm reading multiplied by 1000.
NOTE: Always make shure that Switch Boards are changed in matched pairs. Never mix an old style (different part number) Switch

Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST *(continued)*

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

TABLE F.3 — SWITCH BOARD RESISTANCE TEST. *(continued)*

Apply Positive Test Prove to Terminal	Apply Negative Test Probe to Terminal	Test Result	Conclusion	Repair Action	Next Procedure	Notes
12	401/403	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	
401/403	12	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
9	402/404	Less than 100 ohms	OK	None	Continue	
		Greater than 1K ohm	Open	Replace both Switch Boards	Snubber Test	
402/404	9	Greater than 1K ohm	OK	None	Continue	
		Less than 100 ohms	Shorted	Replace both Switch Boards	Snubber Test	

NOTE: K ohm = ohm reading multiplied by 1000.
NOTE: Always make shure that Switch Boards are changed in matched pairs. Never mix an old style (different part number) Switch

SNUBBER RESISTORS TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

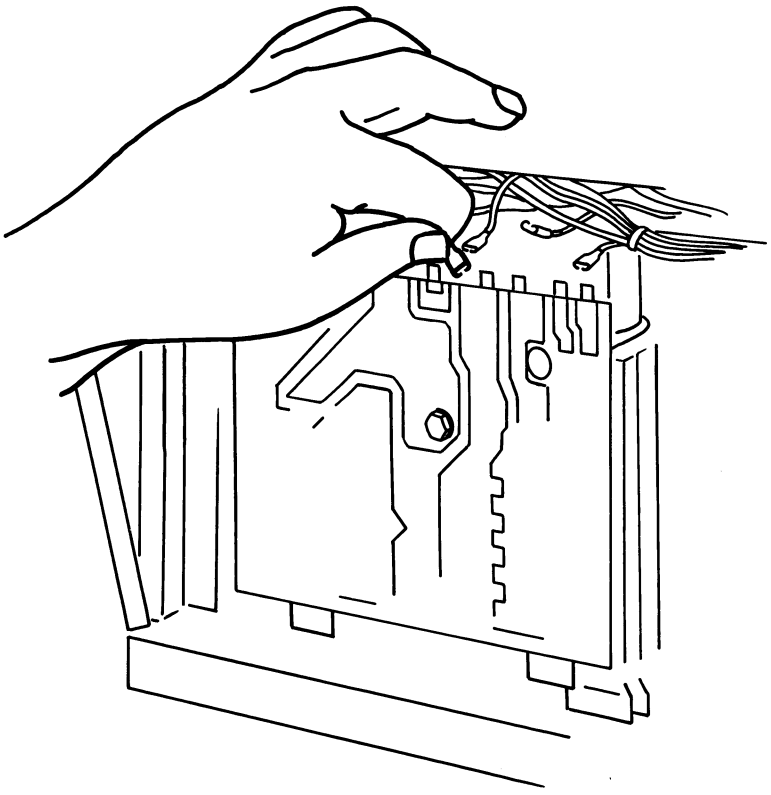
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams.

TEST PROCEDURE

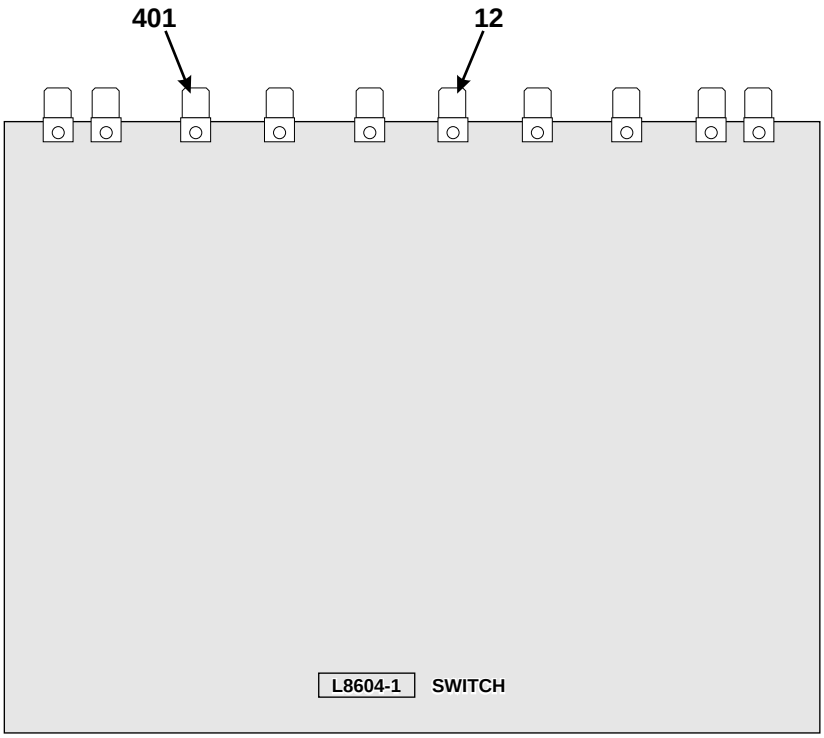
1. Turn main power OFF.
2. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.
3. Locate and gain access to the Switch Board.
4. Remove leads from terminals 401, 402, 403, and 404 on Switch Board.

FIGURE F.13 — REMOVING LEADS.



SNUBBER RESISTORS TEST *(continued)*

FIGURE F.14 — SWITCH BOARD TEST POINTS.



5. Test for 25 ohms resistance from lead 401 to terminal 12 on Switch Board.

   a. If 25 ohms is measured, Resistor R4 is OK.

   b. If 30 ohms or more is measured, Resistor R4 is faulty and must be replaced.

   c. If 20 ohms or less is measured, Resistor R4 is faulty and must be replaced.

6. Repeat same procedures to test R5, R6, and R7 per Table F.4.

TABLE F.4 — SNUBBER RESISTORS TEST.

Check	Test Result	Conclusion	Next Test Step	Repair Action
Lead 401 to Terminal 12	25 ohms	OK	Continue	
	>30 ohms <20 ohms	R4 open R4 faulty		Replace R4
Lead 402 to Terminal 9	25 ohms	OK	Continue	
	>30 ohms <20 ohms	R5 open R5 faulty		Replace R5
Lead 403 to Terminal 12	25 ohms	OK	Continue	
	>30 ohms <20 ohms	R6 open R6 faulty		Replace R6
Lead 404 to Terminal 9	25 ohms	OK	Continue	
	>30 ohms <20 ohms	R7 open R7 faulty		Replace R7

> = GREATER THAN < = LESS THAN

OUTPUT DIODES TEST

⚠ WARNING

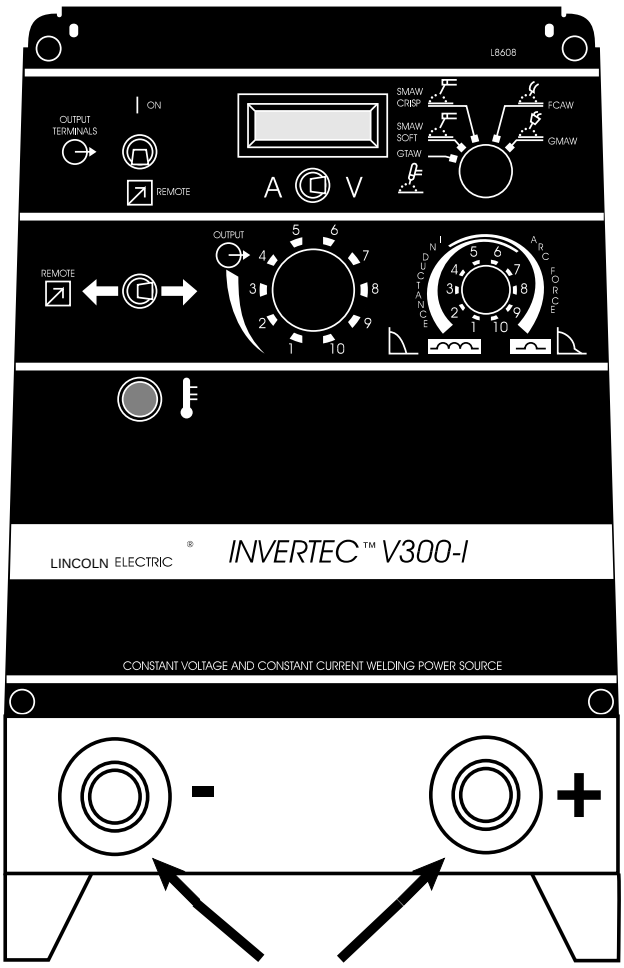
ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

TEST PROCEDURE

1. Perform Input Filter Capacitor Discharge procedure detailed in Maintenace section..
2. Locate the Output Terminals on front panel.

FIGURE F.15 — LOCATION OF OUTPUT STUDS.

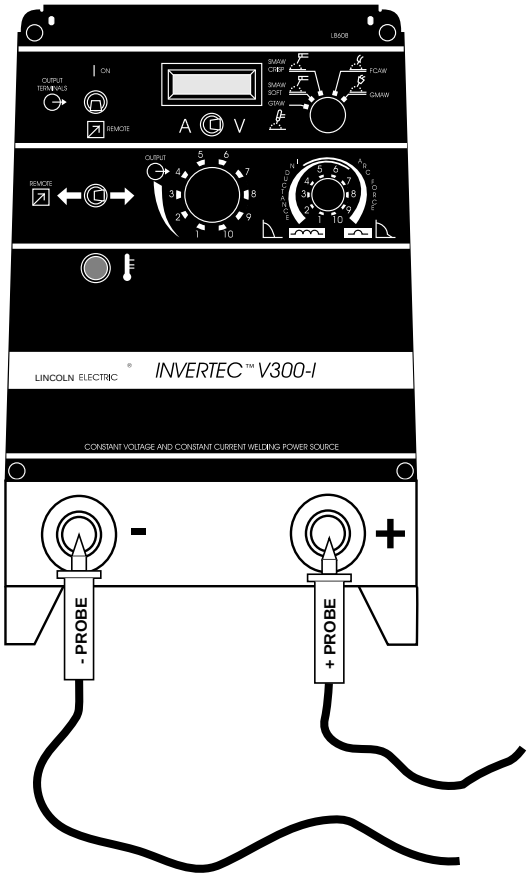


OUTPUT TERMINALS

Return to Section TOC
Return to Master TOC

OUTPUT DIODES TEST *(continued)*

FIGURE F.16 — TESTING OUTPUT DIODES.



3. Remove any output load.

4. Test for more than 200 ohms resistance between positive and negative Output Terminals: positive test lead to positive terminal, negative test lead to negative terminal.

   NOTE: Polarity of test leads is important.

   a. If more than 200 ohms measured, Output Diodes are OK.

   b. If less than 100 ohms measured, an Output Diode is shorted. Test all Output Diodes (D-1 thru D-12) individually.

Return to Section TOC
Return to Master TOC

INPUT RECTIFIER TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

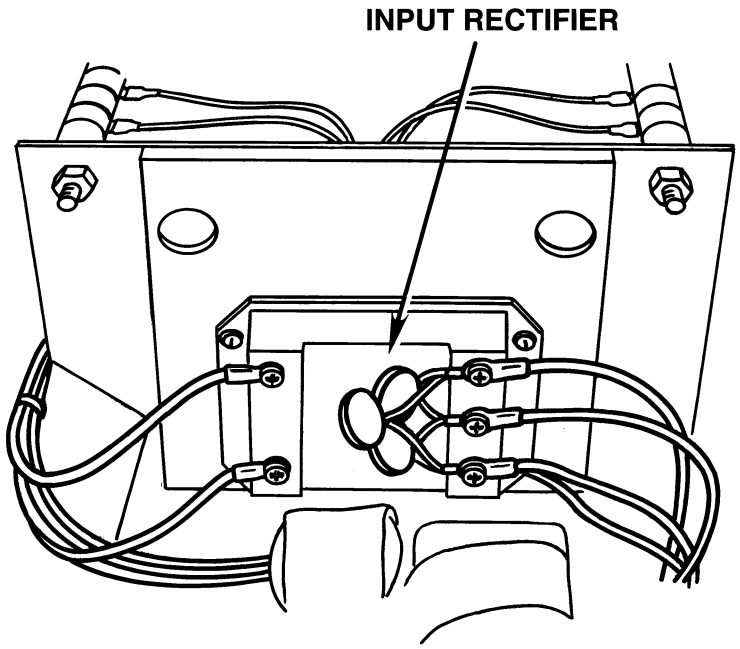
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams

TEST PROCEDURE

1. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.
2. Locate Input Rectifier (Component D-13).
3. Locate leads needed to perform tests shown in Figure F.17.
4. Use ohmmeter to perform tests shown in Table F.5.

FIGURE F.17 — INPUT RECTIFIER LOCATION.



INPUT RECTIFIER TESTS *(continued)*

TABLE F.5
INPUT RECTIFIER TEST

Steps	Test Points		Acceptable Meter Reading
	+ Probe	– Probe	
A	9	H1	Greater than 100K ohms
B	9	A	Greater than 100K ohms
C	9	H5	Greater than 100K ohms
D	H1	9	Less than 100 ohms
E	A	9	Less than 100 ohms
F	H5	9	Less than 100 ohms
G	12	H1	Greater than 100 ohms
H	12	A	Greater than 100 ohms
I	12	H5	Greater than 100 ohms
J	H1	12	Less than 100 ohms
K	A	12	Less than 100 ohms
L	H5	12	Less than 100 ohms

5. Replace Input Rectifier Component D13 when any of tests A-L are not OK.

   NOTE: When installing new Input Rectifier, torque mounting nuts (in a cross tightening pattern) to 6 inch-pounds (.7 Nm). Torque terminals to 26 inch-pounds (3 Nm). ALWAYS GO TO STEP 6 TO CHECK RELATED COMPONENTS.

6. Inspect Main Power Switch S1 and replace if faulty. Go to step 7.

7. Test Capacitors C1 and C2 and replace both Capacitors if either is faulty.

NOTE: Faulty Capacitors could be the reason for Component D13 (Rectifier) failure.

Visually inspect Capacitors for leakage, damage, etc., and use appropriate test equipment to determine component integrity (also check/test Switch Boards for damage).

OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

CIRCUIT DESCRIPTION

One of the functions of the Control Board is to limit the output loading to 370-400 amps for three-phase operation (225-275 amps for single-phase).

The functioning circuit will reduce the output amperage to approximately 200 amps in three-phase operation (100-190 amps single-phase) when overcurrent loading is detected.

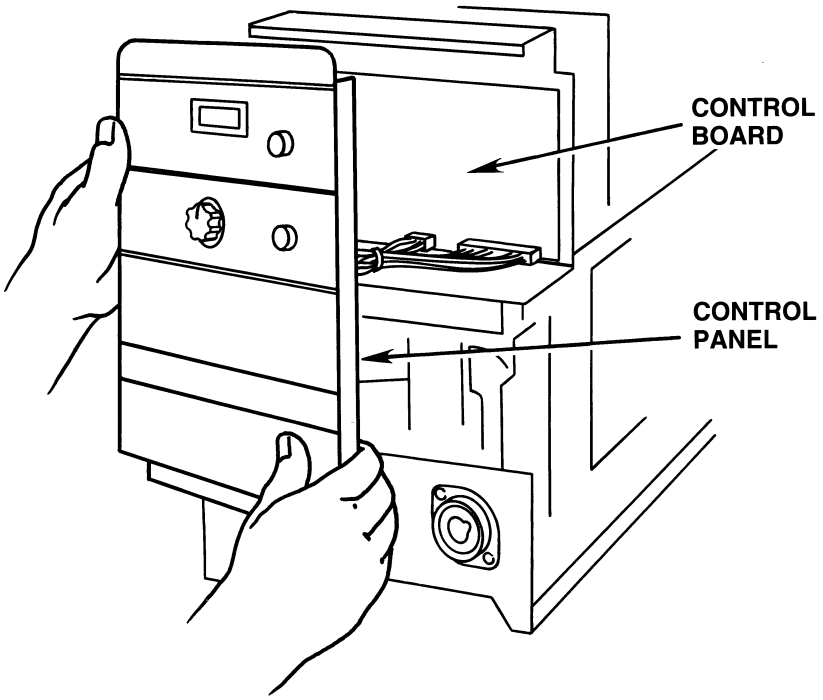
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams
- **NOTE:** See Figure F.22 for Overcurrent Protection Current Trigger Circuit.

Return to Section TOC
Return to Master TOC

OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT TEST
(continued)

FIGURE F.18 — GETTING ACCESS TO CONTROL BOARD.



TEST PROCEDURE

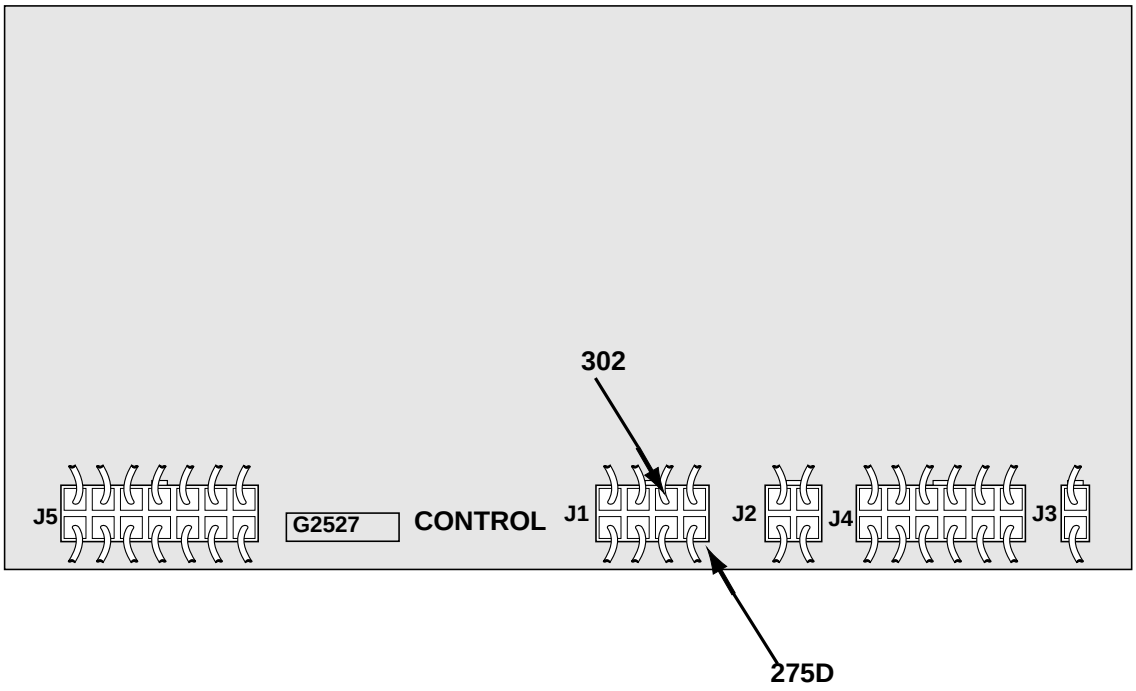
1. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.

2. Remove front panel from machine to access Control Board.

3. Arrange wires so there is ample room to work on the board.

OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT TEST
(continued)

FIGURE F.19 — CONTROL BOARD TEST POINTS.



4. Turn main power ON.

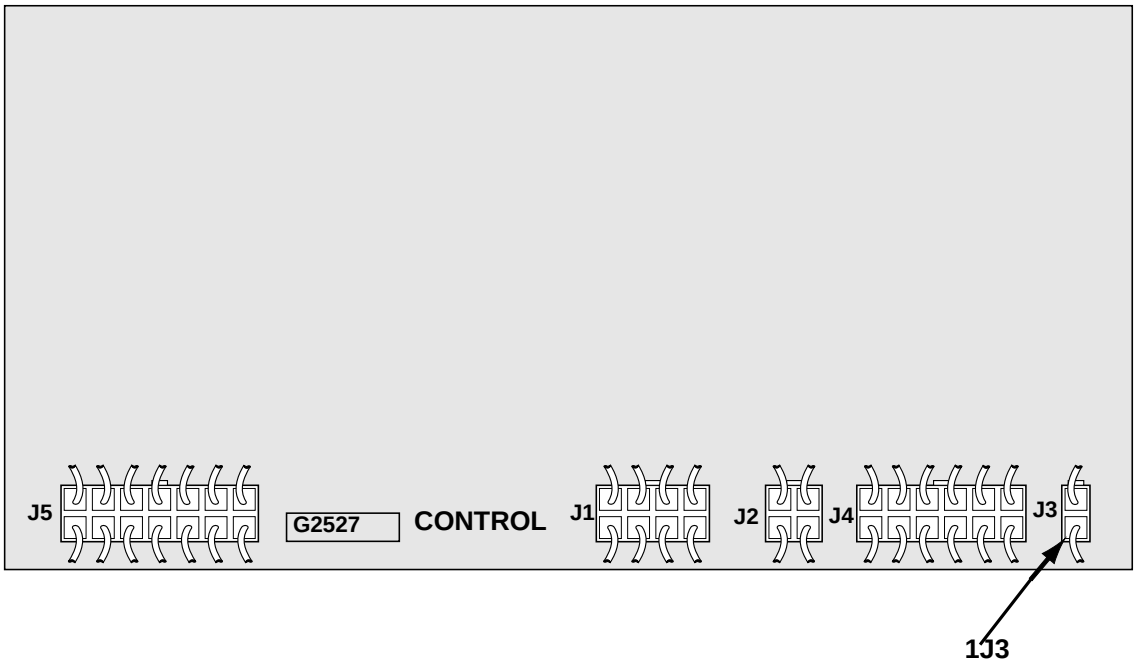
5. Test for 15 VDC between leads 302 and 275D.

   a. If 15 VDC is present, test is OK. Go to step 6.

   b. If 15 VDC is not present, check Power Board and leads 302 and 275D for continuity and wire breakage.

OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT TEST
(continued)

FIGURE F.20 — CONTROL BOARD TEST POINTS.



6. Turn main power OFF.

7. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.

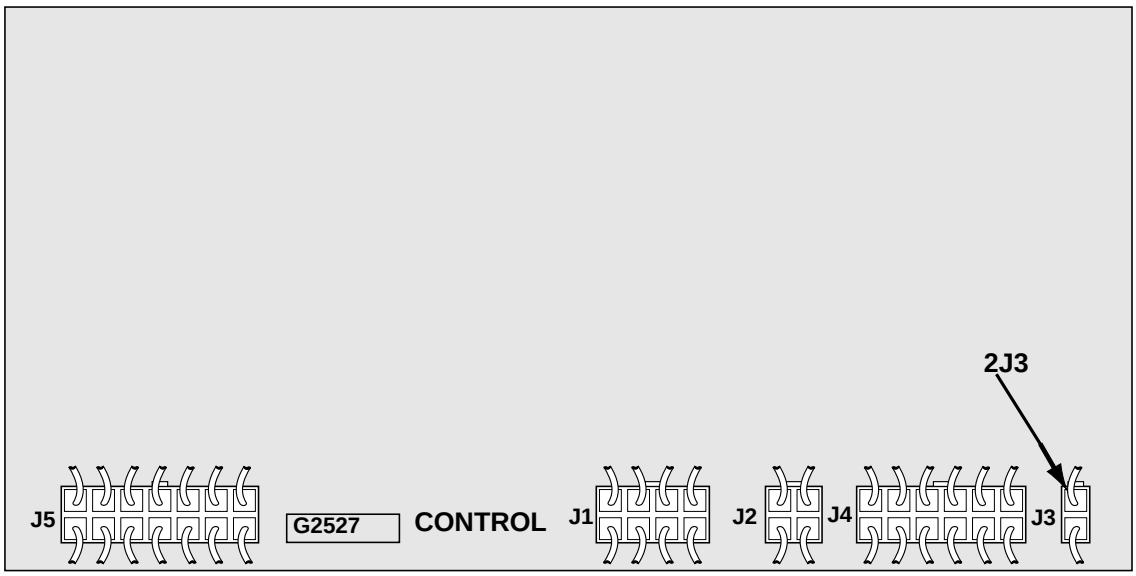
   Test resistance between pin 1J3 and black lead from Control Board to shunt. See Figure F.22.

   a. If zero ohms resistance (continuity) is shown, test is OK. Go to step 8.

   b. If resistance of any value is shown, check wire and connections.

OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT TEST
(continued)

FIGURE F.21 — CONTROL BOARD TEST POINTS.



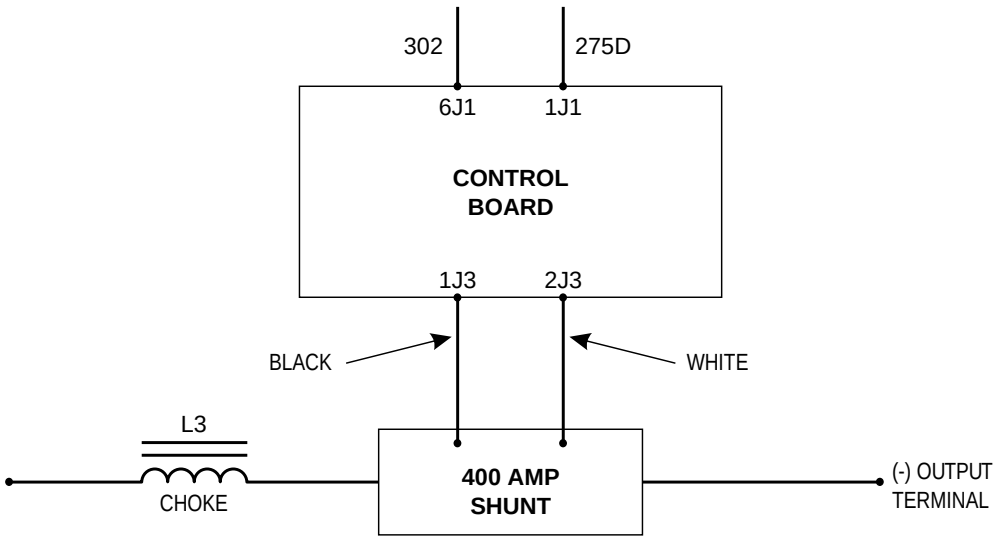
8. Test resistance between pin 2J3 to white lead from Control Board to shunt.

   a. If zero ohms resistance (continuity) is shown, test is OK. See note below.

   b. If resistance of any value is shown, check wire and connections.

NOTE: If tests for steps 5, 7, and 8 are OK and the machine continues to experience the problem, the Control Board should be replaced.

FIGURE F.22 — OVERCURRENT PROTECTION CURRENT TRIGGER CIRCUIT.



OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

⚠ CAUTION

Always turn off power to the machine to change the position of the reconnect switch. Never change the reconnect switch with the main line switch in the on position. this will severely damage the machine.

CIRCUIT DESCRIPTION

Overvoltage protection occurs through two circuits. The Protection Board monitors the voltage applied to the Input Filter Capacitors. If an overvoltage is sensed from conditions such as misconnections or line surges, the Output Trigger Circuit and the Input Power Relays are opened, causing the machine to shut down. In the event that line surges occur, the circuit will reset when the line voltage returns to normal.

Misconnection protection includes the Protection Board function along with a fused auxiliary in the Reconnect Panel. Precharge sampling of the Capacitor(s) also controls for overvoltage via the Driver Board.

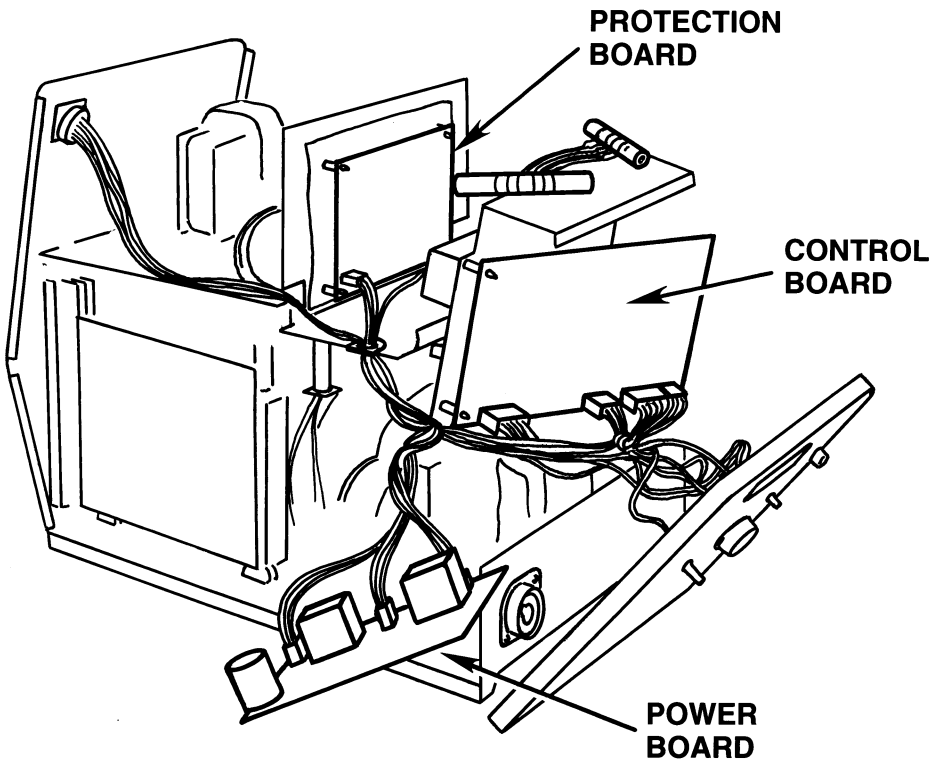
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams

NOTE: Figure F.28 shows the Overvoltage Protection DC Trigger Circuit.

OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.23 — PC BOARDS REMOVED.



TEST PROCEDURE

1. Turn main power OFF.

2. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.

3. Detach the following PC boards so you can gain access to and have ample room to perform the tests: (Do not disconnect from wiring harness.)

   - Control Board
   - Protection Board
   - Power Board

   NOTE: Do not disconnect any wires. The machine must be functional to perform tests.

4. Arrange the PC boards and wiring so you can easily perform the tests.

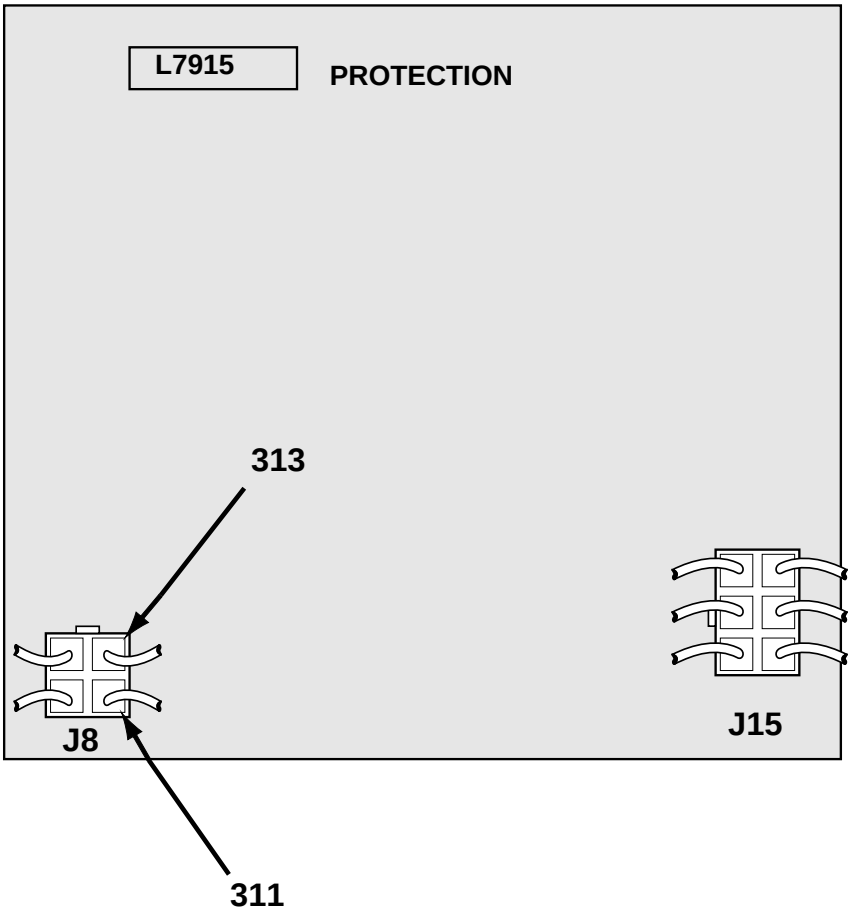
   NOTE: Do not allow live connections to touch each other.

5. Turn main power ON.

6. Move the Output Terminal Switch S4 to the ON position (closed).

OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.24 — PROTECTION BOARD TEST POINT.



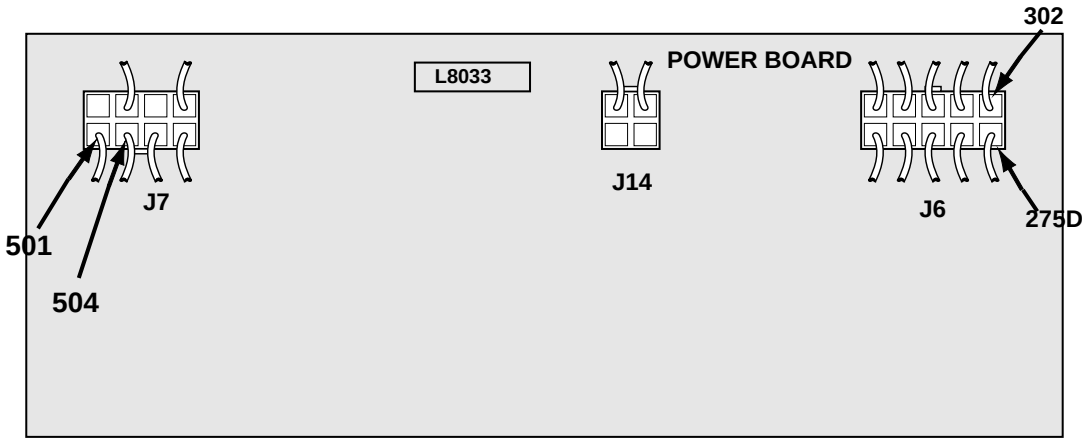
7. Test for 0 VDC between leads 311 and 313 on Protection Board.

   a. If 0-1 VDC is present, the Protection Board is OK. Go to step 8.

   b. If 15 VDC is present, go to step 11.

OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.25 — POWER BOARD TEST POINTS.



8. Test for 15 VDC supply voltage between leads 302 and 275D on Power Board.

   a. If 15 VDC is present, test is OK. Go to step 9.

   b. If 15 VDC is not present, the Power Board may be faulty. Check for 18 VAC input voltage at lead 501 and 504 (J7).

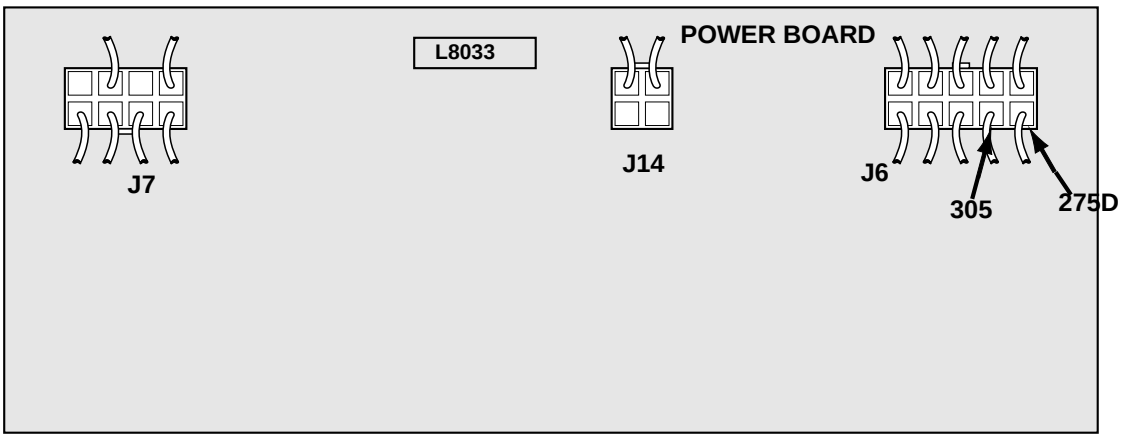
      If 18 VAC is present the Power Board is faulty and must be replaced.

9. Test for 0-1 VDC (DC trigger circuit) between leads 305 and 275D on Power Board.

   a. If 0-1 VDC is present, DC trigger circuit is operating properly.

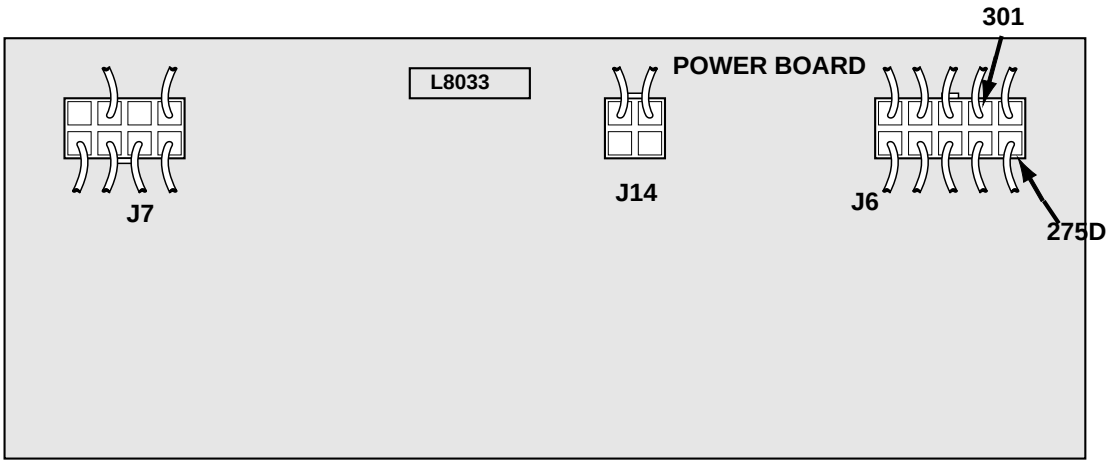
   b. If 15 VDC is present, go to step 10.

FIGURE F.26 — POWER BOARD TEST POINTS.



OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.27 — POWER BOARD TEST POINTS.



10. Test for 0-1 VDC between leads 301 and 275D on Power Board.

    a. If 0-1 VDC is present, AC trigger, Control Board, and Power Board are operating properly.

    b. If 15 VDC is present, go to Thermal Protection AC Trigger Circuit Test .

OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.28 — OVERVOLTAGE PROTECTION DC TRIGGER CIRCUIT.

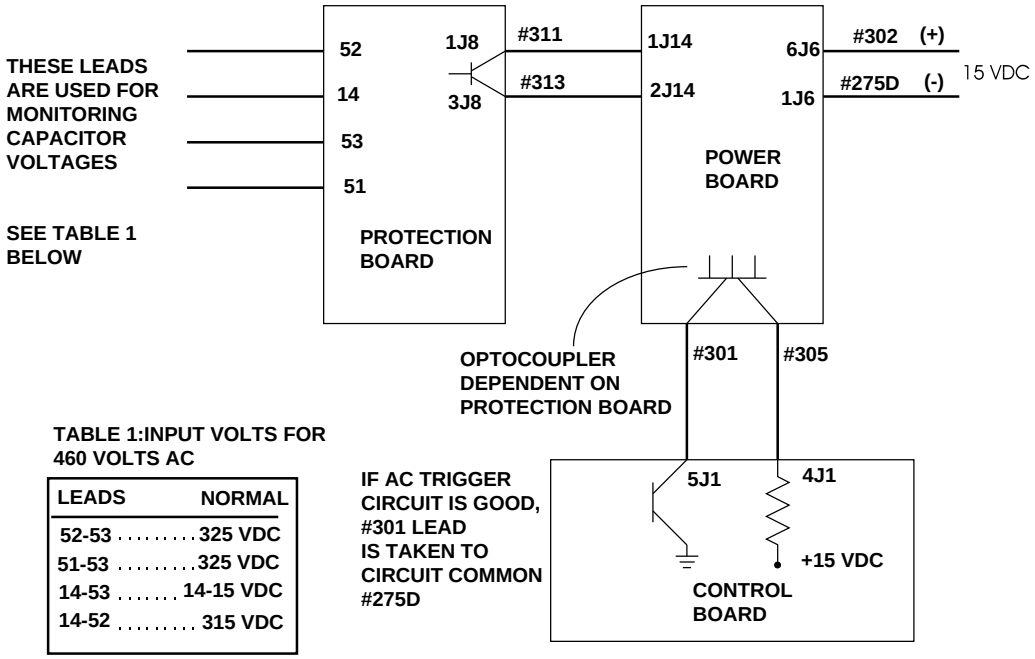


TABLE 1:INPUT VOLTS FOR 460 VOLTS AC

LEADS	NORMAL
52-53	325 VDC
51-53	325 VDC
14-53	14-15 VDC
14-52	315 VDC

11. If 15 VDC is present at step 7, test Capacitor voltages using leads shown in Figure F.28.

    If voltage does not match table, check reconnect for proper position for voltage applied. Also test Capacitor balance. Refer to Static and Dynamic Capacitor Balance Tests.

THERMAL PROTECTION AC TRIGGER CIRCUIT TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

CIRCUIT DESCRIPTION

The choke thermostat will open the normally closed output trigger circuit if overheating occurs due to excessive output loading and/or excessive duty cycle.

The fan thermostat will open the normally closed output trigger circuit if air flow is blocked, the fan motor fails, or if the fan blade breaks. This protection is necessary to avoid overheating of machine components during idle conditions.

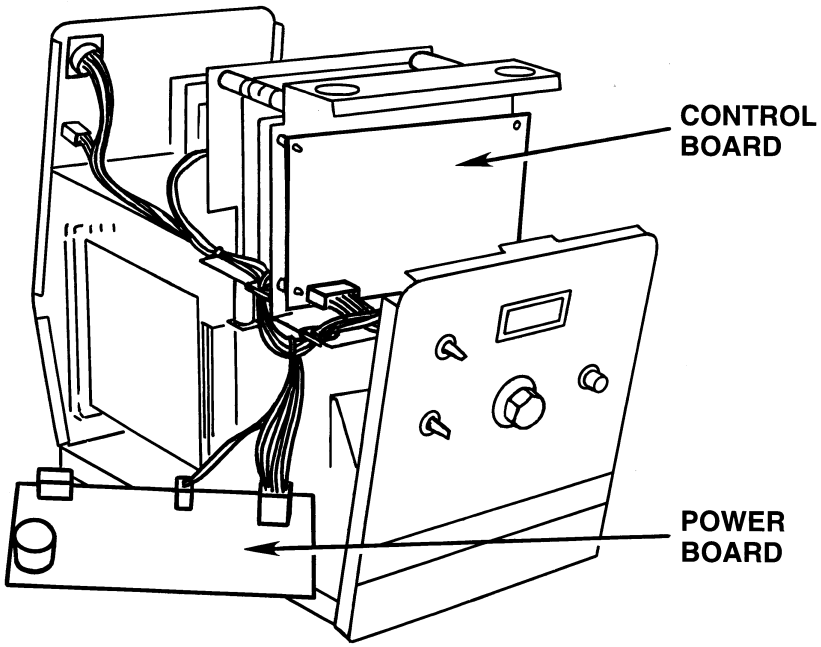
MATERIALS NEEDED

- Analog voltmeter/ohmmeter (multimeter)
- V300-I wiring diagrams

NOTE: Figure F.30 shows the Thermal Protection AC Trigger Circuit.

THERMAL PROTECTION AC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.29 — PC BOARDS REMOVED.



TEST PROCEDURE

1. Turn main power OFF.

2. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section.

3. Detach the following PC boards so you can gain access to and have ample room to perform the tests. (Do not disconnect from wiring harness.)

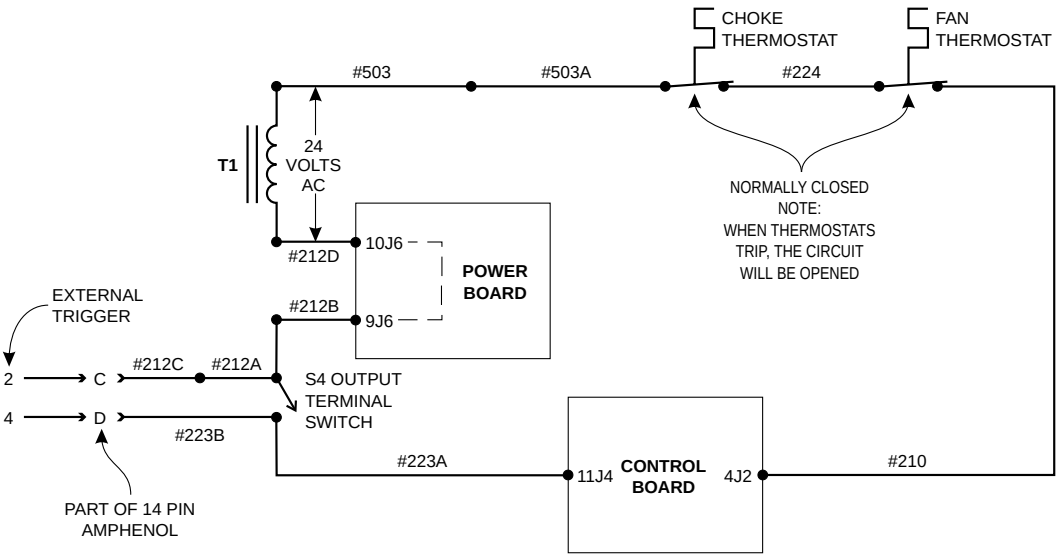
   - Power Board
   - Control Board

NOTE: Do not disconnect any wires. The machine must be functional to perform tests.

Return to Section TOC Return to Master TOC

THERMAL PROTECTION AC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.30 — THERMAL PROTECTION AC TRIGGER CIRCUIT.

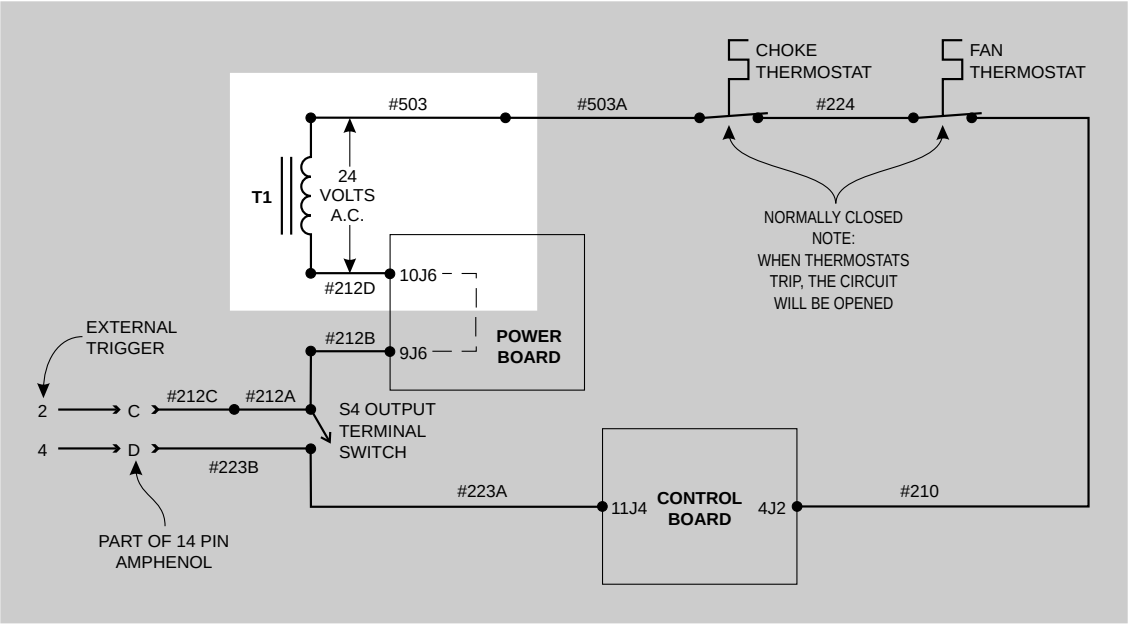


4. Locate the Auxiliary Transformer T1 and leads used for test. See Figure F.30.

5. Turn main power ON.

THERMAL PROTECTION AC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.31 — THERMAL PROTECTION AC TRIGGER CIRCUIT.



6. Test Auxiliary Transformer voltage for 24 VAC between leads 503 and 212D. See Figure F.31.

   a. If 24 VAC is present, transformer is OK. Go to step 7.

   b. If 0 VAC is present, test input voltage to Auxiliary Transformer.

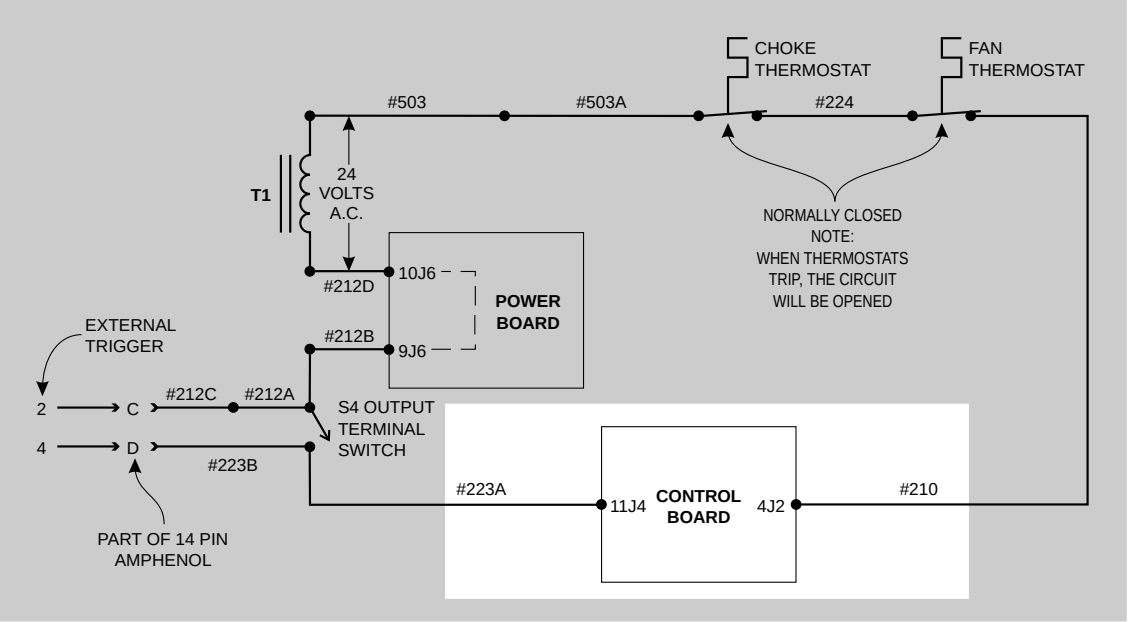
   c. If input voltage to Auxiliary Transformer is correct, replace Auxiliary Transformer.

   d. If input voltage to Auxiliary Transformer is not correct, check Line Switch S12 and connecting leads.

7. Check that Output Terminal Switch S4 is in the ON position (closed).

THERMAL PROTECTION AC TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.32 — THERMAL PROTECTION AC TRIGGER CIRCUIT.

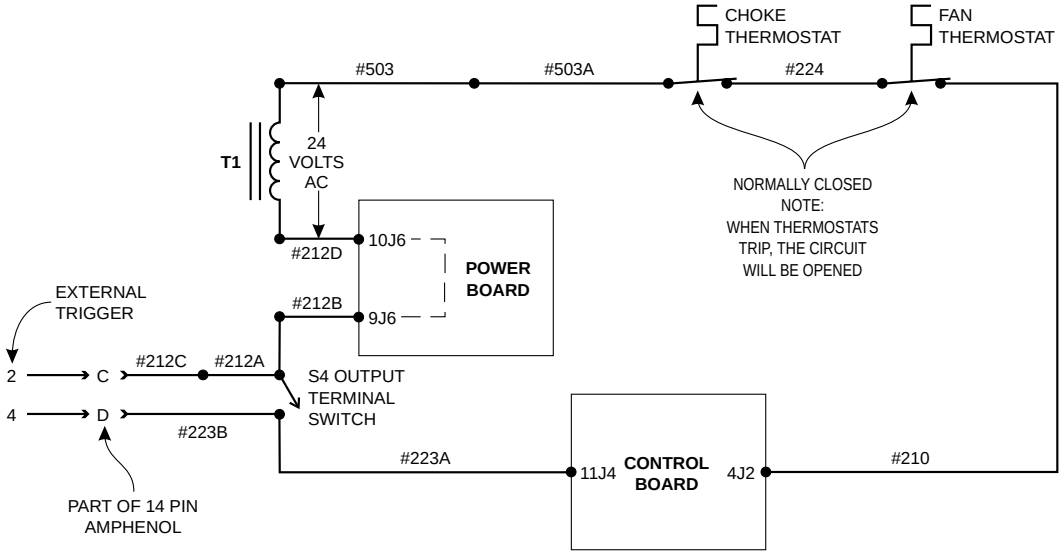


8. Test for 24 VAC between leads 223A and 210.

   a. If 24 VAC is present, then AC Trigger Circuit is functioning normally.

   b. If 0 VAC is present, check Choke Thermostat and Fan Thermostat.

FIGURE F.33 — THERMAL PROTECTION AC TRIGGER CIRCUIT.



Return to Section TOC
Return to Master TOC

CONTROL BOARD TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

– Perform input filter capacitor discharge procedure.

FUNCTION: The Control Board monitors the panel controls to determine which weld process is being employed and how the output should be controlled to optimize welding results. The Control Board controls the FET switching through pulse width modulation circuitry.

The Control Board monitors excessive output current, the thermal protection signal, and the overvoltage signal for the trigger disable function. See Theory of Operation section for details.

TEST PROCEDURE

1. Turn main power OFF.
2. Remove wrap-around cover.
3. Perform Input Filter Discharge procedure detailed in Maintenance section..
4. Check that all wiring connections are secure and all potentiometers and switches are functioning properly.
   a. If all components check OK, go to step 6.
   b. If any connection is loose or any component is faulty, fix it. Go to step 5.
5. Reassemble and operate machine and verify it operates correctly.
   a. If machine does not operate correctly, go to step 6.
6. Obtain new (functioning) Control Board.

   NOTE: Repeat steps 1-3 before attempting to change the Control Board.
7. Remove Control Panel by removing the four mounting screws.
8. Locate the Control Board.
9. Disconnect all Control Board wiring connections and remove old Control Board.
10. Reconnect all Control Board wiring connections and attach new (functioning) Control Board.
11. Reinstall Control Panel.
12. Turn main power ON.
13. Verify machine operates correctly.
    a. If machine operates correctly, the old Control Board was faulty. Discard the old Control Board.
    b. If machine does not operate correctly, the old Control Board was not faulty. Replace the old Control Board and continue to look for wiring and connection problems.

POWER BOARD TEST

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual.

NOTE: Use Test A before disassembling the unit.

TEST PROCEDURE

Test A

1. Turn main power OFF.

2. Position yourself at Switch Board area of the machine (near Case Back) to listen to control relays CR1, CR2, CR3, and CR4 operate (audible click of contacts closing).

3. Turn main power ON.

4. Listen for control relays CR1, CR2, CR3, and CR4 to operate (audible click of contacts closing) after a 5-second delay.

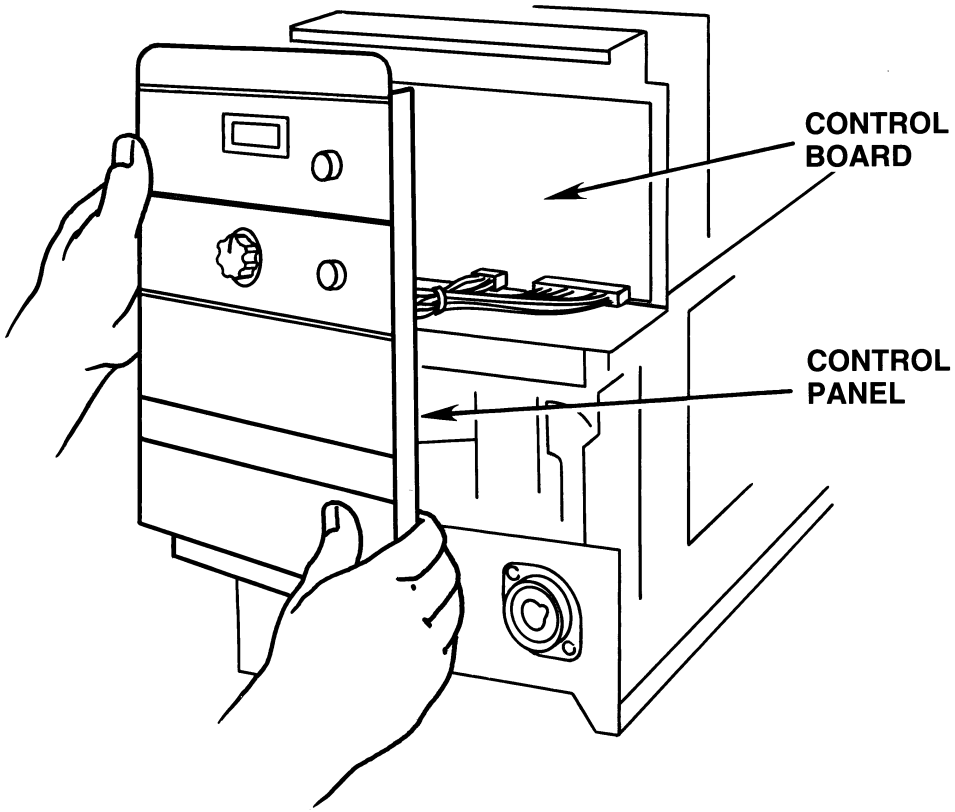
   a. If audible click of control relay contacts closing is heard, Power Board is probably OK.

      NOTE: If there is still a possibility that the Power Board is faulty, go to Test B.

   b. If audible click of control relay contacts closing is not heard, Power Board could be faulty. Go to Test B.

POWER BOARD TEST *(continued)*

FIGURE F.34 — REMOVING CONTROL PANEL.



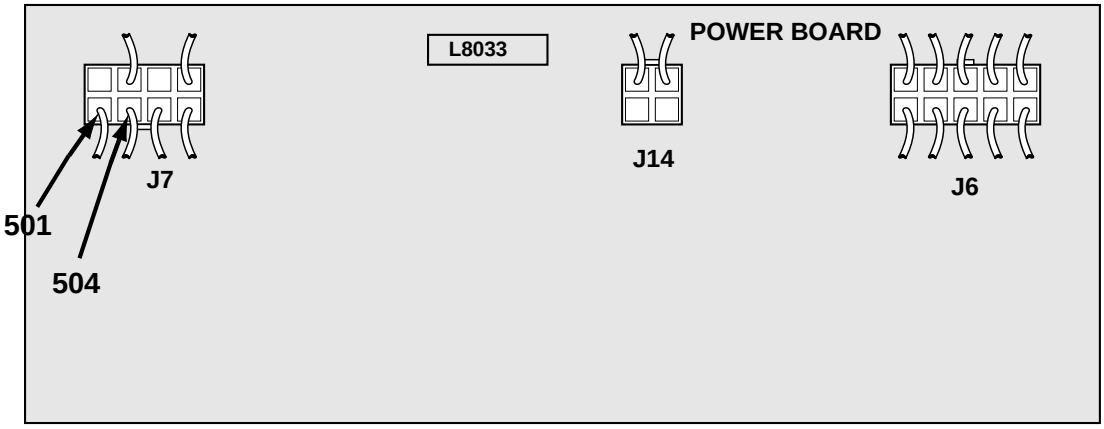
Test B

1. Turn main power OFF.
2. Remove wrap-around cover.
3. Perform Input Filter Capacitor Discharge procedure.
4. Detach Control Panel by removing the four mounting screws. Move the panel to the left to gain access to the Power Board.
5. Turn main power ON.

Return to Section TOC
Return to Master TOC

POWER BOARD TEST *(continued)*

FIGURE F.35 — POWER BOARD TEST POINTS.



6. Test for 18 VAC input from Auxiliary Transformer between leads 504 and 501 (J7) on Power Board.

   a. If 18 VAC is measured, input power from Auxiliary Transformer is OK. Go to step 7.

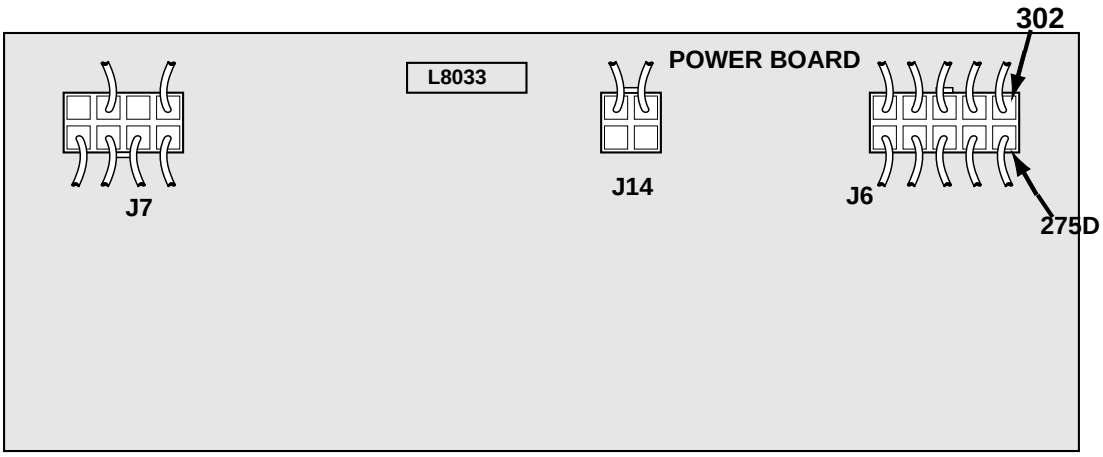
   b. If 18 VAC input power from Auxiliary Transformer is not measured, test Auxiliary Transformer.

7. Test for 15 VDC output between leads 275D (-) and 302 (+) (J6) on Power Board.

   a. If 15 VDC output is measured, Power Board is OK.

   b. If 15 VDC output is not measured, replace Power Board.

FIGURE F.36 — POWER BOARD TEST POINTS.



CAPACITOR REPLACEMENT

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout this manual. Turn off input power to machine. Discharge input capacitors. Only qualified technicians should perform installations, maintenance, and troubleshooting work on the machine.

Capacitors must always be replaced in matched sets (C1 and C2 as a set or C1, C2, C14, and C15 as a set on 575 VAC machines).

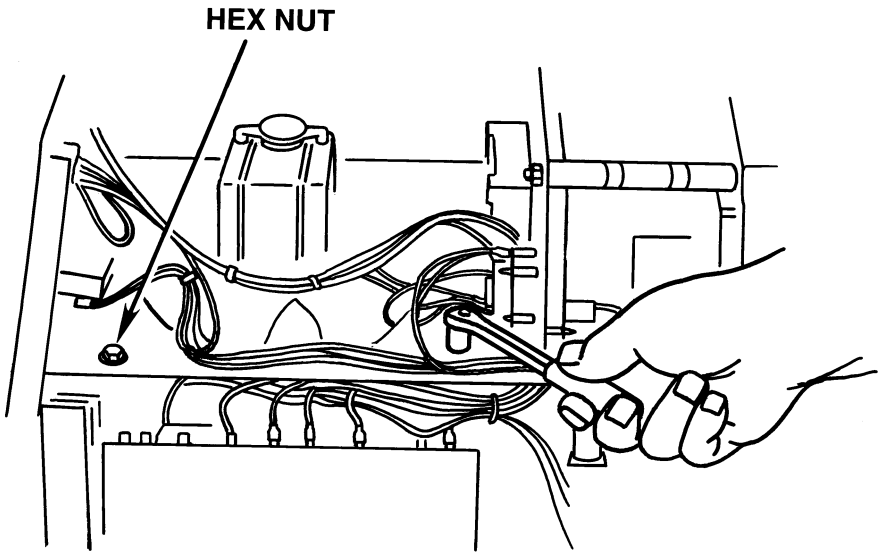
When replacing Capacitors, remove the entire FET heat sink assembly, including Capacitors and Switch Board, as a unit.

Disassemble and reassemble only one unit at a time. Use the other unit as a model during reassembly so that all parts are reinstalled properly.

TEST PROCEDURE

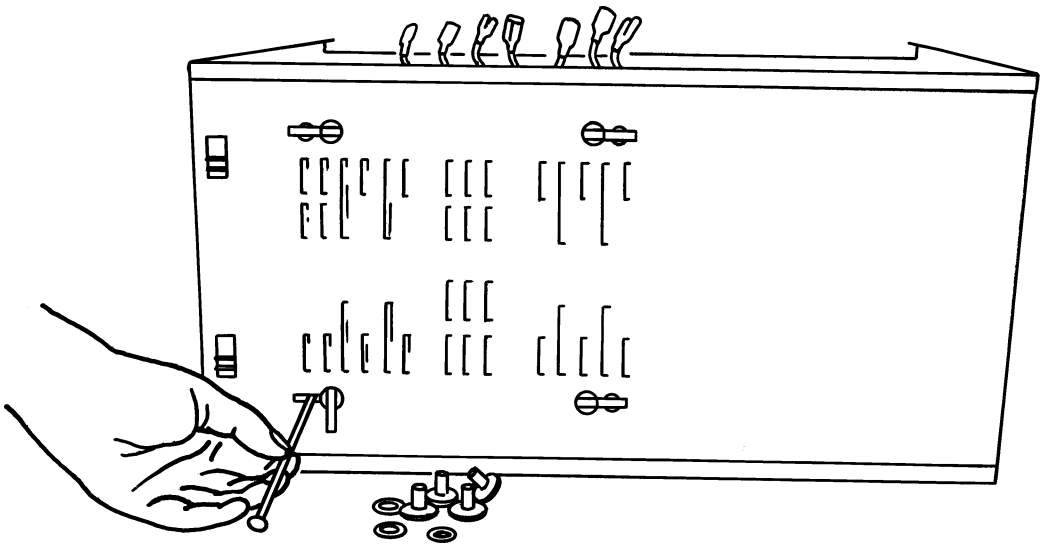
1. Remove the two 3/8” hex head nuts from the top of the through bolts. The hex nuts are located on top of the fan shroud. See Figure F.37.

FIGURE F.37 — REMOVING HEX HEAD NUTS OF THROUGH BOLTS.



CAPACITOR REPLACEMENT *(continued)*

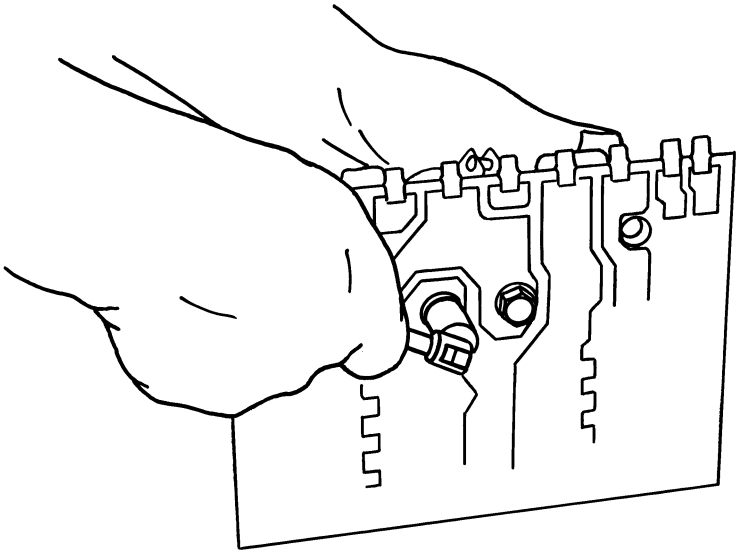
FIGURE F.38 — REMOVING THROUGH BOLTS.



2. Place the machine on its side as shown in Figure F.38. Slide the plastic insulators that go through the base of the machine to one side. Pull the through bolts out of the machine, being careful to save all the insulation and standoff material. Set aside for reassembly.

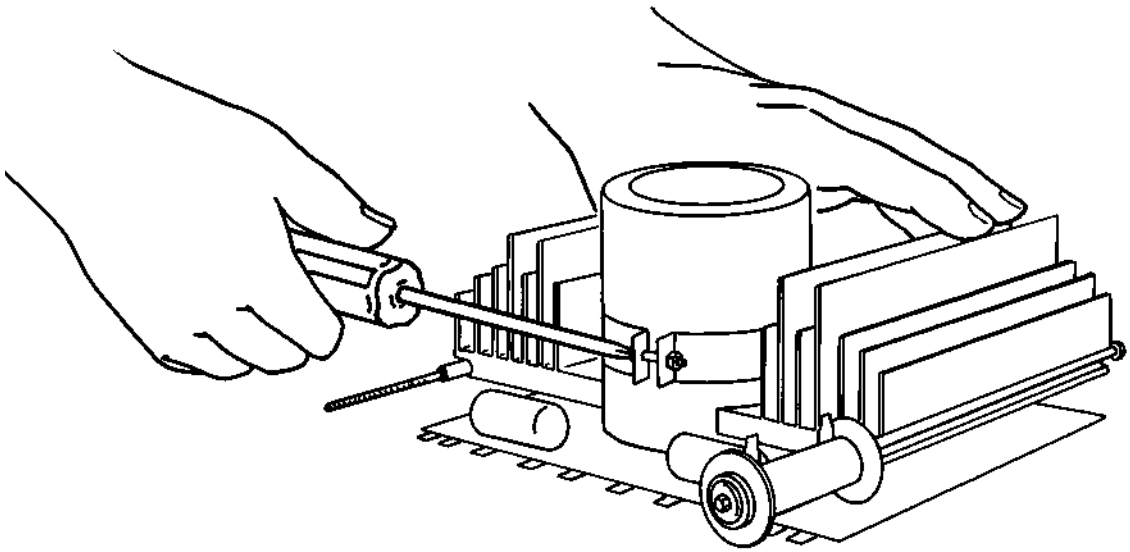
CAPACITOR REPLACEMENT *(continued)*

FIGURE F.39 — REMOVING CAPACITOR NUTS.



3. Remove the two 7/16” hex nuts that hold the Capacitor to the PC board. See Figure F.39.
4. Loosen the set screw of the Capacitor clamp ring and remove the Capacitor from the clamp ring. See Figure F.40.

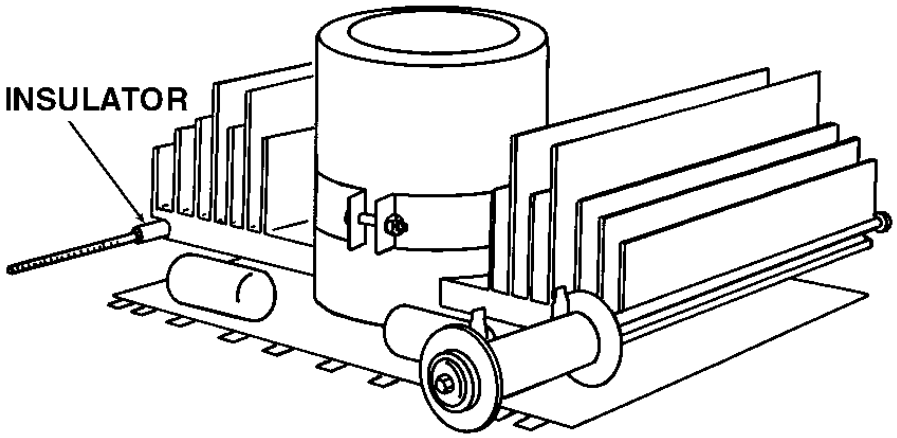
FIGURE F.40 — LOOSENING THE CLAMP RING SET SCREW.



Return to Section TOC
Return to Master TOC

CAPACITOR REPLACEMENT *(continued)*

FIGURE F.41 — COMPLETE SWITCH BOARD ASSEMBLY READY FOR INSTALLATION.



5. Install the new Capacitor and tighten the two 7/16” hex nuts to a torque of 55 inch-pounds (6 Nm). Tighten these nuts in increments of 10 inch-pounds, alternating between the two nuts. See Figure F.41.

6. Perform the “Test After Repair of Switch Boards and/or Capacitors”.

NOTE: Proper capacitor polarity must be noted when attaching the capacitor to the Switch Board assembly.

SWITCH BOARD REPLACEMENT

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout manual. Turn off input power to machine. Discharge input capacitors. Only qualified technicians should perform installations, maintenance, and troubleshooting work on the machine.

If a test indicates that a Switch Board is defective, both Switch Boards must be replaced at the same time.In addition to replacing the Switch Boards, Capacitors C1 and C2 (plus C14 and C15 on 575 VAC models) must also be replaced if the following conditions exist:

a. Machine was operating from 380 VAC or higher when the failure occurred.

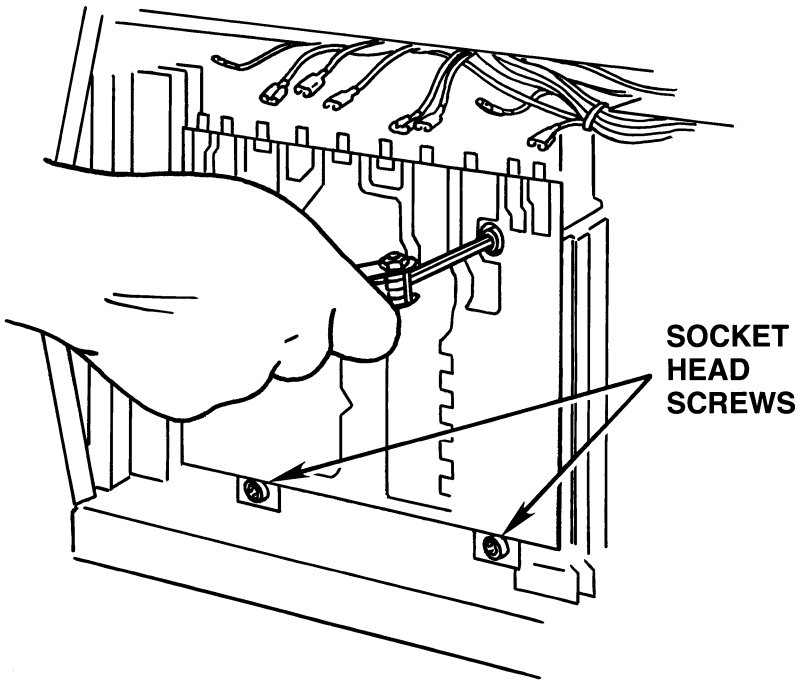
b. Burned areas are visible on the Switch Boards.

TEST PROCEDURE

1. Carefully disconnect the leads at the top of the Switch Board.

2. Remove the four 3/16” socket head cap screws as shown in Figure F.42.

FIGURE F.42 — REMOVING THE SOCKET HEAD CAP SCREWS FROM THE SWITCH BOARD.



SWITCH BOARD REPLACEMENT *(continued)*

3. Remove the two 7/16” head Capacitor screws located in the center of the Switch Board. Hold the PC board firmly while doing this.

4. Remove the Switch Board carefully.

5. Clean the heat sink surfaces thoroughly to remove all the heat sink compound. During machine operation, this compound helps conduct heat from the PC board to the heat sinks.

6. Apply a thin layer (.002”) of Dow 340 Heat Sink Compound to the mounting surfaces of the new PC board and to the Capacitor terminals. DO NOT allow the compound to enter the mounting screw holes because it can distort the torque values.

7. Prepare to mount the new PC board on the heat sink by first lining up the mounting holes. Then press the PC board into place.

8. Insert each of the four socket head screws into the mounting heads and thread finger tight. The threads are soft — be careful not to cross thread the screws.

9. Insert each of the two hex head screws into the Capacitor terminal holes and thread finger tight. Be careful not to cross thread the screws.

10. Torque both sets of screws in 10 inch-pound increments using a diagonal tightening sequence. Torque the four socket head screws to 44 inch-pounds (5 Nm). Torque the two hex head screws to 55 inch-pounds (6 Nm).

11. Reconnect all the leads to the PC board. Double check that each lead is connected to the correct terminal. Failure to reconnect the leads correctly can result in machine damage when the power is applied.

12. Perform the “Test After Repair of Switch Boards and/or Capacitors”.

NOTE: Always make sure that Switch Boards are changed in matched pairs. Never mix an old style (different part number) Switch Board with a new style (new part number).

Return to Section TOC
Return to Master TOC

TEST AFTER REPAIR OF SWITCH BOARDS AND/OR CAPACITORS

The following test must be performed after the Switch Boards and/or the Capacitors have been replaced.

TEST PROCEDURE

1. Turn main power OFF.

2. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section..

3. Connect a shorting conductor across terminals 14 and 53 of Protection Board.

4. Set an ohmmeter to X1000 range and place probes on terminals 9 (+) and 12 (-) of one Switch Board. The meter will show the Capacitors charging up and may take a minute or so to stabilize. The final meter reading should not exceed 8600 ohms (8.6 on the scale).

5. Test the other Switch Board the same way.

NOTE: Repeat the Filter Capacitor Discharge procedure.

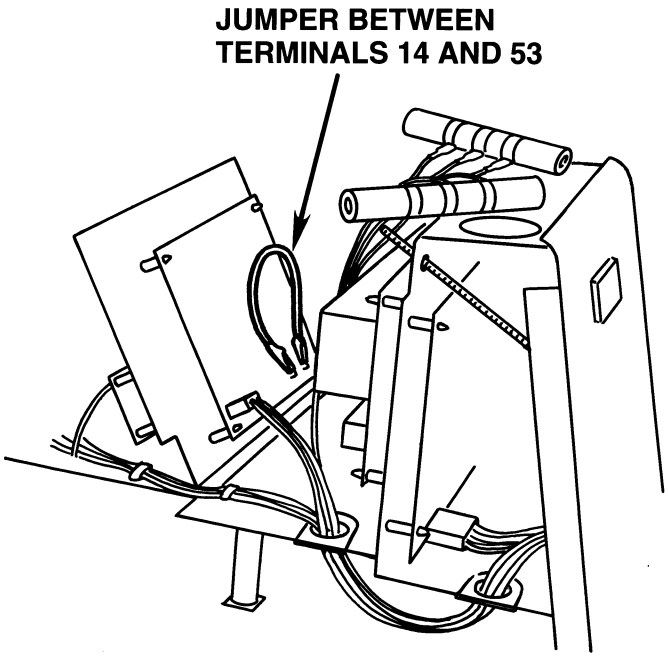
NOTE: Always make sure that Switch Boards are changed in matched pairs. Never mix an old style (different part number) Switch Board with a new style (new part number).

6. Remove the shorting conductor set up in step 3.

7. Install 5-amp fuses in the input supply fuse holders.

   NOTE: These fuses should be installed to protect against excessive current flow caused by a short circuit during the procedure.

FIGURE F.43 — SHORTING TERMINALS 14 AND 53 OF PROTECTION BOARD.



TEST AFTER REPAIR OF SWITCH BOARDS AND/OR CAPACITORS
(continued)

8. Turn on the machine.

9. With the output free of a load, check the open circuit voltages of the output.

10. Connect the machine for 440- or 575-volt operation.

11. With the output free of a load, check open circuit voltages of the output. Voltage should be 70 VDC.

12. Remove the 5-amp fuse from the input supply fuse holders.

13. Install 20-amp fuses and test under load.

    NOTE: A resistive-type grid load bank is recommended.

14. Perform Retest After Repair.

OUTPUT DIODE REPLACEMENT

⚠ WARNING

ELECTRIC SHOCK can kill.
Observe all safety precautions detailed throughout manual. Turn off input power to machine. Discharge input capacitors. Only qualified technicians should perform installations, maintenance, and troubleshooting work on the machine.

---

1. Turn main power OFF.

2. Perform Input Filter Capacitor Discharge procedure detailed in Maintenance section..

3. Detach and remove both Switch Boards and attached capacitors as a unit.

4. Detach the fan shroud to gain access to the diode heat sink and mounting bracket. When the fan shroud is lifted, the tabs securing the heat sink mounting bracket will release.

5. Move the diode heat sink and mounting bracket away from the Case Back.

6. Remove the nut that secures each diode to the heat sink and mounting bracket.

   NOTE: The Output Diodes must be replaced in matched sets.

7. Before mounting the new diode sets, clean and brighten the mounting surfaces of both the diode sets and the heat sink with fine steel

8. Apply an even coating of DOW 340 Heat Sink Compound to the mounting surfaces of the diodes that contact the heat sink. This compound layer should be less than .001 inch thick. DO NOT apply the compound to the diode studs or mounting nut threads.

9. Insert the diode sets into the mounting hole and tighten the diode mounting nuts to a torque of 25 inch-pounds (3 Nm).

Return to Section TOC
Return to Master TOC

INPUT FILTER CAPACITOR CONDITIONING

If the machine will not produce output when turned on and the following two conditions exist:

The machine is connected to operate at an input voltage of 380 VAC or higher and

Power has not been applied to the machine for a long period of time (many months). Then. . .

The Input Filter Capacitor Protection Circuit could have been activated and prevented output. This means the Input Filter Capacitors must be conditioned.

The Input Filter Capacitor Protection Circuit monitors the voltage across Input Filter Capacitors C1 and C2. When it senses an overvoltage condition, the protection circuit will prevent the machine from operating.

To condition the Input Filter Capacitors:

1. Turn main power OFF.
2. Remove any load and do not load machine until conditioning procedure is complete.
3. Turn main power ON.
4. Let the unloaded machine sit for 30 minutes.
5. Turn main power OFF.
6. Turn main power ON.

NOTE: The machine should be ready to operate, and the protection circuit should have automatically reset once the Capacitors have been conditioned and capacitor voltage has reached the acceptable operating level.

ENVIRONMENTAL PROTECTION

If the machine will not produce output when turned on and the following two conditions High voltage connections are covered with an RTV sealant to prevent malfunction in severe environments. Sealant must be applied to connections which have been opened or otherwise lost their protection. A noncorrosive, electronic grade sealant such as Dow Corning 3140, 3145, or 738; Columbus Adhesives 0172; or GE RTV-162 is recommended. Sealant may also be purchased from Lincoln Electric (order E2519 Silicone Rubber RTV Coating). Apply sealant after machine is repaired and tested. All five terminals of Input Rectifier D13 require this type of sealant.

Return to Section TOC
Return to Master TOC

RETEST AFTER REPAIR

Should a machine under test be rejected for any reason requiring the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced, the machine must be retested.

NOTE: 50 Hz machines may be tested using 60 Hz power.

INPUT IDLE AMPS AND IDLE WATTS

Input	Single Phase		Three Phase	
Volts/Hertz	Max. Amps	Max. Watts	Max. Amps	Max. Watts
220/50 or 60	2.75	425	2.75	425
230/60	3.00	450	3.00	450
440/50 or 60	1.38	425		
460/60	1.50	450		
380/50 or 60	1.67	425		
575/60	—	—		

OCV at rated INPUT: V300-PRO, V300-I 60-75V

MAXIMUM ACCEPTABLE OUTPUT AMPS (AT MINIMUM OUTPUT SETTINGS)

Output		
Min. (Max. acceptable), all machines:		
CC modes	12A @ 10V.	(GTAW, SOFT, CRISP)
CV modes	20A @ 19V.	(FCAW, GMAW)

OUTPUTMINIMUM ACCEPTABLE VOLTS (AT MAXIMUM OUTPUT SETTINGS, WITH FULL LOAD)

Min. Acceptable, Max. — All Modes	V300-I		V300-PRO		
1 phase @ 200A	380V —	220/440V 38V	208V —	230/460V 38V	575V 36V
3 phase @ 300A	32V	36V	34V	38V	36V

AUXILIARY TRANSFORMER — 50 Hz or 60 Hz

TEST POINTS	RANGE
18 VAC winding to Power Board J9 pins 1 and 2 Welding terminals sw. remote	17-20 VAC
24 VAC winding to Control Board J2 pin 4 to lead 212	23-26.5 VAC
STANDARD CODES: (Test at Amphenol)	
24 VAC with load, measure across pins C and D	22-25 VAC
42 VAC with load, measure across pins I and K	39-44 VAC
115 VAC with load, measure across pins A and J	109-120 VAC

NOTES

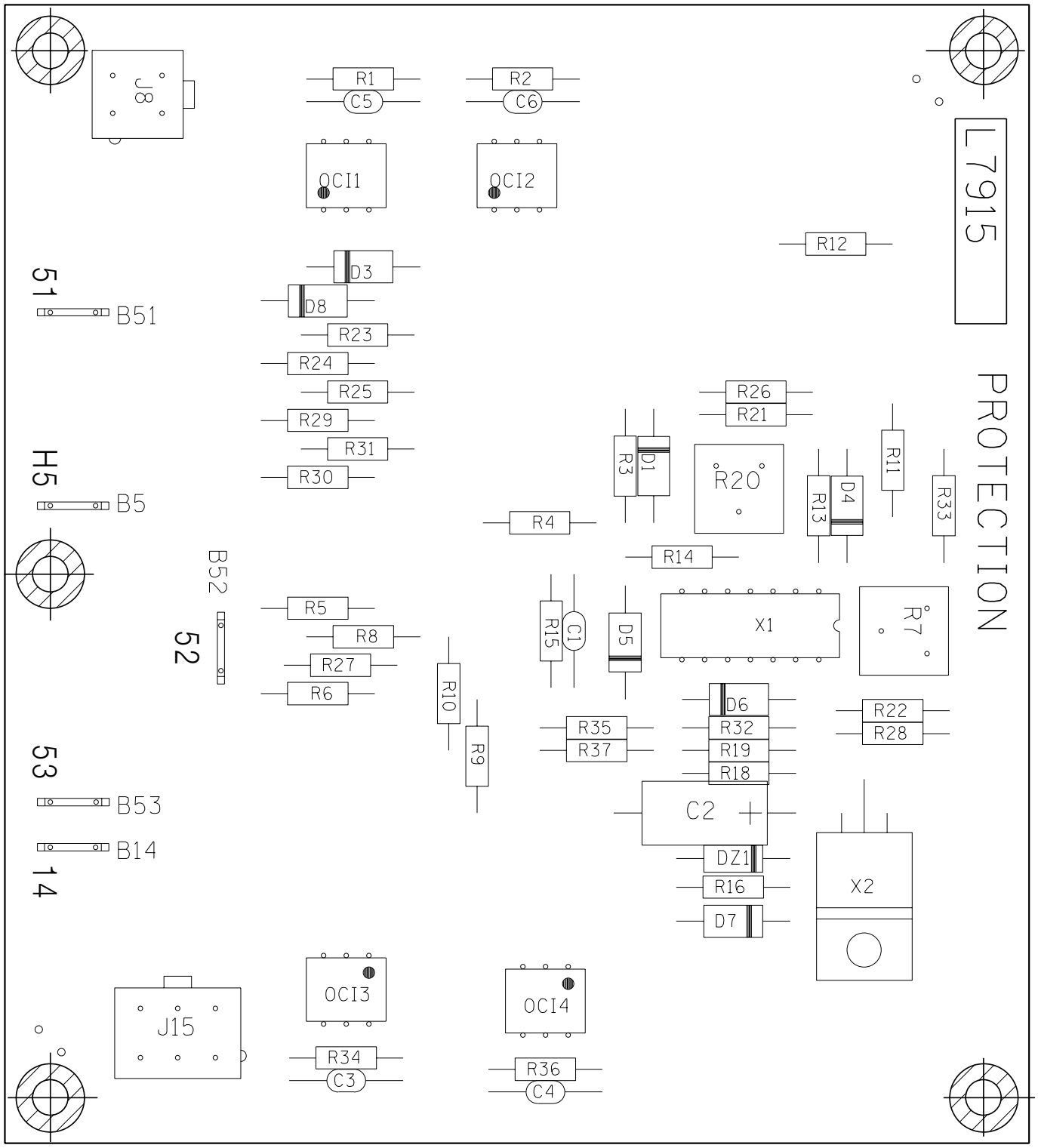
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS
- ELECTRICAL DIAGRAMS SECTION -

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

ELECTRICAL DIAGRAMS

PROTECTION BOARD



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

PROTECTION BOARD

Item	Identification
B5, B14, B51, B52, B53	CONNECTOR, tab 1/4”
C1, C3, C4, C5, C6	CAPACITOR, ceramic
C2	CAPACITOR, tantlm etc. 27µf 35VDC
D1, D3, D4, D5, D6, D7	DIODE, 1A 400V
D8	DIODE, 1A 1000V
DZ1	DIODE, IN4740 Zener 10V 1W
J8	RECEPTACLE, Molex mini 4 pin
J15	RECEPTACLE, Molex mini 6 pin
OCI1, OCI2, OCI3, OCI4	OPTO, Isolator CNY17-3
P8 (plugs into J8)	PLUG HOUSING, Molex mini 4 pin
P15 (plugs into J15)	PLUG HOUSING, Molex mini 6 pin
R1, R2	RESISTOR, MF .25W 1% 681K ohm
R3, R13, R16	RESISTOR, MF .25W 1% 1.82K ohm.
R4, R5, R11, R12	RESISTOR, MF .25W 1% 150K ohm
R6, R8, R9, R10, R27	RESISTOR, MF .25W 1% 56.2K ohm
R7, R20	POTENTIOMETER, Cermet trmr .25W 1% 5K ohm
R14	RESISTOR, MF .25W 1% 100K ohm
R15	RESISTOR, MF .25W 1% 475 ohm
R18, R26, R28, R32	RESISTOR, MF .25W 1% 10K ohm
R19	RESISTOR, MF .25W 1% 3.32K ohm
R21, R23, R24, R25, R29, R30, R31, R33	RESISTOR, MF.25W 1% 15K ohm
R22	RESISTOR, MF .25W 1% 332K ohm
R34, R36	RESISTOR, MF .25W 1% 276K ohm
R35, R37	RESISTOR, MF .25W 1% 332 ohm
TERMINALS (P8, P15)	TERMINALS, Molex mini
X1	QUAD OP-AMP
X2	VOLTAGE REGULATOR, linear 7805 5VDC

NOTE: Individual parts listed are not available from Lincoln Electric.

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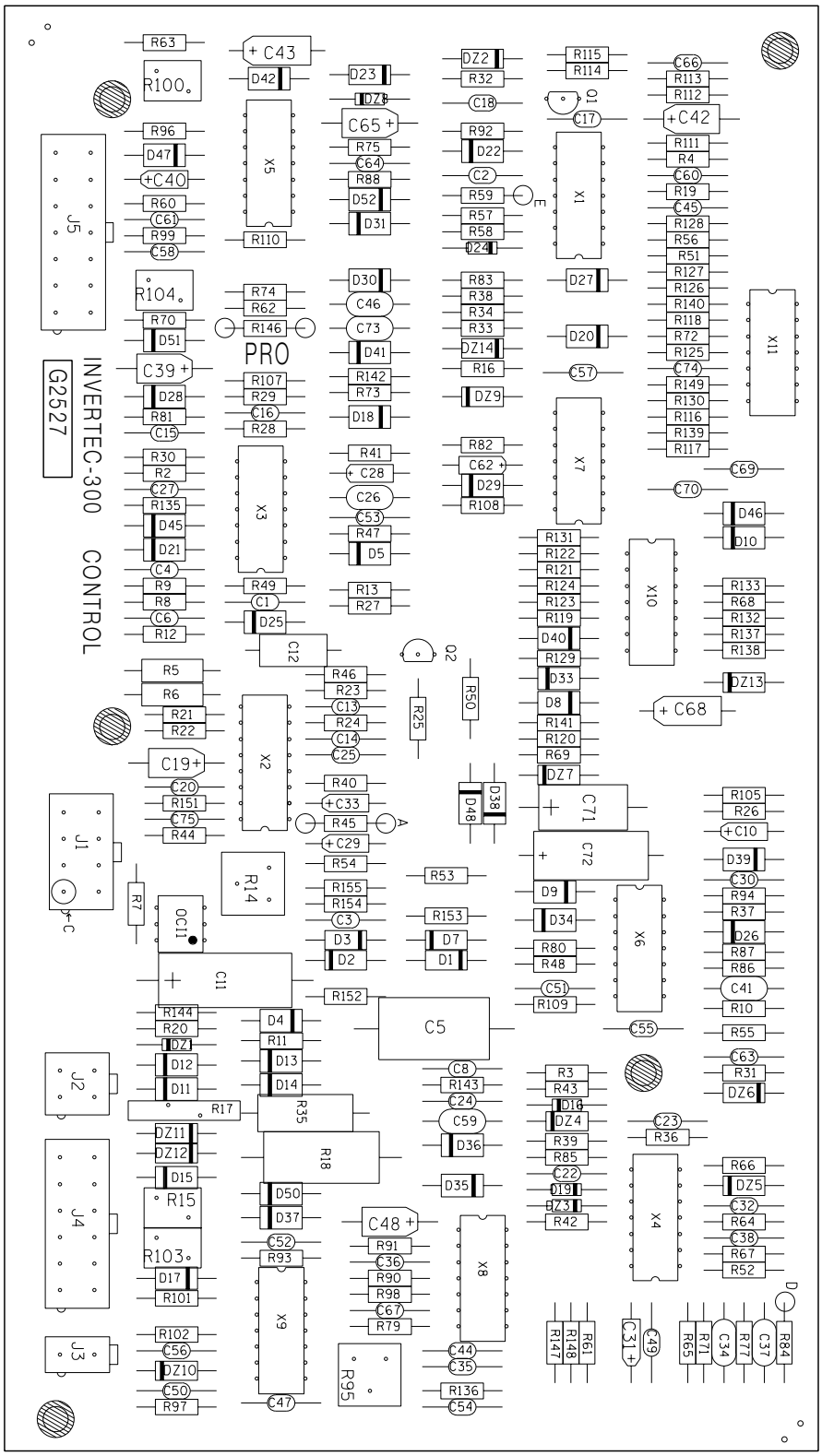
Return to Section TOC Return to Master TOC

ELECTRICAL DIAGRAMS

CONTROL BOARD (G2527)



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Return to Section TOC
Return to Master TOC

CONTROL BOARD (G2527)

Item	Identification
C1, C2, C3, C6, C8, C14, C15, C16, C17, C20, C24, C27, C30, C32, C35, C36, C38, C44, C45, C47, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C60, C61, C63, C64, C66, C67, C69, C70, C74	CAPACITOR, CEMO .022 50V 20%
C4, C23, C75	CAPACITOR, CEMO 150P 100V 5%
C5	CAPACITOR, PEMF 0.33 200V 10%
C10, C29, C33	CAPACITOR, TAEL 1.8 20V 10%
C11	CAPACITOR, ALEL 20 50V +75/-10%
C12	CAPACITOR, PFC .018 50V 2%
C13, C22, C25	CAPACITOR, CEMO 330P 100V 5%
C18	CAPACITOR, CEMO 4700P 50V 10%
C19, C39, C42, C48, C65	CAPACITOR, TAEL 4.7 35V 10%
C25	CAPACITOR, CEMO 47P 100V 5%
C26, C41, C46, C59, C73	CAPACITOR, CEMO 0.1 50V 10%
C28, C62	CAPACITOR, TAEL 1.0 35V 10%
C31, C40	CAPACITOR, TAEL 0.33 50V 10%
C34, C37	CAPACITOR, CEMO 2700P 50V 5%
C43, C68	CAPACITOR, TAEL 2.7 50V 10%
C71	CAPACITOR, TAEL 39 20V 10%
C72	CAPACITOR, TAEL 100 20V 10%
D1, D2, D3, D7	DIODE, AXLDS 1A 400V FR 1N4936
D4, D5, D8, D9, D10, D11, D12, D13, D14, D15, D17, D18, D20, D21, D22, D25, D26, D27, D28, D29, D30, D31, D33, D34, D35, D36, D37, D38, D39, D40, D41, D42, D45, D46, D47, D48, D50, D51, D52	DIODE, AXLDS 1A 400V
D16, D19, D24	DIODE, AXLDS 0.15A 75V 1N914
D23	DIODE, AXLDS 1A 30V Schottky
DZ1, DZ3, DZ8	DIODE, Zener 0.5W 3.0V 5% 1N5225B
DZ2, DZ7	DIODE, Zener 1W 10V 5% 1N4740A
DZ4, DZ6, DZ9, DZ10, DZ13, DZ14	DIODE, Zener 1W 5.1V 5% 1N4733A
DZ5	DIODE, Zener 1W 6.2V 5% 1N4735A
DZ11, DZ12	DIODE, Zener 1W 43V 5% 1N4755A
J1	RECEPTACLE, Molex mini 8 pin
J2	RECEPTACLE, Molex mini 4 pin
J3	RECEPTACLE, Molex mini 2 pin
J4	RECEPTACLE, Molex mini 12 pin
J5	RECEPTACLE, Molex mini 14 pin
OCI1	OPTOCOUPLER, Photo Q 70V CNY17-3
P1 (plugs into J1)	PLUG HOUSING, Molex 8 pin
P2 (plugs into J2)	PLUG HOUSING, Molex 4 pin
P3 (plugs into J3)	PLUG HOUSING, Molex 2 pin
P4 (plugs into J4)	PLUG HOUSING, Molex 12 pin
P5 (plugs into J5)	PLUG HOUSING, Molex 14 pin
Q1, Q2	TRANSISTOR-N, T226 0.5A 40V 2N4401
R2, R4, R8, R20, R23, R32, R38, R43, R45, R46, R51, R57, R64, R68, R87, R109, R125, R139, R141, R143, R151	RESISTOR-MF, .25W 1% 10.0K
R3, R10, R26, R42, R129	RESISTOR-MF, .25W 1% 475K
R5, R6	RESISTOR-CC, .50W 5% 1
R7, R9, R30, R47, R71,	RESISTOR-MF, .25W 1% 47.5K
R11	RESISTOR-MF, .25W 1% 267
R12, R25, R75, R98, R127, R133, R149	RESISTOR-MF, .25W 1% 22.1K
R13, R34, R40, R48, R50, R60, R81, R94, R105, R114, R118, R123, R124	RESISTOR-MF, .25W 1% 100K .
R14	TRIMMER-ST, .50W 10% 5K linear
R15, R100, R103, R104	THERMISTOR-PT, 56 ohms 9 oma
R16, R19, R28, R41, R113,	RESISTOR-MF, .25W 1% 332K
R17	THERMISTOR-PTC,.08-0.19 ohms 1.85A
R18	RESISTOR-CC, 2W 5% 680
R21, R73, R102, R119, R144	RESISTOR-MF, .25W 1% 2.67K
R22, R70, R126, R132, R137, R140	RESISTOR-MF, .25W 1% 26.7K

(continued on next page)

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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

CONTROL BOARD (G2527) – cont'd

Item	Identification
R24, R130	RESISTOR-MF, .25W 1% 56.2K
R27, R37, R53, R55, R58, R92, R115, R136	RESISTOR-MF, .25W 1% 33.2K
R29	RESISTOR-MF, .25W 1% 392K
R31, R79, R88, R90, R93, R97, R99, R121, R135, R142	RESISTOR-MF, 25W 1% 4.75K
R33	RESISTOR-MF, .25W 1% 3.32K
R35	RESISTOR-CC, 1W 5% 390
R36, R66, R85, R91, R110	RESISTOR-MF, .25W 1% 150K
R39, R52, R72, R86	RESISTOR-MF, .25W 1% 221K
R44, R101	RESISTOR-MF, 25W 1% 100
R49, R67, R80, R107,	RESISTOR-MF, .25W 1% 681K
R54	RESISTOR-MF, .25W 1% 16.2K
R56	RESISTOR-MF, .25W 1% 43.2K
R59	RESISTOR-MF, .25W 1% 82.5K
R61, R147, R148	RESISTOR-MF, .25W 1% 10.0
R62	RESISTOR-MF, .25W 1% 8.25K
R63	RESISTOR-MF, .25W 1% 1.00K
R65, R77	RESISTOR-MF, .25W 1% 475
R69	RESISTOR-MF, .25W 1% 18.2K
R74	RESISTOR-MF, .25W 1% 24.3K
R82, R120, R128	RESISTOR-MF, .25W 1% 301
R83	RESISTOR-MF, .25W 1% 267K
R95	TRIMMER-ST, .50W 10% 10K linear
R96	RESISTOR-MF, .25W1 825 %
R131	RESISTOR-MF, .25W 1% 68.1K
R146	RESISTOR-MF, .25W 1% 28.0K
R152, R153, R154, R155	RESISTOR-MF,.25W 1% 26.7K
TERMINALS (P1, P2, P3, P4, P5)	TERMINALS, Molex mini
X1, X3, X11	QUAD, IC-OP-AMP. gen. purpose 224J
X2	CONTROLLER, IC-PWM I-mode 3847
X4	QUAD, IC-OP-AMP high-perf 1014
X5, X6, X8, X9, X10	SWITCH, IC-CMOS analog quad 4066
X7	INVERTER,IC-CMOS Schmitt h ex 4584

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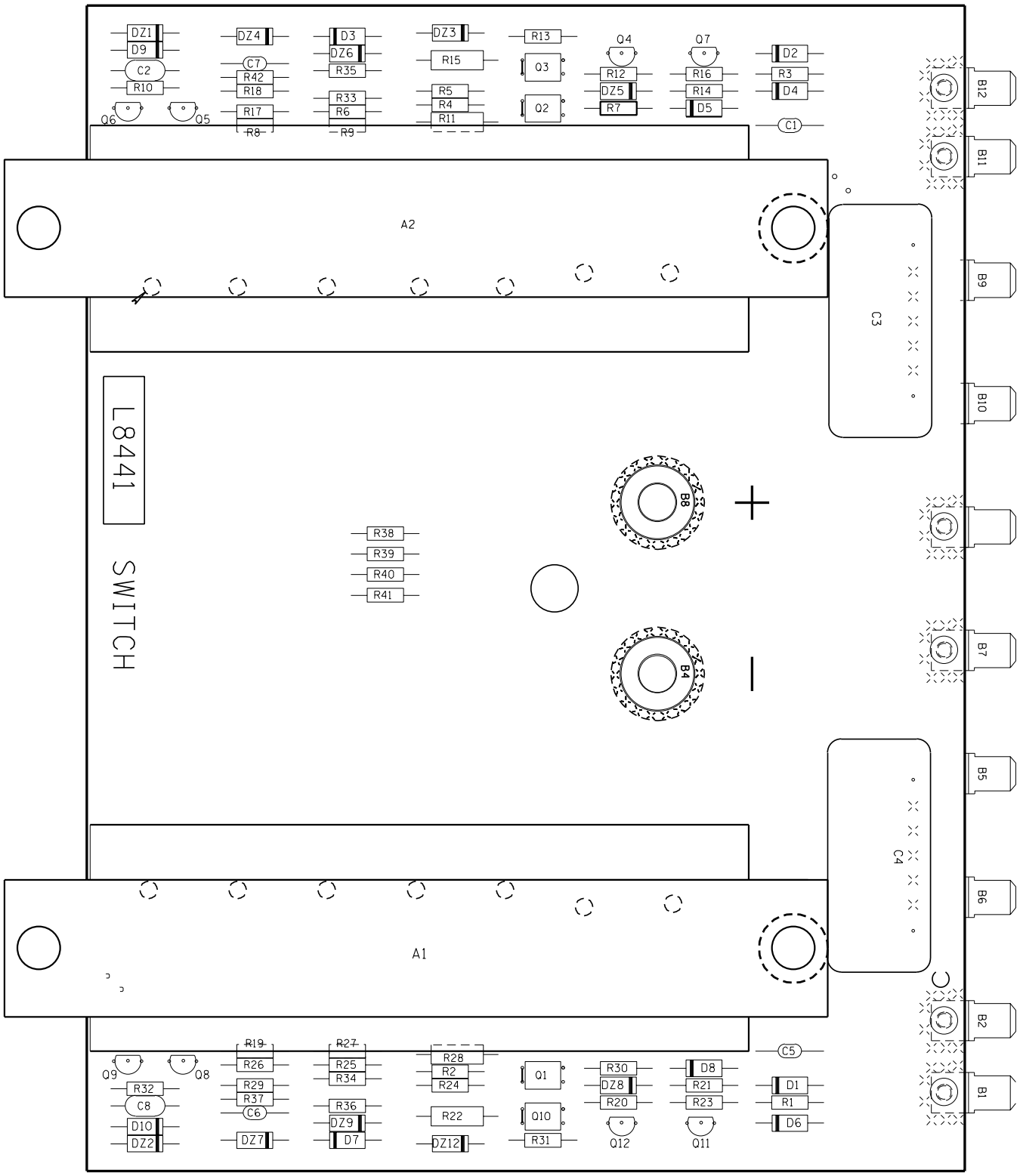
NOTES

ELECTRICAL DIAGRAMS

SWITCH BOARD (L8441)



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SWITCH BOARD (L8441)

Item	Identification
A1	ELECTRONIC MODULE ASSEMBLY
A2	ELECTRONIC MODULE ASSEMBLY
B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12	CONNECTOR, tab QC edge offset 1/4”
C1, C5, C6, C7	CAPACITOR,CEMO .022 50V 20%
C2, C8	CAPACITOR, CEMO 2700P 50V 5%
C3, C4	CAPACITOR-PPF, .047 1200V 5%
D1, D2, D3, D4, D5, D6, D7, D8, D9, D10	DIODE, AXLDS 1A 400V FR 1N4936
DZ1, DZ2, DZ3, DZ12	DIODE, Zener 1W 10V 5% 1N4740A
DZ4, DZ7	DIODE, Zener 1W 15V 5% 1N4744A
DZ5, DZ6, DZ8, DZ9	DIODE, Zener 1W 6.2V 5% 1N4735A
Q1, Q2, Q3, Q10	TRANSISTOR-NMF, 4PDIP 1A 100V RFD110
Q4, Q12	TRANSISTOR-N, T226 0.5A 40V 2N4401
Q5, Q6, Q7, Q8, Q9, Q11	TRANSISTOR-P, T226 0.5A 40V 2N4403
R1, R3, R5, R24	RESISTOR-MF, .25W 1% 100 ohm
R2, R4	RESISTOR-MF, .25W 1% 221 ohm
R6, R8, R9, R17, R19, R25, R26, R27, R33, R34	RESISTOR-MF, .25W 1% 10.0 ohm
R7, R30	RESISTOR-MF, .25W 1% 1.50K ohm
R10, R32	RESISTOR-MF, .25W 1% 15.0K ohm
R11, R15, R22, R28	RESISTOR-CC, .50W 5% 1 ohm
R12, R14, R20, R21	RESISTOR-MF, .25W 1% 1.00K ohm
R13, R31	RESISTOR-MF, .25W 1% 20.0 ohm
R16, R23	RESISTOR-MF, .25W 1% 22.1K ohm
R18, R29, R37, R42	RESISTOR-MF, .25W 1% 475 ohm
R35, R36	RESISTOR-MF, .25W 1% 47.5 ohm
R38, R39, R40, R41	RESISTOR-MF, .25W 1% 39.2K ohm

NOTE: Individual parts listed are not available from Lincoln Electric.

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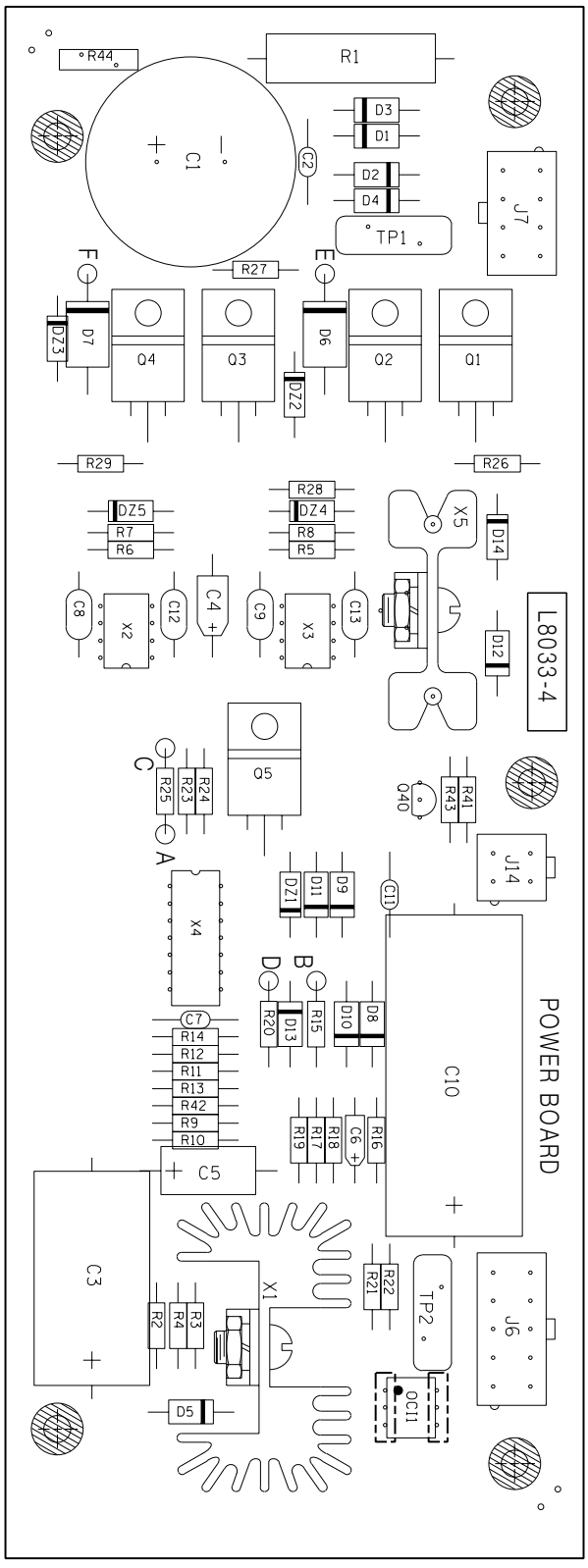
Return to Section TOC Return to Master TOC

ELECTRICAL DIAGRAMS

POWER BOARD (L8033)



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POWER BOARD (L8033)

Item	Identification
X1	REGULATOR ASBLY
C2,C7,C11	.022/50
J7	CONNECTOR
X5	VOLT. REG. & HEAT SINK ASBLY.
C3	150/50
D1,D2,D3,D4,D5,D8,D9, D10,D11,D12,D13	1N4004
C6	1.8/20
C4	4.7/35
C5	39uF/20VDC
C1	3300/50
OCI1	OPTO ISOLATOR
X2,X3	8 PIN I.C. (SS)
C8,C9,C12,C13	.1/50
J6	HEADER
C10	500/50
DZ1	1N4744A
DZ2,DZ3	1N4746A
Q1,Q3	3A/60V. TRANSISTOR
Q2,Q4	3A ,60V. PNP TRANSISTOR
Q5	3.5A. 60V. MOSFET (SS)
D6,D7	1N5822 SCHOTTKY BARRIER DIODE
R1	.0 OHM, 5W RESISTOR
TP1,TP2	15J
R11,R19,R26,R27	10K 1/4W
R5,R6,R10,R22	100K 1/4W
R4	1.5K 1/4W
R14,R41	15K 1/4W
R9	1150K 1/4W
R21	2.21K 1/4W
R3	243 1/4W
R7,R8,R24	267 1/4W
R2	2.67K 1/4W
R18	26.7K 1/4W
R20	267K 1/4W
R13,R15,R16,R17	33.2K 1/4W
R23	4.75K
R12	475K 1/4W
R25	5.11K 1/4W
X4	LM224 OP-AMP
J14	HEADER
Q40	2N4401
R42,R43	100 1/4W
DZ4,DZ5	1N4742A
R28,R29	10 1/4W
D14	1N4936
R44	THERMISTOR

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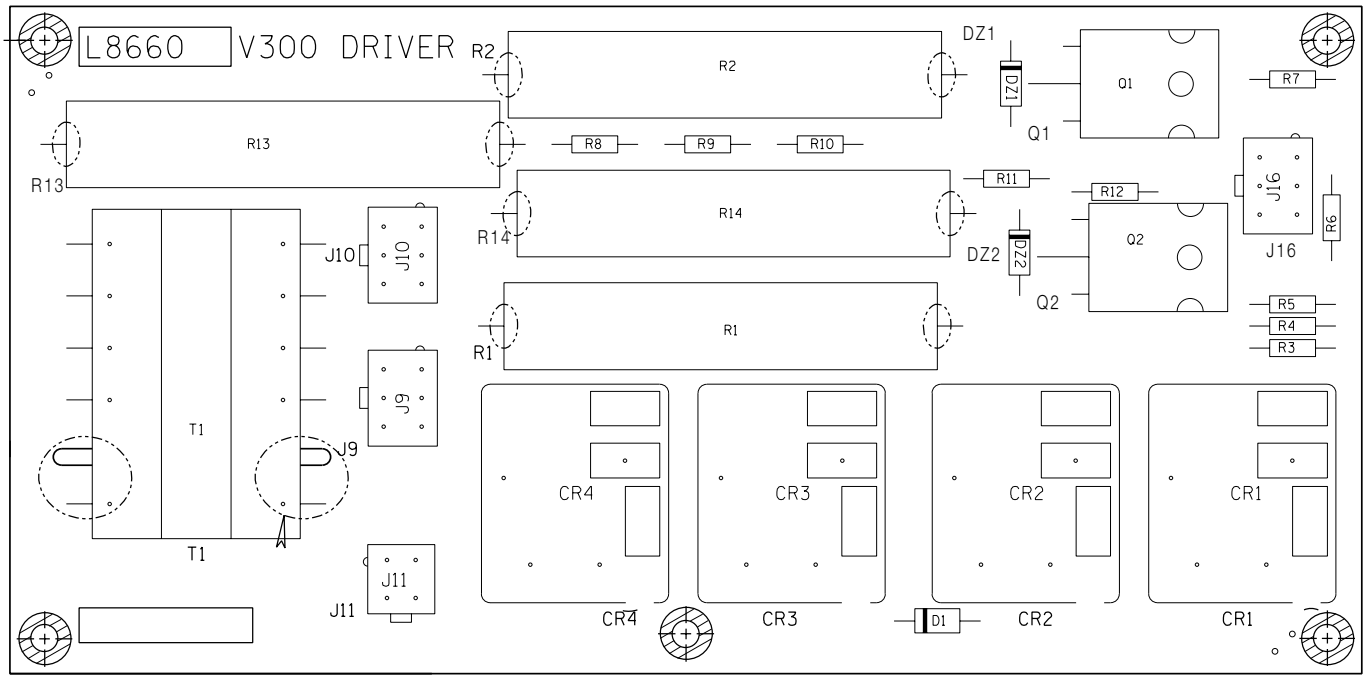
ELECTRICAL DIAGRAMS

DRIVER BOARD (L8660)

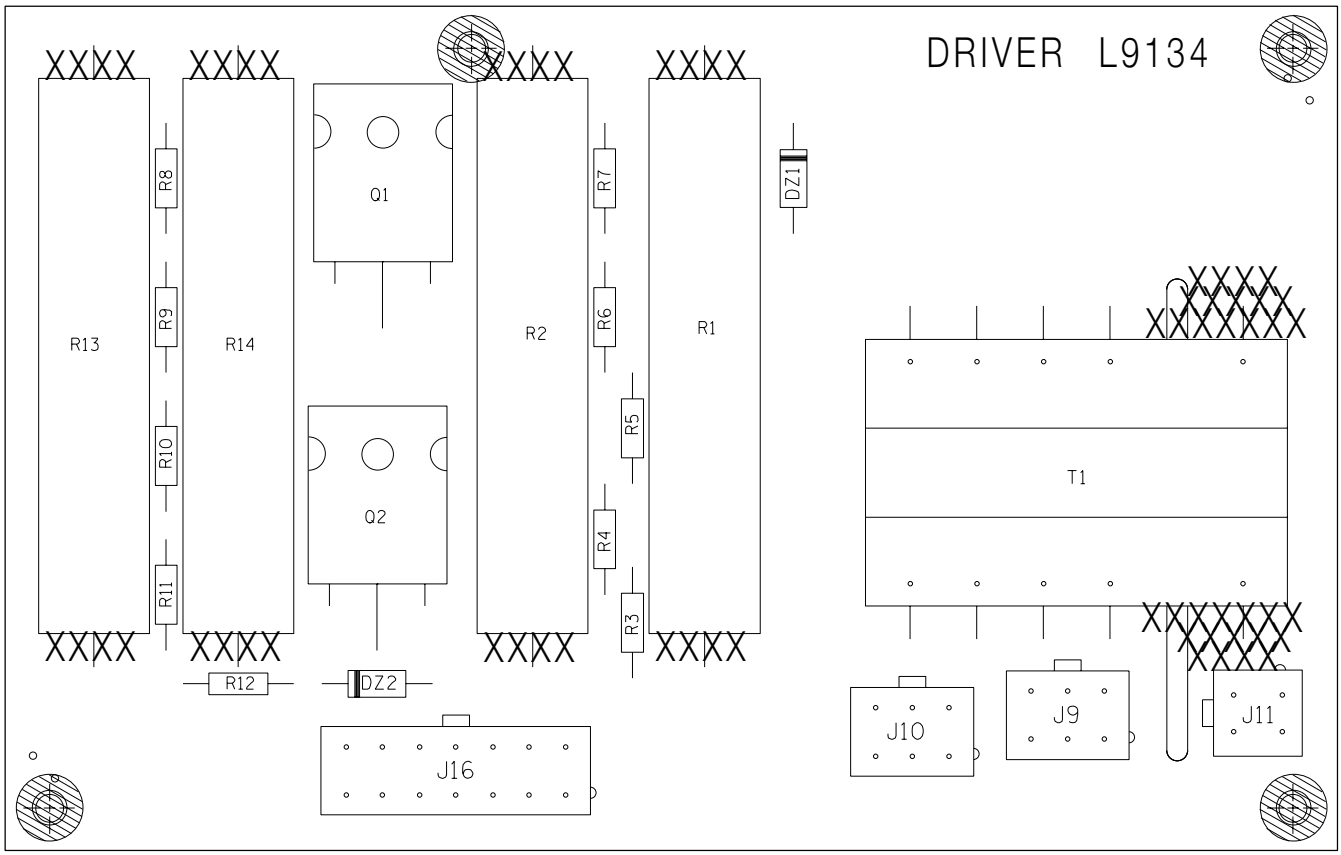


Item	Description
CR1, CR2, CR3, CR4	RELAY, SPNO 24VDC 6000 ohms AG-CDO
D1	DIODE, AXLDS 1A 400V
DZ1, DZ2	DIODE, Zener 1W 12V 5% 1N4742A
J9, J10, J16	CONNECTOR, Molex mini PCB 6 pin
J11	CONNECTOR, Molex mini PCB 4 pin
P9, P10, P16 (plugs into J9, J10, J16)	PLUG, Molex mini 6 pin
P11 (plugs into J11)	PLUG, Molex mini 4 pin
Q1, Q2	TRANSISTOR, NMFT247 4A 900V
R1, R2, R13, R14	RESISTOR, WW 20W 5% 250K
R3, R4, R5, R6, R8, R9,	RESISTOR, MF .25W 1% 150K
R7, R12	RESISTOR, MF .25W 1% 100K
T1	TRANSFORMER, PCB

NOTE: Individual parts listed are not available from Lincoln Electric.

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

DRIVER BOARD (L9134)



Item	Description
J11	HEADER
J9,J10	HEADER
T1	TRANSFORMER
J16	HEADER
R1,R2,R13,R14	20 WATT 250 OHM RESISTOR
DZ1,DZ2	1N4742A
Q1,Q2	FET (SS)
R7,R12	100 1/4W
R3,R4,R5,R6,R8,R9, R10,R11	150K 1/4W

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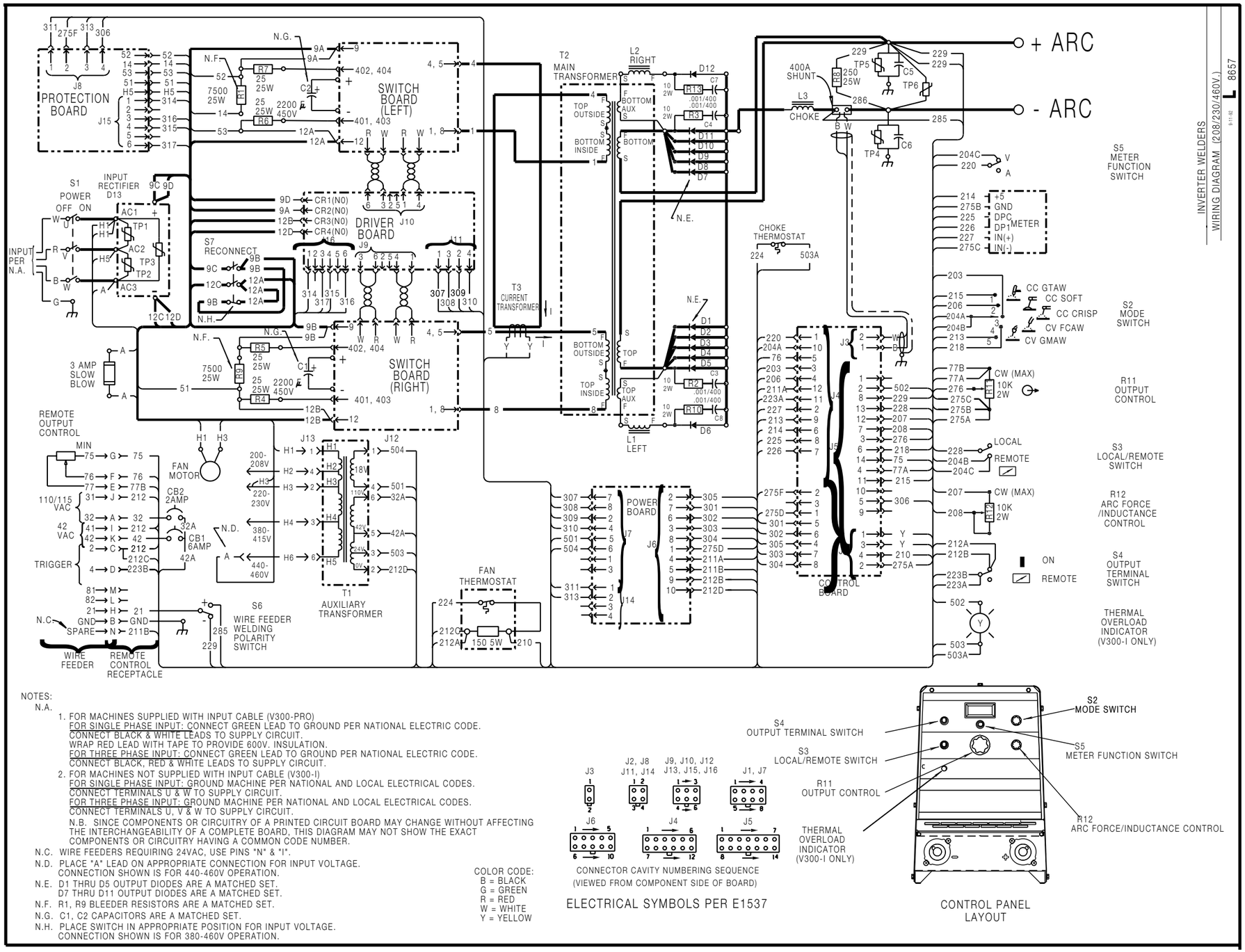
Wiring Diagram — Invertec V300-I — Code 9826



NOTES:

N.A.

1. FOR MACHINES SUPPLIED WITH INPUT CABLE (V300-PRO)
   FOR SINGLE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
   CONNECT BLACK & WHITE LEADS TO SUPPLY CIRCUIT.
   WRAP RED LEAD WITH TAPE TO PROVIDE 600V. INSULATION.
   FOR THREE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
   CONNECT BLACK, RED & WHITE LEADS TO SUPPLY CIRCUIT.
2. FOR MACHINES NOT SUPPLIED WITH INPUT CABLE (V300-I)
   FOR SINGLE PHASE INPUT: GROUND MACHINE PER NATIONAL AND LOCAL ELECTRICAL CODES.
   CONNECT TERMINALS U & W TO SUPPLY CIRCUIT.
   FOR THREE PHASE INPUT: GROUND MACHINE PER NATIONAL AND LOCAL ELECTRICAL CODES.
   CONNECT TERMINALS U, V & W TO SUPPLY CIRCUIT.

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

N.C. WIRE FEEDERS REQUIRING 24VAC, USE PINS "N" & "I".

N.D. PLACE "A" LEAD ON APPROPRIATE CONNECTION FOR INPUT VOLTAGE.
CONNECTION SHOWN IS FOR 440-460V OPERATION.

N.E. D1 THRU D5 OUTPUT DIODES ARE A MATCHED SET.
D7 THRU D11 OUTPUT DIODES ARE A MATCHED SET.

N.F. R1, R9 BLEEDER RESISTORS ARE A MATCHED SET.

N.G. C1, C2 CAPACITORS ARE A MATCHED SET.

N.H. PLACE SWITCH IN APPROPRIATE POSITION FOR INPUT VOLTAGE.
CONNECTION SHOWN IS FOR 380-460V OPERATION.

COLOR CODE:
B = BLACK
G = GREEN
R = RED
W = WHITE
Y = YELLOW

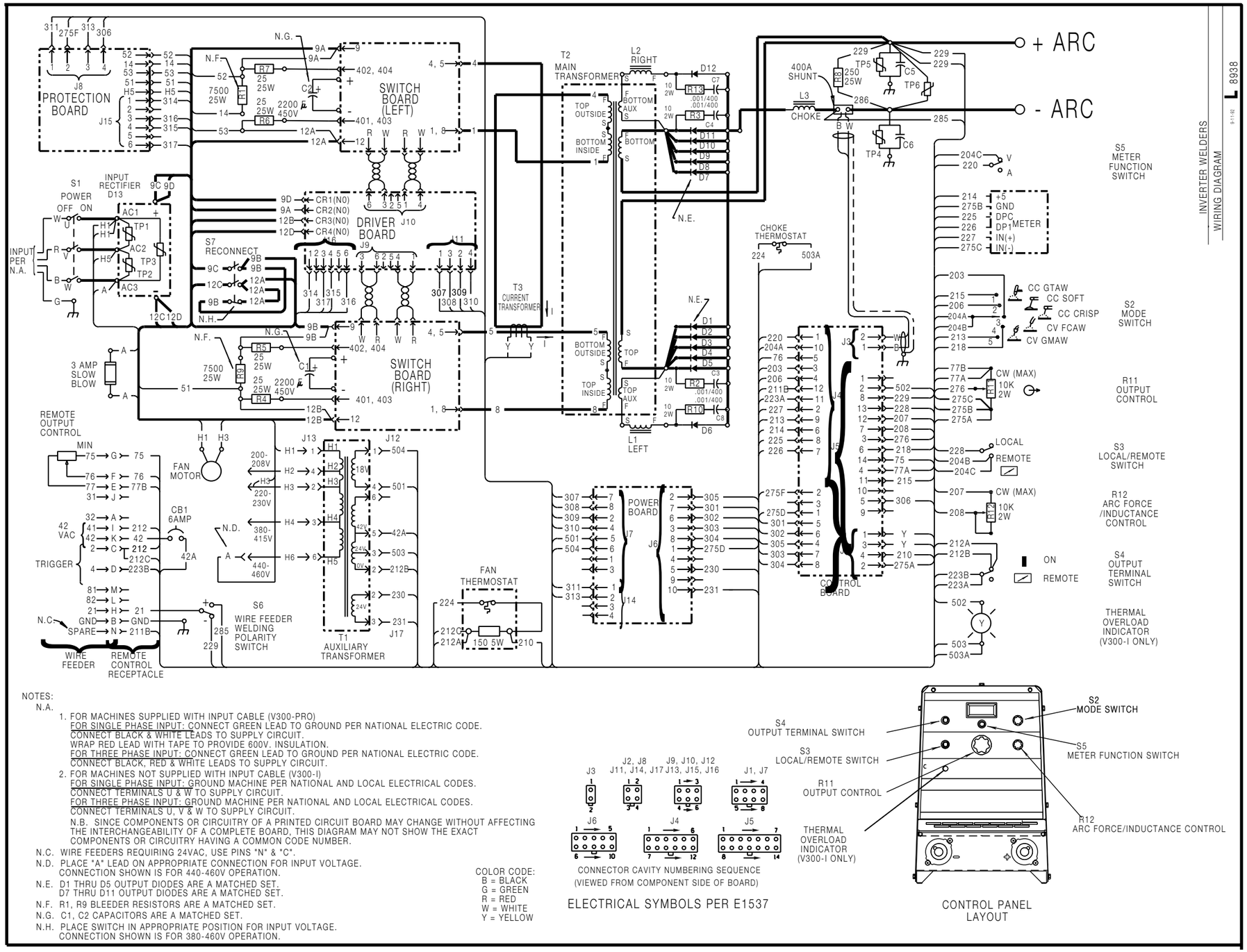
CONNECTOR CAVITY NUMBERING SEQUENCE
(VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537

CONTROL PANEL LAYOUT

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

Wiring Diagram — Invertec V300-I — Code 9827



NOTES:

N.A.

1. FOR MACHINES SUPPLIED WITH INPUT CABLE (V300-PRO)
   FOR SINGLE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
   CONNECT BLACK & WHITE LEADS TO SUPPLY CIRCUIT.
   WRAP RED LEAD WITH TAPE TO PROVIDE 600V. INSULATION.
   FOR THREE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
   CONNECT BLACK, RED & WHITE LEADS TO SUPPLY CIRCUIT.
2. FOR MACHINES NOT SUPPLIED WITH INPUT CABLE (V300-I)
   FOR SINGLE PHASE INPUT: GROUND MACHINE PER NATIONAL AND LOCAL ELECTRICAL CODES.
   CONNECT TERMINALS U & W TO SUPPLY CIRCUIT.
   FOR THREE PHASE INPUT: GROUND MACHINE PER NATIONAL AND LOCAL ELECTRICAL CODES.
   CONNECT TERMINALS U, V & W TO SUPPLY CIRCUIT.

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

N.C. WIRE FEEDERS REQUIRING 24VAC, USE PINS "N" & "C".

N.D. PLACE "A" LEAD ON APPROPRIATE CONNECTION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 440-460V OPERATION.

N.E. D1 THRU D5 OUTPUT DIODES ARE A MATCHED SET. D7 THRU D11 OUTPUT DIODES ARE A MATCHED SET.

N.F. R1, R9 BLEEDER RESISTORS ARE A MATCHED SET.

N.G. C1, C2 CAPACITORS ARE A MATCHED SET.

N.H. PLACE SWITCH IN APPROPRIATE POSITION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 380-460V OPERATION.

COLOR CODE:
B = BLACK
G = GREEN
R = RED
W = WHITE
Y = YELLOW

CONNECTOR CAVITY NUMBERING SEQUENCE (VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537

CONTROL PANEL LAYOUT

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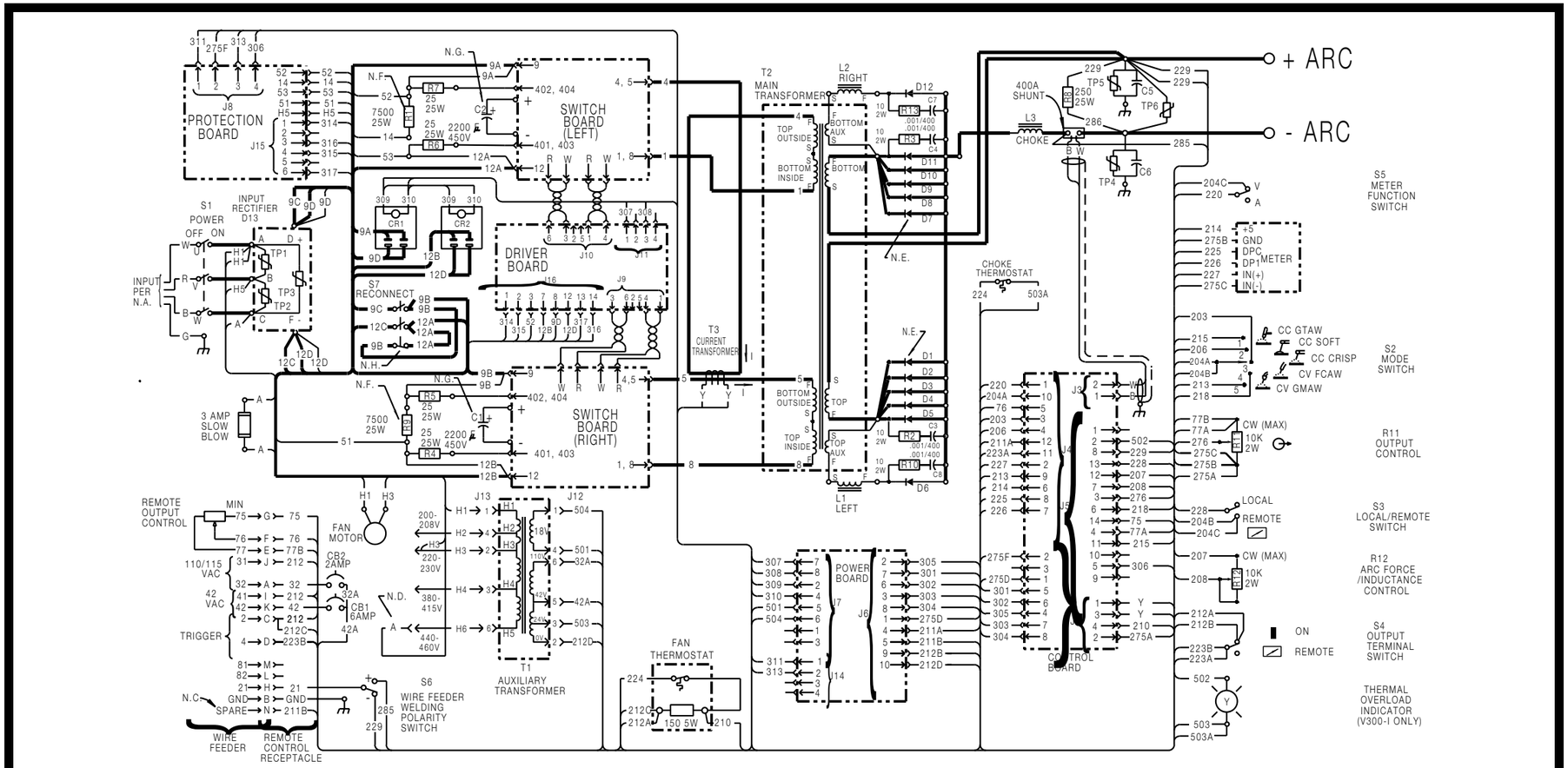
Wiring Diagram — Invertec V300-I — Code 10036

WIRING DIAGRAM (208/230/460V.)



NOTES:
N.A.
1. FOR MACHINES SUPPLIED WITH INPUT CABLE (V300-PRO)
   FOR SINGLE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
   CONNECT BLACK & WHITE LEADS TO SUPPLY CIRCUIT.
   WRAP RED LEAD WITH TAPE TO PROVIDE 600V. INSULATION.
   FOR THREE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
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N.C. WIRE FEEDERS REQUIRING 24VAC, USE PINS "N" & "I".

N.D. PLACE "A" LEAD ON APPROPRIATE CONNECTION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 440-460V OPERATION.

N.E. D1 THRU D5 OUTPUT DIODES ARE A MATCHED SET.
D7 THRU D11 OUTPUT DIODES ARE A MATCHED SET.

N.F. R1, R9 BLEEDER RESISTORS ARE A MATCHED SET.

N.G. C1, C2 CAPACITORS ARE A MATCHED SET.

N.H. PLACE SWITCH IN APPROPRIATE POSITION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 380-460V OPERATION.

COLOR CODE:
B = BLACK
G = GREEN
R = RED
W = WHITE
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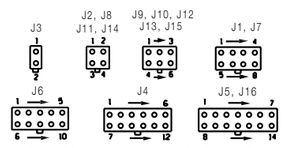
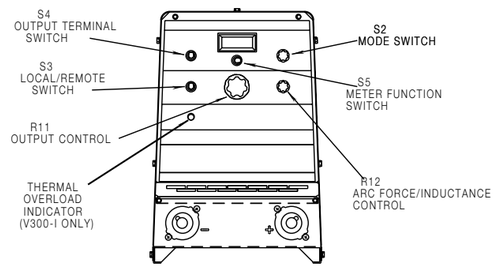


CONNECTOR CAVITY NUMBERING SEQUENCE
(VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537



CONTROL PANEL LAYOUT

12-2-93L

LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

L9299

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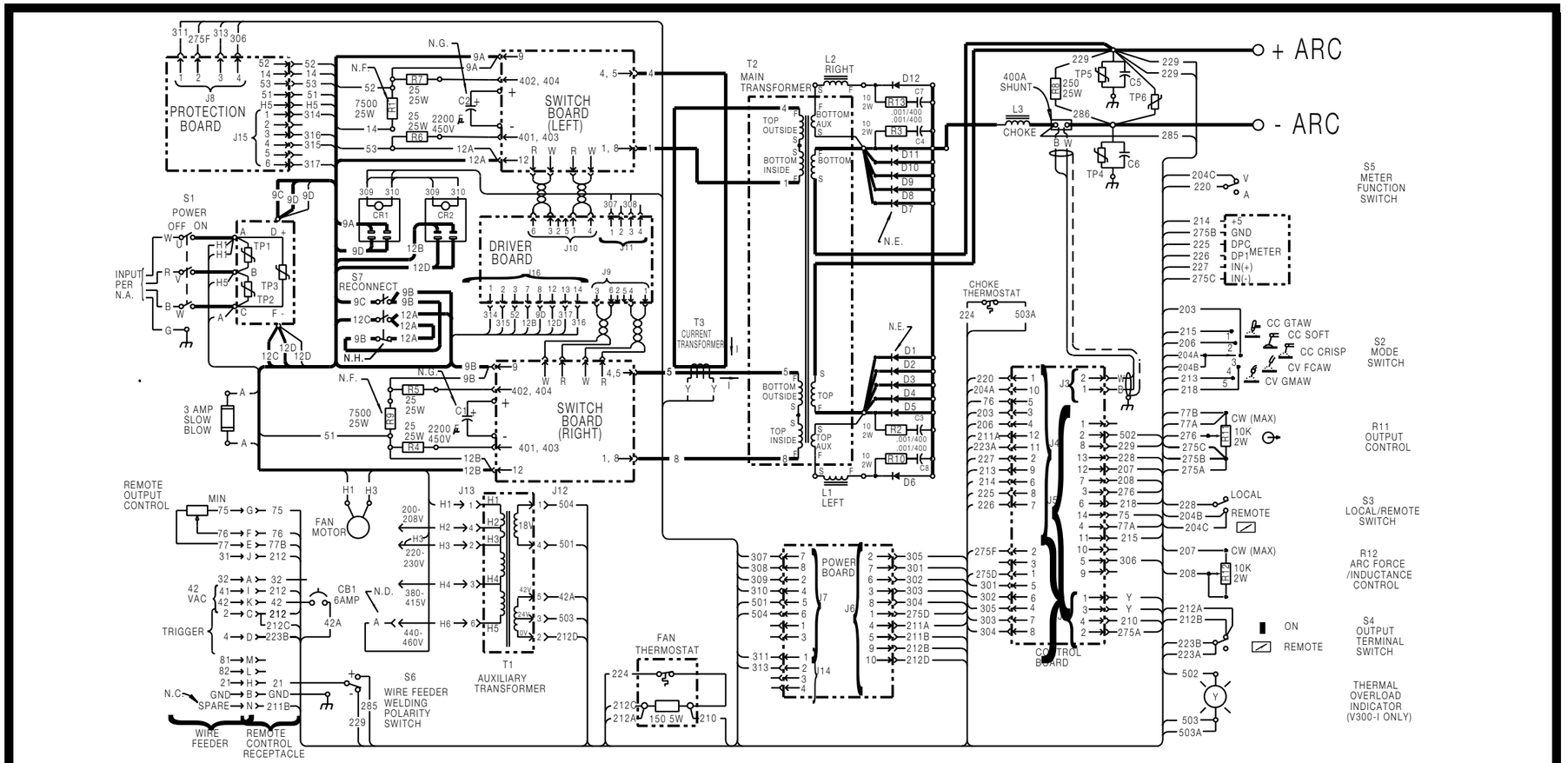
Return to Section TOC
Return to Master TOC

Wiring Diagram — Invertec V300-I — Code 10037



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   FOR SINGLE PHASE INPUT: CONNECT GREEN LEAD TO GROUND PER NATIONAL ELECTRIC CODE.
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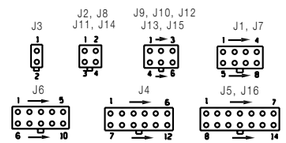
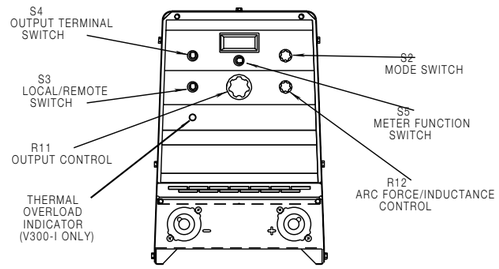


CONNECTOR CAVITY NUMBERING SEQUENCE (VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537



CONTROL PANEL LAYOUT

12-2-93L

L9300

LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

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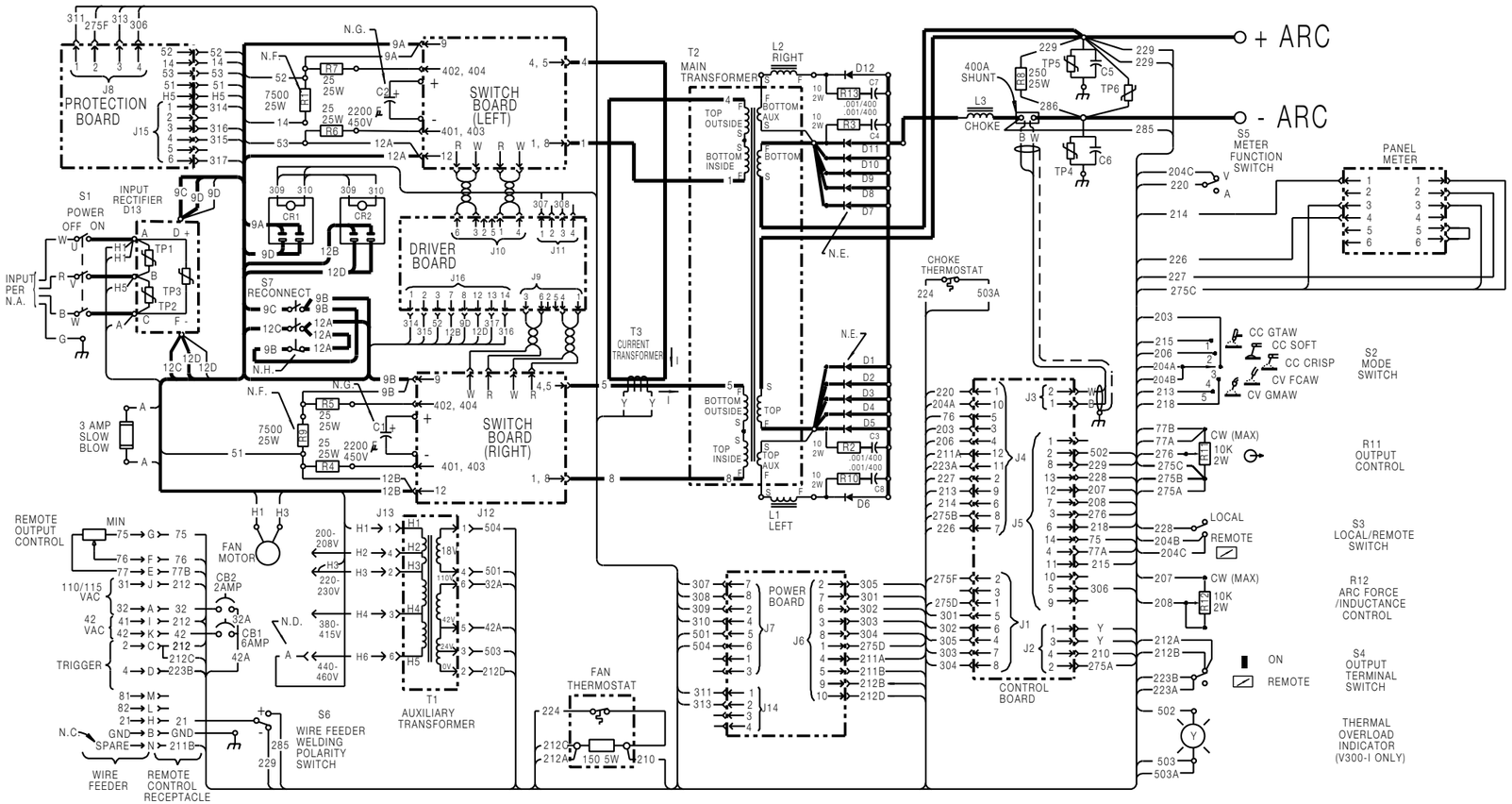
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

Wiring Diagram — Invertec V300-I — Code 10132

WIRING DIAGRAM - (CODE 10132)



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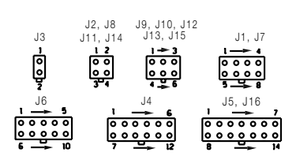
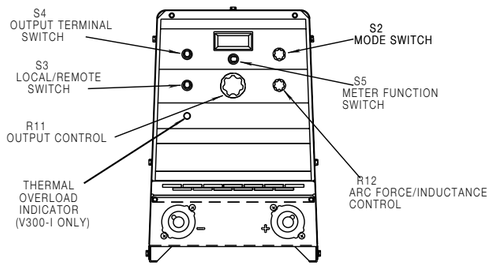


CONNECTOR CAVITY NUMBERING SEQUENCE (VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537



CONTROL PANEL LAYOUT

2-11-94F

LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

L9567

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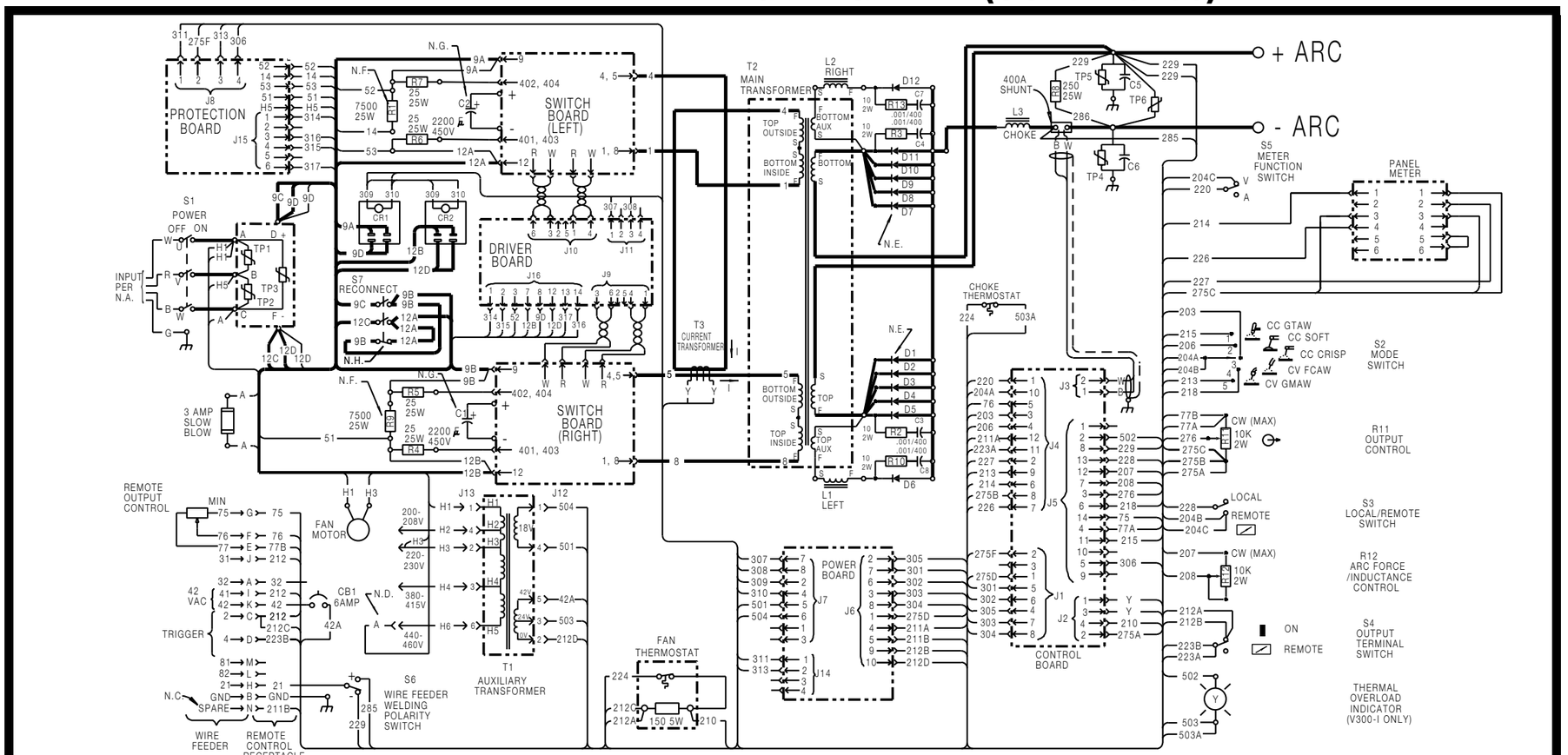
Wiring Diagram — Invertec V300-I — Code 10133

WIRING DIAGRAM - (CODE 10133)



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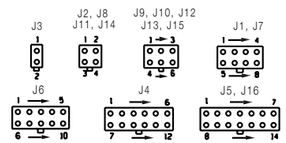
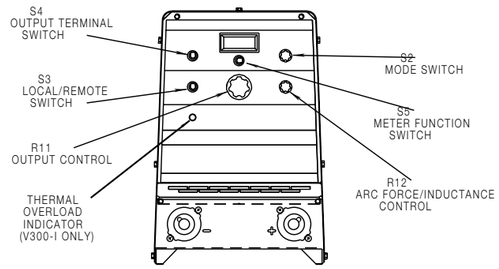


CONNECTOR CAVITY NUMBERING SEQUENCE (VIEWED FROM COMPONENT SIDE OF BOARD)

ELECTRICAL SYMBOLS PER E1537



CONTROL PANEL LAYOUT

2-11-94F

L9568

LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

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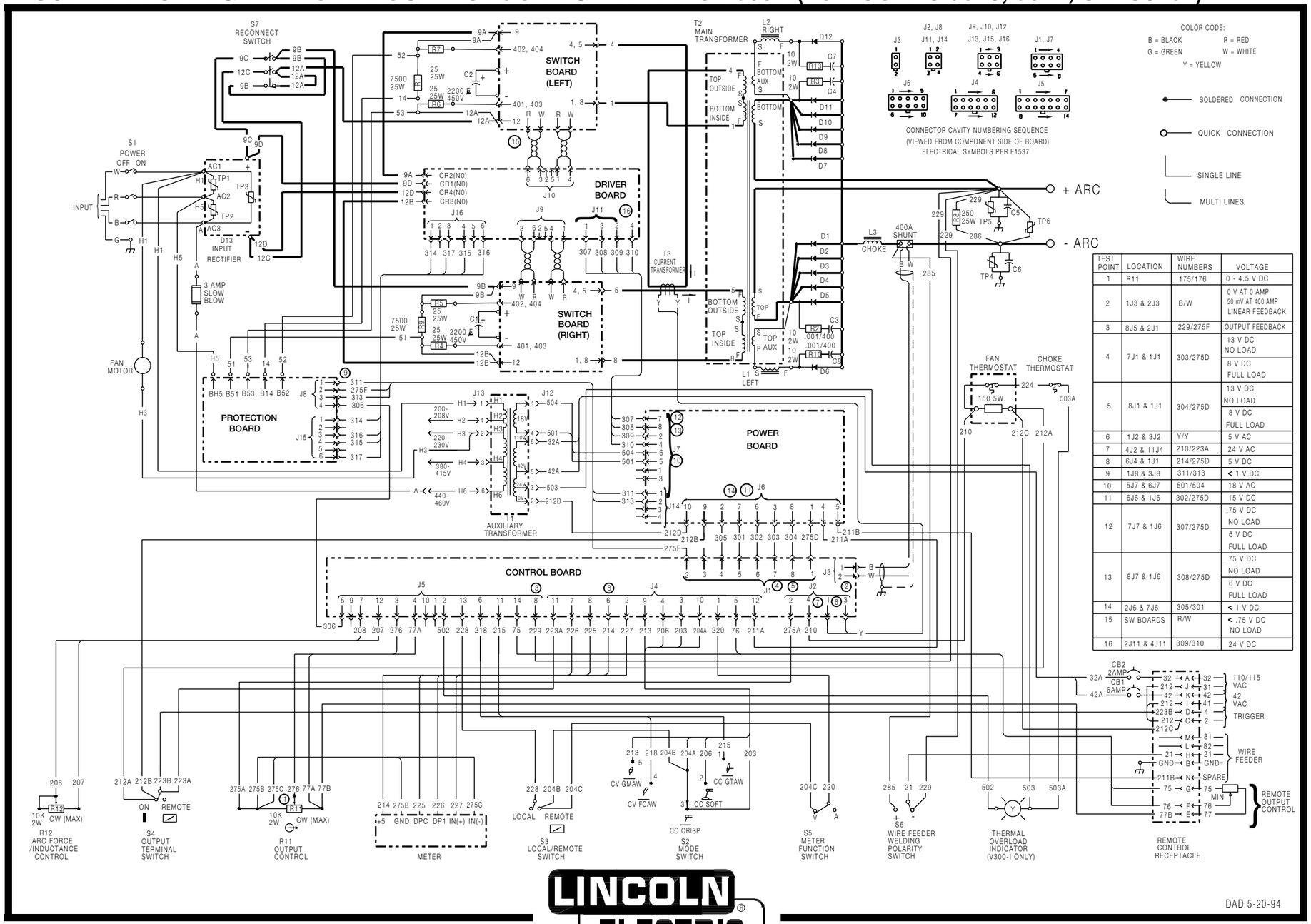
Return to Section TOC
Return to Master TOC

Schematic Diagram For Troubleshooting Invertec V300-I

SCHEMATIC DIAGRAM FOR TROUBLESHOOTING INVERTEC V300-I (FOR CODES 9826, 9827, SPLC6792)



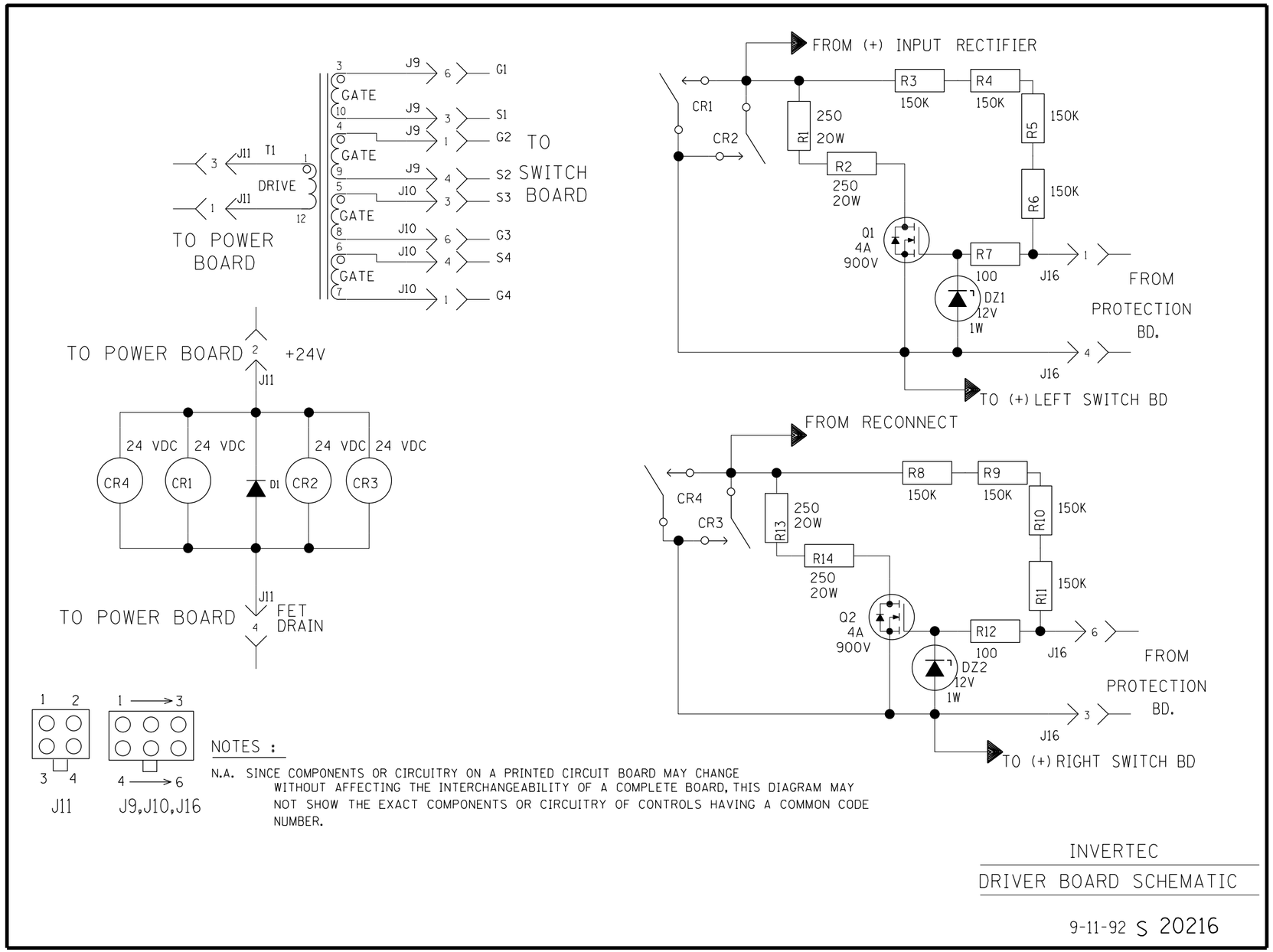
TEST POINT	LOCATION	WIRE NUMBERS	VOLTAGE
1	R11	175/176	0 - 4.5 V DC
2	1J3 & 2J3	B/W	0 V AT 0 AMP 50 mV AT 400 AMP LINEAR FEEDBACK
3	8J5 & 2J1	229/275F	OUTPUT FEEDBACK
4	7J1 & 1J1	303/275D	13 V DC NO LOAD
			8 V DC FULL LOAD
5	8J1 & 1J1	304/275D	13 V DC NO LOAD
			8 V DC FULL LOAD
6	1J2 & 3J2	Y/Y	5 V AC
7	4J2 & 11J4	210/223A	24 V AC
8	6J4 & 1J1	214/275D	5 V DC
9	1J8 & 3J8	311/313	< 1 V DC
10	5J7 & 6J7	501/504	18 V AC
11	6J6 & 1J6	302/275D	15 V DC
12	7J7 & 1J6	307/275D	.75 V DC NO LOAD
			6 V DC FULL LOAD
13	8J7 & 1J6	308/275D	.75 V DC NO LOAD
			6 V DC FULL LOAD
14	2J6 & 7J6	305/301	< 1 V DC
15	SW BOARDS	R/W	< .75 V DC NO LOAD
16	2J11 & 4J11	309/310	24 V DC

CLEVELAND, OHIO U.S.A.

NOTE: This machine schematic is provided for reference only and may not be totally applicable to every code covered in this manual.

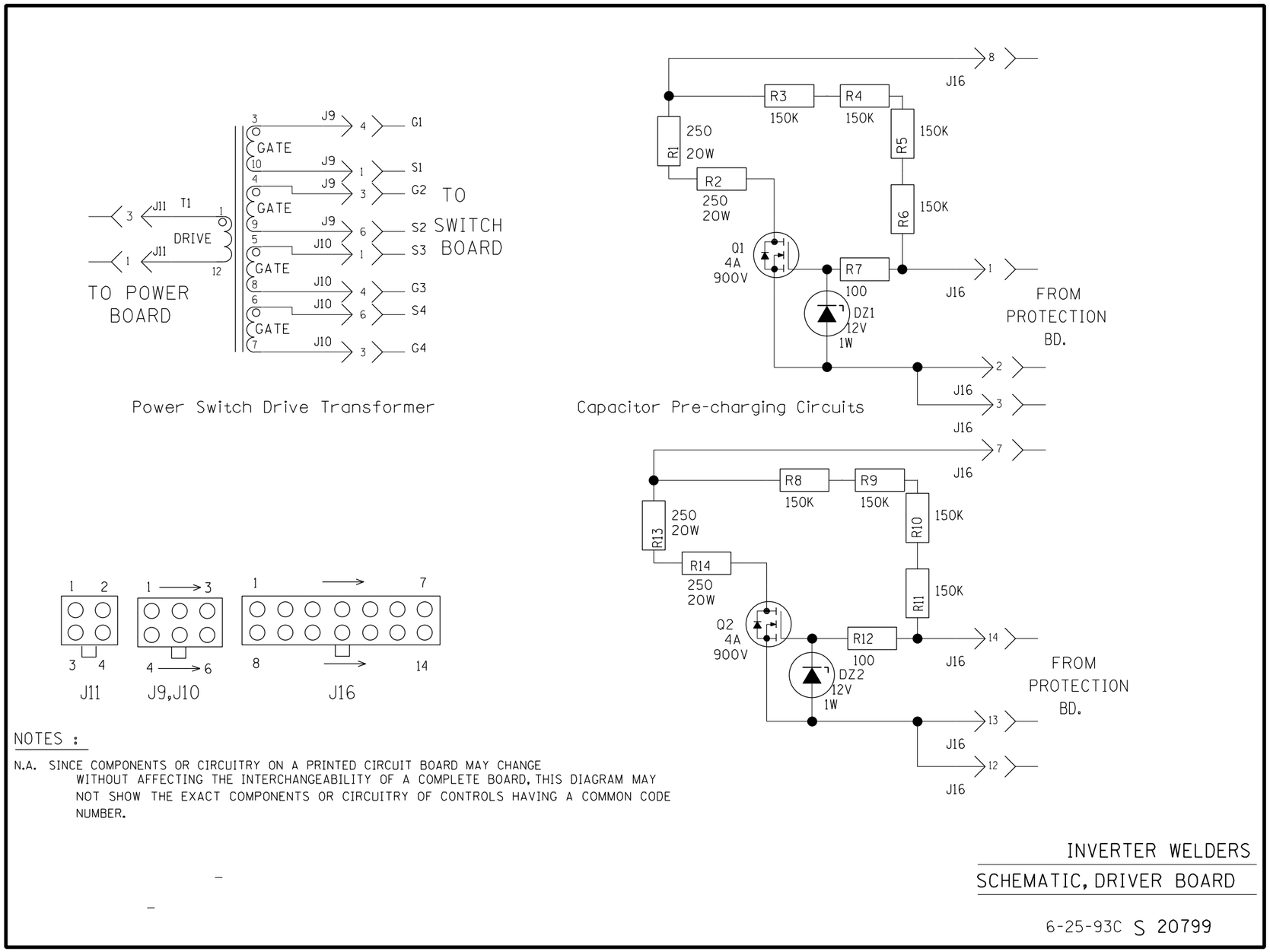
Return to Section TOC
Return to Master TOC

Schematic Diagram — Driver Board (L8660-1)



NOTE: Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. This Printed Circuit Board schematic is provided for reference only. It may not be totally applicable to your machine's specific PC board version. This diagram is intended to provide general information regarding PC board function. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in Danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Schematic Diagram — Driver Board (L9134-1)



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INVERTER WELDERS

SCHEMATIC, DRIVER BOARD

6-25-93C S 20799

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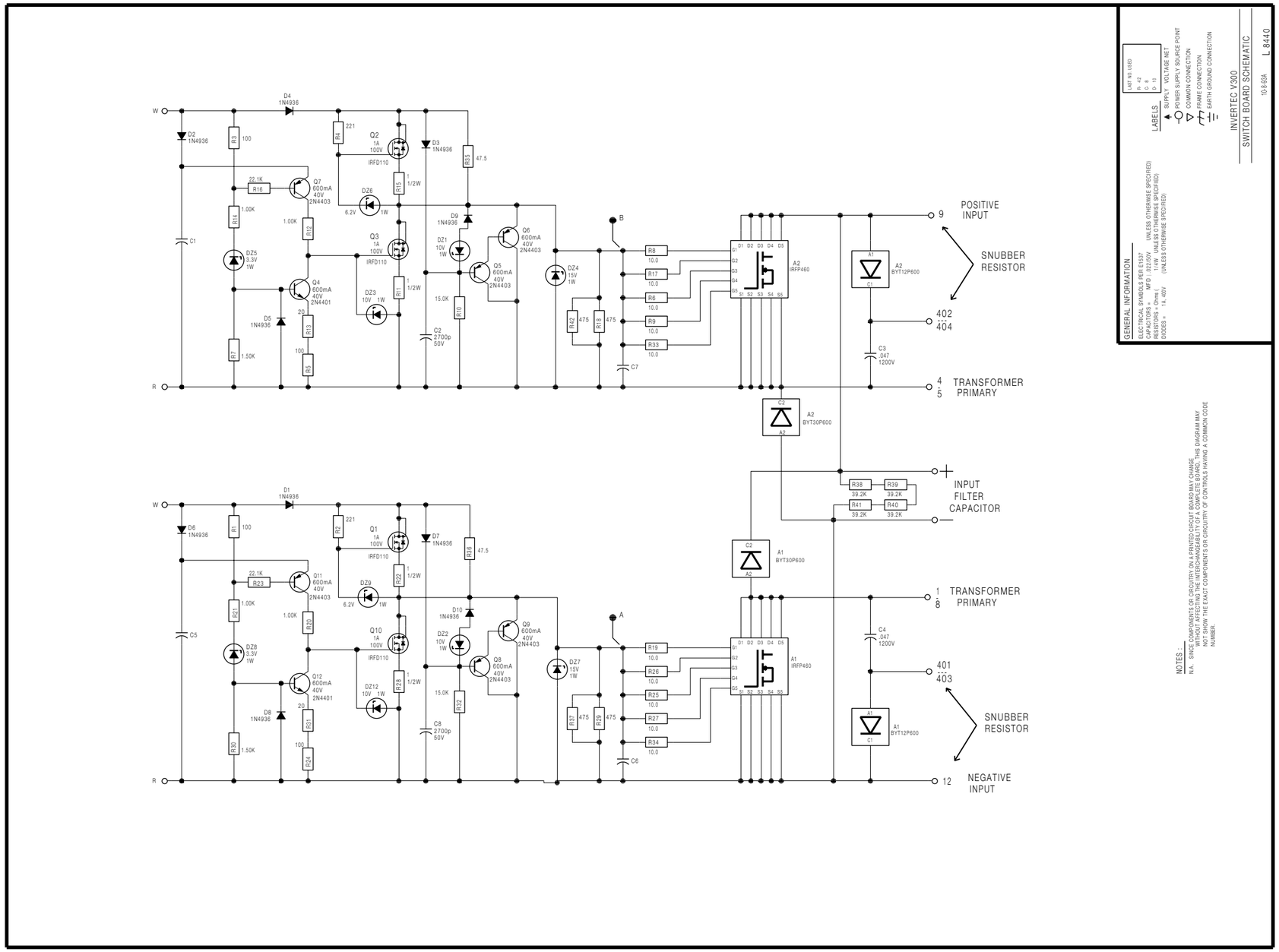
Schematic Diagram —Switch Board



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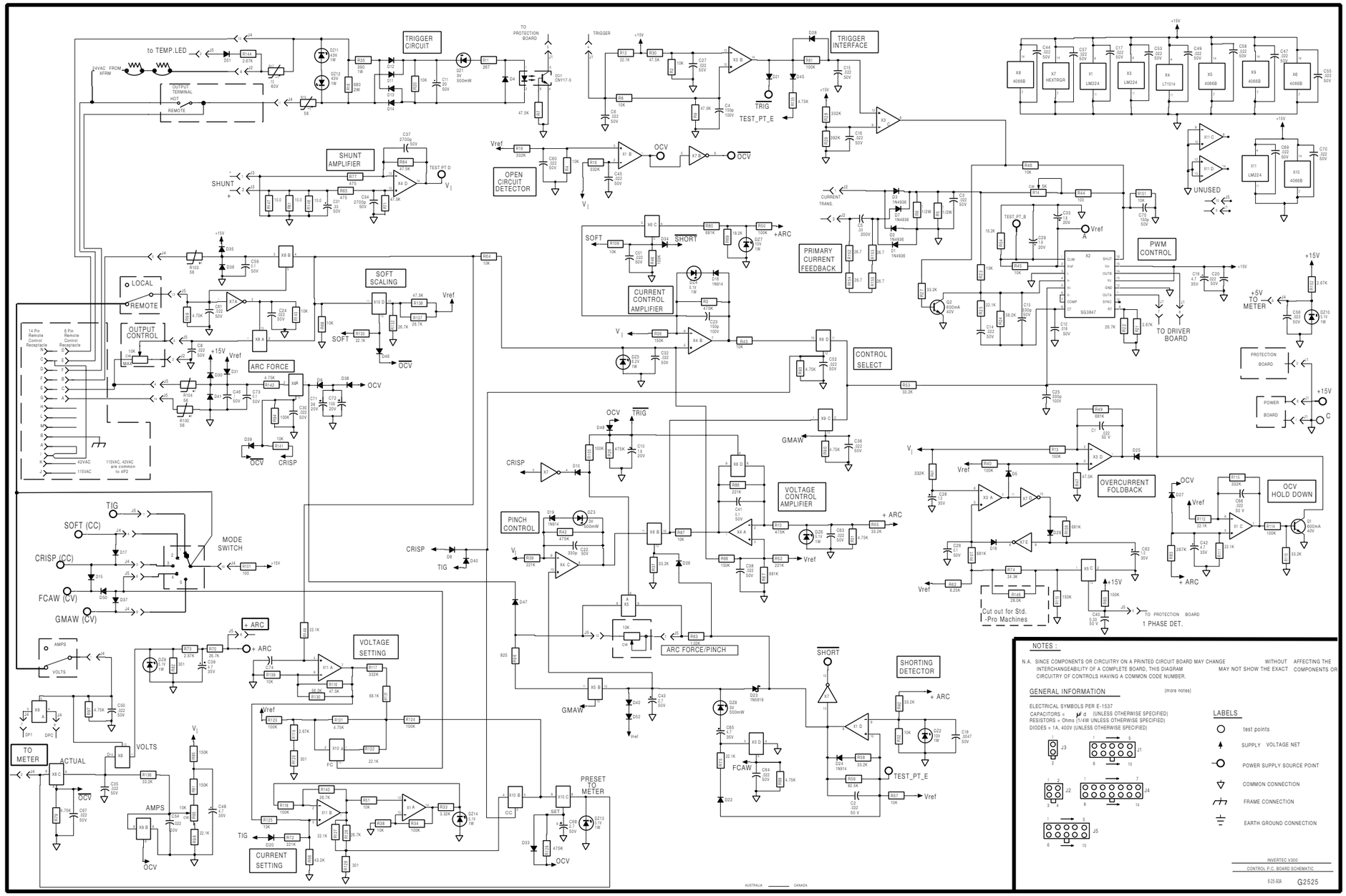
Schematic Diagram — Control Board



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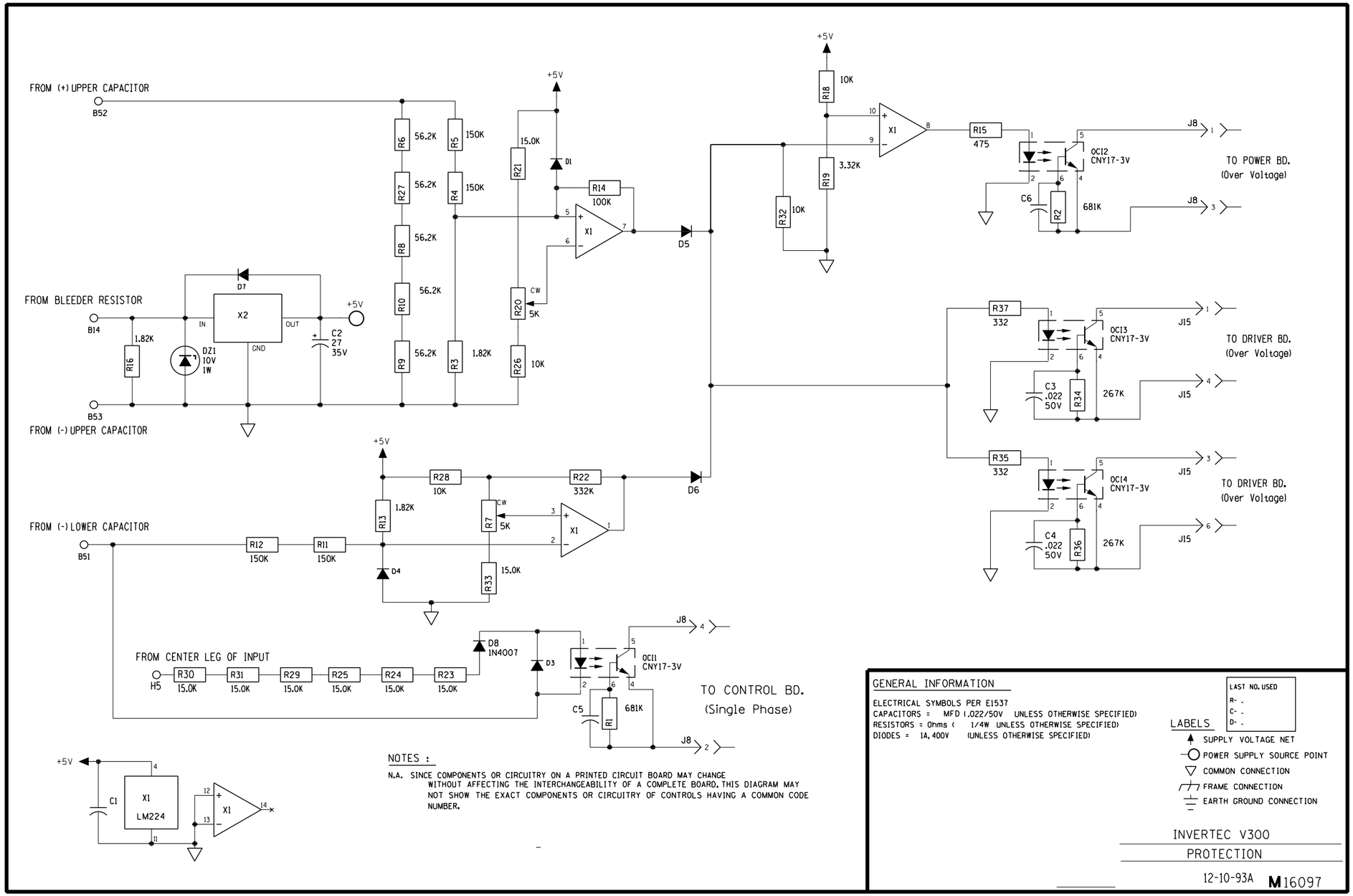
Schematic Diagram — Protection Board



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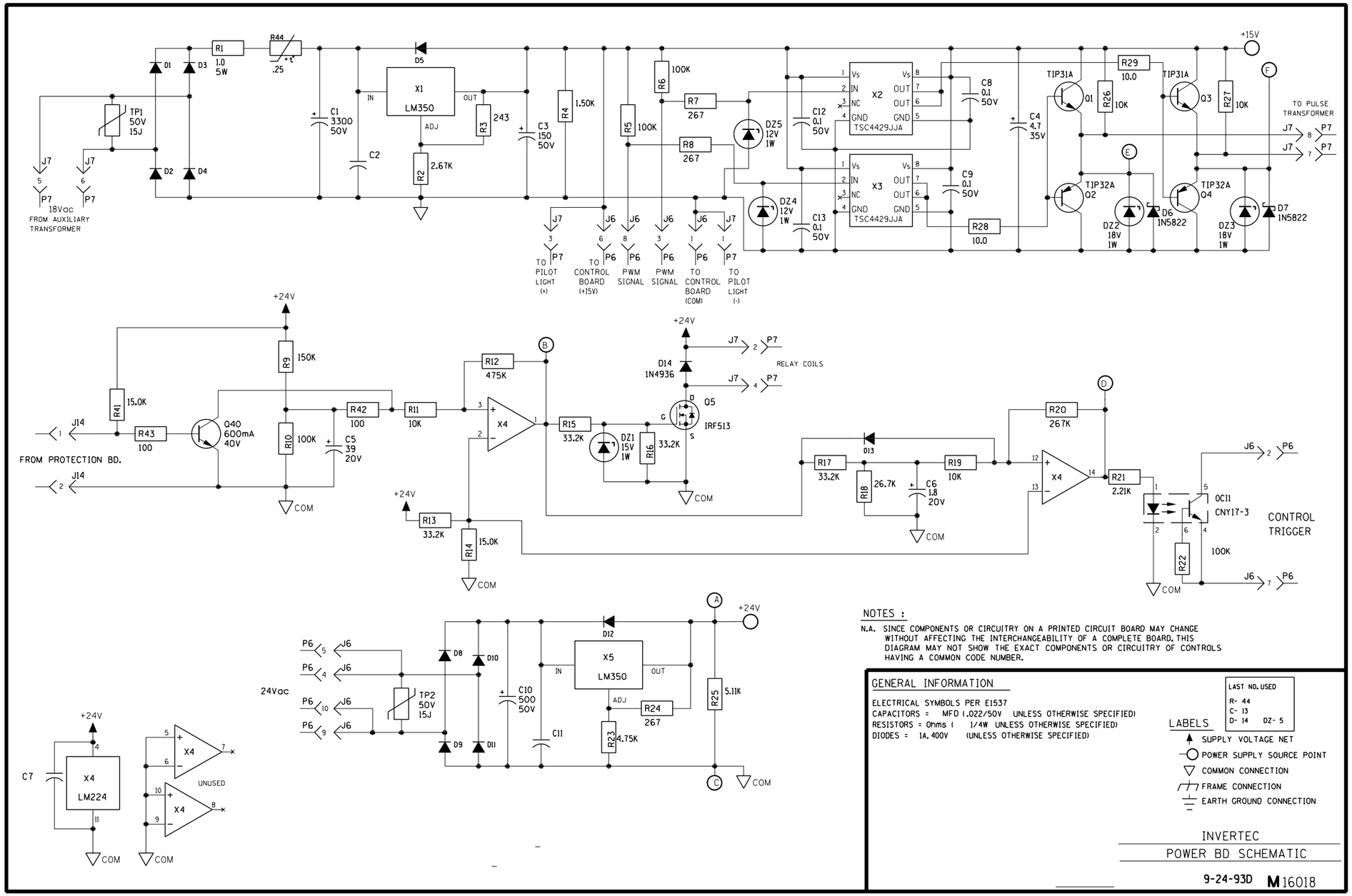
Schematic Diagram — Power Board



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