



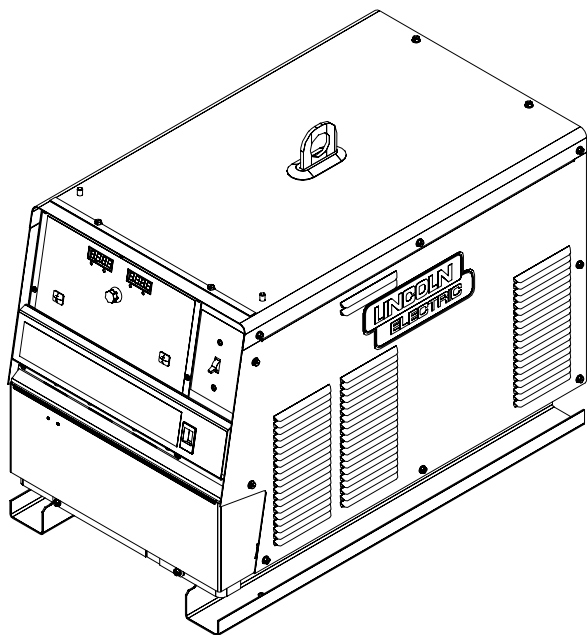
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

INVERTEC® V450-PRO

For use with machines having Code Numbers:

11212

SERVICE MANUAL



⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

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



FOR ENGINE powered equipment.

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



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



1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

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

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

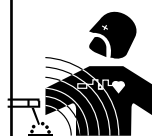


1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



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



ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

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

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



ELECTRIC SHOCK can kill.

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

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

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

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

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

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

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

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

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

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



ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

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

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



FUMES AND GASES can be dangerous.

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

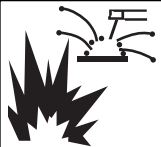
5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically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

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

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

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

5.f. Also see item 1.b.



WELDING and CUTTING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire.

Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

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

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

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

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



CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.

- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

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

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

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

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



FOR ELECTRICALLY powered equipment.

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

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

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

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

PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
 - a. Les circuits à l'électrode et à la pièce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
 - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
 - c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
 - d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
 - e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
 - f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s'appliquent aussi au pistolet de soudage.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas où on reçoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.
3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:
 - a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
 - b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
 - c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans latéraux dans les zones où l'on pique le laitier.

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

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

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

Electromagnetic Compatibility (EMC)

Conformance

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

Introduction

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

Installation and Use

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

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

Assessment of Area

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

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

Electromagnetic Compatibility (EMC)

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

Methods of Reducing Emissions

Mains Supply

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

Maintenance of the Welding Equipment

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

Welding Cables

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

Equipotential Bonding

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

Earthing of the Workpiece

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

Screening and Shielding

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

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

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TECHNICAL SPECIFICATIONS - INVERTEC® V450-PRO

INPUT AT RATED OUTPUT - THREE PHASE ONLY					
INPUT VOLTS-FREQUENCY	OUTPUT CONDITIONS	INPUT CURRENT AMPS	IDLE POWER	POWER FACTOR @ RATED OUTPUT	EFFICIENCY @ RATED OUTPUT
	AMPS / VOLTS / DUTY CYCLE				
208/230/460/575V - 60HZ.	450A@38V.100% 570A@43V. 60%	58/53/25/22 82/78/37/31	400 Watts Max.	.95 MIN.	88%
200/220/440/575V - 50HZ.	400A@36V.100% 500A@40V. 60%	49/45/23/18 67/61/31/25			
OUTPUT					
PULSE FREQUENCY	PULSE VOLTAGE RANGE	PULSE AND BACKGROUND TIME RANGE	AUXILIARY POWER (CIRCUIT BREAKER PROTECTED)		
0.15 - 1000 Hz	5 - 55 VDC	100 MICRO SEC. -3.3 SEC.	24VAC 42VAC AT 10 AMPS 115VAC AT 15* AMPS		
OPEN CIRCUIT VOLTAGE		PROCESS CURRENT RANGE (DC)	CURRENT		
30-76		MIG/MAG	50-570 Average Amps		
76		FCAW	40-570 Average Amps		
76		SMAW	55-570 Average Amps		
18-76		GTAW	5-570 Average Amps		
76		Pulse	5-750 Peak Amps		
RECOMMENDED INPUT WIRE AND FUSE SIZES FOR MAXIMUM RATED OUTPUT					
INPUT VOLTAGE / FREQUENCY	TYPE 75°C COPPER WIRE IN CONDUIT AWG(MM ²) SIZES	TYPE 75°C GROUND WIRE IN CONDUIT AWG(MM ²) SIZES	TYPE 75°C (SUPER LAG) OR BREAKER SIZE (AMPS)		
208/50/60HZ	4(25)	8(10)	100		
230/50/60HZ	4(25)	8(10)	100		
460/50/60HZ	8(10)	10(6)	50		
575/50/60HZ	10(6)	10(6)	40		
PHYSICAL DIMENSIONS					
HEIGHT	WIDTH	DEPTH	WEIGHT		
26.10 in 663 mm	19.86 in 505 mm	32.88 in 835 mm	293 lbs. 133 kg.		
TEMPERATURE RANGES					
OPERATING TEMPERATURE RANGE			STORAGE TEMPERATURE RANGE		
-20°C to +40°C			-40°C to +40°C		

* Earlier models used 10 amps circuit breaker.

INVERTEC® V450-PRO



SAFETY PRECAUTIONS

Read this entire installation section before you start installation.



WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box

before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.

- Do not touch electrically hot parts.
- Always connect the V450-PRO grounding lug (located inside the reconnect input access door) to a proper safety (Earth) ground.

SELECT SUITABLE LOCATION

Do not use the Invertec® in outdoor environments without appropriate protection. The V450-PRO power source should not be subjected to falling water, nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.



WARNING

Do not mount the V450-PRO over combustible surfaces. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .060" (1.6mm) thick, which shall extend not less than 5.90" (150mm) beyond the equipment on all sides.

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides and bottom. Water, Dirt, dust, or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdowns.

Machines are equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled, whether under loaded or open circuit conditions. The fan also runs for a period of time (approximately 5 minutes) after the output is disabled, to ensure all components are properly cooled.

If desired, the F.A.N. feature can be disabled (causing the fan to run whenever the power source is on). To disable F.A.N., connect leads 444 and X3A together at the output of the solid state fan control relay, located on the back of the Control PC board enclosure. (See Wiring Diagram)

LIFTING

Lift the machine by the lift bail only. The lift bail is designed to lift the power source only. Do not attempt to lift the V450-PRO with accessories attached to it.

STACKING


V450-PRO machines can be stacked to a maximum of 3 high.



CAUTION

The bottom machine must always be placed on a firm, secure, level surface. There is a danger of machines toppling over if this precaution is not taken.

MACHINE GROUNDING

The frame of the welder must be grounded. A ground terminal marked with the symbol  is located inside the reconnect/input access door for this purpose. See your local and national electrical codes for proper grounding methods.

HIGH FREQUENCY PROTECTION

Locate the V450-PRO away from radio controlled machinery.



CAUTION

The normal operation of the V450-PRO may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

INPUT CONNECTION



WARNING

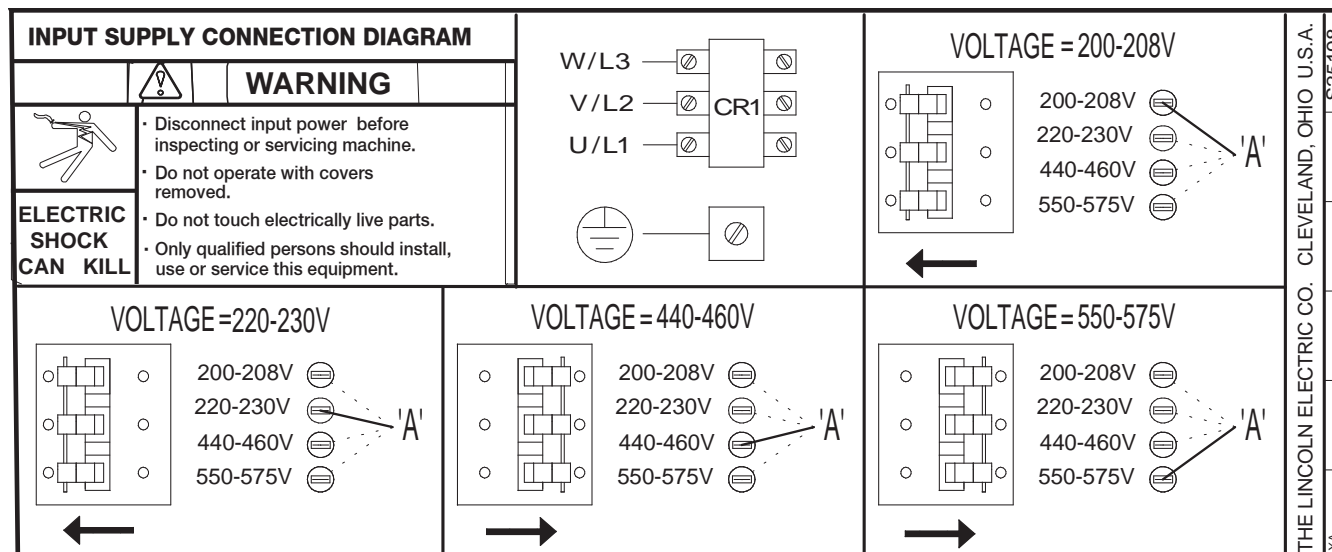
Only a qualified electrician should connect the input leads to the V450-PRO. Connections should be made in accordance with all local and national electrical codes and the connection diagram located on the inside of the reconnect/input access door of the machine. Failure to do so may result in bodily injury or death.

Use a three-phase supply line. A 1.75 inch (45 mm) diameter access hole for the input supply is located on the upper left case back next to the input access door. Connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal located on the inside of the input access door or refer to Figure A.1 on the following page.

INVERTEC® V450-PRO



FIGURE A.1 - CONNECTION DIAGRAM ON CONNECTION/INPUT ACCESS DOOR



NOTE: Turn main input power to the machine OFF before performing connection procedure. Failure to do so will result in damage to the machine.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to the Technical Specifications at the beginning of this Installation section for recommended fuse and wire sizes. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called “inverse time” or “thermal/magnetic” circuit breakers). Choose an input and grounding wire size according to local or national electrical codes. Using fuses or circuit breakers smaller than recommended may result in “nuisance” shut-offs from welder inrush currents, even if the machine is not being used at high currents.

INPUT VOLTAGE CHANGE OVER (FOR MULTIPLE INPUT VOLTAGE MACHINES ONLY)

Welders are shipped connected for the highest input voltage listed on the rating plate. To move this connection to a different input voltage, see the diagram located on the inside of the input access door. If the main reconnect switch or link position is placed in the wrong position, the welder will not produce output power.

If the Auxiliary (A) lead is placed in the wrong position, there are two possible results. If the lead is placed in a position higher than the applied line voltage, the welder may not come on at all. If the Auxiliary (A) lead is placed in a position lower than the applied line voltage, the welder will not come on, and the two circuit breakers or fuses in the reconnect area will open. If this occurs, turn off the input voltage, properly connect the (A) lead, reset the breakers, and try again. For machines equipped with a fuse in the reconnect area, turn off the input voltage and replace the fuse with the spare fuse that is attached to the reconnect switch pin.

ELECTRODE AND WORK CABLE CONNECTIONS

Connect a work lead of sufficient size and length (Per Table 1) between the proper output terminal on the power source and the work. Be sure the connection to the work makes tight metal-to-metal electrical contact. To avoid interference problems with other equipment and to achieve the best possible operation, route all cables directly to the work and wire feeder. Avoid excessive lengths and do not coil excess cable.

Minimum work and electrode cable sizes are as follows:

TABLE A.1

(Current (60% Duty Cycle))	MINIMUM COPPER WORK CABLE SIZE AWG
	Up To-100 Ft. Length (30 m)
400 Amps	2/0 (67 mm ²)
500 Amps	3/0 (85 mm ²)
600 Amps	3/0 (85 mm ²)

NOTE: K1796 coaxial welding cable is recommended to reduce the cable inductance in long cable lengths. This is especially important when Pulse welding up to 350 amps.

CAUTION

When using inverter type power sources like the V450-PRO, use the largest welding (electrode and work) cables that are practical. At least 2/0 (67 mm²) copper wire - even if the average output current would not normally require it. When pulsing, the pulse current can reach very high levels. Voltage drops can become excessive, leading to poor welding characteristics, if undersized welding cables are used.

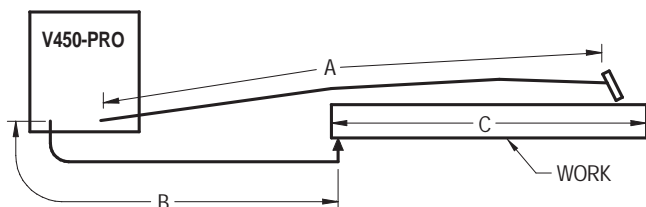
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CABLE INDUCTANCE, AND ITS EFFECTS ON PULSE WELDING

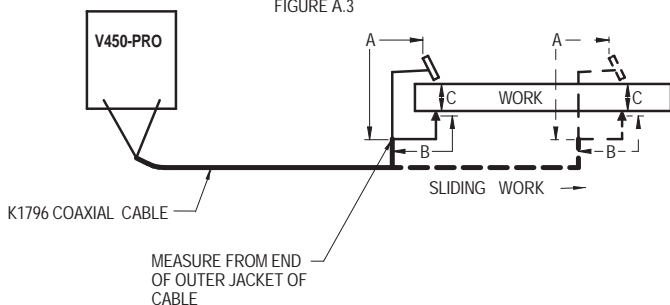
For Pulse Welding processes, cable inductance will cause the welding performance to degrade. For the total welding loop length less than 50 ft. (15.24m), traditional welding cables may be used without any effects on welding performance. For the total welding loop length greater than 50 ft. (15.24m), the K1796 Coaxial Welding Cables are recommended. The welding loop length is defined as the total of electrode cable length (A) + work cable length (B) + work length (C) (See Figure A.2).

FIGURE A.2



For long work piece lengths, a sliding ground should be considered to keep the total welding loop length less than 50 ft. (15.24m). (See Figure A.3.)

FIGURE A.3



Output connections on some V450-PRO are made via 1/2-13 threaded output studs located beneath the spring-loaded output cover at the bottom of the case front.

Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire feeder and the positive (+) output stud on the power source (located beneath the spring loaded output cover near the bottom of the case front). Connect the other end of the electrode cable to the wire drive feed plate. The electrode cable lug must be against the feed plate. Be sure the connection to the feed plate makes tight metal-to-metal electrical contact. The electrode cable should be sized according to the specifications given in the work cable connections section. Connect a work lead from the negative (-) power source output stud to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned.

For additional Safety information regarding the electrode and work cable set-up, See the standard "SAFETY INFORMATION" located in the front of the Instruction Manuals.



CAUTION

Excessive voltage drops caused by poor work piece connections often result in unsatisfactory welding performance.

NEGATIVE ELECTRODE POLARITY

When negative electrode polarity is required, such as in some Innershield applications, switch the output connections at the power source (electrode cable to the negative (-) stud, and work cable to the positive (+) stud).

CONNECTIONS OF WIRE FEEDERS TO V450-PRO

LF-72, 74 Connection Instructions

- Turn the Invertec® power switch "off".
- Connect the K1797-[] control cable from the LF-72, 74 to the 14-pin MS-style connector.
- Connect the electrode cable to the output terminal of the polarity required by electrode. Connect the work lead to the other terminal.
- If a remote control such as K857 is to be used with the LF-72, 74 the remote can be connected directly to the 6-pin MS-style connector on the front of the Invertec® or use a K864 adapter to connect the LF-72, 74 and the remote to the 14-pin MS-style connector.

LN-10, DH-10 Connection Instructions

- Turn the Invertec® power switch "off"
- Connect the K1505 control cable from the LN-10 to the 14-pin MS-style connector.
- Connect the electrode cable to the output terminal of polarity required by the electrode. Connect the work lead to the other terminal.
- Set the meter polarity switch on the front of the Invertec® to coincide with wire feeder polarity used.
- See the LN-10 manual for details on accessing Control DIP Switch. Dip Switches for the V350 and the same settings may be used for the V450.

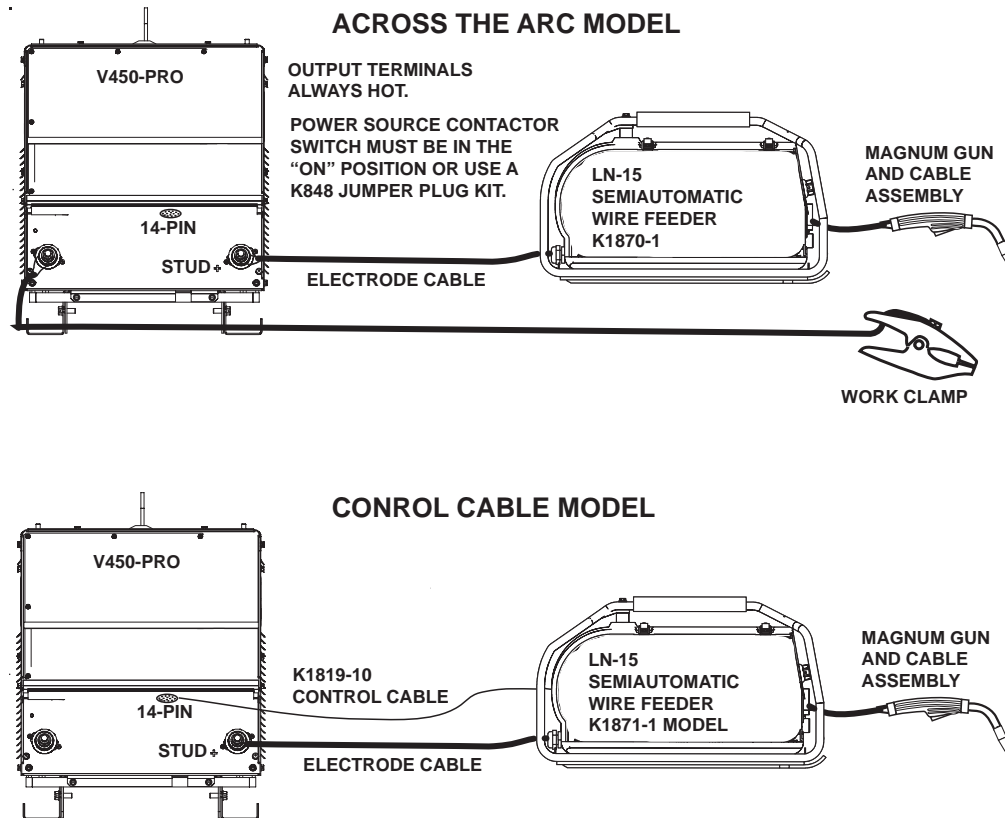
LN-15 Connection Instructions (See Figure A.4)

- Turn the Invertec® power switch "off".
- Connect the electrode cable to the output terminal of polarity required by electrode. (See Figures below)
- Set the meter polarity switch on the front of the Invertec® to coincide with wire feeder polarity used.

LN-25 Connection Instructions

- Turn the Invertec® power switch "off".
- Connect the electrode cable to the output terminal of polarity required by electrode. Connect the work lead to the other terminal.
- LN-25 with Remote Control 6-Pin (K444-1) and 14-pin (K444-2) remotes can be connected directly to the 6-pin & 14-pin MS-style connectors. The 42 Volt Remote Voltage and Output Control (K624-1) Kit can be connected to the V450's 14-pin MS-style connector using Remote Control Cable assembly K627- []. LN-25s with a K431-1 remote kit can be connected to the V450's 14-pin MS-style connector using a K432 cable and K876 adapter. (See connection diagram S19899). Or the K432 cable could be modified with a K867 Universal Adapter Plug (See connection diagram S19405) to connect it to the V450's 14-pin MS-style connector.

FIGURE A.4
ACROSS THE ARC MODEL



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LN-742 Connection Instructions

- Turn the Invertec® power switch "off"
- A K1819-1 Input cable assembly is required to connect the LN-742 to the Invertec®.
- Connect the control cable from the LN-742 to the 14-pin MS-style connector.
- Connect the electrode cable to the output terminal of the polarity required by electrode. Connect the work lead to the other terminal.
- Set the meter polarity switch on the front of the Invertec® to coincide with wire feeder polarity used. The wire feeder will now display the welding voltage.
- If a remote control such as K857 is to be used with the LN-742, the remote can be connected directly to the 6-pin MS-style connector on the front of the Invertec® or use a K864 adapter to connect the LN-742 and the remote to the 14-pin MS-style connector.

Cobramatic Connection Instructions

- Turn the Invertec® power switch "off"
- Connect the control cable from the Cobramatic to the 14-pin MS-style connector.
- Connect the electrode cable to the output terminal of the polarity required by electrode. Connect the work lead to the other terminal.
- Set the meter polarity switch on the front of the Invertec® to coincide with wire feeder polarity used.
- If a remote control such as K857 is to be used with the Cobramatic, the remote can be connected directly to the 6-pin MS-style connector on the front of the Invertec® or use a K864 adapter to connect the cobramatic and the remote to the 14-pin MS-style connector.

TIG Module K930-2

The TIG Module connects to the Factory and Advanced Process V450-Pro versions with a K936-1 (9-14 pin) control cable. Connect the K936-1 to the 14-Pin MS-style connector.

General Instructions for Connection of Wire Feeders to V450-Pro

Wire feeders other than those listed above may be used provided that the auxiliary power supply rating of the V450-Pro is not exceeded and the V450-PRO output is not actively controlled by the wire feeder. (Like an LN-9). K867 universal adapter plug is required. See connection diagram S24985 in Operator Manual.

REMOTE CONTROL OF INVERTEC®

Remote Control K857, Hand Amptrol K963 and Foot Amptrol K870 may be used.

PARALLEL OPERATION

The V450-Pro are operable in parallel in CC mode. For best results, the currents of each machine should be reasonably equally balanced. As an example, with two machines set up in parallel for a 800 amps procedure, each machine should be set to deliver approximately 400 amps, not 450 amps from one and 350 amps from the other. This will minimize nuisance shutdown conditions. In general, more than two machines in parallel will not be effective due to the voltage requirements of procedures in that power range.

To set machine outputs, start with output control pots and arc control pots in identical positions. Use the output control pots to balance the currents and maintain the desired current. The arc control pots should be kept identical on the two machines.

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SAFETY PRECAUTIONS

⚠ WARNING

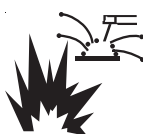
ELECTRIC SHOCK can kill.

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



FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion.

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



ARC RAYS can burn eyes and skin.

- Wear eye, ear and body protection.

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

GENERAL DESCRIPTION

The Invertec® V450-Pro offers multi-process CV, CC, and DC welding and is rated 570 amps, 43 volts at a 60% duty cycle.

DUTY CYCLE

The V450-Pro is rated at 570 amps, 60% duty cycle (based on a 10 minute cycle). It is also rated at 450 amps, 100% duty cycle.

OPERATIONAL FEATURES and CONTROLS:

UPPER CONTROL PANEL

1. ON, OFF- SWITCH

2. AMPS Meter

- Prior to STICK or TIG operation (current flow), the meter displays preset current value (either +/- 2 amps or +/- 3% (e.g. 3 amps on 100), whichever is greater).
- Prior to CV operation, the meter displays four dashes indicating AMPS unable to be preset.
- During welding, this meter displays actual average amps.

- After welding, the meter holds the actual current value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

3. VOLT METER

- Prior to CV operation (current flow), the meter displays desired preset voltage value (+/- .5V).
- Prior to STICK or TIG operation, the meter displays the Open Circuit Voltage of the Power Source or four dashes if the output has not been turned on.
- During welding, this meter displays actual average volts.
- After welding, the meter holds the actual voltage value for 5 seconds. The displays blink indicating that the machine is in the "Hold" period.
- Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above.

4. OUTPUT CONTROL

- Output control is conducted via a single turn potentiometer.
- Adjustment is indicated by the meters as stated above.
- When in TIG modes, this control sets the maximum welding current. Full depression of a foot or hand Amptrol results in the preset level of current.

5. WELD TERMINALS-REMOTE / ON

- Two status lights indicate the location of trigger control as determined by the "WELD TERMINALS" push button.
- If trigger control is local "weld terminals on", the ON display will be lit.
- If trigger control is remote "weld terminals remotely controlled", the REMOTE display will be lit.
- The unit will power up in "pre-determined preferred" trigger modes.

STICK = ON

CV = REMOTE

TIG = REMOTE if remote output controls are attached to the machine.

TIG = ON if remote output controls are not attached to the machine.

For all versions, these trigger modes can be over-ridden (switched) with the WELD TERMINALS push button. When changed, the unit will power up in the configuration it was in

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6. THERMAL

- This status light indicates when the power source has been driven into thermal overload. If the output terminals were "ON", the "ON" light will blink indicating that the output will be turned back on once the unit cools down to an acceptable temperature level. If the unit was operating in the "REMOTE" mode, the trigger will need to be opened before or after the thermal has cleared and closed after the machine has cooled down to an acceptable temperature to establish output.

7. CONTROL-REMOTE / LOCAL

- Two status lights indicate the location of output control as pre-determined by the power sources auto-configure system.
- The LOCAL display will be lit when control is at the power source.
- The REMOTE display will be lit when a remote pot/control is detected.

These Output Control configurations can be overridden (switched) with the CONTROL push button. When changed, the unit will power up in the configuration it was in when it was last powered down.

Hidden Middle Control Panel – Process Set Up Panel

The middle control panel is removable to allow for upgrades (see Field Installed Options/Accessories). Additionally, this panel is hidden by an access door to provide protection to the controls.

8. WELD MODE SELECT - STANDARD (See Figure B.1)

The Mode Control button selects from the following welding modes.

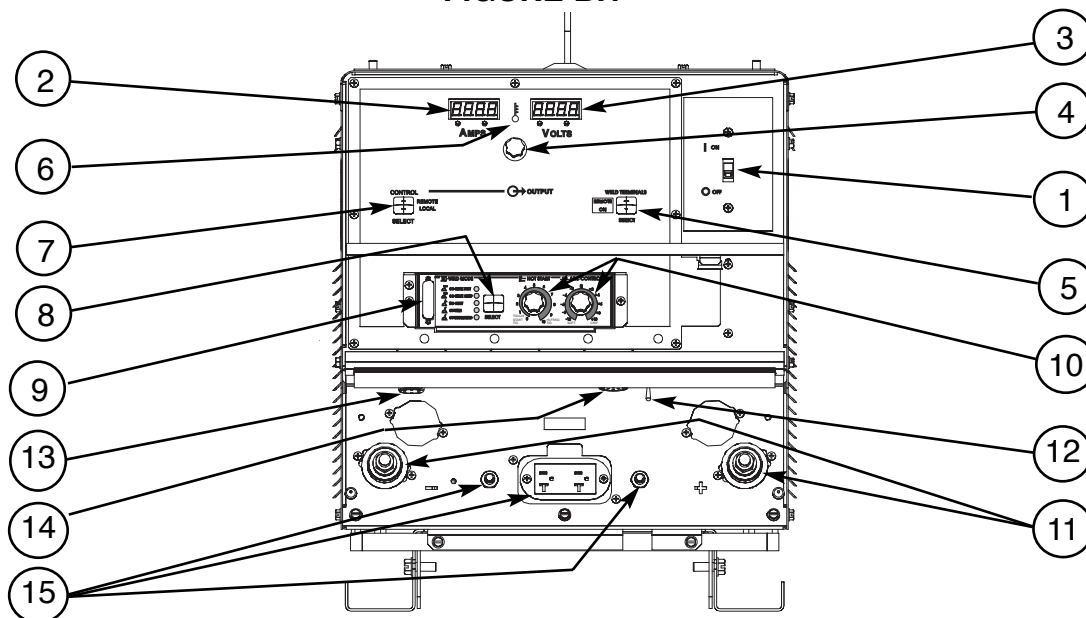
CC-STICK SOFT: The Stick Soft process features continuous control ranging from 5 to 570 amps. This mode was intended for most SMAW applications, and Arc Gouging.

- Arc Gouging: Setting the output of the Stick Soft mode to 570 amps or setting the arc control to maximum will enable the arc-gouging mode. The actual output current will depend on the size of carbon used. The recommended maximum size carbon is 3/8"(9.5mm).
- The Hot Start control regulates the starting current at arc initiation. Hot Start can be adjusted from minimum (0), with no additional current added at arc start, to maximum (10), with double the preset current or 570 amps (max of machine) added for the first second after arc initiation.
- The Arc Control regulates the Arc Force to adjust the short circuit current. The minimum setting (-10) will produce a "soft" arc and will produce minimal spatter. The maximum setting (+10) will produce a "crisp" arc and will minimize electrode sticking.

CC-STICK CRISP:The Stick Crisp mode features continuous control from 5 to 570 amps with a crisp shorting response optimized for E6010 type electrodes.

- Arc Gouging: Setting the output of the Crisp mode to 570 amps or setting the arc control to maximum will enable the arc-gouging mode. The actual output current will depend on the size of carbon used. The recommended maximum size carbon is 3/8"(9.5mm).
- The Hot Start control regulates the starting current at arc initiation. Hot Start can adjust starting current up or down by 25% of the preset value. The recommended setting for Hot Start is 5 where the initial current is equal to the preset current.

FIGURE B.1



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- The Arc Control regulates the Arc Force to adjust the short circuit current. The minimum setting (-10) will produce a "soft" arc and will produce minimal spatter. The maximum setting (+10) will produce a "crisp" arc and will minimize electrode sticking.

TIG GTAW: The TIG mode features continuous control from 5 to 570 amps. The TIG mode can be run in either the TIG touch start or high frequency (optional equipment required) assisted start mode.

- The Hot Start control selects the starting mode desired. A setting of less than 5, the TIG lift start mode is selected. The OCV is controlled below 10v and the short circuit "TIG touch" current is maintained at 25 amps independent of the preset current.

When the tungsten is lifted, an arc is initiated and the output is regulated at the preset value. Hot start settings between 0 and 5 regulate the arc initiation current. A setting of 5 results in the most positive arc initiation. A setting of 0 reduces hot start.

- Hot Start settings between 5 and 10, select high frequency assisted starting TIG mode. In this range, the OCV of the machine is controlled between 50 and 70 volts. If using the Lincoln K930-1 TIG Module, set the Hot start to 10 for maximum OCV.
- The Arc Control is not used in the TIG mode.

CV-WIRE: The CV-WIRE mode features continuous control from 10 to 40 volts. This mode was intended for most GMAW, FCAW, and MCAW applications.

- The Hot Start control is not used in the CV-WIRE mode.
- The Arc Control regulates pinch effect. At the minimum setting (-10), minimizes pinch and results in a soft arc. Low pinch settings are preferable for welding with gas mixes containing mostly inert gases. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc. High pinch settings are preferable for welding FCAW and GMAW with CO₂.

CV-INNERSHIELD: The CV-INNERSHIELD mode features continuous control from 10 to 45 volts. This mode was designed for self-shielded flux cored wires that require tight voltage control.

- The Hot Start control is not used in the CV-INNERSHIELD mode.
- The Arc Control regulates pinch effect. At the minimum setting (-10), minimizes pinch and results in a soft arc. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc. Most self-shielded wires work well at an Arc Control setting of 5.

8A. WELD MODE SELECT-FOR MACHINES EQUIPPED WITH OPTIONAL ADVANCED PROCESS PANEL

(See Figure B.2 UPPER AND MIDDLE SECTION)
See (WELD MODE DETAILS) in this section.

To program welding modes, the **SELECT knob** is used to Scroll through all welding modes. The **MEMORY button** is used to store and access welding modes into locations M1 thru M8.

Modes:

In addition to the 5 welding modes described in **SECTION 7**, the **Advance Process Panel** allows you to select the Following additional modes.

• **Constant Power mode**

In the Power Mode;
The work point will be in the Volts window. The Amp window will have **CP** displayed indicating Constant Power. Once current starts flowing and during the 5 second “Hold” feature the displays will show Volts and Amps respectively.

• **Gouge Mode**

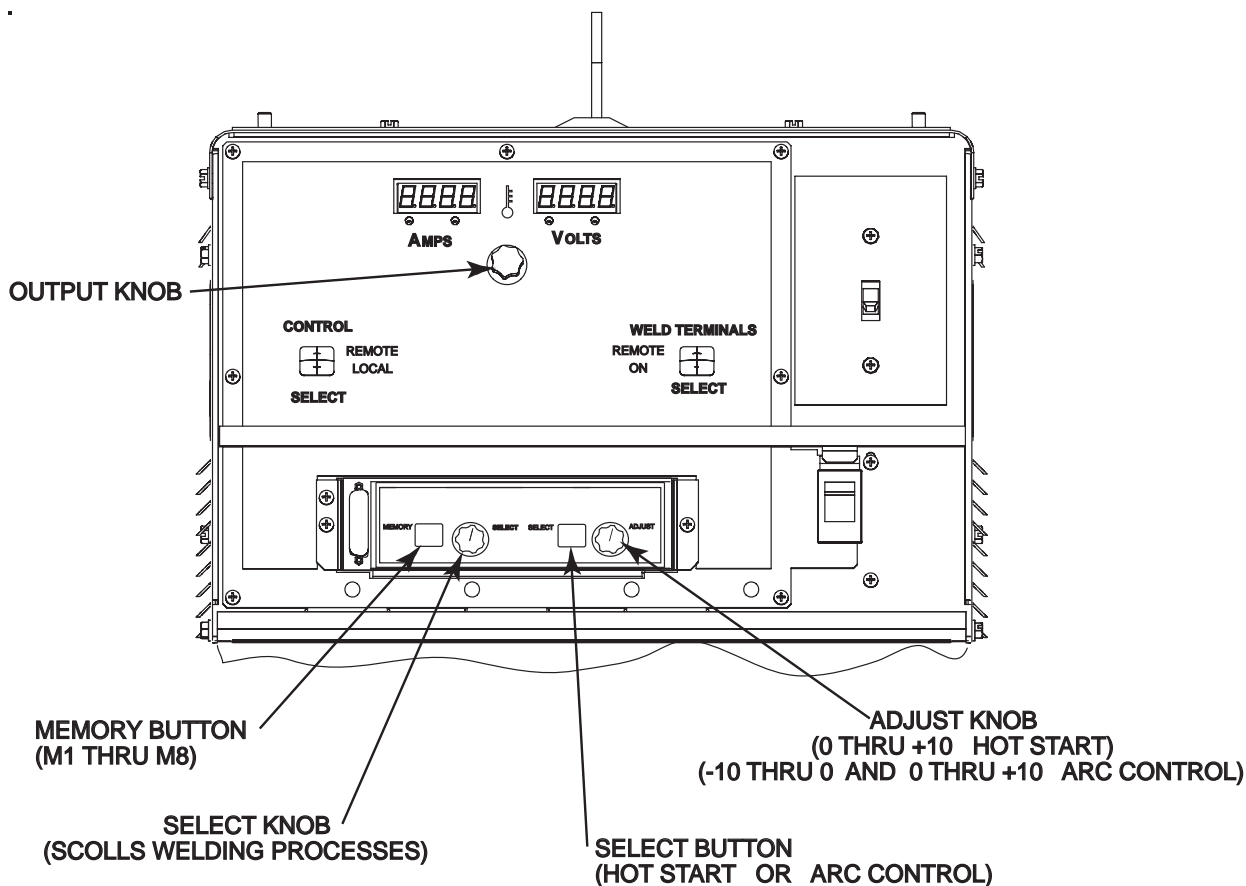
The gouging mode is specifically designed for carbon arc gouging with electrodes up to 3/8”.

• **Pulsed Modes**

In Pulse Modes;
The work point will be in the Amps window and should be set close to the wire feed speed of the wire feeder in inches per minute. The Volts window will have **SPd** displayed indicating Wire Feed Speed. Once current starts flowing and during the 5 second “Hold” feature the displays will show amps and volts.

Pulse Mode features that are displayed while selecting a Welding pulse mode are listed below:
Steel - .030”, .035”, .045”, .052”, 1/16” – Argon Blends
Stainless Steel - .030”, .035”, .045” – Argon Blends & Helium/Argon Blends
Aluminum - .035”, 3/64”, 1/16” – 4043 & 5356
Metal Core - .045”, .052”, 1/16” – Argon Blends
Nickel - .035”, .045” – Argon/Helium blends

FIGURE B.2



ADVANCE PROCESS PANEL- MIDDLE SECTION OF WELDER (OPTIONAL)

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MEMORY SELECTIONS:

(See *Figure B.2* for location of controls)

The **MEMORY button** and **SELECT knob** are used together to select a welding process and store it in memory (M1 thru M8). The **SELECT knob** scrolls through the welding process modes and memory M1 thru M8. The **MEMORY button** stores the welding process in memory.

- **SELECT button**" (The right button) selects between the "Hot Start" or "Arc Control". The < will indicate the active feature shown below.

Right Digital Window
 "Hot Start" (-10 to 0 +10)
 "Arc Control" (0 to 10) <

- The **ADJUST knob** adjusts the desired settings for the Hot Start or Arc Control feature that is active.

WELDING PROCESS MODES AVAILABLE

Stick SMAW, TIG GTAW
 Gouge CAG, CV MIG GMAW
 CV Flux Core, Pulse MIG

ELECTRODE MATERIAL

Steel, Metal Core, Stainless, Aluminum, Nickel

EXAMPLE OF SAVING WELDING MODES TO MEMORY

The following example is how to select **Pulse MIG** using .035 steel and store it into memory.

1. Turn the **SELECT knob** until welding process is displayed.

RIGHT WINDOW	LEFT WINDOW
Pulse MIG	Argon Blends
Steel .035	

2. Wait two seconds and the right window will display Arc Control on the second line on the right side.

Pulse MIG	Argon Blends
Steel .035	Arc Cntrl ### <

3. **SPd** is displayed in the upper right **Volts** window. The left **Amps** window matches the desired wire feed speed that is set on the wire feeder. Adjust the **OUTPUT knob** until desired number is displayed.

4. Start welding. If the arc length is too short, turn the **Output knob** up. If the arc length is too long, turn the **Output knob** down.

The Arc Control, which is displayed in the right digital window, can be used to fine-tune the arc length and characteristics.

5. After all adjustments have been made press and hold the **MEMORY button** until the display changes. The right and the left window will display a memory position, for example M1 (or turn knob to select memory of your choice). To store in M1, push the **MEMORY button** again to save the Pulse Mig mode to memory M1.

6. The display in the digital windows read as follows:
 M1 Pulse MIG Argon Blends
 Steel .035 Arc Cntrl 1.2

7. To save a second welding mode to a memory position of your choice, turn the **SELECT knob** until the desired welding process mode is displayed in right digital window. Then follow steps 2 thru 6.

8. Adjust the output control to the correct wire feed setting and the V450-PRO is ready to weld again. (**NOTE:** The wire feed speed setting is not stored in memory and will need to be reset.)

9. Adjust the Arc Control and note that the M1 goes away indicating that the V450-PRO settings no longer match what is stored in memory. Going back to the original settings will not bring the M1 back. You will need to push the **MEMORY button** to recall the original settings in M1.

NOTE: After all memory; M1 thru M8, are used and the welder needs to store another welding process, a new welding process will overwrite what was originally in the memory and will read:

Save to MEM
 M1 Overwrite

M1, which previously stored Pulse Mig, is now overwritten with the new welding process.

WELD MODE DETAILS:

Mode	Range	Comments
Stick Soft	55 - 570 amps	The stick soft mode is the best selection for general stick applications. Arc Control = Arc Force Hot Start = Initial hot start current (min = start a match set amps, Max. = greatest hot start current) During hot start, arc force is set at high and is fast response. For gouging applications: Turn current up to 570 amps.
Stick Crisp	55 - 570 amps	The stick crisp mode features an aggressive arc force routine well suited for Exx10, Exx11 series electrodes. Arc Control = Arc Force Hot Start = Initial hot start current (Mid range = welding current and will vary up and down with knob control.) During hot start, arc force is set at high and is fast response. For gouging applications: Turn current up to 570 amps.
GTAW (Tig mode)	5 - 570 amps	The tig mode produces a soft, steady constant current waveform for either touch start or high frequency assisted start DC GTAW applications. Hot Start = Min to Mid range = Touch start with low OCV Mid to Max range = High frequency assisted starting with adjustable OCV up to 70 volts.
GMAW - CV	10 - 45 volts	The GMAW - CV mode is the best selection for general MIG welding, Metal core, and gas shielded applications. Arc Control = Pinch (Min = min pinch, softest arc), (Max = max pinch, crispest arc)
FCAW-SS	10 - 45 volts	The FCAW-SS mode is designed for Self Shielded Innershield products that require tight voltage control. For example; the NR 203 series or NR 207) Arc Control = Pinch (Min = min pinch, softest arc), (Max = max pinch, crispest arc)
ADVANCED PULSE PANEL WELDING PROGRAMS		
Gouging	60 - 570 amps	The gouging mode is specifically designed for carbon arc gouging with electrodes up to 3/8".
GMAW - Power	0.1 - 20 KW	The GMAW - power mode is similar in operation to other GMAW modes. The power mode features a very stable short arc performance, which is especially good when welding small diameter (.025 and .030 steel and stainless) wires for low procedures. The short arc steel and stainless applications, a fast response for spray applications, and a drooper type spray mode characteristic for Aluminum.

PULSE PROGRAMS:

MODE	IPM*	COMMENTS
.030 Steel	75 - 800	<p>The V450 pulse programs are non-synergic and allow independent control of the wire feed speed and the arc length. The Output Control Knob on the V450, adjusts an "SPD" value. Similar to trim, the "SPD" value indicates the relative arc length setting. The value of "SPD" is meant to be a starting point at which to set the arc length relative to the wire feed speed. Depending on the application, the "SPD" value can be adjusted to obtain the desired arc length.</p> <p>The "SPD" value displayed on the V450 may not match the actual wire feed speed!</p> <p>The operation of the Arc Control knob on the V450 is similar to the Power Wave series. As Arc Control is increased, the frequency is increased and the background reduced. Decreasing Arc Control will reduce frequency and increase background current. Arc Control acts to fine tune the arc plasma to the specific application. Preferred gas selections:</p> <p>Steel Argon Blends = Argon with CO₂ additions from 2 to 20 % or Oxygen additions from 2 to 5%.</p> <p>Stainless Argon Blends = Argon with Oxygen additions up to 2%.</p> <p>Stainless He Ar CO₂ = ~ 90% Helium, 7 1/2 % Argon 2 1/2 CO₂ Aluminum 100% Argon</p> <p>The Nickel Alloy pulse programs are non adaptive. The operator sets the output control knob to deliver the correct arc length at the desired wire feed speed and stick out. While welding, the operator manipulates the stick out to maintain the correct arc length. This method of operation produces very stable arc performance considering the nature of nickel alloys. Preferred gas: Argon/Helium Blends = for the best results add helium to the argon base from 0-25%.</p>
.035 Steel	50 - 800	
.045 Steel	60 - 800	
.052 Steel	60 - 750	
1/16 Steel	60 - 600	
.045 Metal Core	60 - 700	
.052 Metal Core	60 - 500	
1/16 Metal Core	60 - 500	
.030 Stainless Ar Blends	100 - 800	
.030 Stainless He Ar CO ₂	100 - 800	
.035 Stainless Ar Blends	70 - 800	
.035 Stainless He Ar CO ₂	70 - 700	
.045 Stainless Ar Blends	50 - 700	
.045 Stainless He Ar CO ₂	60 - 700	
.035 Aluminum 4043	125 - 700	
.035 Aluminum 5356	130 - 750	
3/64 Aluminum 4043	85 - 600	
3/64 Aluminum 5356	85 - 700	
1/16 Aluminum 4043	55 - 300	
1/16 Aluminum 5356	65 - 400	
.035 Nickel Alloys (Non Adaptive)	60 - 700	
.045 Nickel Alloys (Non Adaptive)	60 - 600	
PULSE ON PULSE		
.035 4043 (4x Pulse on Pulse)	125 - 600	<p>Arc Control = Pulse on Pulse frequency. For faster travel speed welds, the arc control should be increased.</p> <p>For larger puddle, slower travel speeds, the arc control should be decreased.</p>
3/64 4043 (4x Pulse on Pulse)	85 - 400	
1/16 4043 (4x Pulse on Pulse)	65 - 315	
.035 5356 (5x Pulse on Pulse)	140 - 700	
3/64 5356 (5x Pulse on Pulse)	100 - 550	
1/16 5356 (5x Pulse on Pulse)	75 - 360	

*IPM (INCHES PER MINUTE)

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LN-10/DH-10 Wire Feeder Compatibility Note:

The LN-10 and DH-10 feeders can be used to pulse weld and in the power mode with the panel. The displays on the LN-10 & DH-10 do not show the wire feed speed or power.

9. SERIAL PORT FOR SOFTWARE UPDATES

10. HOT START and ARC CONTROL features have different functions depending on the welding Mode that is active. Each feature is described under the welding mode heading. (**See Item 8 or 8A for specified Mode Operations**) (**See Figure B.1 or B.2**)

LOWER CASE PANEL (See Figure B.1)

The output studs, Meter Polarity switch and remote connector are located on the lower case front.

11. Both Output terminals are "STUD" connectors.

12. The **METER POLARITY** switch is located above the output connectors. The switch provides a work connection for wire feeder voltmeters. Place the switch in the position of the electrode polarity indicated by the decal. **The switch does not change the welding polarity.**

13. 6-pin MS-style connector for remote control.

14. 14-PIN MS-style connector for wire and remote control.

15. AUXILIARY POWER

- 115VAC, 42VAC and 24VAC power is available from the 14-pin MS-style connector.
- 42 VAC supply is rated at 10 amps.
- 24 VAC supply is rated at 10 amps.
- 115VAC outlet rated at 15* amps.

* Earlier models used a 10 amp circuit breaker.

REMOTE CONTROL SELECTION

The Invertec® V450-Pro has auto sensing of remote output controls. If after connecting or removing a remote, the Invertec® V450-Pro did not configure the way you would like the local or remote control settings can be changed by pushing the OUTPUT CONTROL or WELD TERMINAL button. (A user cannot select between the 6 and 14 pin MS-style connectors.)

CV modes

- The remote will default to the 14-pin MS-style connector if a remote is connected. If no remote is connected to the 14-pin MS-style connector, then the remote will default to the 6-pin MS-style connector if a remote is connected to it.
- In all of the CV modes, the WELD TERMINAL control will default to REMOTE.

TIG Mode

- The remote will default to the 6-pin MS-style if a remote control is connected to the 6-pin MS-style and to the 14-pin MS-style connector. If a remote is not connected to the 6-pin MS-style connector, then the remote will default to the 14-pin MS-style connector if a remote is connected.
- If a remote control is connected to any of the MS-style connectors, the WELD TERMINAL control will default to REMOTE. If there are not any remote control devices attached, the WELD TERMINAL control will default to ON.

CC-Stick Modes

- The remote will default to only the 6-pin MS-style connector if a remote is connected to it.
- The WELD TERMINAL control will default to ON with or without a remote connected.

Types of Remote OUTPUT CONTROL

- The Invertec® V450-Pro's Output Control can be controlled by either a potentiometer connected between 77 & 75 with the wiper connected to 76 or a 0V to 10V DC supply connected between 76 & 75. (76 needs to be positive)
- 14-Pin Ms-style connector lead 75 is pin G, lead 76 is pin F and lead 77 is pin E.
- 6-Pin Ms-style connector lead 75 is pin C, lead 76 is pin B and lead 77 is pin A.

Potentiometer Control

- The total resistance should be between 2,000 ohms (2K) and 10,000 ohms (10K)
- The machine output will be at minimum when lead 76 (wiper) is at the end of the potentiometer that is connected to 75. The machine's output will increase as the wiper of the potentiometer is moved to the end that is connected to 77. (Note: In TIG mode, moving the lead 76 (wiper) to lead 77 would produce the current that has been set by the Invertec® V450-Pro's front panel Output Control.)
- Remotes of this type offered by Lincoln Electric are the K857, K812 and K870.

Voltage Control

- The supply should be an isolated supply. (Not referenced to earth ground, any auxiliary power from the Invertec® V450-Pro or the welding output) The supply should be capable of supplying at least 20mA.
- 0 volts supplied to 76 will set the Invertec® V450-Pro to minimum output for the mode that has been selected while 10 volts supplied to 76 will set the Invertec® V450-Pro to the maximum output for the mode. (**NOTE:** In TIG mode, 10 volts supplied to lead 76 would produce the current that has been set by the Invertec® V450-Pro's front panel Output Control.)

INVERTEC® V450-PRO



Types of Remote WELD TERMINAL Control

- The Invertec® V450-Pro's Weld Terminals can be controlled from each of the MS-style connectors. The circuit has a nominal OCV of 15VDC and requires a dry contact closure (less than 100 ohms) to activate the output of the Invertec® V450-Pro.
- 14-Pin MS-style connector, the Weld Terminals are controlled from pin C (lead 2) and pin D (lead 4). Pin C is positive.
- 6-Pin MS-style connector, the Weld Terminals are controlled from pin D (lead 2) and pin E (lead 4). In the 6-pin MS-style connector pin D is positive.

LIMITATIONS

- The V450-Pro is not recommended for processes other than those listed.
- The V450-Pro can only be used with the recommended equipment and options.

RECOMMENDED PROCESSES

Properly equipped, the Invertec® V450-Pro supports GMAW-P, FCAW, SMAW, GTAW and CAC-A processes for a variety of materials, including mild steel, stainless steel, cored wires, and aluminum.

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OPTIONS / ACCESSORIES

K857	Remote Output Control
K814	Arc Start Switch
K812	Hand Operated Amptrol
K870	Foot Operated Amptrol

NOTE: All of the above remote controls connect directly to the 6-pin MS-style connector, with either a K864 or K876 adapter and connect it to the 14 pin wire feeder MS-style connector. (See Diagram in Operator Manual)

K930-[]	TIG Module
K428, K446, K449	LN-25 *
K617 (-1 or -2) K618 (-1 or -2)	LN-742
K2327-[]	LF-72
K2426-[]	LF-74
K1559-1, K1564-1	LN-10
K1499-1, K1521-1	DH-10
K1587-1	Cobramatic

*Not recommended for pulse welding

FIELD INSTALLED OPTION (ALL VERSIONS)

- **K1763-1** Advanced Process Panel

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SAFETY PRECAUTIONS

⚠ WARNING



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



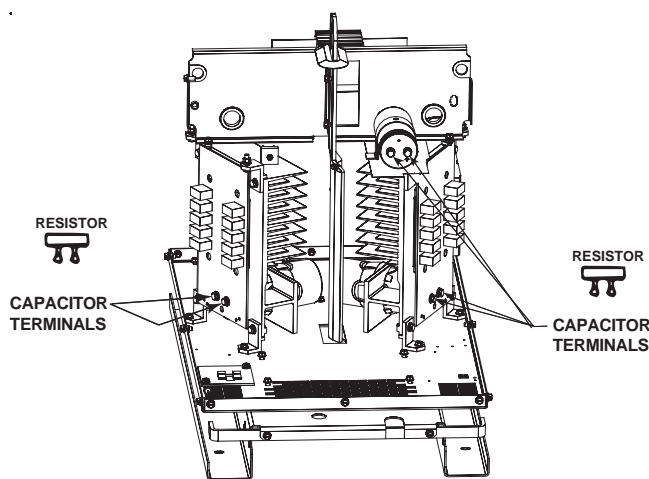
EXPLODING PARTS can cause injury.

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

See additional warning information throughout this Operator's Manual

CAPACITOR DISCHARGE PROCEDURE

1. Obtain a power resistor (25 ohms, 25 watts).
2. Hold resistor body with electrically insulated glove. **DO NOT TOUCH TERMINALS.** Connect the resistor terminals across the two studs in the position shown. Hold in each position for 1 second. Repeat for all three capacitors.



3. Use a DC voltmeter to check that voltage is not present across the terminals on three capacitors.

VISUAL INSPECTION

Clean interior of machine with a low-pressure air stream. Make a thorough inspection of all components. Look for signs of overheating, broken leads or other obvious problems. Many problems can be uncovered with a good visual inspection.

ROUTINE MAINTENANCE

1. Every 6 months or so, the machine should be cleaned with a low pressure airstream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean these areas:
 - All printed circuit boards
 - Power switch
 - Main transformer
 - Input rectifier
 - Auxiliary Transformer
 - Reconnect Switch Area
 - Fan (Blow air through the rear louvers)
2. Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to insure that high voltage parts are protected and correct spacings are maintained. All external sheet metal screws must be in place to insure case strength and electrical ground continuity.

OVERLOAD PROTECTION

The machine is electrically protected from producing high output currents. Should the output current exceed 570A, an electronic protection circuit will reduce the current to approximately 100A. 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

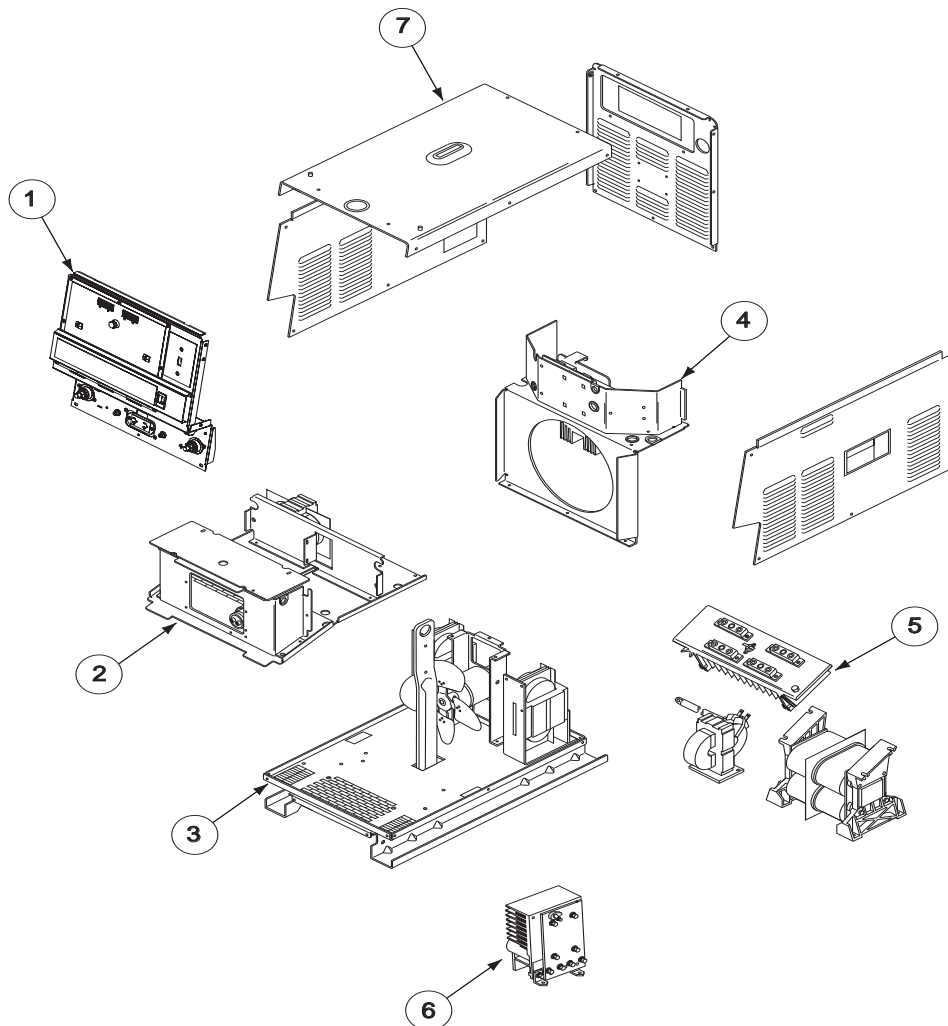
Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostat will prevent output voltage or current.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

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.

See *Voltage Current Calibration Procedure*.

1. Case Front Assembly
2. Control Box & Horizontal Plate
3. Base, Lift Bale & Fan Assembly
4. Input Assembly
5. Transformer & Output Assembly
6. Switch Board Heatsink Assembly
7. Covers Assembly

Figure D.1 - Major Component Location



INVERTEC® V450-PRO



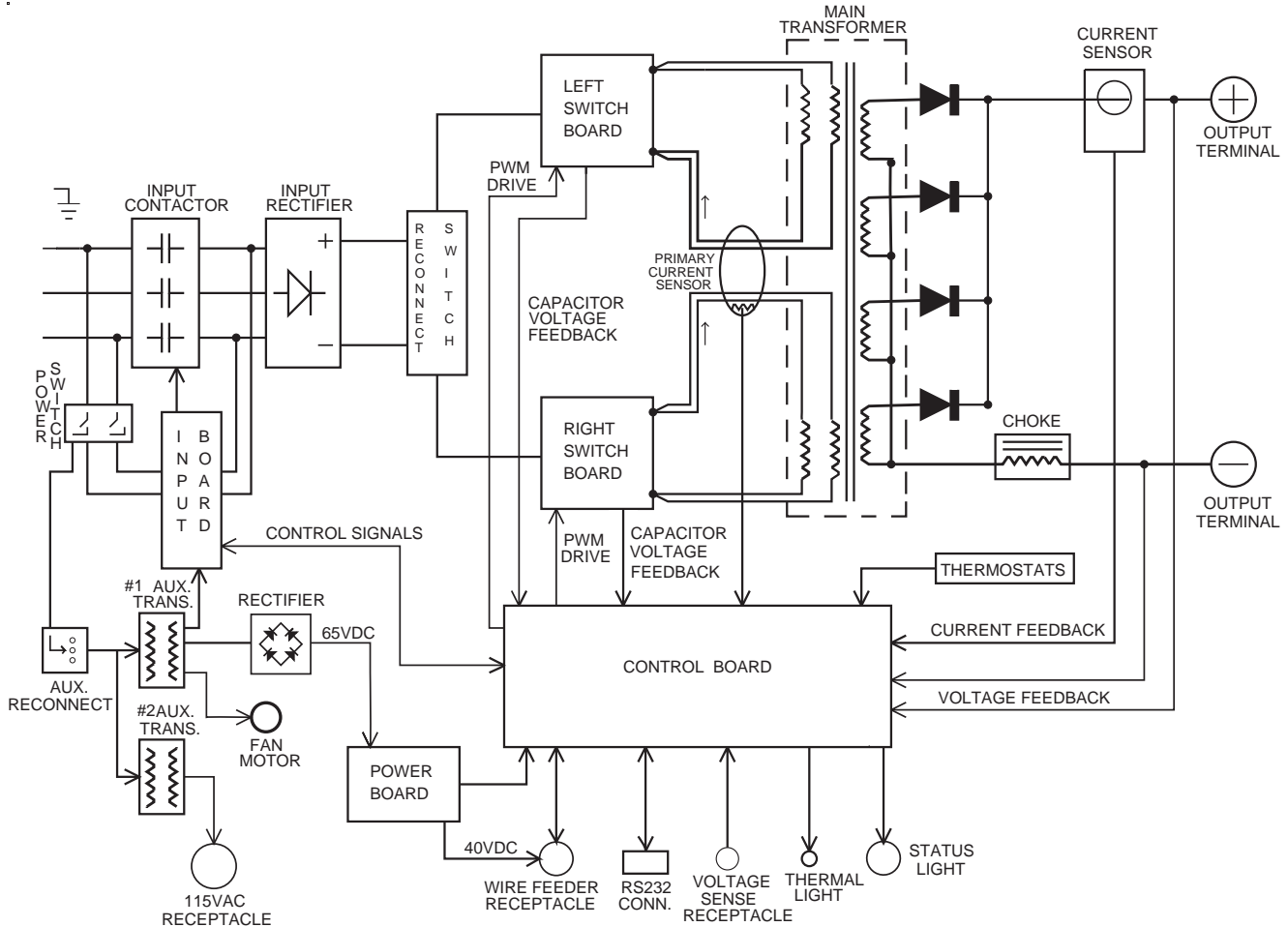
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FIGURE E.1 BLOCK LOGIC DIAGRAM



INVERTEC® V450-PRO



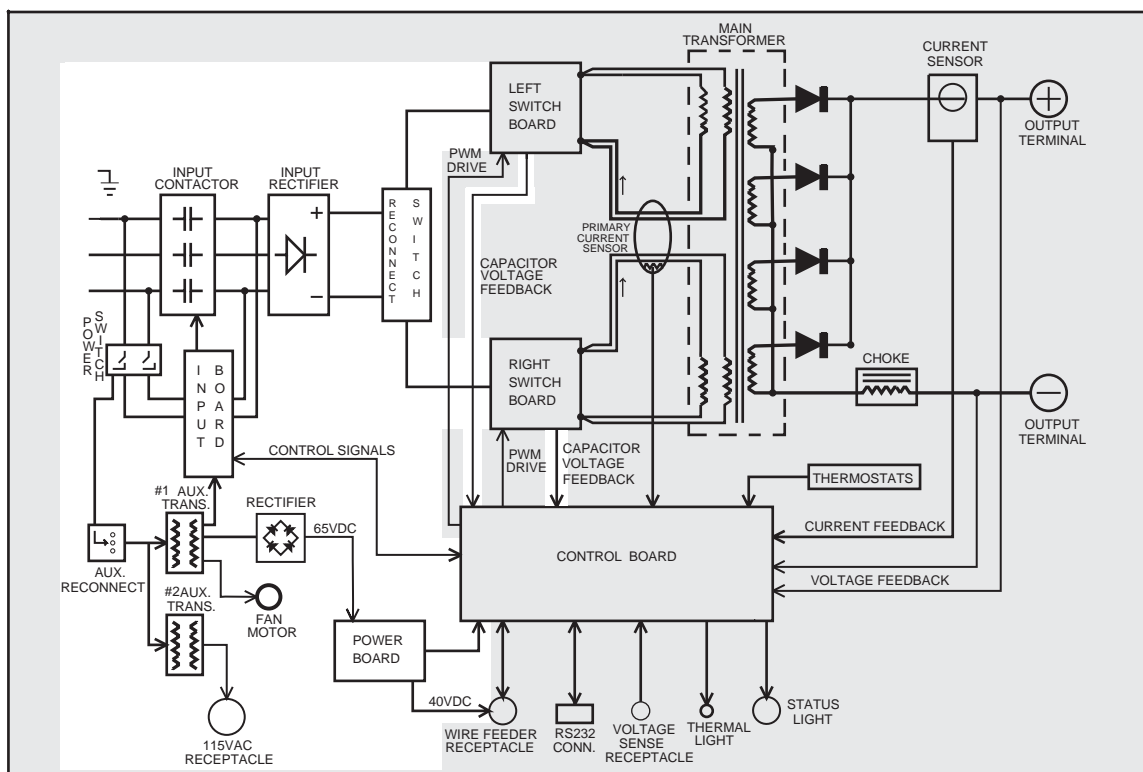
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FIGURE E.2 - INPUT VOLTAGE AND PRECHARGE.



POWER SOURCE GENERAL DESCRIPTION

The INVERTEC® V450-PRO is an inverter based welding power source that is designed to be a multi-process welding system. It is a high performance, digitally controlled inverter capable of complex, high-speed waveform control. With the appropriate modular components it can support constant current, constant voltage and pulse welding processes. The output rating is 450 amps at 36 volts with a 100% duty cycle.

INPUT VOLTAGE AND PRECHARGE

The INVERTEC® V450-PRO can be connected for a variety of three phase voltages. Refer to Figure E.2. The initial input power is applied to the INVERTEC® V450-PRO through a line switch located on the front of the machine. Two phases of the three-phase input power is applied to the input board and both auxiliary transformers. The various secondary voltages developed by the #1 auxiliary transformer are applied to the input board, the power board rectifier and the fan motor. The 115 VAC secondary voltage developed by the No. 2 auxiliary transformer is applied to the 115 VAC receptacle.

The 65 VDC produced from the power board rectifier is utilized by the power board to provide various DC voltages for the control board and wire feeder.

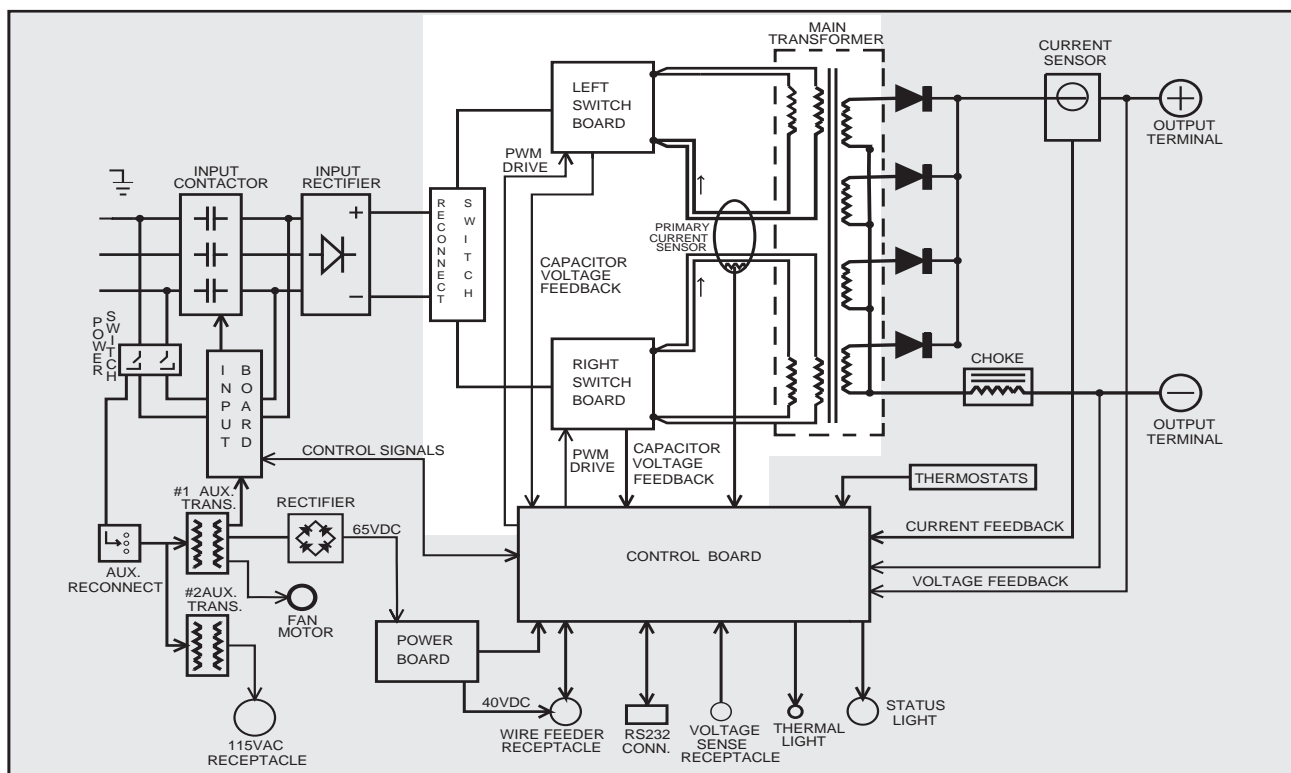
The two phases, which are connected to the input board through the power switch, are connected to the input rectifier. During precharge or “soft start” these two phases are current limited by the input board. This AC input voltage is rectified, and the resultant DC voltage is applied through the reconnect switches to the input capacitors located on the switch boards. The control board monitors the voltage across the capacitors. When the capacitors have charged to an acceptable level, the control board signals the input board to energize the main input contactor making all three phases of input power, without current limiting, available to the input capacitors. At this point, the INVERTEC® V450-PRO is in the “Run Mode” of operation. If the capacitors become under or overvoltage, the control board will signal the input board to de-energize the main input contactor, and the INVERTEC® V450-PRO will be disabled.

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

INVERTEC® V450-PRO



FIGURE E.3 – SWITCH BOARDS AND MAIN TRANSFORMER



SWITCH BOARDS AND MAIN TRANSFORMER

There are two switch boards in the INVERTEC® V450-PRO, each containing an input capacitor and insulated gate bipolar transistor (IGBT) switching circuitry. Refer to Figure E.3. When the machine reconnect switches are configured for a lower input voltage (below 300 VAC) the input capacitors are connected in parallel. When the machine is configured for higher input voltages (300 VAC and above) the input capacitors are connected in series.

When the input capacitors are fully charged they act as power supplies for the IGBT switching circuit. The Insulated Gate Bipolar Transistors switch the DC power, from the input capacitors, “on and off” thus supplying pulsed DC current to the main transformer primary windings. See *IGBT Operation Discussion and Diagrams* in this section.

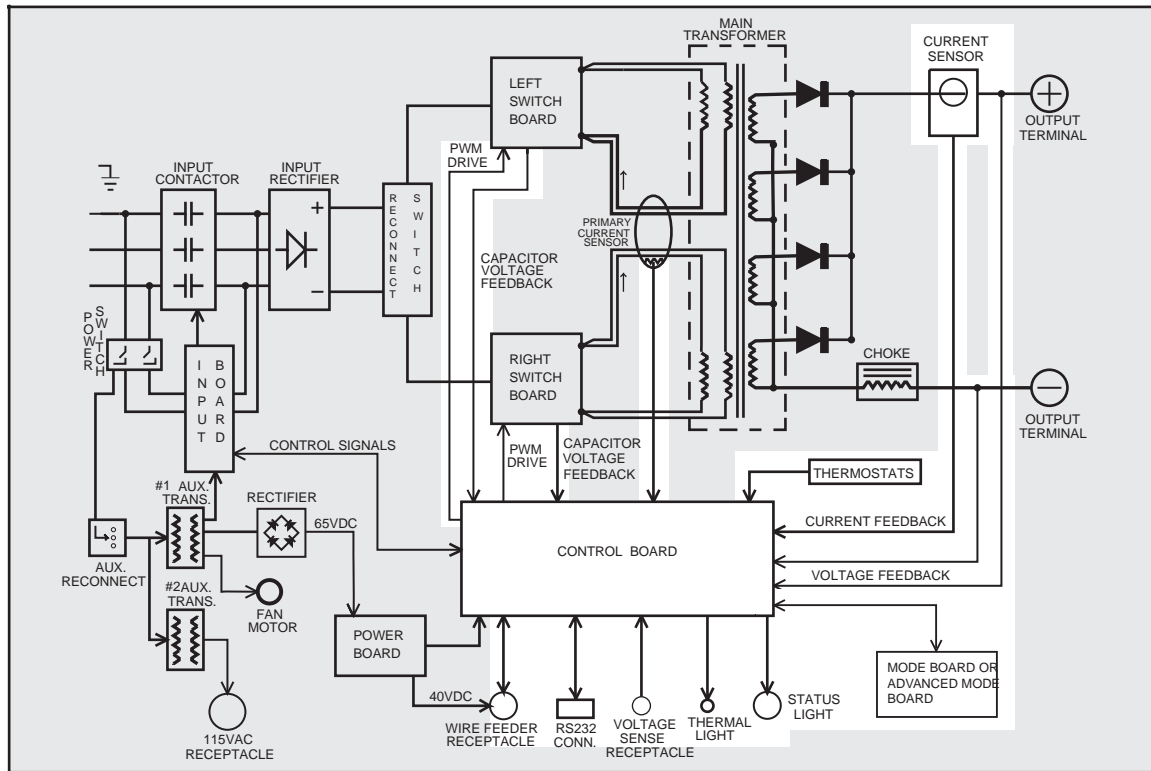
Each switch board feeds current to a separate, oppositely wound primary winding of the main transformer. The reverse directions of current flow through the main transformer primaries and the offset timing of the IGBT switch boards induce an AC square wave output signal at the secondary of the main transformer. These primary currents are monitored by the current transformer (CT). If the primary currents become abnormally high, the control board will shut off the IGBTs, thus disabling machine output. The DC current flow through each primary winding is clamped back to each respective input capacitor when the IGBTs are turned off. This is needed due to the inductance of the transformer primary winding. The firing of the two switch boards occurs during halves of a 50 microsecond interval, creating a constant 20 kHz output.

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

INVERTEC® V450-PRO



FIGURE E.4 - CONTROL BOARD & MODE SELECTION BOARD



CONTROL BOARD & MODE SELECTION

The control board performs the primary interfacing functions to establish and maintain output control of the INVERTEC® V450-PRO. Refer to Figure E.4. The control board sends and receives digital command information through the wire feeder receptacle and or the RS232 connector. The software that is contained within the control board processes and compares these commands with the voltage and current feedback information it receives from the current sensor and voltage sensing leads. The appropriate pulse width modulation (PWM) signal (See **Pulse Width Modulation** in this section) is sent to the switch board IGBTs. In this manner, the digitally controlled high-speed welding waveform is created.

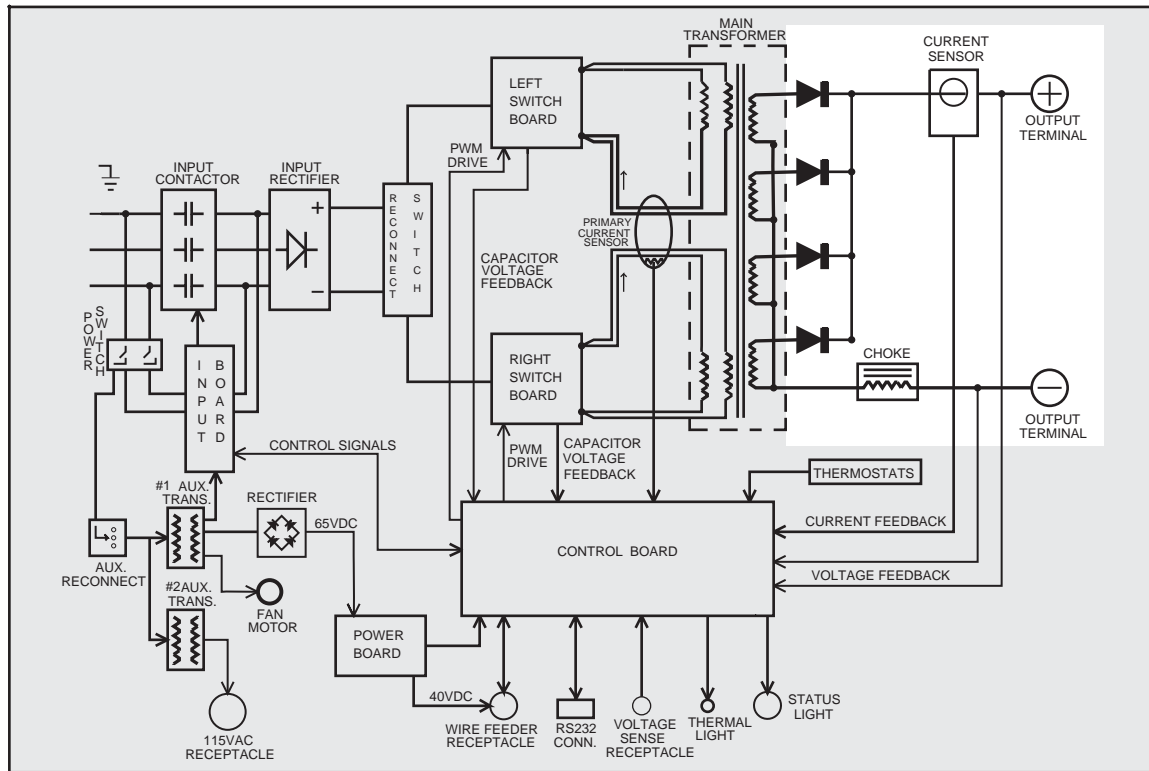
The control board also monitors the thermostats, main transformer primary current, and capacitor voltage, and activates either the thermal light and/or the status light. Dependent upon the fault situation, the control board will either disable or reduce machine output, or de-energize the main input contactor.

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

INVERTEC® V450-PRO



FIGURE E.5 - OUTPUT RECTIFIER AND CHOKE



OUTPUT RECTIFIER AND CHOKE

The output rectifier receives the AC output from the main transformer secondary and rectifies it to a DC voltage level. Since the output choke is in series with the negative leg of the output rectifier and also in series with the welding load, a filtered DC output is applied to the machine output terminals. See Figure E.5.

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

INVERTEC® V450-PRO

LINCOLN
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THERMAL PROTECTION

Two normally closed (NC) thermostats protect the machine from excessive operating temperatures. These thermostats are wired in series and are connected to the control board. One of the thermostats is located on the heat sink of the output rectifier and the other is located near the fan. (On later production machines this thermostat is located on the output choke) Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond its duty cycle or output rating. If excessive operating temperatures should occur, the thermostats will prevent output from the machine. The yellow thermal light, located on the front of the machine, will be illuminated. The 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 are obstructed, then the power must be removed from the machine, and the fan problem or air obstruction corrected. The F.A.N. (fan as needed) system is controlled by the control board via a solid-state relay.

PROTECTIVE CIRCUITS

Protective circuits are designed into the INVERTEC® V450-PRO to sense trouble and shut down the machine before damage occurs to the machine's internal components.

OVER CURRENT PROTECTION

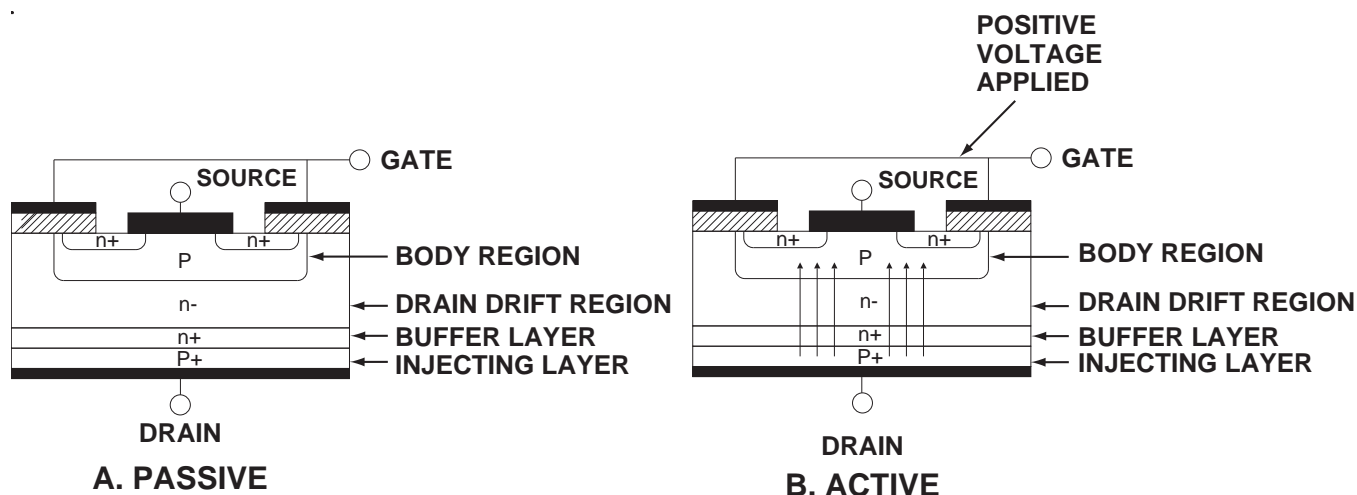
If the average current exceeds 590 amps, then the peak current will be limited to 100 amps until the average current decreases to fewer than 50 amps.

UNDER/OVER VOLTAGE PROTECTION

A protective circuit is included on the control board to monitor the voltage across the input capacitors. In the event that a capacitor voltage is too high, or too low, the protection circuit will de-energize the input contactor. Machine output will be disabled and the "soft start" mode will be repeated. The protection circuit will prevent output if any of the following circumstances occur.

1. Capacitor conditioning is required. (May be required if machine has been off for a long period of time and is connected for high input voltage operation.)
2. Voltage across a capacitor exceeds 390 volts. (High line surges or improper input voltage connections.)
3. Voltage across a capacitor is under 70 volts. (Due to improper input voltage connections.)
4. Internal component damage.

FIGURE E.6 - IGBT OPERATION



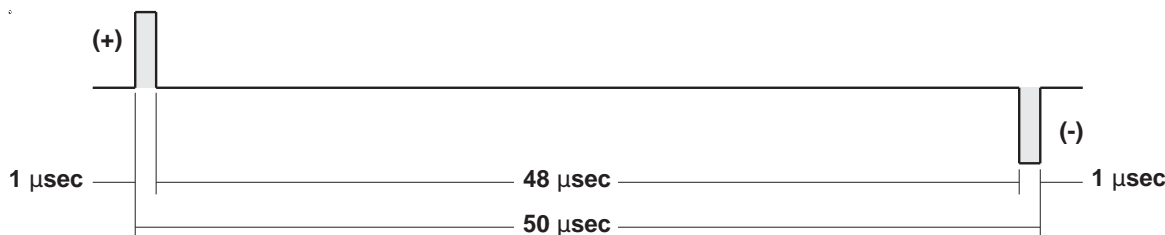
INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBT are semiconductors well suited for high frequency switching and high current applications.

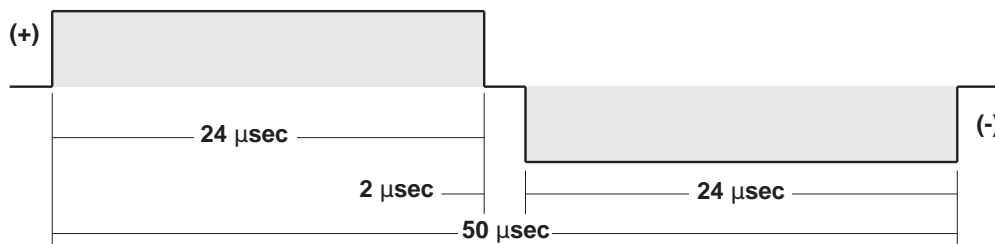
Example A in Figure E.6 shows an IGBT in passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned OFF like a light switch.

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

FIGURE E.7 - TYPICAL IGBT OUTPUTS



MINIMUM OUTPUT



MAXIMUM OUTPUT

PULSE WIDTH MODULATION

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 IGBT is turned on and off for different durations during the cycle. The top drawing in Figure E.7 shows the minimum output signal possible over a 50-microsecond time period.

The positive portion of the signal represents one IGBT group¹ conducting for one microsecond.

The negative portion is the other IGBT group¹. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only two microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signal on for 24 microseconds each, and allowing only two 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 that is under the curve indicates that more power is present.

¹An IGBT group consists of two IGBT modules feeding one transformer primary winding.

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).

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

Step 2. PERFORM EXTERNAL TESTS.

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

Step 3. RECOMMENDED COURSE OF ACTION

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

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

⚠ CAUTION

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

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

**ELECTRIC SHOCK
can kill.**

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

⚠ CAUTION

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

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

PC board can be damaged by static electricity.

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

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

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

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

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

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

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

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

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

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.

a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.

b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.

6. Always indicate that this procedure was followed when warranty reports are to be submitted.

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal covers are removed.		Contact the Lincoln Electric Service Department at 1-888-935-3877.
The input fuses repeatedly fail or the input circuit breakers keep tripping.	<ol style="list-style-type: none"> 1. Input fuses or breakers may be improperly sized. 2. The reconnect panel may not be configured properly for the applied voltage. 	<ol style="list-style-type: none"> 1. Check the reconnect panel connections and associated wiring. See the Wiring Diagram and Input Information in Section A for the proper input voltage. Check the input voltage and make sure it is correct.
The input fuses fail or input breakers trip after the CR-1 contactor closes	<ol style="list-style-type: none"> 1. Input fuses or breakers may be improperly sized. 2. The reconnect panel may not be configured properly for the applied voltage. 3. A component in the input circuitry has failed. 	<ol style="list-style-type: none"> 1. Check the re-connect panel connections and associated wiring. See the Wiring Diagram and Input Information in Section A. 2. Perform the Input Rectifier Test. If the Input Rectifier is defective, perform tests 3 and 4. 3. Perform the IGBT Switch Board Test. 4. Perform the Input 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 1-888-935-3877.

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
<p>The machine is dead - - no lights - - no output - - the machine appears to have no power.</p>	<ol style="list-style-type: none"> 1. Make sure the input power switch SW1 is in the ON position. 2. Check the main input fuses or breakers and make sure all three phases are present. 3. Check the CB3 breaker (located in the reconnect area). Reset if tripped. 	<ol style="list-style-type: none"> 1. Check the input power switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram or Machine Diagram for the welder in Section G. 2. Replace or reset input fuses or breaker. 3. If CB-3 opens repeatedly, perform the Auxiliary Transformer Test. 4. The power board rectifier may be faulty. Check the rectifier and associated wiring. See the Wiring Diagram or Machine Diagram for the welder in Section G. 5. Perform the Power Board Test. 6. Perform the Control Board Check. The Control Board may be faulty.
<p>The Auxiliary Receptacle is "dead". No 120VAC present.</p>	<ol style="list-style-type: none"> 1. Check CB-2 on the case front. Reset if necessary. 2. Check CB-3 in the reconnect area. Reset if necessary. 3. Make sure all three input phases are present 	<ol style="list-style-type: none"> 1. Check the receptacle and associated wiring. See the Wiring Diagram or Machine Diagram in Section G. 2. Perform the Auxiliary Transformer Test #2.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
<p>The INVERTEC® V450-PRO does not have welding output. The main input contactor (CR1) is not activating.</p> <p>NOTE: This problem will normally be accompanied by an error code.</p> <p>The Diagnostic Utility is also available on the Service Navigator.</p>	<ol style="list-style-type: none"> 1. The input voltage may be too high or too low or reconnect panel may be incorrectly connected 2. May be a thermal shutdown. Check to see if the Thermal LED is ON 3. The primary current limit has been exceeded (CR1 drops out when the output is initiated). 4. The power source (upper section) has failed. If nothing is evident from a visual inspection, perform tests as shown. <p>NOTE: Error codes as indicated by LED 9 and 10 on the Control Board.</p>	<ol style="list-style-type: none"> 1. Make certain that the input voltage is proper, according to the Rating Plate located on the rear of the machine. See Installation Section of this manual. 2. See “Thermal LED is ON” in this section. 3. Possible short in output circuit. Turn machine off. Remove all leads from the output of the machine. 4. Perform the Input Contactor Test. 5. Perform the Input Board Test. 6. Perform the Auxiliary Transformer test for T-1 7. Perform the Input Rectifier test. 8. Perform the IGBT Switch Board Test. 9. Perform the Power Board Test. 10. Perform the Control Board Check. The Control Board may be faulty.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Thermal light is ON. The machine regularly “overheats.”	<ol style="list-style-type: none"> 1. The welding application may be exceeding the recommended duty cycle and/or limits of the machine. 2. Dirt and dust may have clogged the cooling channels inside the machine. Refer to the Maintenance Section of this manual. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance around the machine. Check the upper section of the machine and AC/DC switch lower section intakes. 4. Make sure the fan is functioning correctly. Machines are equipped with F.A.N. (fan as needed) circuitry. The fans run whenever the output is enabled and will continue running for a period of time (approximately 5 minutes) after the output is disabled. 	<ol style="list-style-type: none"> 1. One of the thermostats may be faulty. Also check associated wiring for loose or faulty connections. See the Wiring Diagram or the Machine Diagram in Section G. There are a total of 2 thermostats in the system. 2. Temporarily jumper out the thermostat circuit at the Control Board. See the Machine Diagram in this manual to jump this circuit function for test only. If the machine does not reset, the Control Board is defective. If it does reset, perform the Thermostat Test. 3. Temporarily jump around the fan relay contacts to test fan relay function. See the Machine Diagram in Section G to test the fan relay function. <p>CAUTION: 120VAC is used to run the fan.</p>

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELD AND ARC QUALITY PROBLEMS		
General degradation of weld performance.	<ol style="list-style-type: none"> 1. Wire feed problem. 2. Cabling problems. 3. Verify weld mode is correct for process. 4. Machine calibration. 	<ol style="list-style-type: none"> 1. Check for proper wire speed and consistent feeding. 2. Check for poor connections and/or excessive loops in the weld cables. <p>NOTE: The presence of heat in external welding circuits indicates poor connections or undersized weld cables.</p> <ol style="list-style-type: none"> 3. Select the correct weld mode for the application. Refer to the Instruction Manual. 4. Perform Choke Test. 5. Perform Current Transducer Test and Check Sense Lead Routing.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELD AND ARC QUALITY PROBLEMS		
<p>Machine shuts down during a weld.</p> <p>NOTE: The Diagnostic Utility can be used to check the 'event log' to determine cause of shut-down.</p>	<p>1. Secondary over-current occurred.</p>	<p>1. Adjust parameters to minimize momentary shorting of the arc.</p> <p>2. Check for single phase input, (loss of L2) which will reduce the secondary current limit. Check input fuses or current in all three phases for balance (+/- 5 amps).</p>

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

STATUS LIGHTS ARE LED'S 9 AND 10 ON CENTER TOP OF CONTROL BOARD

Fault Codes			
Code	Description		Corrective Action
31	Primary over current.	If condition persists contact an authorized Lincoln Field Service Shop	The machine needs to be turned off and back on to reset the machine.
32	CAP bank A under voltage.	Check input power reconnect to make sure the machine is connected for the input power being supplied.	Self-clearing as condition ceases.
33	CAP bank B under voltage.		
34	CAP bank A over voltage.		
35	CAP bank B over voltage.		
37	Soft start Failed.		
39	Glitch on the primary over current fault interrupt; possibly caused by noise or a signal level (misc. hardware fault #1)	Check the machine ground. If problem persists contact an authorized Lincoln Field Service Shop	Self-clearing as condition ceases.
43	CAP delta; CAP A and B are out of balance.	Check input power reconnect to make sure the machine is connected for the input power being supplied.	
44	Main CPU problem. The DSP has detected a problem with the CPU.	Check the machine ground.	
47	Possible erroneous electrical noise on Voltage/Frequency capacitor feed back circuit. (misc. hardware fault #2)	If problem persists contact an authorized Lincoln Field Service Shop	
48	The main contactor opened unexpectedly. (misc. hardware fault #3)	If condition persist contact an authorized Lincoln Field Service Shop	Self-clearing
"bad node' "####"	The selected weld mode does not exist in the weld table that is presently loaded in the machine.	If condition persists contact an authorized Lincoln Field Service Shop	Press the Mode Select button to select a different mode

CAUTION

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

INVERTEC® V450-PRO



Observe Safety Guidelines detailed in the beginning of this manual.

Displays	Description
Scrolling dash	Appears at power up while the machine is going through its self configuration
"Err" "####"	Fault code display. The first fault to occur will be displayed for three seconds. The display will cycle through fault codes for all faults that persist after the initial three-second period are displayed for 1 second each.
"----" "----"	Weld mode is changing
"----" "####"	A constant voltage weld mode is selected, machine output is off. The numeric value in the right display is the work point.
"####" "----"	A constant current weld mode is selected, machine output is off. The numeric value in the left display is either the work point or a work point limit, depending on the weld mode and remote configuration.
"####" "####"(on steady)	Machine output is on. Left display is current, right display is voltage. If actively welding, the displays are arc current and arc voltage. If not actively welding, the display will show work point.
"####" "####" (blinking)	Weld just finished – the average arc voltage and current will be blinked for 5 seconds following a weld. If the work point changes during this 5 second period, the display will revert to the above mode.

CAUTION

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

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INVERTEC® V450-PRO



INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

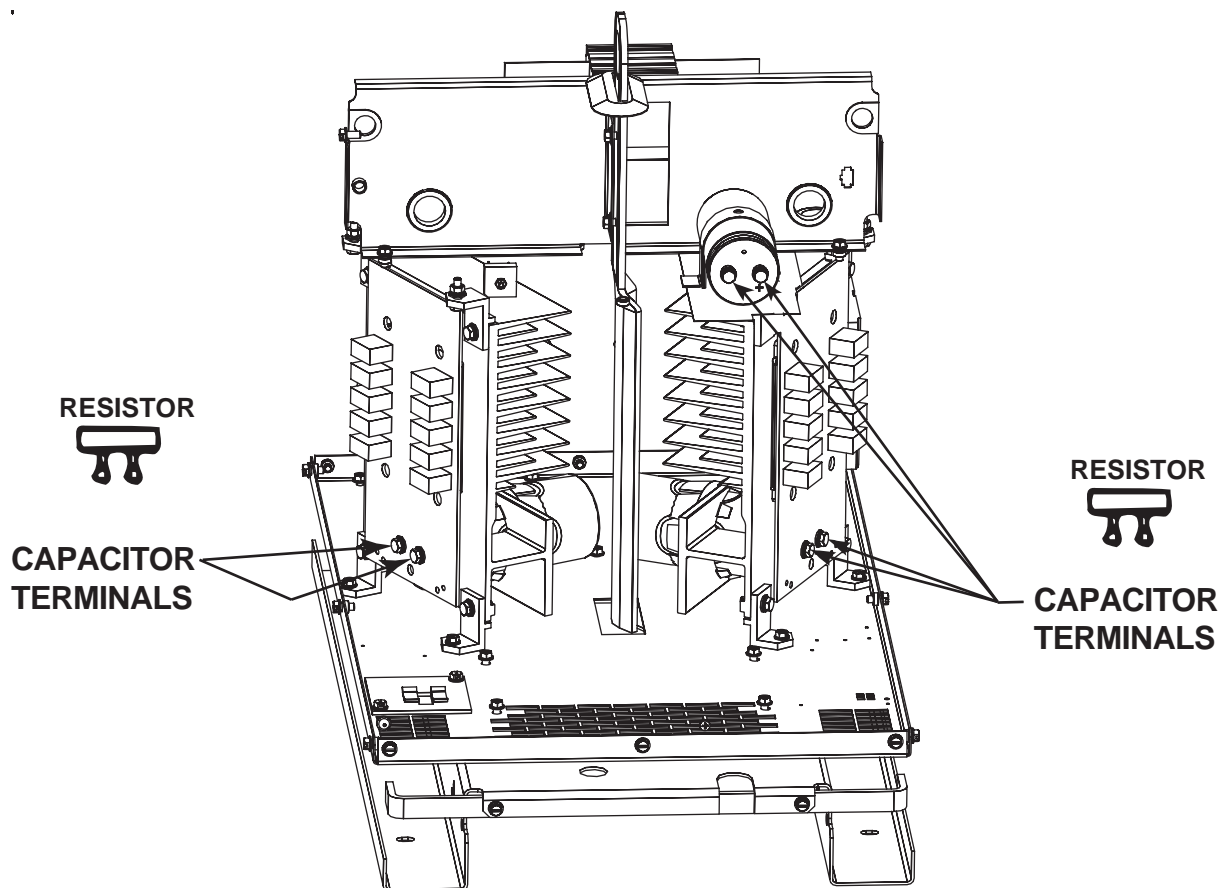
This procedure will drain off any charge stored in the four large capacitors that are part of the switch board assembly. This procedure **MUST** be performed as a safety precaution before conducting any test or repair procedure that requires you to touch internal components of the machine.

MATERIALS NEEDED

- 5/16" Nut Driver
- Insulated Pliers
- Insulated Gloves
- High Wattage Resistor (25-1000 ohms and 25 watts minimum)
- DC Volt Meter

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE (continued)

FIGURE F.1 – CAPACITOR TERMINAL LOCATION



PROCEDURE

1. Remove input power to the INVERTEC® V450-PRO.
2. Using the 3/8" nut driver, remove the left and right case sides.
3. Be careful not to make contact with the capacitor terminals that are located in the bottom center of the left and right side switch boards. See Figure F.1.
4. Carefully check for a DC voltage at the capacitor terminals on both boards. Note the polarity is marked on the PC board and also lead #19 is positive.
5. If any voltage is present, proceed to Step #6. If no voltage is present, the capacitors are discharged.
6. Using the high wattage resistor (25-1000 ohms @ 25 watts (minimum), electrically insulated gloves and pliers, connect the resistor across the two capacitor terminals. Hold the resistor in place for 10 seconds. DO NOT TOUCH THE CAPACITOR TERMINALS WITH YOUR BARE HANDS. **NEVER USE A SOLID CONDUCTOR W/LESS THAN 25 OHM RESISTANCE FOR THIS PROCEDURE.**
7. Repeat procedure for the other capacitor.
8. Recheck the voltage across the capacitor terminals. The voltage should be zero. If any voltage remains, repeat the discharge procedure.

NOTE: Normally the capacitors discharge in about two minutes after input power is removed.

INVERTEC® V450-PRO



VOLTAGE AND CURRENT CALIBRATION PROCEDURE

WARNING

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

TEST DESCRIPTION

This test will help determine if the machine is capable of producing welding output and to check and adjust, if necessary, the voltage and or current calibration.

MATERIALS NEEDED

- Resistive Load Bank
- Calibrated Test Voltmeter
- Calibrated Test Ammeter

VOLTAGE AND CURRENT CALIBRATION PROCEDURE (continued)

CALIBRATION CHECK

The calibration of the V450-PRO can be checked using a resistive load bank with the V450-PRO in mode 200. Mode 200 is a constant current test mode.

NOTE: Before attempting to calibrate the voltage or current setting of the V450-PRO, be sure to read the entire voltage or current calibration section. If the steps are not completed quickly, the machine will automatically leave the calibration mode without changing the calibration settings. The voltage and current calibration settings of the V450-PRO are completely independent of each other. Adjusting one will not affect the other.

1. Press and hold in the **Mode SELECT** button.
2. Turn on the V450-PRO.
3. Rotate the **Output Knob**, while still holding the mode select button in, until the displays read "mode 200".

NOTE: Machines with an Advanced Process Panels do not have a mode select button. Use the same procedure except hold in the Memory button on the advanced process panel instead of the mode select button.

4. Release the **Mode SELECT/MEMORY button** and the machine will be in mode 200.
5. With the machine in mode 200 apply a resistive load to the welding output terminals (approximately .087 ohms) set the machine output to 300 amps and enable the Weld Terminals. (Weld Terminals Select ON).
6. Using the test meters note the output voltage and current.
7. The V450-PRO voltmeter must match the test meter reading to within +/- 1 volt.
8. The V450-PRO ammeter must match the test meter within +/- 5 amps.
9. If the voltmeter does not meet the specification then proceed to the **Voltage Calibration Procedure**.
10. If the ammeter does not meet the specification then proceed to the **Current Calibration Procedure**.

VOLTAGE CALIBRATION

NOTE: If the Mode SELECT/MEMORY button is not pressed within 30 seconds after adjusting the Output Control knob the machine will leave the calibration mode and use the previous calibration settings.

1. Connect the resistive load band (approximately .087 ohms) and test voltmeter to the welding output terminals.
2. Press and hold in the **Mode SELECT/MEMORY button**.
3. Turn on the V450-PRO.
4. Rotate the **Output Control knob** until the display reads "vol cAL".
5. Release the **Mode SELECT/MEMORY button**.
6. Adjust the **Output Control knob** until the actual output voltage reading on the test voltmeter is 20volts +/- .5 volts.
7. Wait for the machine's output to be automatically turned off and then back on.
8. Adjust the **Output Control knob** again if necessary to make the actual voltage output 20 volts +/- .5 volts.
9. Wait for the machine's output to be automatically turned off and then back on.
10. Repeat the above two steps if necessary.
11. Press and release the **Mode SELECT/MEMORY button** to save the calibration.

VOLTAGE AND CURRENT CALIBRATION PROCEDURE (continued)

CURRENT CALIBRATION PROCEDURE

NOTE: If the **Mode SELECT/MEMORY button** is not pressed within 30 seconds after adjusting the Output Control knob the machine will leave the calibration mode and use the previous calibration settings.

1. Connect the resistive load band (approximately .087 ohms) and test ammeter to the welding output terminals.
2. Press and hold in the **Mode SELECT/MEMORY button**.
3. Turn on the V450-PRO.
4. Rotate the **Output Control knob** until the display reads "cur cAL".
5. Release the **Mode SELECT/MEMORY button**.
6. The left display will change to "IcAL" to indicate that current calibration is in progress.
7. The right display will scroll the following message: Adj oCP SorEAL cur-300A.
8. Adjust the Output Control knob until the actual output current reading on the test ammeter is 300amps +/-2A.
9. Wait for the machine's output to be automatically turned off and then back on.
10. Adjust the **Output Control knob** again if necessary to make the actual output current reading on the test ammeter 300 amps +/-2A.
11. Wait for the machine's output to be automatically turned off and then back on.
12. Repeat the above two steps if necessary.
13. Press and release the **Mode SELECT/MEMORY button** to save the calibration.
14. The left display will scroll the message IcAL SAVEd.
15. The machine will reset to normal operation.

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INVERTEC® V450-PRO



TROUBLESHOOTING AND REPAIR

MAIN SWITCH BOARD TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

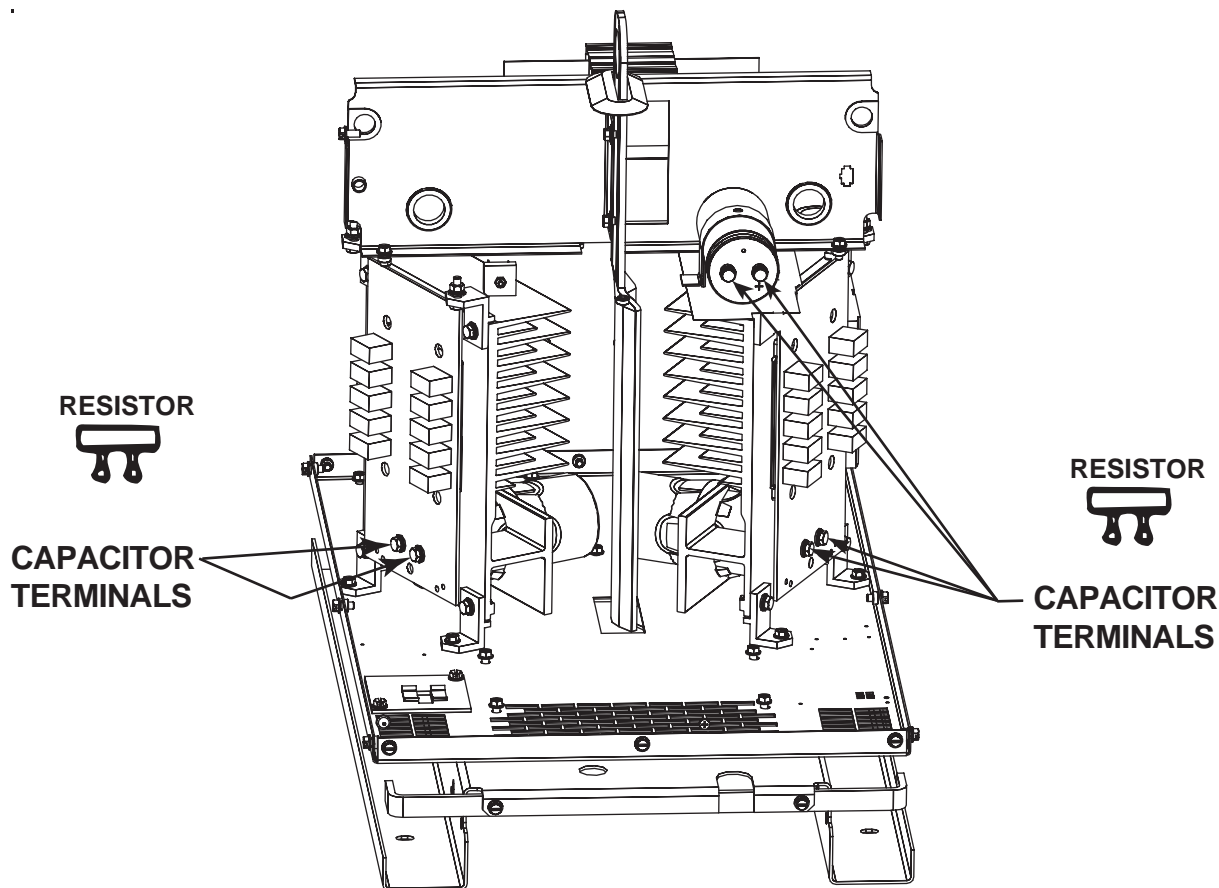
This test will help determine if the “power section” of the switch boards are functioning correctly. This test will NOT indicate if the entire PC board is functional. This resistance test is preferable to a voltage test with the machine energized because this board can be damaged easily. In addition, it is dangerous to work on this board with the machine energized.

MATERIALS NEEDED

- Analog Volt/Ohmmeter
- 5/16 in. Wrench
- 7/16 in. Wrench

MAIN SWITCH BOARD TEST PROCEDURE (continued)

FIGURE F.2 - CAPACITOR TERMINAL LOCATIONS



TEST PROCEDURE

1. Remove input power to the INVERTEC® V450-PRO.
2. Perform the **Capacitor Discharge Procedure**.
3. Use a DC voltmeter to check that the voltage is not present across the terminals on three capacitors.
4. Locate label and remove leads 19C and 19D from the reconnect switches with the 3/8" wrench. Note lead placement for reassembly. Clear leads. See Figure F.2.
5. Using the Analog ohmmeter, perform the following resistance tests. See Figure F.2 for the test points. Any readings below 100 ohms can be considered a short circuit. However, readings usually are below 30 ohms. A short on any of the following points indicates a possible failed switch board.

<ul style="list-style-type: none"> Check 11/12 to -20 and 11/12 to +19 Check 15/16 to -20 and 15/16 to +19 Check 13/14 to -20 and +19 to 13/14 Check 17/18 to -20 and +19 to 17/18 	<ul style="list-style-type: none"> 6. If any test fails (measures a short) isolate the PC board and retest, if board still fails, replace switch board. See Switch Board Removal and Replacement. 7. If the switch board tests are OK, check the molex pin connections and associated wiring from the switch boards to the control board. See the Wiring Diagram. 8. Reconnect leads 19C and 19D to the reconnect switches. Ensure that the leads are installed in the same location they were removed from. 9. Install the right and left case sides and top using the 3/8" nut driver.
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INPUT RECTIFIER TEST PROCEDURE**⚠ WARNING**

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

TEST DESCRIPTION

This test will help determine if the input rectifier has “shorted” or “open” diodes.

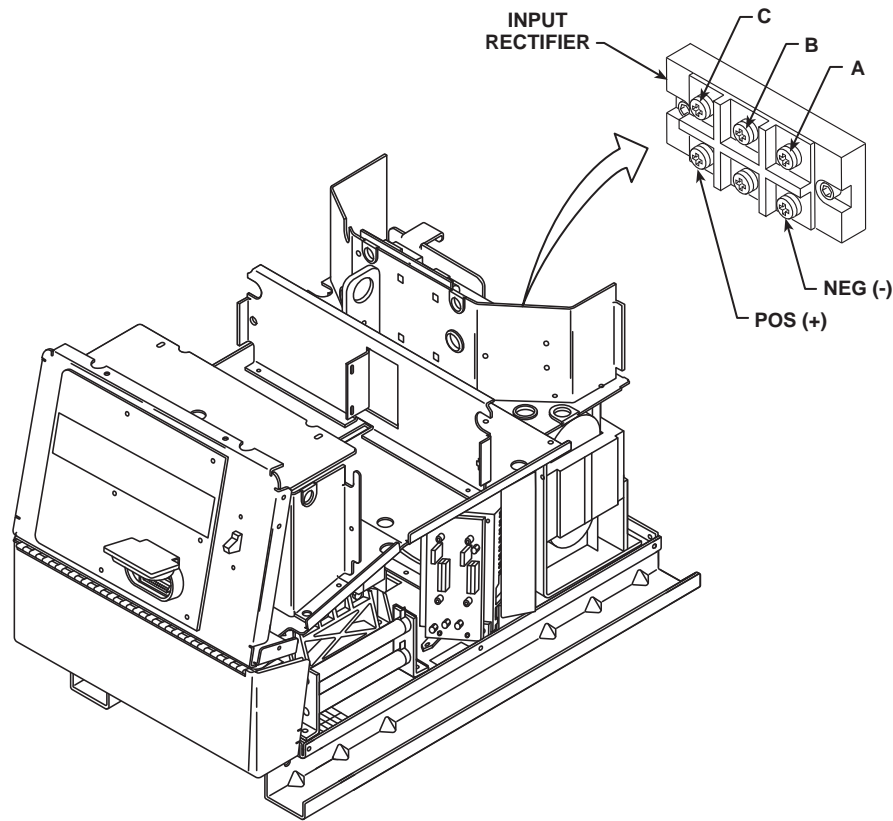
MATERIALS NEEDED

- Analog Voltmeter/Ohmmeter (Multimeter)
- 5/16” Nut Driver
- Phillips Head Screwdriver
- Wiring Diagram

TROUBLESHOOTING AND REPAIR

INPUT RECTIFIER TEST PROCEDURE (continued)

FIGURE F.3 - INPUT RECTIFIER



PROCEDURE

1. Remove input power to the INVERTEC® V450-PRO.
2. Using the 3/8" nut driver, remove the case top.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the Input Rectifier and lead locations. Refer to Figure F.3.
5. With the Phillips head screwdriver remove the positive and negative leads from the rectifier.

NOTE: Some RTV sealant may have to be removed from the input rectifier terminals. The RTV should be replaced when test is complete.

INPUT RECTIFIER TEST PROCEDURE (continued)

6. Use the analog ohmmeter to perform the tests detailed in Table F.1.
 7. If the input rectifier does not meet the acceptable readings outlined in the table, the component may be faulty. Replace.
- NOTE:** Before replacing the input rectifier, perform *the Switch Board Test* and the *Input Contactor Test*.
8. When installing a new input rectifier, see *Input Rectifier Removal and Replacement* procedure.
 9. If the input rectifier is good, be sure to reconnect the positive and negative leads to the correct terminals and torque to 31 in.-lbs. See the Wiring Diagram.
 10. Replace any RTV sealant previously removed.
 11. Install the case top.

TABLE F.1 – INPUT RECTIFIER TEST POINTS AND ACCEPTABLE READINGS

TEST POINT TERMINALS		ANALOG METER X100 RANGE
+ Probe	- Probe	Acceptable Meter Readings
A	NEG	Greater than 1000 ohms
B	NEG	Greater than 1000 ohms
C	NEG	Greater than 1000 ohms
A	POS	Approx. 500 ohms
B	POS	Approx. 500 ohms
C	POS	Approx. 500 ohms
NEG	A	Approx. 500 ohms
NEG	B	Approx. 500 ohms
NEG	C	Approx. 500 ohms
POS	A	Greater than 1000 ohms
POS	B	Greater than 1000 ohms
POS	C	Greater than 1000 ohms

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INVERTEC® V450-PRO



TROUBLESHOOTING AND REPAIR

INPUT CONTACTOR TEST PROCEDURE

WARNING

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

TEST DESCRIPTION

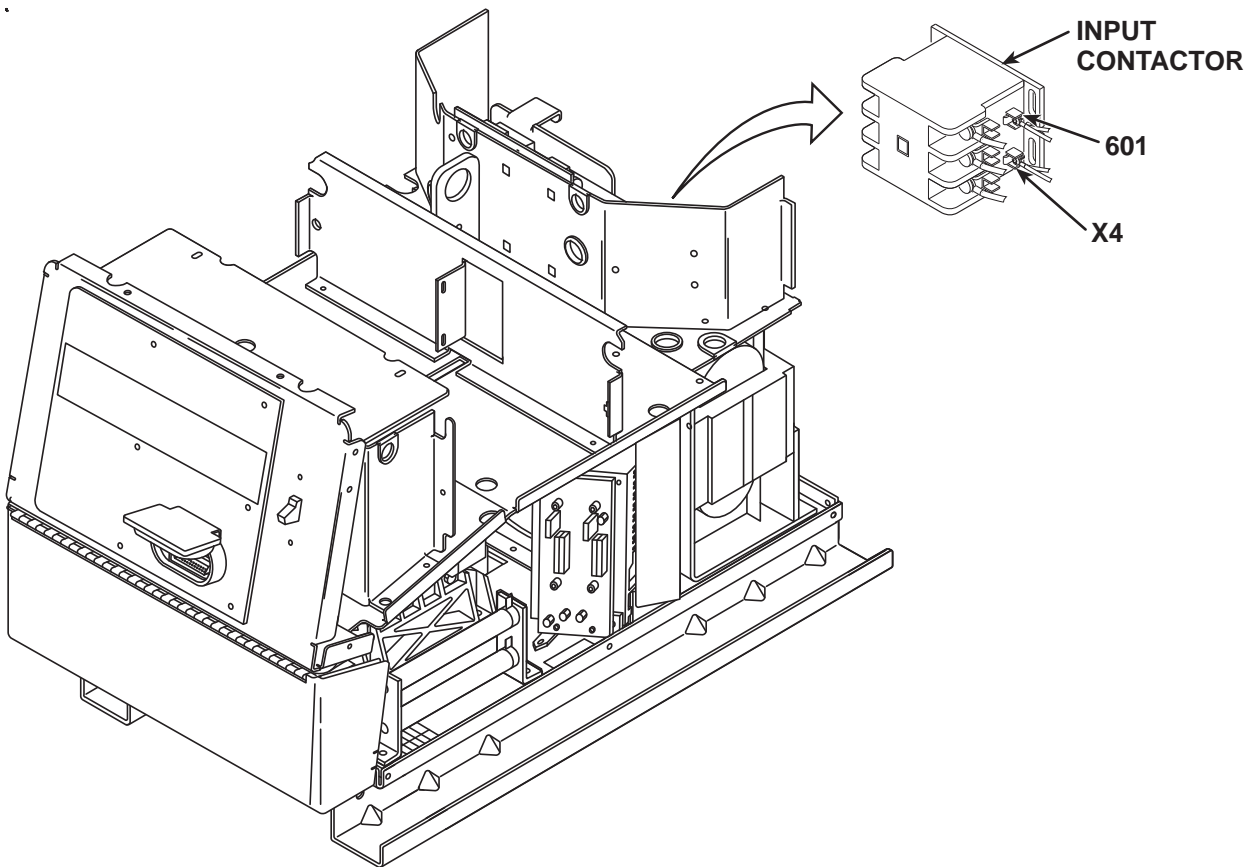
This test will help determine if the input contactor is functional and if the contacts are functioning correctly.

MATERIALS NEEDED

- 3/8" Nut Driver
- Volt-Ohmmeter
- External 24 VAC supply

INPUT CONTACTOR TEST PROCEDURE (continued)

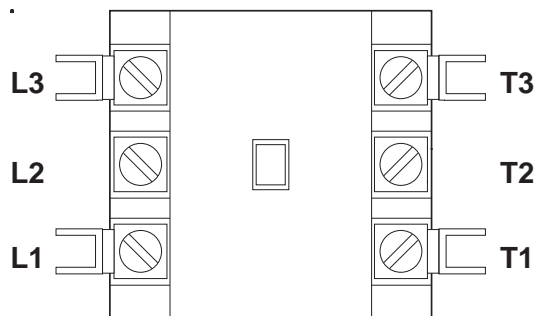
FIGURE F.4 – INPUT CONTACTOR COIL

**PROCEDURE**

1. Remove input power to the INVERTEC® V450-PRO.
2. Using the 3/8" nut driver, remove the input access panel and case top.
3. Locate, mark, and remove the two leads (601, X4) that are connected to the input contactor coil. See Figure F.4.
4. Using the external 24 VAC supply, apply 24 VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace.

INPUT CONTACTOR TEST PROCEDURE (continued)

FIGURE F.5 – INPUT CONTACTOR TEST POINTS



5. With the input contactor activated, check the continuity across the three sets of contacts. (Zero ohms or very low resistance is normal.) See Figure F.5. If the resistance is high, the input contactor is faulty. Replace the input contactor.
6. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty.
7. Reconnect the two leads (601, X4) to the input contactor coil.
8. Install the input access door and case top using the 3/8" nut driver.

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INVERTEC® V450-PRO



INPUT BOARD TEST PROCEDURE**⚠ WARNING**

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

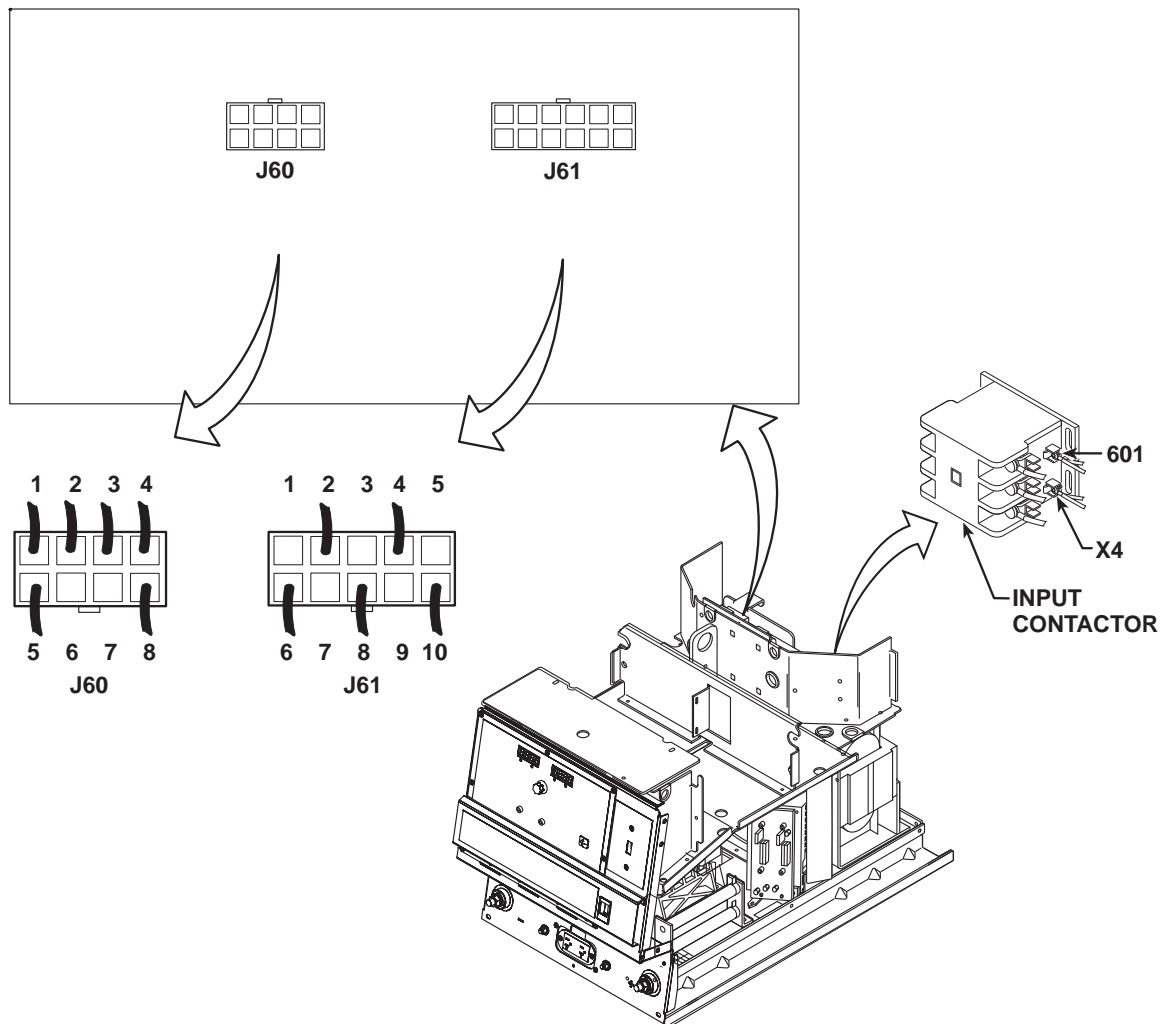
TEST DESCRIPTION

This test will help determine if the Input Board is sending the correct voltages, as well as if the Input Board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

3/8" Nut Driver
Volt-Ohmmeter
Wiring Diagram

FIGURE F.6 – INPUT CONTACTOR CR1



PROCEDURE

1. Remove input power to the INVERTEC® 450-PRO.
2. Using the 3/8" nut driver, remove the case top.
3. Remove lead X4 from the coil terminal of main input contactor CR1. Insulate lead X4. See Figure F.6.
4. Carefully apply input power to the INVERTEC® 450-PRO.



WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

5. Turn on the INVERTEC® 450-PRO. Carefully test for the correct voltages according to **Table F.2**.

INPUT BOARD TEST PROCEDURE (continued)

6. Remove input power to the INVERTEC® V-450 PRO. If any of the voltages are low or not present, perform the **Input Contactor Test**. If that checks out, the Input Board may be faulty.
7. Reconnect lead X4 to the main input contactor CR1 coil terminal.
8. Carefully apply the correct input voltage to the INVERTEC® V-450 PRO.
9. Turn on the INVERTEC® V-450 PRO. Check for the presence of 24 VAC from lead X4 to lead 601. **See Figure F.6**. If the voltage is not present, perform the **Auxiliary Transformer #1 Test**.

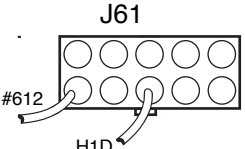
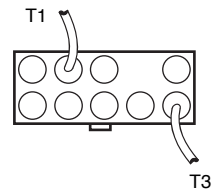
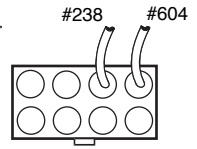
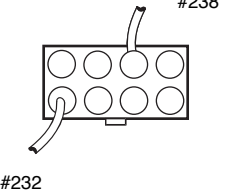
This 24 VAC is the coil voltage for main input contactor CR1. It will normally be present approximately 12 seconds after input line switch (SW1) is activated.
10. When the test is completed, remove input power from the INVERTEC® V-450 PRO.
11. Install the case top using the 3/8" nut driver.

⚠ WARNING**ELECTRIC SHOCK can kill.**

High voltage is present when input power is applied to the machine.

INPUT BOARD TEST PROCEDURE (continued)

TABLE F.2 – INPUT BOARD VOLTAGE CHECKS

TEST POINTS	LEAD NUMBERS	EXPECTED VOLTAGE READINGS	COMMENTS
PLUG J61 PIN 8 (H1D) TO PLUG J61 PIN 2 (612)	J61 	SAME AS INPUT VOLTAGE	Present when Input Switch SW1 is closed.
PLUG J61 PIN 10 (T3) TO PLUG J61 PIN 2 (T1)	J61 	A LITTLE LESS THAN INPUT VOLTAGE	This is Pre-Charge Voltage and will normally be present 6 seconds after activating Input Switch SW1. The Pre-Charge Voltage should remain for approximately 6 seconds and then be removed.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 4 (604)	J60 	13 – 15 VDC	This is the Coil Voltage for the Pre-Charge Relay. Normally this DC Voltage will be present 6 seconds after Input Switch SW1 is activated. This 13 - 15 VDC will remain for approximately 6 seconds and then be removed. The Relay is controlled by the Control Board. See the Wiring Diagram.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 5 (232)	J60 	13 – 15 VDC	This is the DC Coil Voltage for the Control Relay. Normally this DC Voltage will be present approximately 12 seconds after Input Switch SW1 is activated. The Relay is controlled by the Control PC Board. See the Wiring Diagram.

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

TROUBLESHOOTING AND REPAIR

AUXILIARY TRANSFORMER NO. 2 TEST

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

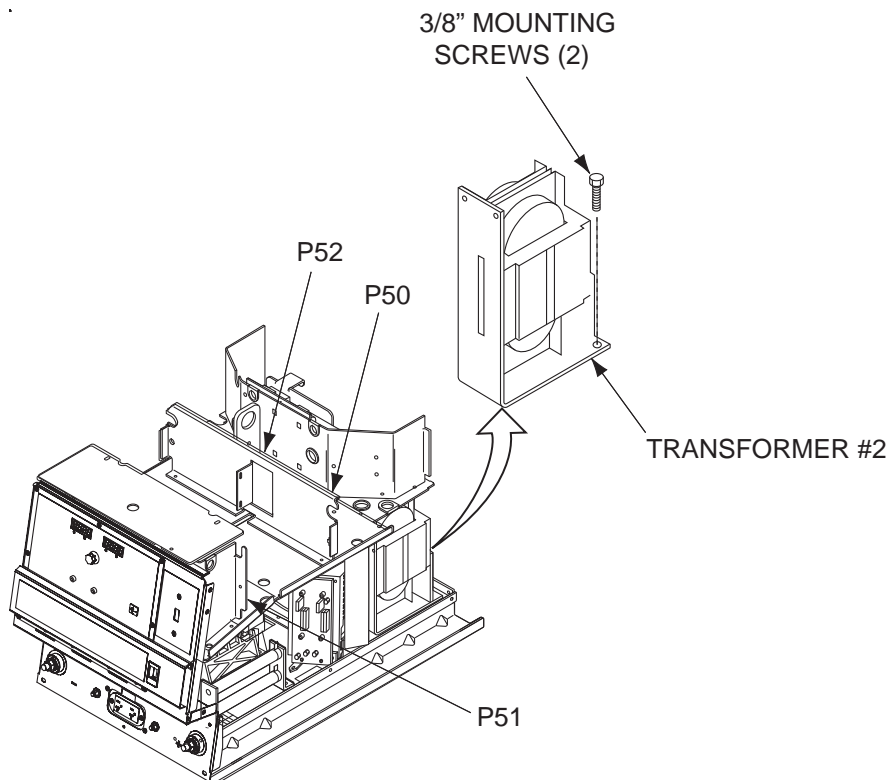
This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 2, as well as if the correct voltage is being induced on the secondary winding of the transformer.

MATERIALS NEEDED

Volt-Ohmmeter (Multimeter)
3/8 in. Nut Driver
Wiring Diagram

AUXILIARY TRANSFORMER NO. 2 TEST (continued)

FIGURE F.7 – PLUGS P52 AND P54



PROCEDURE

1. Remove the main input supply power to the INVERTEC® V-450 PRO.
2. Remove any load that may be connected to the 115 VAC receptacle.
3. Using the 3/8 in. nut driver, remove the left and right case sides.
4. Perform the **Capacitor Discharge Procedure**.
5. Locate plugs P50 and P51 at the Auxiliary Transformer No. 2. See Figure F.7.
6. Carefully apply the correct input power and check for 115 VAC at plug P51 pins #1 and #4.
7. If 115 VAC is present, the Auxiliary Transformer No. 2 is good.
8. If 115 VAC is not present between pins #1 and #4, check the associated leads and plugs for loose or faulty connections.
9. Carefully test for the correct AC input voltage applied to the primary windings at H6 and H1. (P50 Pins 1 and 5) Normal is 550-575 VAC. See wiring diagram.
10. If the correct AC input voltage is applied to the primary of the Auxiliary Transformer No. 2 and the secondary voltage is NOT correct, the transformer may be faulty. Replace.
11. Install the left and right case sides using the 3/8 in. nut driver.

WARNING

High voltage is present at plug P50.

TROUBLESHOOTING AND REPAIR

AUXILIARY TRANSFORMER NO. 1 TEST

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

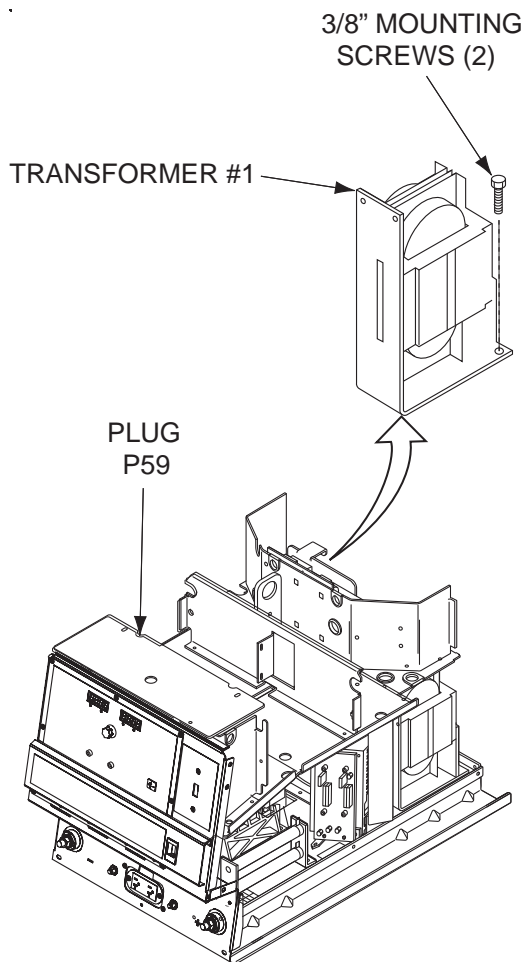
This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 1, as well as if the correct voltage is being induced on the secondary windings of the transformer.

MATERIALS NEEDED

Volt-Ohmmeter (Multimeter)
3/8 in. Nut Driver
Wiring Diagram

AUXILIARY TRANSFORMER NO. 1 TEST (continued)

FIGURE F.8 – TEST LEAD LOCATIONS



PROCEDURE

1. Remove the main input supply power to the INVERTEC® V450-PRO.
 2. Using the 3/8 in. nut driver, remove the case sides and top.
 3. Perform the **Capacitor Discharge Procedure**.
 4. Locate leads X8 and 41B at Power Board Bridge.
 5. Locate secondary leads X3 and X5 (fan motor leads).
 6. Locate secondary lead X4 (at main contactor).
 7. Carefully apply the correct input voltage to the INVERTEC® V450-PRO and check for the correct secondary voltages per **Table F.3**.
- NOTE:** The secondary voltages will vary if the input line voltage varies.
8. If the secondary voltages are present, the T1 auxiliary transformer is functioning properly. If any of the secondary voltages are missing or low, check to make certain the primary is configured correctly for the input voltage applied. See Wiring Diagram.
 9. If the correct voltage is applied to the primary, and the secondary voltage(s) are not correct, the T2 transformer may be faulty.
 10. Install the case sides and top using the 3/8" nut driver.

INVERTEC® V450-PRO



AUXILIARY TRANSFORMER NO. 1 TEST (continued)

TABLE F.3

LEAD IDENTIFICATION	NORMAL EXPECTED VOLTAGE
X8 to 41B	28 VAC
X3 to X5	115 VAC
X3 to X4	24 VAC
X6 to X7	24 VAC
X6 to X9	42 VAC

Return to Section TOC

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Return to Section TOC

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Return to Master TOC

Return to Master TOC

Return to Master TOC

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Return to Master TOC
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Return to Master TOC

INVERTEC® V450-PRO



POWER BOARD TEST**⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

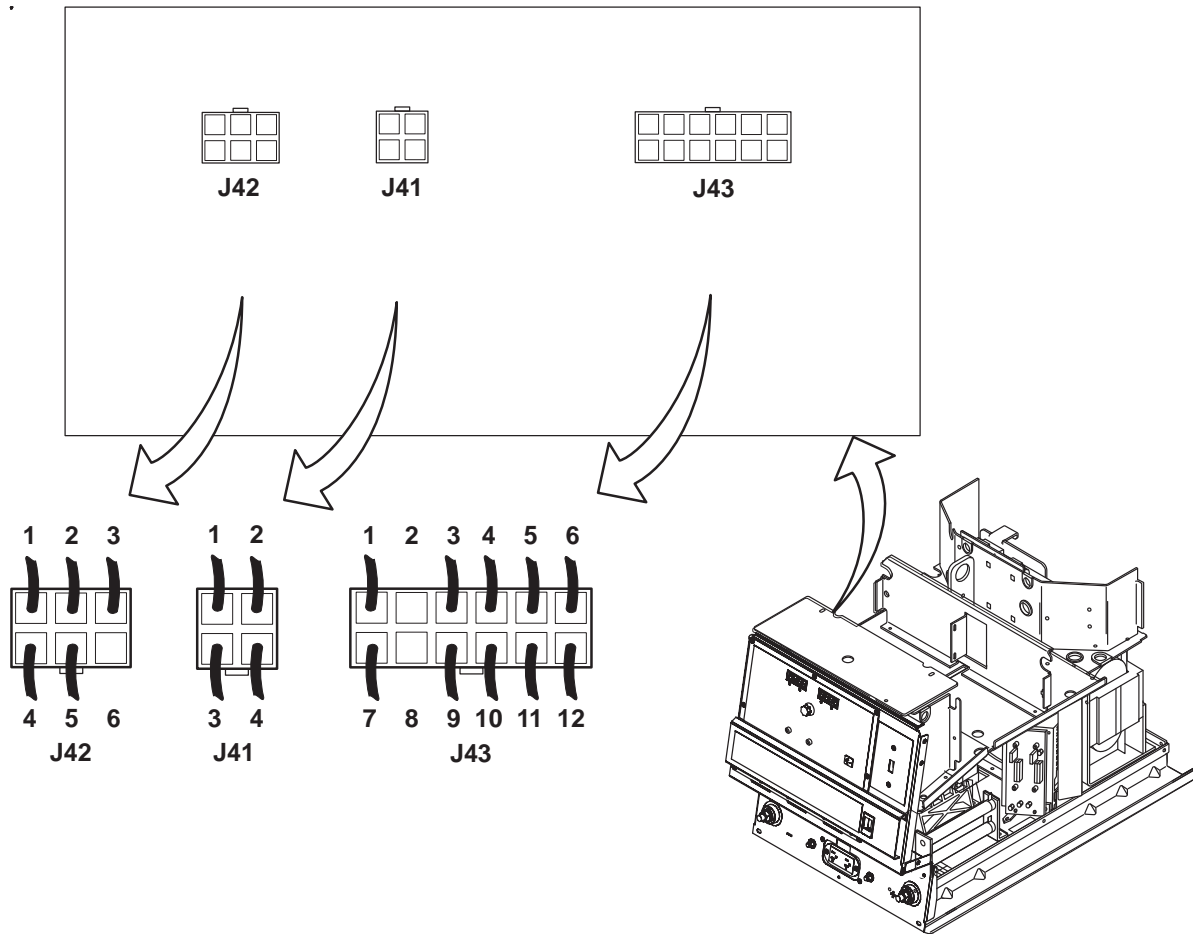
This test will help determine if the power board is receiving the correct voltages as well as if the power board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

- 3/8 in. Nut Driver
- Volt-Ohmmeter
- Wiring Diagram

POWER BOARD TEST (continued)

FIGURE F.9 – POWER BOARD



PROCEDURE

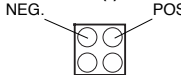
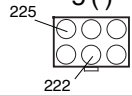
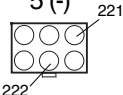
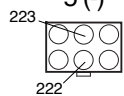
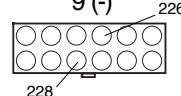
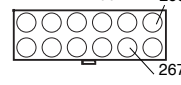
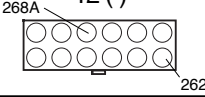
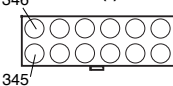
1. Remove input power to the INVERTEC® V-450 PRO.
2. Using the 3/8" nut driver, remove the case top.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the Power Board and plugs J42 and J43. **Do not remove plugs or leads from the Power Board.** See Figure F.9.
5. Carefully apply input power to the INVERTEC® V-450 PRO.
6. Turn on the INVERTEC® V-450 PRO. Carefully test for the correct voltages at the Power Board according to **Table F.4**.
7. If either of the 40 VDC voltages is low or not present at plug J41, check capacitor C3 and the rectifier bridge. See the Wiring Diagram. Also perform the **T1 Auxiliary Transformer Test**.
8. If any of the DC voltages are low or not present at plugs J42 and/or 43, the Power Board may be faulty.
9. Install the case top using the 3/8" nut driver.

 **WARNING**
**ELECTRIC SHOCK can kill.**

High voltage is present when input power is applied to the machine.

POWER BOARD TEST (continued)

TABLE F.4 – POWER BOARD VOLTAGE CHECKS

CHECK POINT LOCATION	TEST DESCRIPTION	CONNECTOR PLUG PIN NO.	LEAD NO. OR IDENTITY	NORMAL ACCEPTABLE VOLTAGE READING
POWER BOARD CONNECTOR PLUG J41	CHECK 40 VDC INPUT FROM DC BUS BOARD	2 (+) 1 (-) 	477 (+) 475 (-)	38 – 42 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +15 VDC SUPPLY FROM POWER BOARD	1 (+) 5 (-) 	225 (+) 222 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +5 VDC SUPPLY FROM POWER BOARD	3 (+) 5 (-) 	221 (+) 222 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK -15 VDC SUPPLY FROM POWER BOARD	2 (+) 5 (-) 	222 (+) 223 (-)	-15 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC "RS-232" SUPPLY FROM POWER BOARD	4 (+) 9 (-) 	226 (+) 228 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +15 VDC SPI SUPPLY FROM POWER BOARD	6 (+) 11 (-) 	266 (+) 267 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC SPI SUPPLY FROM POWER BOARD	3 (+) 12 (-) 	268A (+) 262 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +20 VDC STT SUPPLY FROM POWER BOARD	7 (+) 1 (-) 	345 (+) 346 (-)	+20 VDC

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Return to Master TOC

INVERTEC® V450-PRO



CURRENT TRANSDUCER TEST**⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

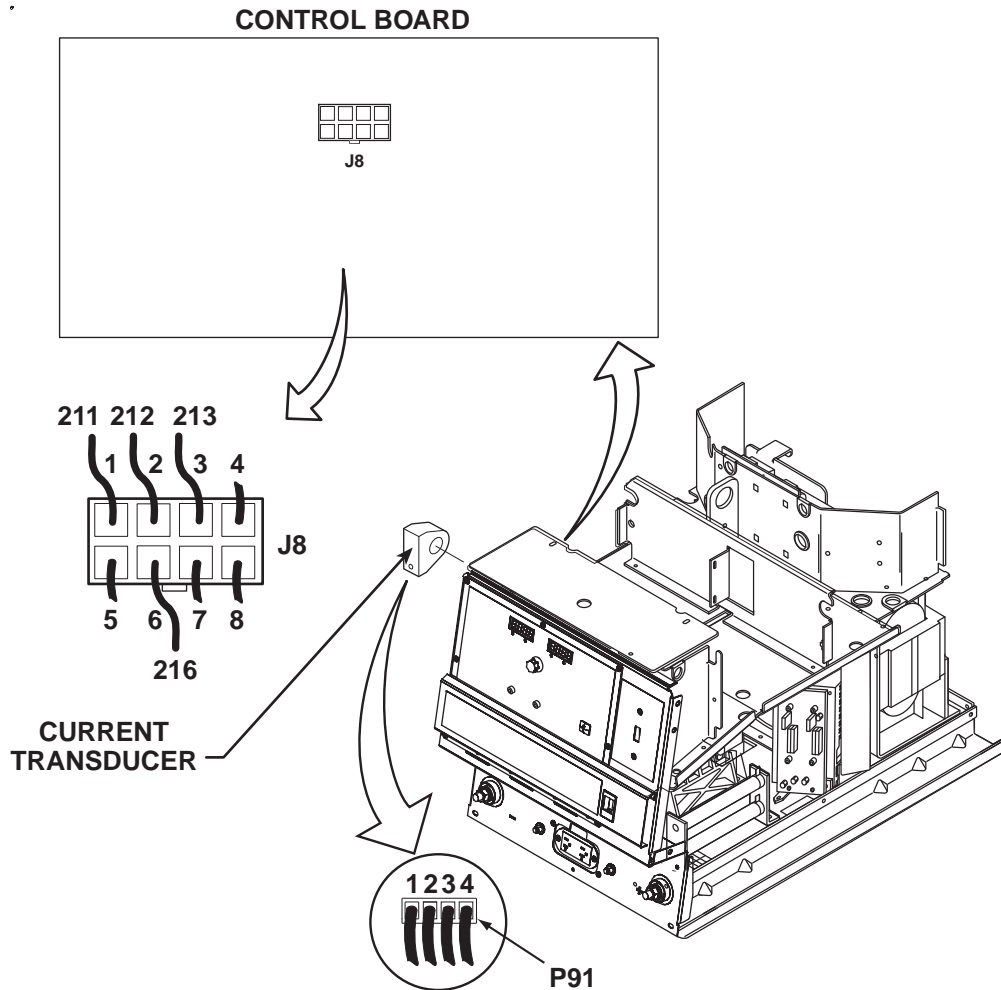
TEST DESCRIPTION

This test will help determine if the V450-PRO current transducer and associated wiring are functioning correctly.

MATERIALS NEEDED

3/8" Nut Driver
Volt-Ohmmeter

FIGURE F.10 – CURRENT TRANSDUCER TEST



TEST PROCEDURE

1. Remove input power to the V-450 PRO.
2. Using the 3/8" nut driver, remove the case top and the control box cover.
3. Locate the current transducer leads at Control Board plug J8. See Figure F.10.
4. Carefully apply input power to the V-450 PRO.



WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

CURRENT TRANSDUCER TEST (continued)

5. Turn on the V-450 PRO. Check for the correct DC supply voltage to the current transducer at plug J8. **See Figure F.10.**
 - A. Pin 2 (lead 212+) to pin 6 (lead 216-) should read +15 VDC.
 - B. Pin 3 (lead 213-) to pin 6 (lead 216+) should read -15 VDC.

If the DC supply voltages are not present, the control board may be faulty.
6. If both of the supply voltages are low or missing, check the associated leads between plug J8 and current transducer plug P91 and the Control Board.
7. With the V-450 PRO triggered, check the feedback voltage from the current transducer. The current feedback voltage can be read at plug J8 on the Control Board.
 - A. Pin 1 (lead 211) to pin 6 (lead 216) should read 2.0 VDC (machine loaded to 250 amps).
8. If for any reason the machine cannot be loaded to 250 amps, Table F.5 shows what feedback voltage is produced at various current loads.
9. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead 211 (plug J8 pin 1) has continuity (zero ohms) between the current transducer and the control board. See the Wiring Diagram.
10. Install the right side case cover using the 3/8" nut driver.

TABLE F.5 - CURRENT FEEDBACK AT VARIOUS OUTPUT LOADS

OUTPUT LOAD CURRENT	EXPECTED TRANSDUCER FEEDBACK VOLTAGE
500	4.0
450	3.6
400	3.2
350	2.8
300	2.4
250	2.0
200	1.6
150	1.2
100	0.8
50	0.4

Return to Section TOC

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INVERTEC® V450-PRO



THERMOSTAT TEST – THERMAL PROTECTION

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

NOTE: The procedures and tests described in this test are written with the understanding that the repair technician fully understands the process of locating and accessing (within the welding machine) the specific board or device involved in each procedure or test.

TEST DESCRIPTION

The Thermostats are located in various locations within the welding machine. See **Machine Diagram** for specific locations.

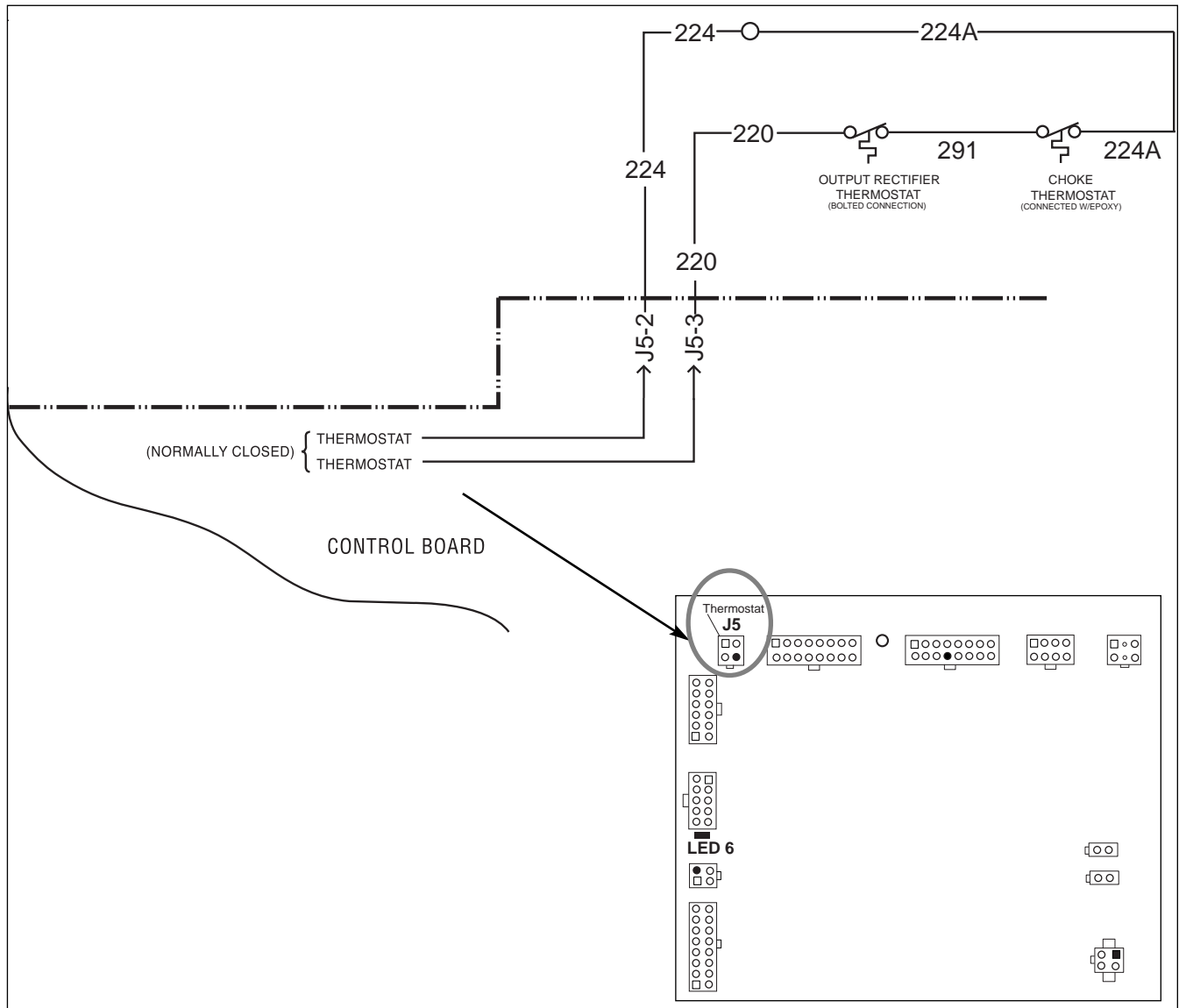
This test will determine if a thermostat is intermittently opening or is fully open.

MATERIALS NEEDED

Small, gauge (#18) short jumper wire
(Wire should be approximately 4 inches in length)

THERMOSTAT TEST – THERMAL PROTECTION (continued)

FIGURE F.11 – THERMOSTAT CIRCUIT



SIMPLIFIED TEST PROCEDURE

NOTE: Never run the V-450 PRO under load when any of the thermostats are bypassed. This is only a means of isolating the inoperative or open thermostat.

1. Temporarily bypass thermostat circuits with a shorting jumper as follows:

- All thermostats at the Control Board (2J5 to 3J5)
- Choke thermostat only (224A to 291)
- Output Rectifier thermostat only (220 to 291)
Located on the Output Rectifier Heat Sink

All thermostats are normally closed so moving the jumper as indicated and watching the Thermal LED should help determine which thermostat or associated wiring is defective.

Don't forget to check the incline splice 224 to 224A as a possible open.

Return to Section TOC

Return to Master TOC

FAN CONTROL AND MOTOR TEST**⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

This test will help determine if the fan motor, control board, switch board, and associated leads and connectors are functioning correctly.

MATERIALS NEEDED

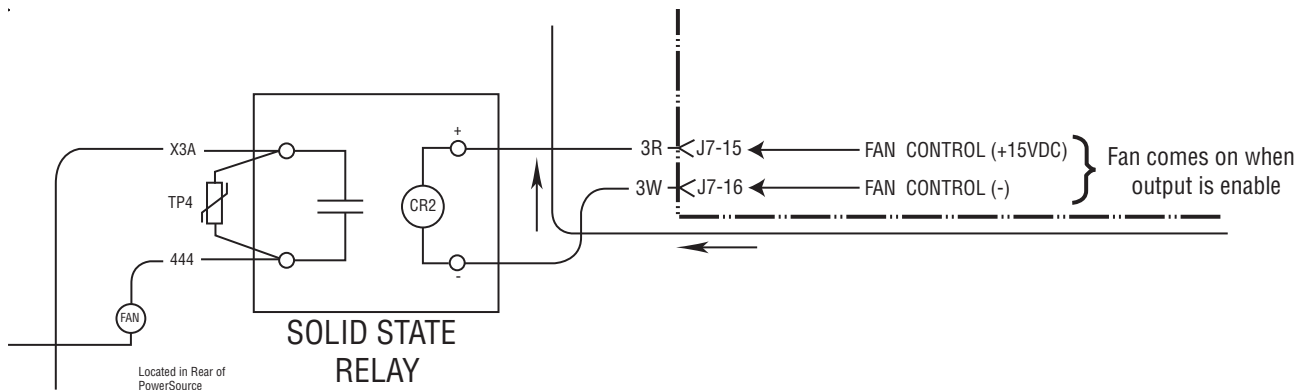
Voltmeter
3/8" Nut Driver

FAN CONTROL AND MOTOR TEST (continued)

TEST PROCEDURE

1. Remove the input power to the V450-PRO machine.
2. Using the 3/8" nut driver, remove the case top and control box cover.
3. Perform the *Capacitor Discharge Procedure*.

FIGURE F.12



4. Carefully apply the correct input power to the machine.
5. Carefully check for 115VAC at X3A and 444. See Figure F.12.

WARNING: HIGH VOLTAGE IS PRESENT AT THE RELAY TERMINALS.

6. If the 115VAC is low or not present, perform the *Auxiliary Transformer Test*. Check circuit breaker CB2 and associated leads for loose or faulty connections. See *Wiring Diagram*.
7. Energize the weld output terminals (Select Weld Terminals ON) and carefully check for 115VAC at the fan motor leads. If the 115VAC is present and the fan is not running, the fan motor may be faulty. See *Wiring Diagram*.

WARNING: HIGH VOLTAGE IS PRESENT AT THE FAN LEADS.

WARNING



ELECTRIC SHOCK can kill.
High voltage is present when input power is applied to the machine.

FAN CONTROL TEST PROCEDURE

1. Locate plug J7 on the control board. Do not remove the plug from the control board. See Figure F.12.
2. Energize the weld output terminals (Select Weld Terminals ON) and carefully check for +15VDC at plug J7 pins 15 & 16 on the control PC board. If the 15VDC is present and the fan is not running then the relay or fan may be faulty. If the 15VDC is not present when the weld terminals are energized, then the control board may be faulty.

WARNING



HIGH VOLTAGE IS PRESENT AT THE SWITCH BOARD.

TROUBLESHOOTING AND REPAIR

OUTPUT RECTIFIER TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

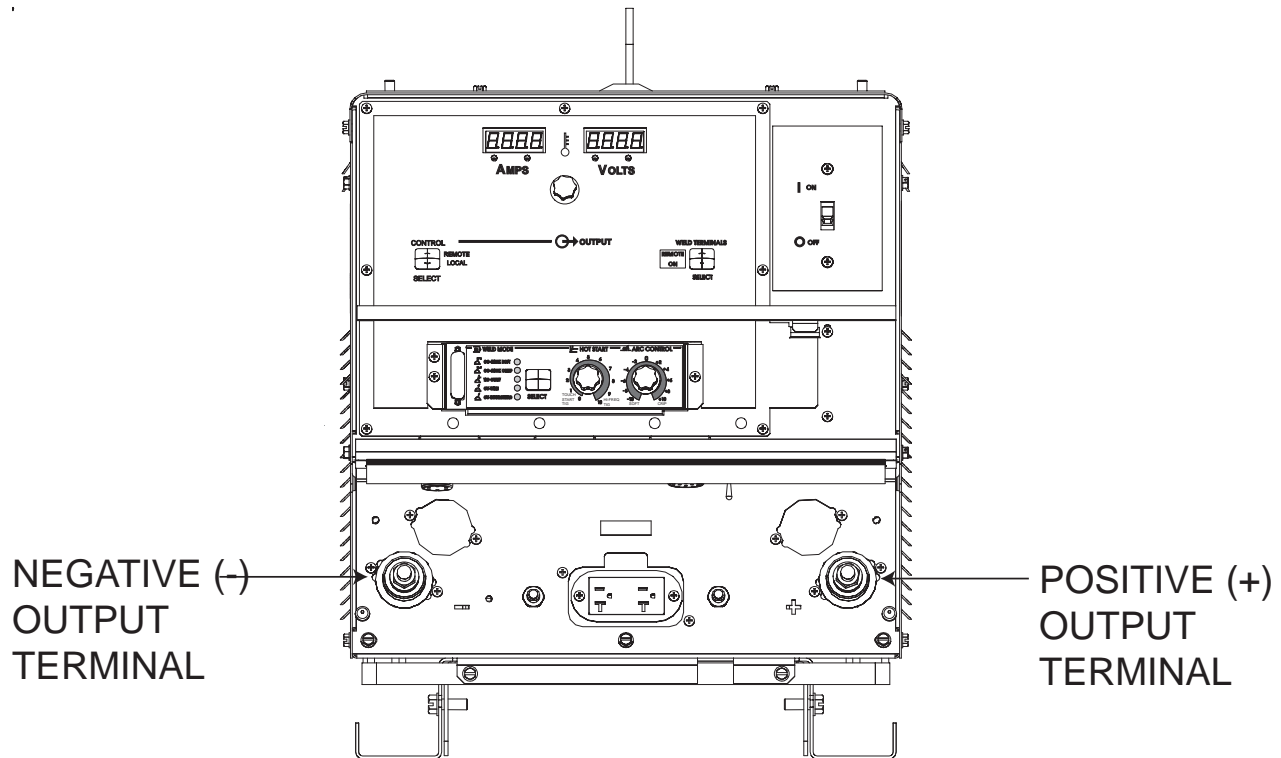
This test will help determine if any of the output rectifiers are shorted.

MATERIALS NEEDED

Analog Volt-Ohmmeter
3/8" Nut driver
5/16" Wrench

OUTPUT RECTIFIER TEST PROCEDURE (continued)

FIGURE F.13 - OUTPUT TERMINAL LOCATION



PROCEDURE

1. Remove main input supply power to the V450-PRO.
2. Remove any output load that may be connected to the V450-PRO.
3. With the analog ohmmeter, measure the resistance between the positive and negative output terminals. Refer to Figure F.13.
4. If the reading is approx. 50 ohms, the output rectifier modules are not shorted. If the reading is less than 10 ohms, one or more of the rectifier modules may be shorted. Reverse meter probe and verify low reading.
5. Remove the case top perform the **Input Filter Capacitor Discharge** procedure.
6. Using the 5/16" wrench, remove and insulate lead 202A from the negative output terminal. Repeat step 4 to confirm if it is less than 10 ohms short.
7. Reconnect lead 202A to the negative output terminal.
8. Replace the shorted modules if necessary.

Important: The positive (+) meter probe must be attached to the positive output terminal and the negative (-) meter probe must be attached to the negative output terminal.

INVERTEC® V450-PRO



CHOKE TEST PROCEDURE**⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

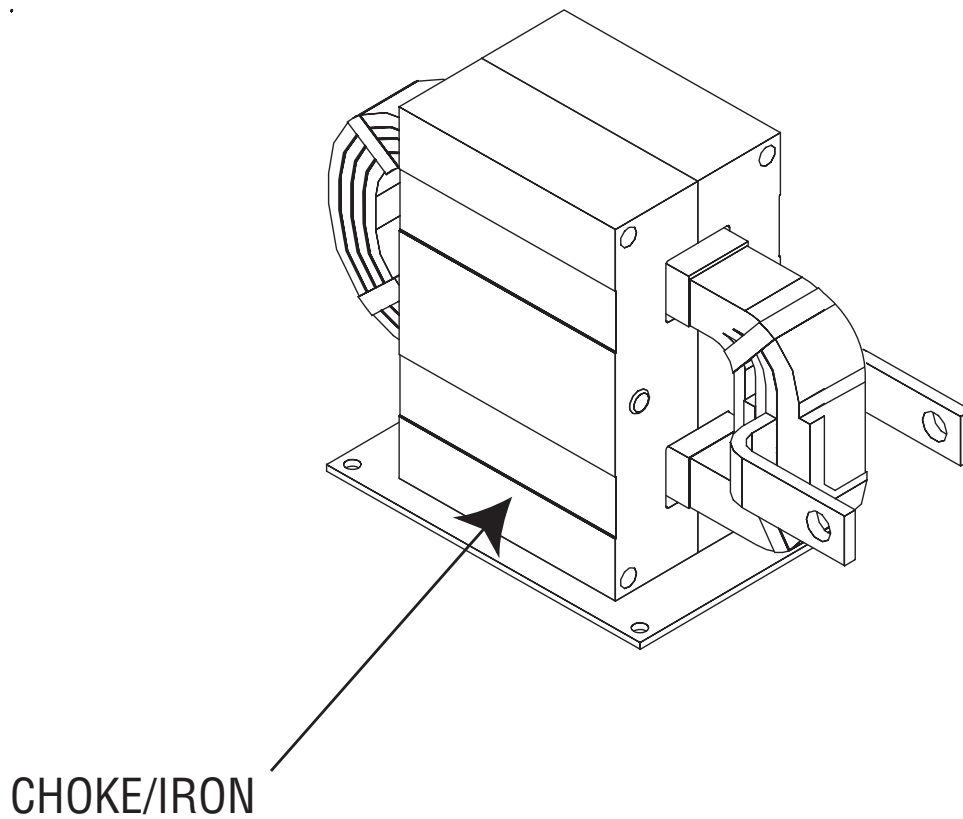
The Weld Choke is located down and behind the work stud. This test will help determine whether the Choke is shorted to ground or is open.

MATERIALS NEEDED

Digital Volt/Ohmmeter

CHOKE TEST PROCEDURE (continued)

FIGURE F.14 – CHOKE ASSEMBLY

**PROCEDURE**

1. Using an Ohmmeter, make sure that the choke windings are not grounded to the lamination ($> 1\text{megohm}$).

No windings or terminal connections should look burned or over-heated. AC welding may cause choke to buzz slightly.

CONTROL BOARD CHECK

Since the functions of the Control Board are primarily software related, there are not very many tests to be performed that will help in diagnosing a problem with the board itself. Elimination of problems in the areas where loss of function is taking place will help decide by process of elimination if the Control Board is the defective component. As a result, the troubleshooting chart will typically recommend other areas to be tested before the Control Board.

If the Control Board does seem to be the most likely solution, perform the checks outlined below, and then try downloading the latest software into the machine. If a solution is still not evident, use the Diagnostic facility to take a "snapshot" that can then be sent to the Lincoln Service Department via e-mail for assistance in determining where the problem. Contact the Lincoln Service Department at 1-888-935-3877.

TEST PROCEDURE

1. Check the LED's on the Control Board. Compare the pattern to Page 3 of the **Machine Schematic**.

Normal operation will show 8 Green LED's ON and both Red LED's OFF.

Green LED's 1 through 8 indicate the presence of the various DC supplies to the Board.

LED 7 (red) will only be ON in the event of a Primary Over Current. Cycle the Power Switch to reset LED 7.

LED's 9 (green) & 10 (red) will mimic the Status LED on the front panel in the event of an error. If the Status LED is OFF, these will still indicate the error code.

2. If any of the Green LED's 1 through 8 are not lit or are dimmer than the others:

Turn the power off and disconnect all of the Control Board Molex connectors except J4 and turn the power back on . If the LED(s) in question stay the same:

Check the DC voltage levels in connector J4. See the **Machine Schematic** for correct readings.

If voltages are correct, replace the Control Board. If not, replace the Power Board.

3. If LED's 9 & 10 are flashing an error code and all other LED's are correct:

Check the Error Code list in this section to determine where the problem may be.

If the Error Code is not listed, contact the Lincoln Service Department for determination.

4. Check the DIP switches. In a single machine set-up, switches 1 through 7 should be OFF. Switch 8 should be ON if a remote sense lead is attached.

NOTE: If any switches need to be changed because the machine was removed from a multi machine application be sure to write down their position before changing them so they can be properly reset when the machine is returned to it's position.

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INVERTEC® V450-PRO



SPI CABLE RESISTANCE AND VOLTAGE TEST PROCEDURE**⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

TEST DESCRIPTION

This test will help determine if there is a possible “open” in the SPI cable and also if the correct supply voltages are being applied to the boards in the SPI network.

MATERIALS NEEDED

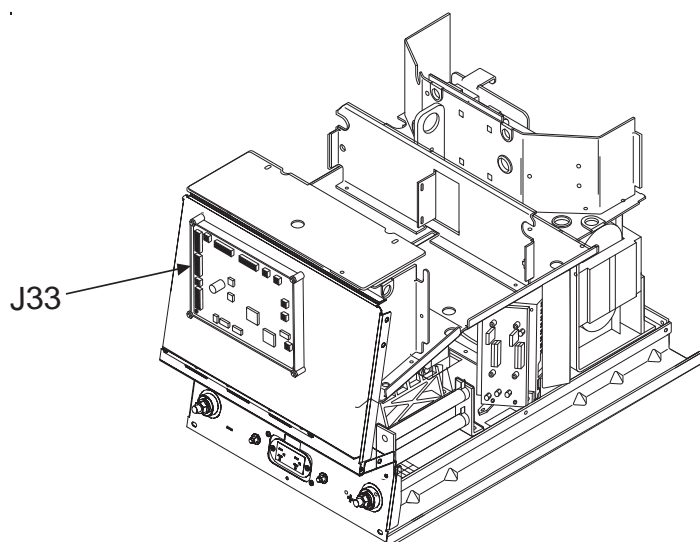
Volt/Ohmmeter
5/16” Nut Driver
Phillips Head Screwdriver

SPI CABLE RESISTANCE AND VOLTAGE TEST PROCEDURE (continued)

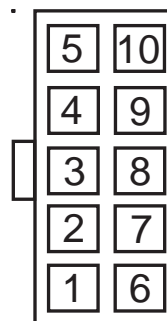
TEST PROCEDURE

1. Remove the input power to the V450-PRO.
2. Using the #2 Phillips screwdriver, remove the case front panel.
5. Locate and remove plug J33 from the control board. See Figure F.15.
6. Check the resistance and continuity of the SPI cable by testing with the ohmmeter from each pin on plug J33 to the corresponding pins on plug J34. See the Wiring Diagram.
7. The resistance reading pin to corresponding pin should be zero ohms or very low resistance. If the resistance reading is high or "open" check the plug connections to the SPI network PC boards. If the connections are OK and the resistance is high or "open" the SPI cable may be faulty.
8. Reconnect the plug into the control board.
9. With plug J33 reinstalled in the control board, carefully apply the correct input power to V450-PRO.
10. Turn on the machine.
11. Carefully check for the presence of +15VDC from plug J33 pin -1(+) to plug J33 pin -10(-) at the display board receptacle.
12. Carefully check for the presence of +5VDC from plug J33 pin -2(+) to plug J33 pin -10(-) at the display board receptacle.
13. If either of these voltages are low or not present, the control board may be faulty. Replace. Also Perform the **Power Board Test**.
14. Remove the input power to the V450-PRO machine.
15. Replace any cable ties previously removed.
16. Replace the case front.

FIGURE F.15 - Plug J33



PLUG J33



CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

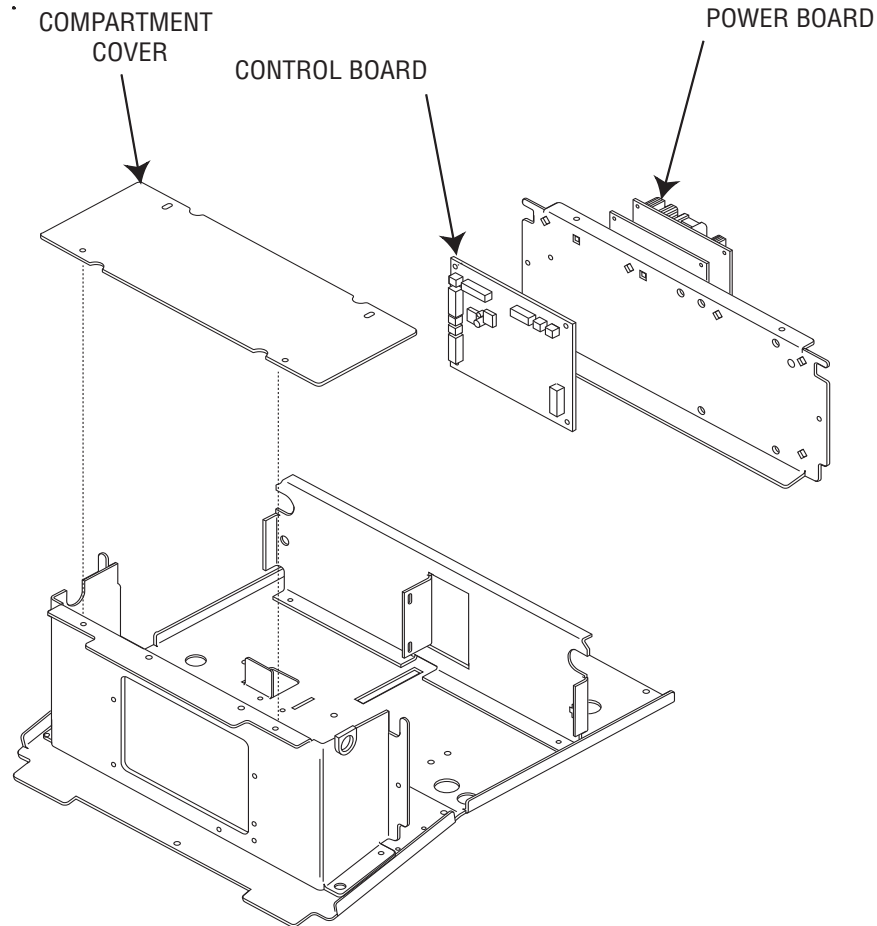
This procedure will aid the technician in the removal and replacement of either the power board or the control board.

MATERIALS NEEDED

- 3/8 in. Nut Driver
- Phillips Head Screwdriver
- Anti-Static Wrist Strap

CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.16 – BOARD LOCATION



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Remove the case top, sides and front.
3. Perform the **Capacitor Discharge Procedure**.
4. Observe all static electricity precautions.
5. Using the 3/8 in. nut driver, remove the PC board compartment cover. Refer to Figure F.16.
6. Remove the molex plugs from the control board.
7. Label and remove the two molex plugs and white and black wires with quick connects from the power PC board.
8. Using the 3/8 in. nut driver, remove the two screws holding the rear of the Control Box in place.
9. Clear the lead harnesses from the left and right sides, and carefully remove the power and control PC board assembly.
10. Remove either the power or the control board from the PC board assembly.

CONTROL OR POWER BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

INSTALLATION PROCEDURE

1. Install either the power or control board to the PC board assembly and secure it in place.
2. Carefully slide the power and control PC board assembly into place, making sure to clear the lead harnesses on the right and left side of the PC board compartment.
3. Secure the rear of the control box in place.
4. Connect two molex plugs and black and white wires with quick disconnects to the power PC board.
5. Connect the molex plugs to the control PC board.
6. Install the PC board compartment cover using the 3/8 in. nutdriver.
7. Install the case top and sides using the 3/8 in. nut driver and Phillips screwdriver.

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INPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

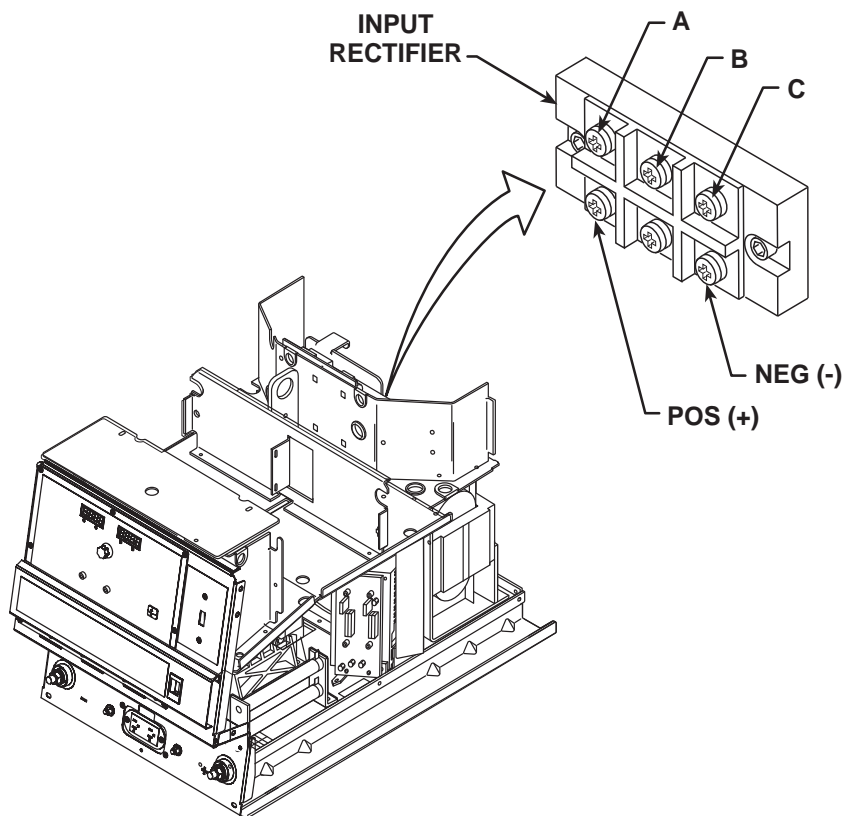
This procedure will aid the technician in the removal and replacement of the input rectifier module.

MATERIALS NEEDED

- 3/8" Nut Driver
- 3/16" Allen Wrench
- Phillips Head Screwdriver

INPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.17 – INPUT RECTIFIER LOCATION



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top, input access panel and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate and remove the RTV sealant from the input rectifier connection terminals. See Figure F.17.
5. Label and, using the Phillips head screwdriver, carefully remove the five leads from the input rectifier terminals. Note placement for reassembly. See Figure F.17.
6. Using the 3/16" allen wrench, remove the two mounting screws and washers from the rectifier module.
7. Carefully remove the input rectifier module.

REPLACEMENT PROCEDURE

1. Clean heat sink surfaces.
2. Apply an even coating of joint compound (Penetrox A-13) to both the heat sink and module mounting surfaces. The joint compound should be 0.002 - 0.005 in. thick per surface.
3. Mount the module to the heat sink and evenly torque the mounting screws (with washers) to 44 in/lbs.
4. Assemble the leads to the correct module terminals and torque to 26 in/lbs. See Figure F.17.
5. Apply RTV sealant to the rectifier connection terminals.
6. Install the case top, sides, and input access panel using the 3/8" nut driver.

INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

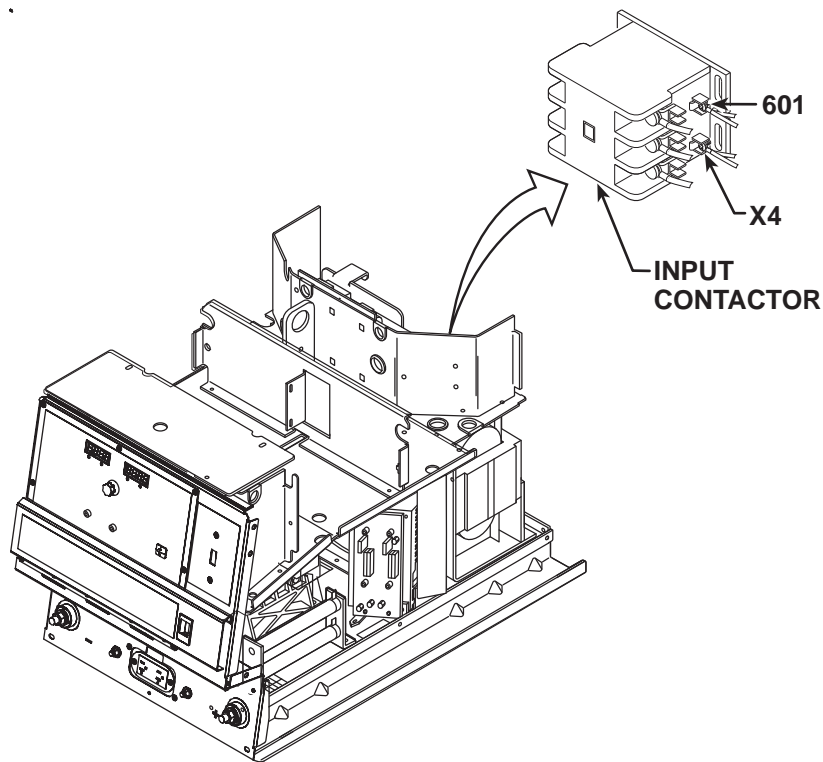
This procedure will aid the technician in the removal and replacement of the input contactor.

MATERIALS NEEDED

- 3/8" Nut Driver
- 5/16" Nut Driver
- Slot Head Screwdriver

INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.18 – INPUT CONTACTOR LOCATION



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top, and input access panel.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the input contactor. Label leads and, using the slot head screwdriver, carefully remove the leads from the input contactor terminals. Note placement for reassembly. See Figure F.18.
5. With the 5/16" nut driver, remove the three mounting screws.
6. Carefully remove the input contactor.

REPLACEMENT PROCEDURE

1. Mount the contactor and tighten the mounting screws.
2. Assemble the previously removed leads to the correct terminals. See wiring diagram
3. Install the case top, sides, and input access panel using the 3/8" nut driver.

AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

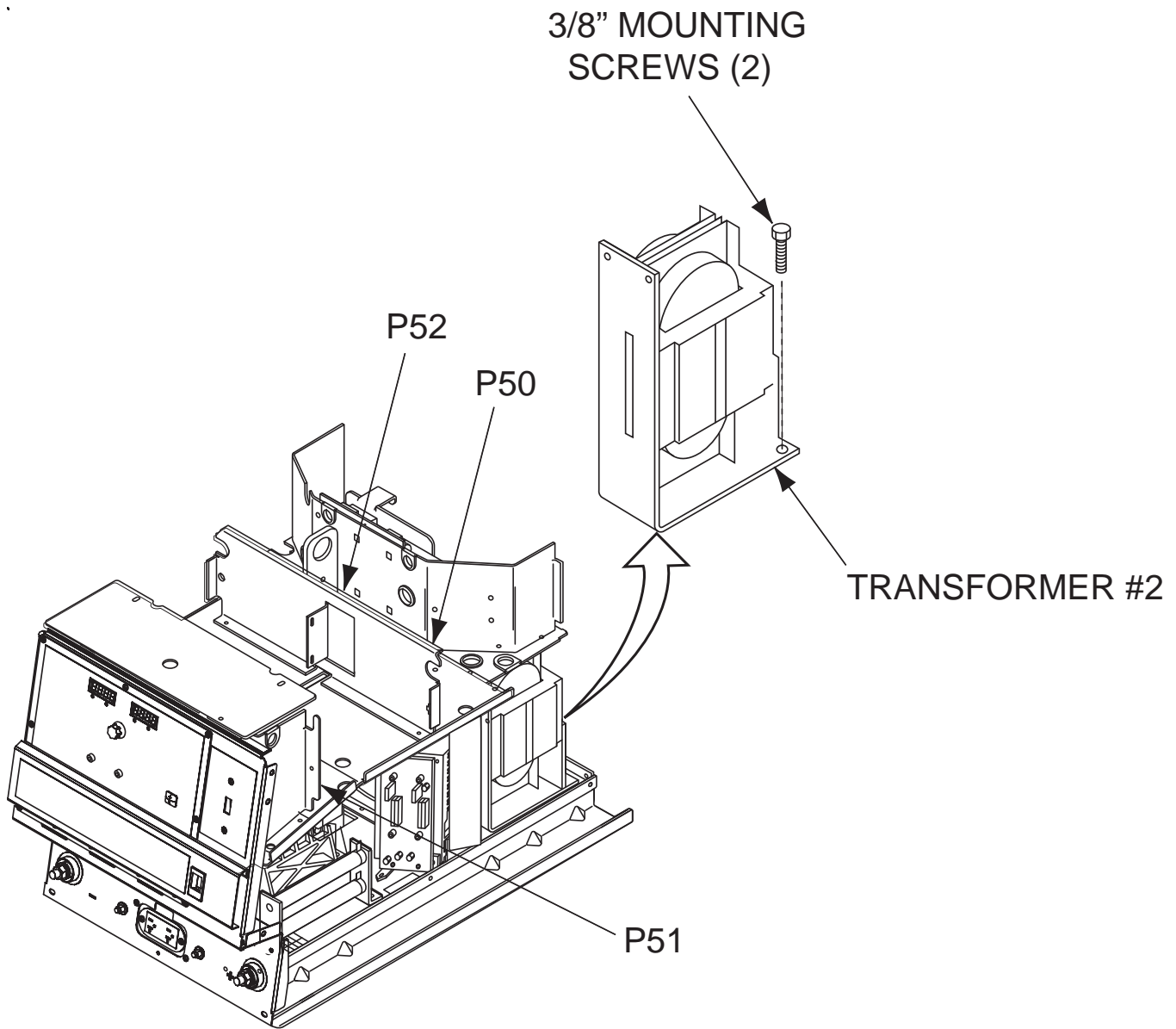
This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 2.

MATERIALS NEEDED

3/8" Nut Driver
Wire Cutters

AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.19 – TRANSFORMER AND PLUG LOCATIONS



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top, input access panel and case sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 3/8" nut driver, remove the case back.
5. Disconnect plugs P50, P51, and P52 and clean.
6. Using the 3/8" nut driver, remove the two transformer mounting screws. See Figure F.19.
7. Label and clean all leads for transformer removal.

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AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the V450-PRO.
2. Install the two mounting screws that hold the transformer to the machine base using the 3/8" nut driver.
3. Connect plugs P50, P51 and P52.
4. Connect any leads and install cable ties as necessary.
5. Install the case back using the 3/8" nut driver.
6. Install the case top, sides, and input access panel using the 3/8" nut driver.

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AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

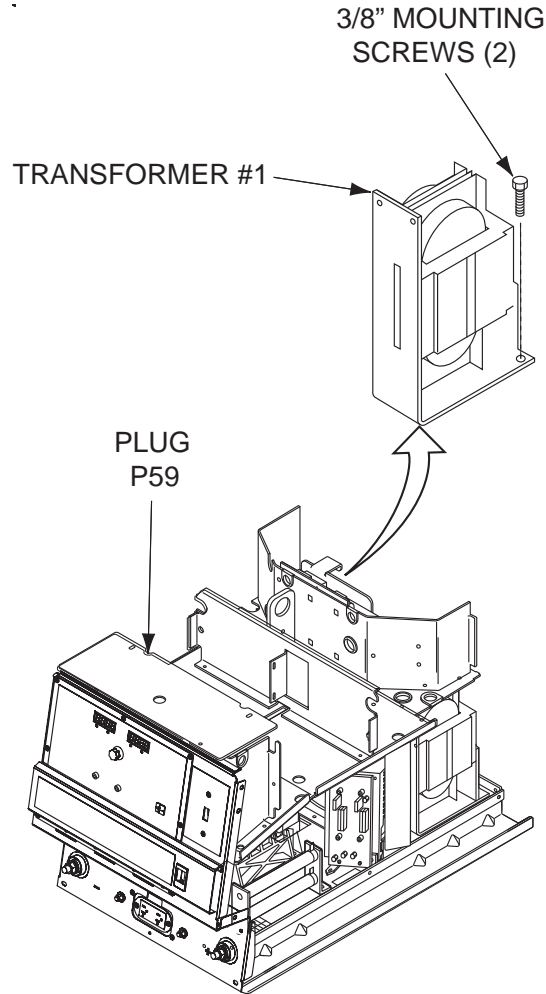
This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 1.

MATERIALS NEEDED

- 3/8" Nut Driver
- Wire Cutters
- Wire Splicer and Soldering Equipment

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.20 – DOOR REMOVAL



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top, and input access panel.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 3/8" nut driver, remove the case back.
5. Remove leads 41B and unplug P59. See Figure F.20.
6. Label and cut or remove all primary and secondary leads from transformer #1. See Wiring Diagram.
7. Disconnect plug P59. See Figure F.20.

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE (continued)

8. Cut any necessary cable ties and clear the leads.
9. Using the 3/8" nut driver, remove the two mounting screws that hold the transformer to the fan baffle and the machine base.
10. Carefully remove the transformer from the V450-PRO.

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the V450-PRO.
2. Install the two mounting screws that hold the transformer to the fan baffle and the machine base using the 3/8" nut driver.
3. Reconnect plug P59 and lead 41B.
4. Reconnect all primary and secondary leads. See Wiring Diagram.
5. Reposition any wire leads and install cable ties as necessary.
6. Install the case back using the 3/8" nut driver.
7. Install the case top, sides, and input access panel using the 3/8" nut driver.

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CONTROL, REMOTE, MODE OR DISPLAY PC BOARD REMOVAL AND REPLACEMENT

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

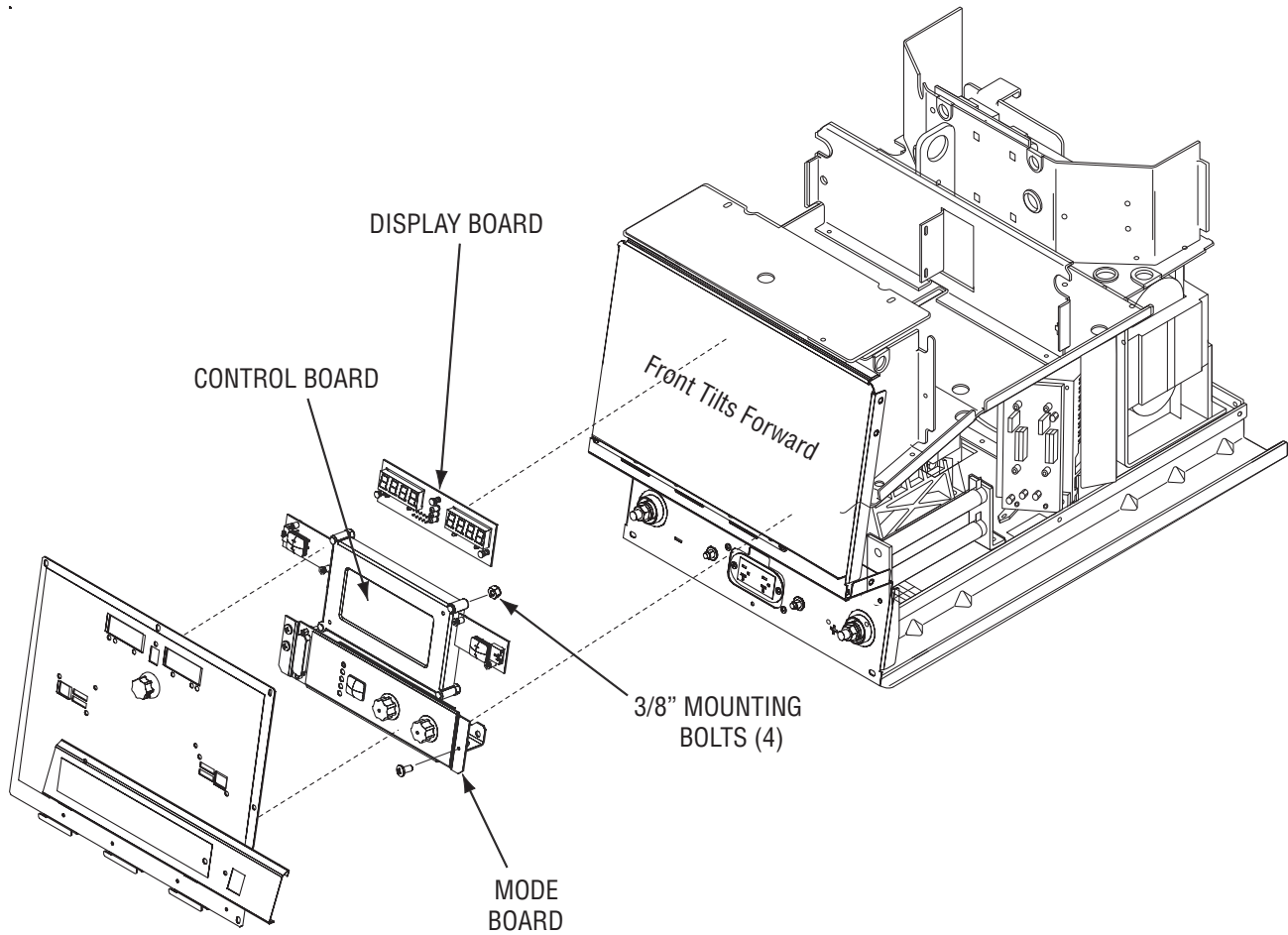
This procedure will aid the technician in the removal and replacement of the Control Board, Remote Board, Mode Board or Display PC Board.

MATERIALS NEEDED

3/8" Nut Driver
Anti-Static Wrist Strap

CONTROL, REMOTE, MODE OR DISPLAY PC BOARD REMOVAL AND REPLACEMENT (continued)

FIGURE F.21 – BOARD LOCATIONS



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the Phillips screwdriver, remove the case front mounting screws and tilt forward.
3. Observe all static electricity precautions.
4. Remove, replace and add panels as needed and/or follow advanced process panel kit instructions.

CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

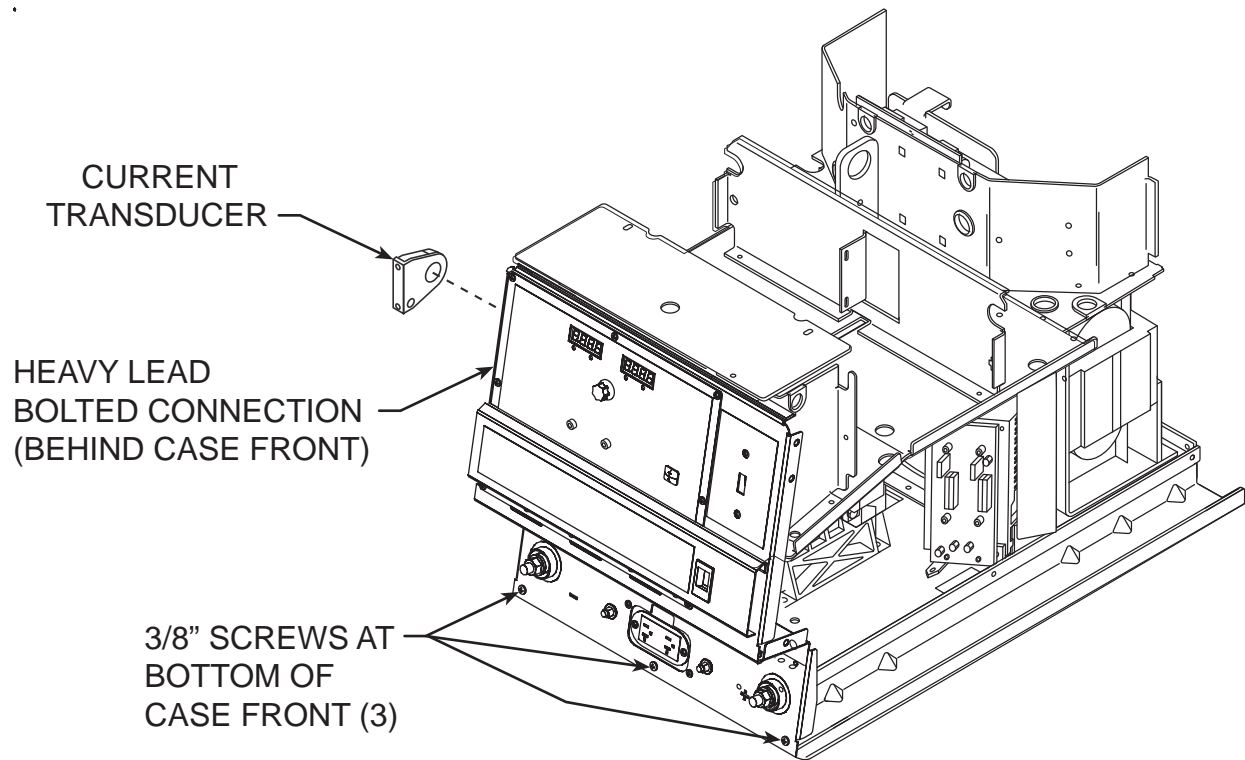
This procedure will aid the technician in the removal and replacement of the Current Transducer.

MATERIALS NEEDED

- 3/8" Nut driver
- 5/16" Open-End Wrench
- 9/16" Wrench
- 3/4" Wrench
- Phillips Head Screwdriver
- Wire Cutters
- Wiring Diagram

CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.22 – CURRENT TRANSDUCER LOCATION



REMOVAL PROCEDURE

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top and sides and the control box cover.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 3/8" socket wrench or nut driver, remove the three screws along the bottom case front. See Figure F.22.
5. Using the 3/8" socket wrench, remove the four screws that hold the case front to the machine.
6. Label all leads to all output terminals. Using the 5/16" wrench and the 3/4" wrench, remove all leads from the two output terminals.
7. Cut any necessary cable ties. Then carefully swing the front panel aside.
8. Remove the insulating tape from the heavy lead bolted connection. Using the 9/16" wrenches, remove the bolt, lock washer and nut.

CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE (continued)

9. Using the Phillips head screwdriver, remove the screws and lock washers that hold the transducer to the front panel.
10. Remove the Current Transducer.
11. Remove the standoffs from the transducer and save them for reassembly with the new transducer. Note placement upon removal.
12. Remove plug P91. See Wiring Diagram.
3. Run the heavy lead through transducer and secure the bolted connection with the 9/16" bolt, lock washer and nut. Replace the insulating tape around the connection.
4. Replace plug P91 into the new current transducer.
5. Using the 5/16" wrench and the 3/4" wrench, attach all leads previously removed to the three output terminals. See the Wiring Diagram.

REPLACEMENT PROCEDURE

1. Attach the stand-offs to the transducer.
2. Position the transducer on the back of the front panel and attach it with the two phillips screws and lock washers. Feed the output leads through the transducer. Note direction of output lead through current transducer.
6. Replace any cable ties cut during removal.
7. Install the case top and sides using the 3/8" nut driver.

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SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

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

DESCRIPTION

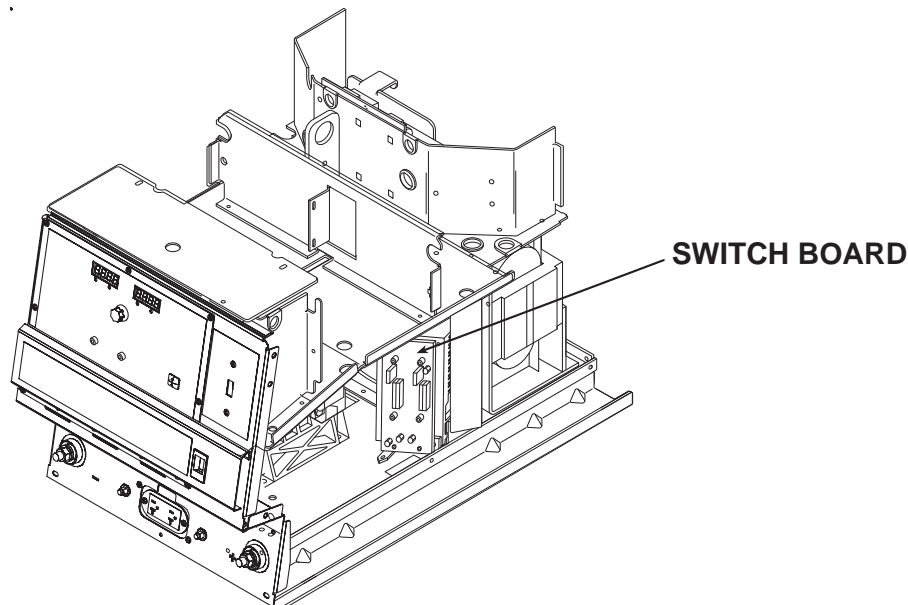
This procedure will aid the technician in the removal and replacement of the switch board(s) and/or filter capacitor(s).

MATERIALS NEEDED

- 3/8" Nut Driver
- 7/16" Wrench
- 3/16" Allen Wrench
- Slot-Head Screwdriver
- Penetrox A13 Thermal Joint Compound

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.23 – SWITCH BOARD LOCATION



REMOVAL PROCEDURE

NOTE: Observe all static electricity precautions.

Lead and plug references below use a slash (/) to indicate machine right side/left side wire number differences.

1. Remove input power to the V450-PRO.
2. Using the 3/8" nut driver, remove the case top and sides.
3. Perform the **Capacitor Discharge Procedure**.
4. Using the 3/8" nutdriver, remove the screw mounting the plastic high voltage protective shield. Remove the shield and it's mount from the machine.
5. Remove molex plug J50 from the top of the switch board. **See Figure F.24.**
6. Remove the mylar insulating shield covering leads 13/14 or 17/18 (marked clearly on the board). Cut any necessary cable ties.
7. Using the 7/16" wrench, remove leads 13/14 or 17/18 from the switch board. **See Figure F.24.**
8. Using the 7/16" wrench, remove leads 11/12 or 15/16 from the switch board. **See Figure F.24.**
9. Using the 7/16" wrench, remove leads 19C/D+ and 20C/D- from the switch board capacitor connection bolts. **See Figure F.24.**
10. With the slot head screwdriver, remove the two nylon mounting screws at the bottom of the switch board. Note placement of the shake-proof washers and fiber spacers.
11. Using the 3/16" allen wrench, carefully remove the four cap screws that mount the switch board to the heat sink.
12. Carefully remove the switch board from the heat sink.
13. If the filter capacitor is to be removed, carefully slide it out of the mounting bracket.

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT (continued)

REPLACEMENT PROCEDURE

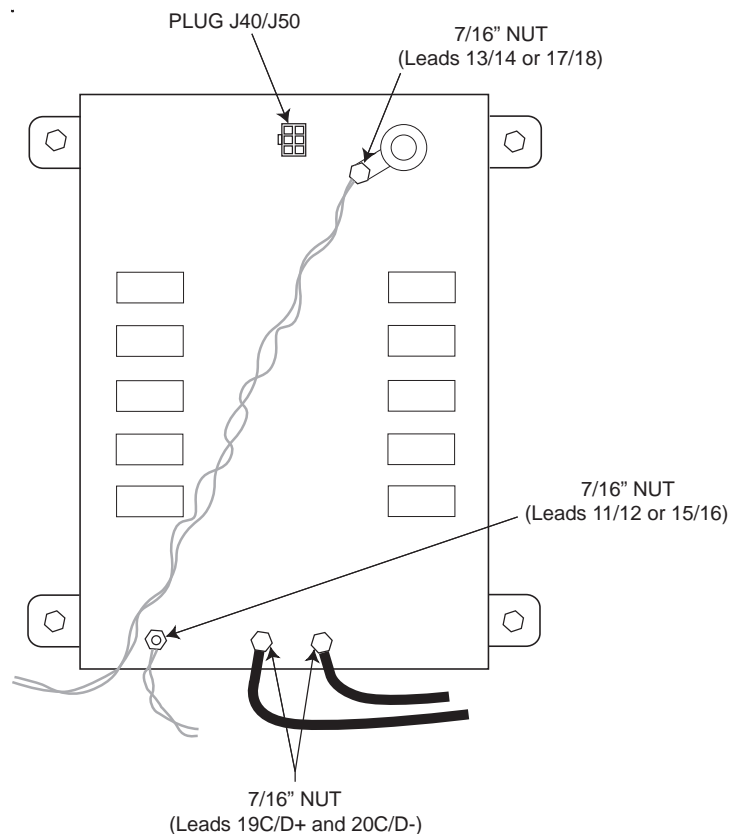
1. If the filter capacitor is to be replaced, carefully slide the new capacitor into the mounting bracket. Position the capacitor so the correct polarity terminal is lined up with the correct hole on the switch board.
2. All heat sink and IGBT mounting surfaces must be clean.
3. Apply a thin coat of thermal compound (Penetrox A13) 0.005 to 0.010 inches thick to the mating surfaces. Do not apply around mounting holes.
4. Apply a thin coat of Penetrox A13 to the capacitor terminals. Be careful not to apply compound to screw threads or threaded area of terminals.
5. Mount the new switch board and tighten the four cap head screws in the following manner.
 6. Make sure the capacitor is positioned correctly. Connect leads 19C/D+ and 20C/D- to the correct terminals. Tighten to 55 in/lbs.
 7. Position and mount the two nylon screws, fiber spacers, and washers. Torque from 4 to 8 in-lbs.
 8. Connect leads 15/16 to the correct terminal.
 9. Connect leads 17/18 to the correct terminal.
 10. Install the mylar insulating shield covering leads 15/16. Replace the cable tie.
 11. Connect molex plug J40/J50 to the top of the switch board.
 12. Using the 5/16" nut driver, install the plastic high voltage protective shield.
 13. Install the case top and sides using the 3/8" nut driver.

Tighten all until snug.

Tighten all from 24 to 28 in-lbs.

Tighten all from 40 to 48 in-lbs.

FIGURE F.24 – SWITCH BOARD LEADS



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RETEST AFTER REPAIR

Retest a machine:

If it is rejected under test for any reason that requires you to remove any part which could affect the machine's electrical characteristics.

OR

If you repair or replace any electrical components.

INPUT IDLE AMPS AND WATTS

Input Volts/Hertz	Maximum Idle Amps	Maximum Idle KW
208/60	4.0	0.40
230/60	3.3	0.40
400/60	2.1	0.40
460/60	2.0	0.40
575/60	1.8	0.40

MAXIMUM OUTPUT VOLTAGES

Input Volts/Hertz	Output Terminals - No load	115 Volt Receptacles	
208/60	50-70 VDC	OCV	10 Amp Load
230/60		115 - 123 VAC	111 - 119 VAC
400/60			
460/60			
575/60			

Electrical Diagrams	G-1
Wiring Diagram - Complete Machine - (G4923)	G-2
Schematic – Complete Machine - (G4875)	G-3 / G-5
Schematic – Digital Control PC Board (G3789)	G-6 / G-9
Schematic - Digital Power Supply PC Board (G5631)	G-10
Schematic – Input PC Board - (M19528)	G-11
PC Board Assembly – Input PC Board - (L11396)	G-12
Schematic - Switch PC Board - (L11385)	G-13
PC Board Assembly – Switch PC Board - (G3734)	G-14
Schematic – SPI / Remote Control PC Board - (G4017)	G-15
Schematic - Display PC Board - (L11108)	G-16
PC Board Assembly – Display PC Board - (L11130)	G-17
Schematic - LED Potentiometer PC Board - (S25258)	G-18
PC Board Assembly – LED Potentiometer PC Board - (M19874)	G-19
Schematic - LED Select PC Board - (S25259)	G-20
PC Board Assembly – LED Select PC Board - (M19875)	G-21

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

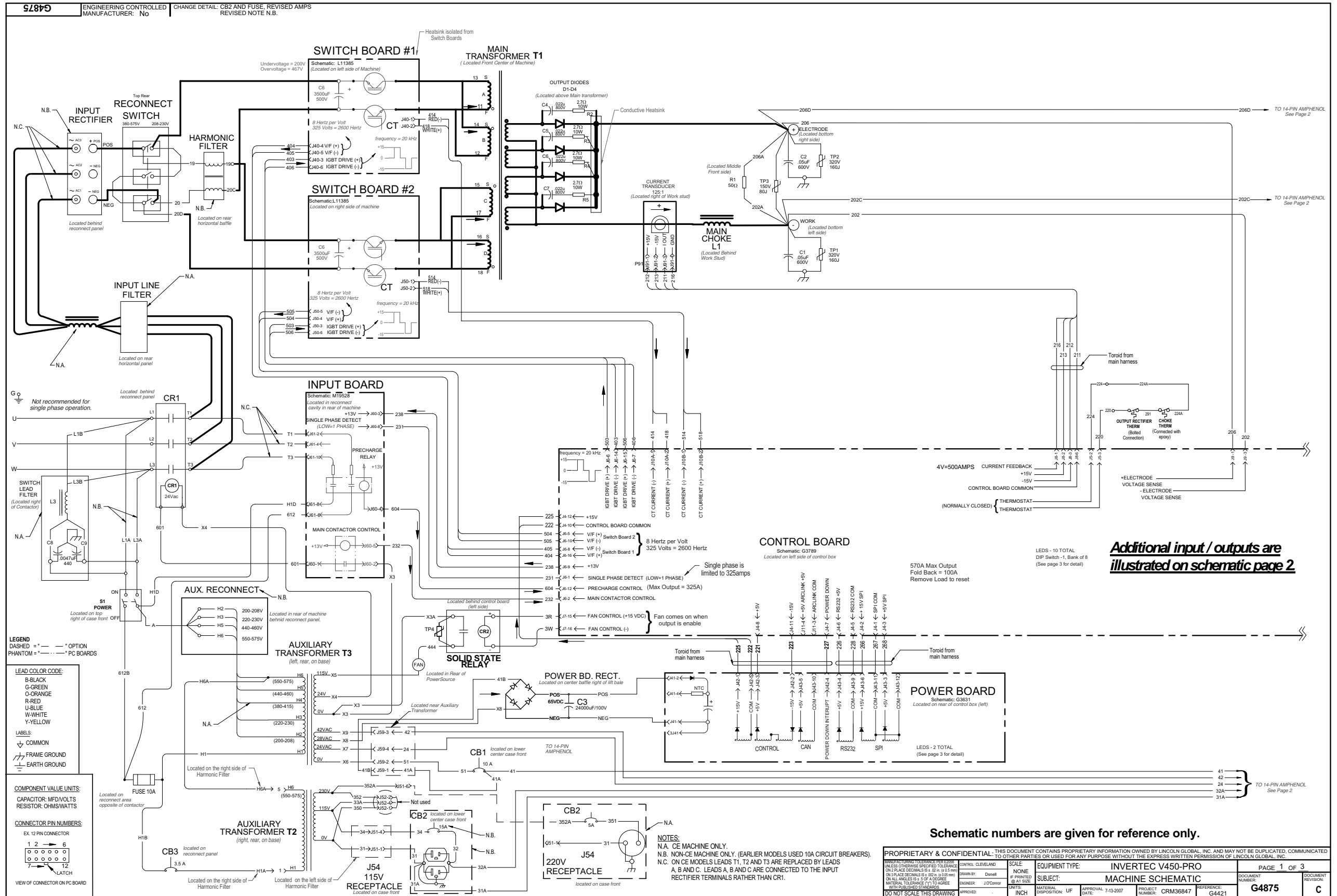
SCHEMATIC - COMPLETE MACHINE - (G4875 SHEET 1)

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

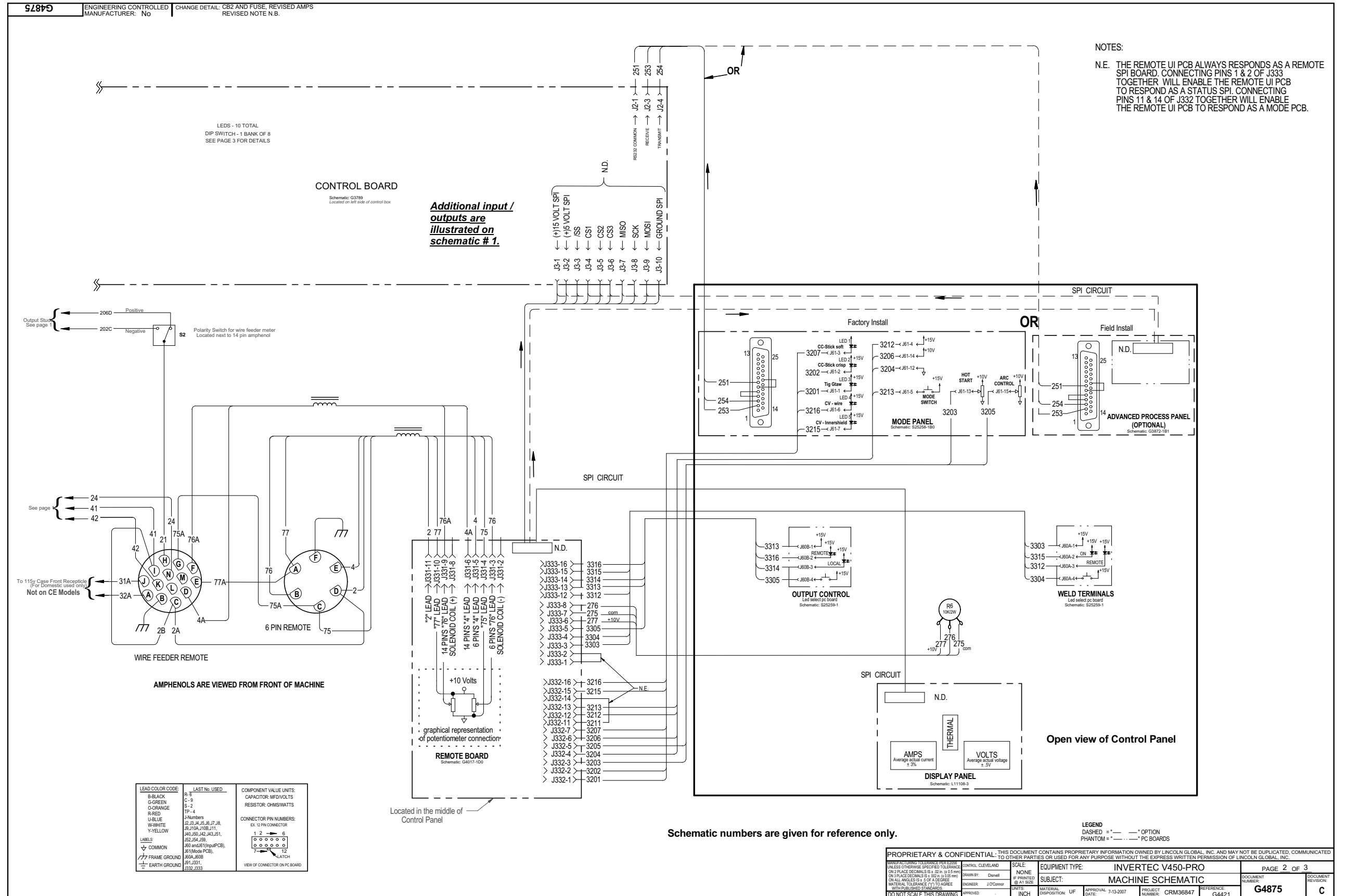
SCHEMATIC - COMPLETE MACHINE - (G4875 SHEET 2)

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

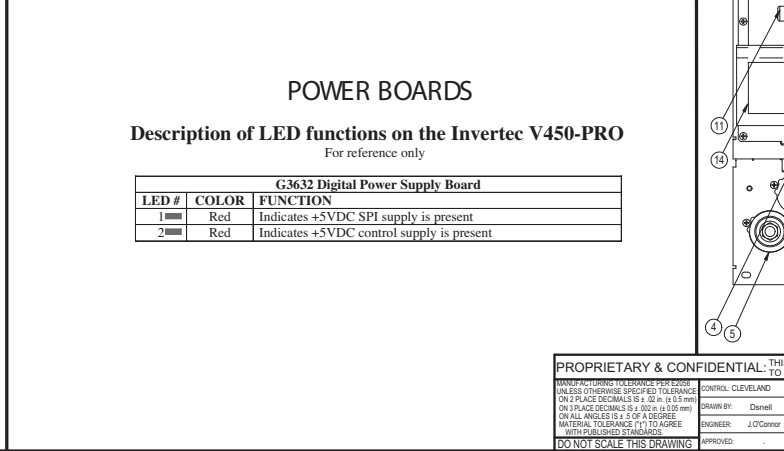
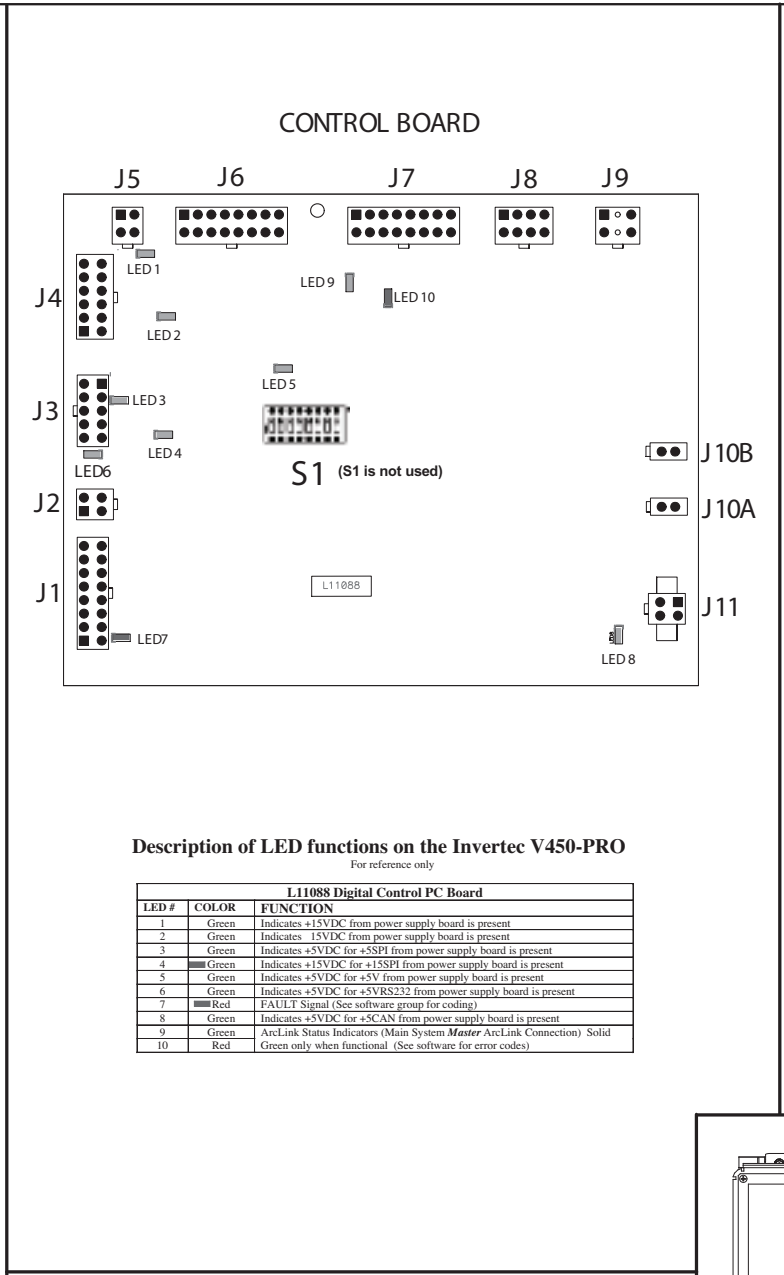
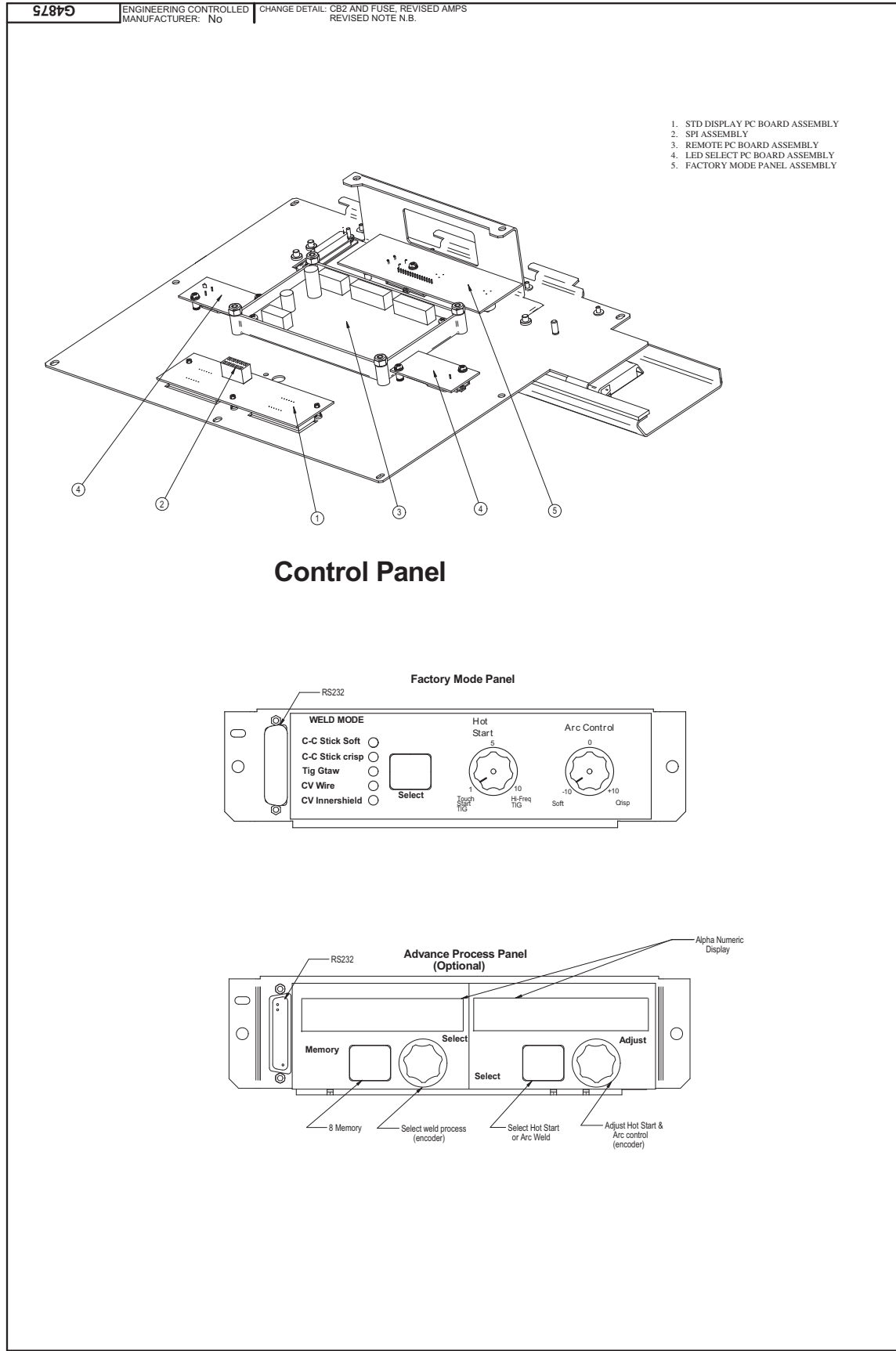
SCHEMATIC - COMPLETE MACHINE - (G4875 SHEET 3)

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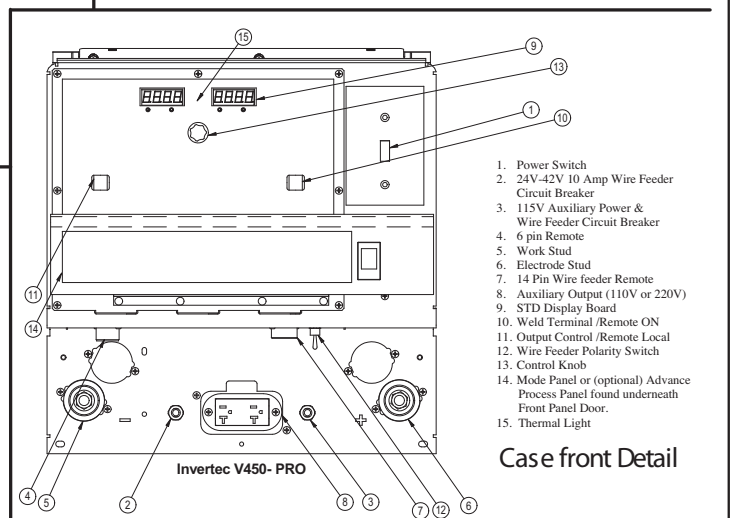
Return to Section TOC



Error codes for the Invertec V450-PRO

The following is a list of possible error codes that the Power Wave can output via the status light

Error Code #	Indication
21	Unprogrammed Weld Mode. Contact the Service Department for instructions on reloading the Welding Software.
22	Empty Weld Table. Contact the Service Department for instructions on reloading the Welding Software.
23	Weld Table checksum error. Contact the Service Department for instructions on reloading the Welding Software.
31	Primary overcurrent error. Excessive Primary current present. May be related to a switch board or output rectifier failure.
32	Capacitor A under voltage (Left side facing machine). Low voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
33	Capacitor B under voltage (Right side facing machine). Low voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
34	Capacitor A over voltage (Left side facing machine). Excess voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
35	Capacitor B over voltage (Right side facing machine). Excess voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
36	Thermal error. Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
37	Softstart error. Capacitor precharge failed. Usually accompanied by codes 32-35.
41	Secondary overcurrent error. The secondary (weld) current limit has been exceeded. When this occurs the machine output will phase back to 100 amps, typically resulting in a condition referred to as noodle welding.
43	Capacitor delta error. The maximum voltage difference between the main capacitors has been exceeded. May be accompanied by errors 32-35.
49	Single phase error. Indicates machine is running on single phase input power. Usually caused by the loss of the middle leg (L2).
Other	Use Snap Shot to interpret other errors or Diagnostic Software



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MANUFACTURING TOLERANCES PER ASME Y14.5M UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ±.02 in. ±.5 mm ON 3 PLACE DECIMALS IS ±.005 in. ±.127 mm ON ALL ANGLES IS ±.5 OF A DEGREE MATERIAL TOLERANCES FTY TO AGREE WITH PUBLISHED STANDARDS DO NOT SCALE THIS DRAWING	CONTROL: CLEVELAND DRAWN BY: Densell ENGINEER: J O'Connor	SCALE: NONE IF PRINTED @ 1:1 SIZE UNITS: INCH	EQUIPMENT TYPE: INVERTEC V450-PRO SUBJECT: MACHINE SCHEMATIC	PROJECT NUMBER: CRM36847 APPROVAL DATE: 7-13-2007	DOCUMENT NUMBER: G4875 REFERENCE: G4421	PAGE 3 OF 3 DOCUMENT REVISION: C
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NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - DIGITAL CONTROL PC BOARD - (G3789 SHEET 1)

Return to Section TOC

Return to Section TOC

Return to Section TOC

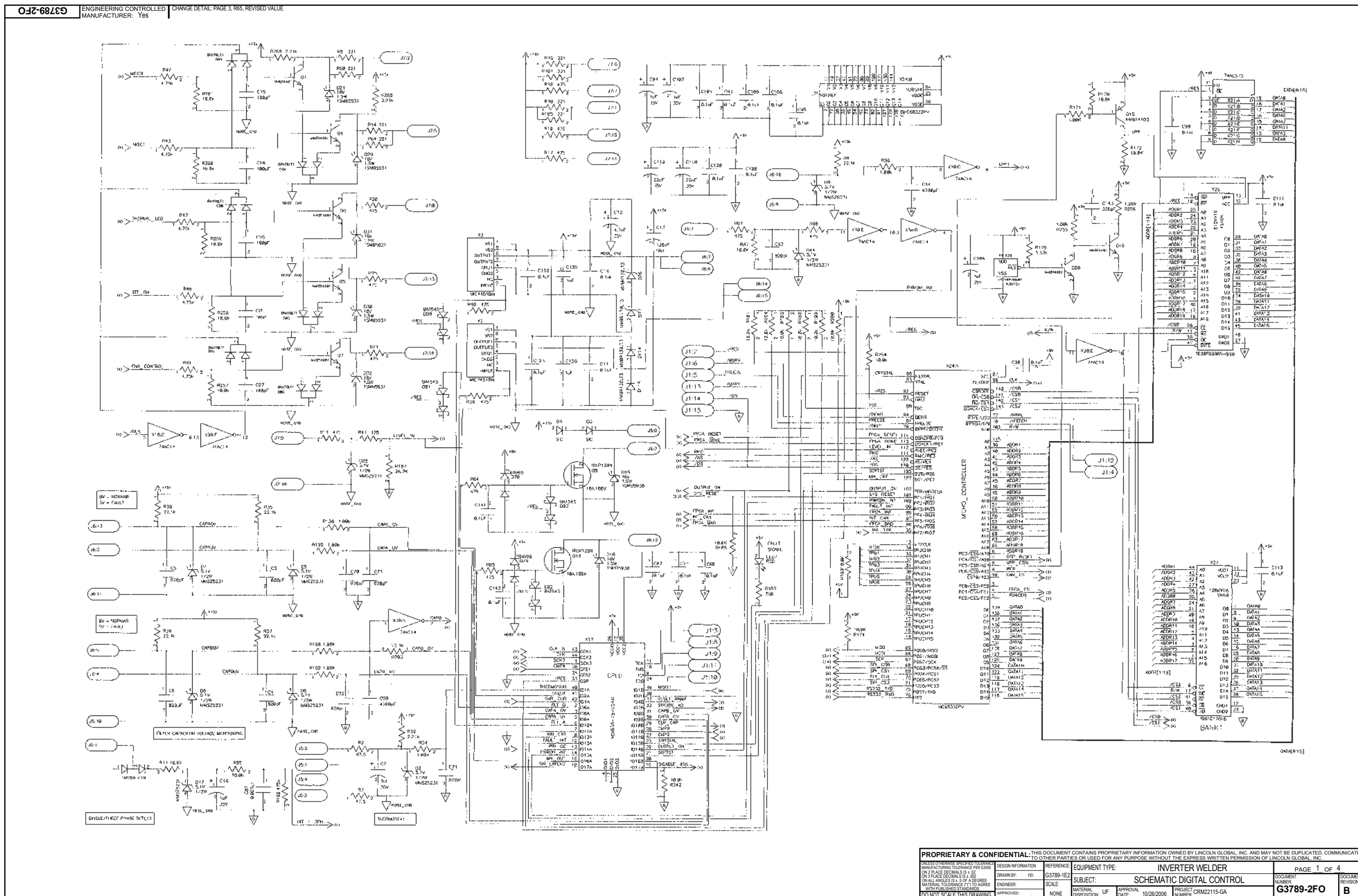
Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



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DESIGN INFORMATION MANUFACTURING TOLERANCE PER EDGE: ON 3 PLACE DECIMALS (±.005) ON 4 PLACE DECIMALS (±.0005) ON 5 PLACE DECIMALS (±.0001) MATERIAL TOLERANCE (±) TO AGREE WITH PUBLISHED DIMENSIONS	REFERENCE G3789-1E2 SCALE NONE
EQUIPMENT TYPE INVERTER WELDER	PAGE 1 OF 4
SUBJECT SCHEMATIC DIGITAL CONTROL	DOCUMENT NUMBER G3789-2FO
MATERIAL DISPOSITION: UF	APPROVAL DATE: 10/26/2006
PROJECT NUMBER: CRM22115-GA	DOCUMENT REVISION: B

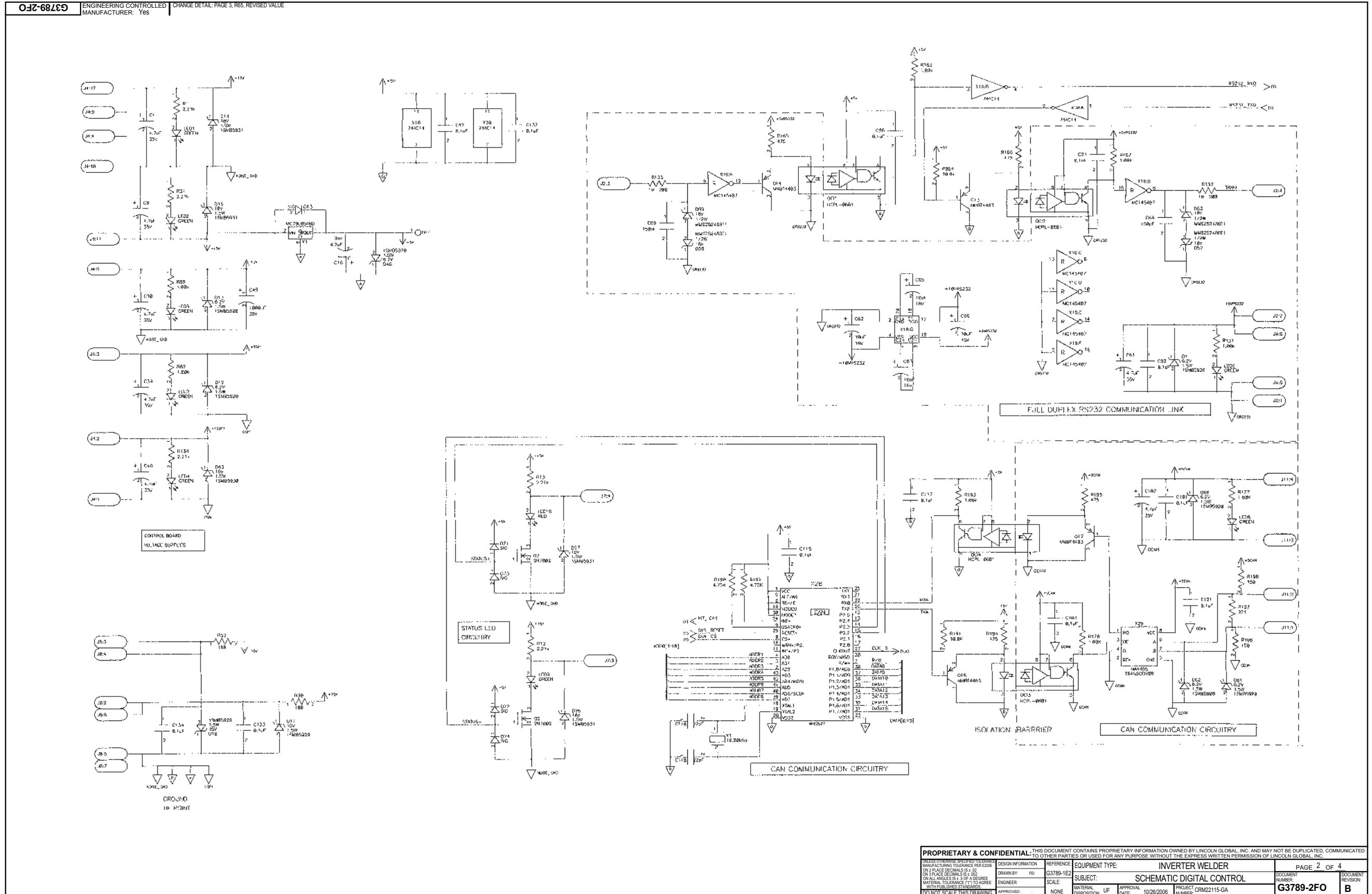
SCHEMATIC - DIGITAL CONTROL PC BOARD - (G3789 SHEET 2)

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC



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UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS (IN PARENTHESES). DIMENSIONS IN PARENTHESES ARE FOR REFERENCE ONLY. DIMENSIONS IN PARENTHESES ARE FOR REFERENCE ONLY. DIMENSIONS IN PARENTHESES ARE FOR REFERENCE ONLY. DIMENSIONS IN PARENTHESES ARE FOR REFERENCE ONLY.	DESIGN INFORMATION DRAWN BY: FEI ENGINEER:	REFERENCE G3789-1E2 SCALE:	EQUIPMENT TYPE: INVERTER WELDER SUBJECT: SCHEMATIC DIGITAL CONTROL
APPROVED:	NONE	MATERIAL DISPOSITION:	APPROVAL DATE: 10/26/2006 PROJECT NUMBER: CRM2115-GA
DO NOT SCALE THIS DRAWING		PAGE 2 OF 4	DOCUMENT NUMBER: G3789-2FO REVISION: B

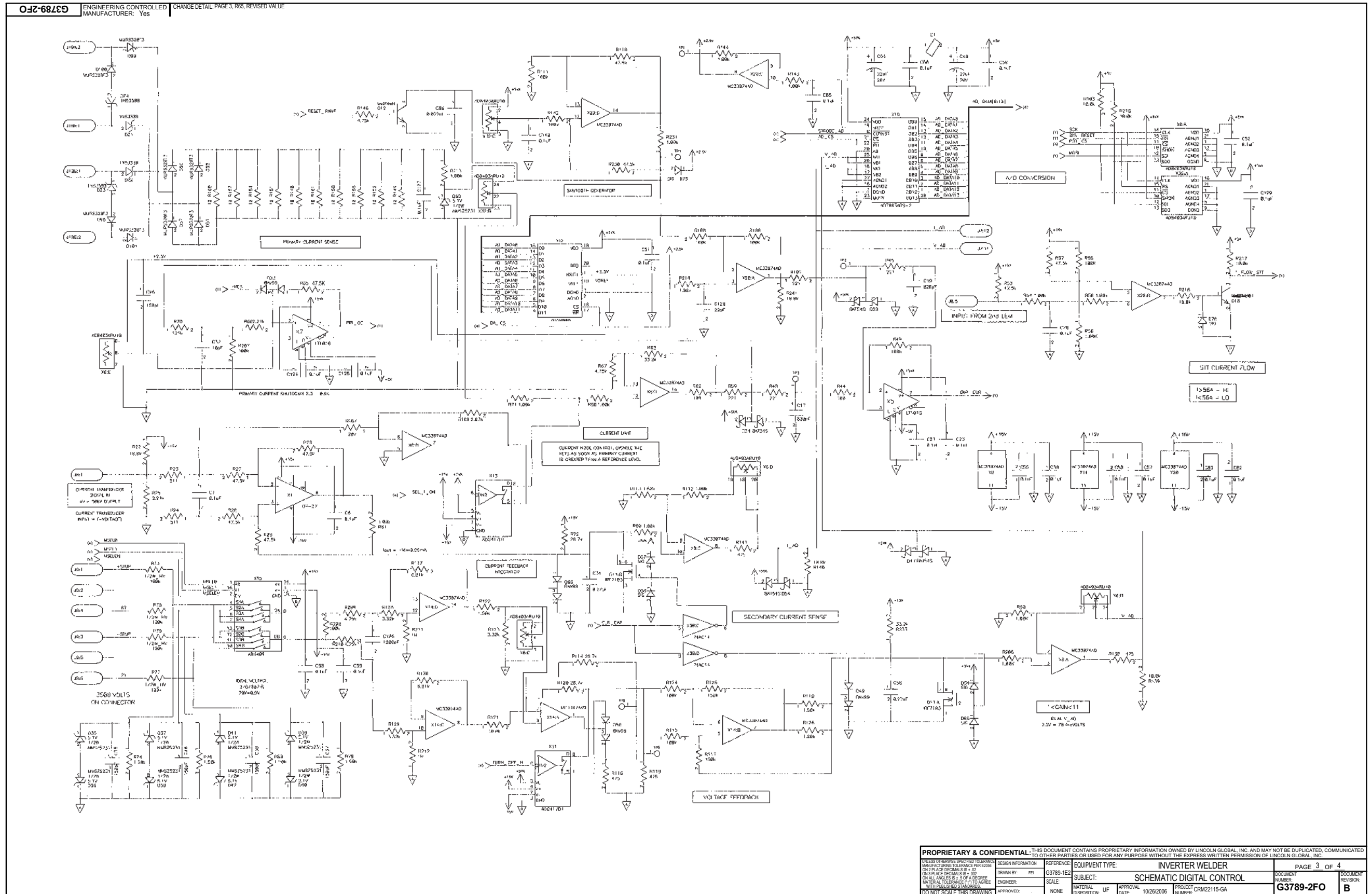
SCHEMATIC - DIGITAL CONTROL PC BOARD - (G3789 SHEET 3)

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Return to Section TOC

Return to Section TOC

Return to Section TOC



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SUBJECT: SCHEMATIC DIGITAL CONTROL		SCALE:		PROJECT NUMBER: CRM2215-GA	
MATERIAL DISPOSITION: UF		APPROVAL DATE: 10/26/2006		DOCUMENT REVISION: B	

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



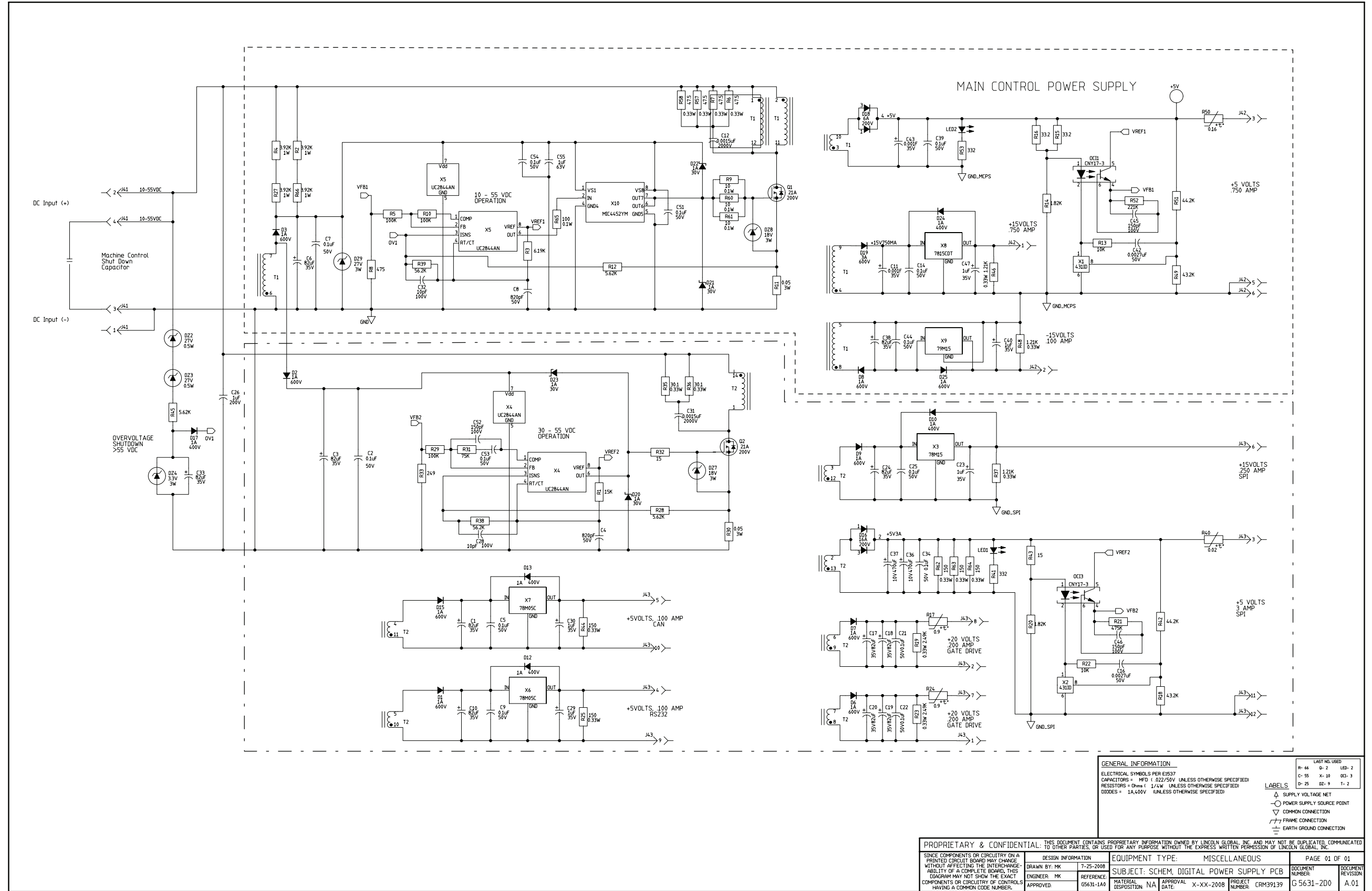
SCHEMATIC - DIGITAL POWER SUPPLY PC BOARD - (G5631)

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER IEC37
 CAPACITORS = MFD (0.22/50V UNLESS OTHERWISE SPECIFIED)
 RESISTORS = OHMS (1/4W UNLESS OTHERWISE SPECIFIED)
 DIODES = 1A/400V UNLESS OTHERWISE SPECIFIED

LAST USED

R-66	Q-2	LED-2
C-55	X-10	DCI-3
D-25	DI-9	I-2

LEGEND

- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- ▽ COMMON CONNECTION
- ⌋ FRAME CONNECTION
- ⊥ EARTH GROUND CONNECTION

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DESIGN INFORMATION	EQUIPMENT TYPE: MISCELLANEOUS	PAGE 01 OF 01
DRAWN BY: MK	DATE: 7-25-2008	DOCUMENT NUMBER: G5631-2D0
ENGINEER: MK	REFERENCE: G5631-1A0	REVISION: A.01
APPROVED:	MATERIAL DISPOSITION: NA	APPROVAL DATE: X-XX-2008
	PROJECT NUMBER: CRM39139	

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

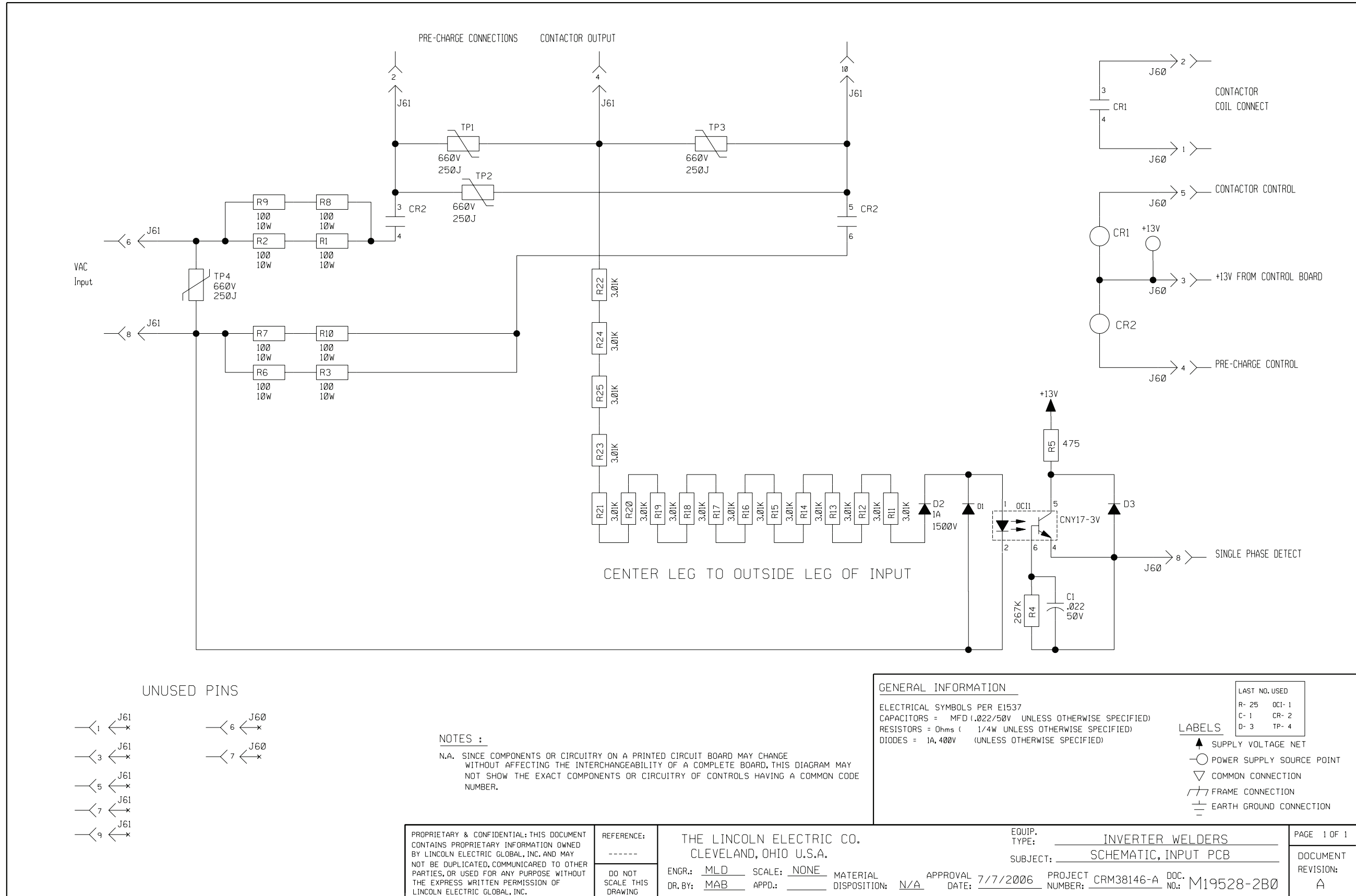
SCHEMATIC - INPUT PC BOARD - (M19528)

Return to Section TOC

Return to Section TOC

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Return to Section TOC



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

PC BOARD ASSEMBLY - INPUT PC BOARD - (L11396)

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Return to Section TOC

Return to Section TOC

Z-96117 L11396-2	ENGINEERING CONTROLLED MANUFACTURER: No	CHANGE DETAIL: REVISED NOTE N.B.
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P.C. BOARD BLANK INFORMATION
BUY COMPLETE AS L11396-B
(2 LAYER BOARD PER E3281)
(MAKES 8 BOARDS PER PANEL, SEE ELECTRONIC FILE
FOR ADDITIONAL INFORMATION)

REFERENCES	QTY	PART NO.	DESCRIPTION
C1	1	S16668-5	.022/50
CR1, CR2	2	S14293-18	DPST RELAY
D1, D3	2	T12199-1	1N4004
D2	1	T12705-58	DIODE, 1.0A, 1500V
N.C. J60	1	S24020-8	HEADER, VERTICAL
N.C. J61	1	S24020-10	HEADER, VERTICAL
OI1	1	S15000-22	OPTO ISOLATOR
R1, R2, R3, R6, R7, R8, R9, R10	8	S24376-3	100/10W
R4	1	S19400-2673	267K 1/4W
R5	1	S19400-4750	475 1/4W
R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25	15	S19400-3011	3.01K 1/4W
TP1, TP2, TP3, TP4	4	T13640-23	MOV, 250J, 660V

ITEM	REQ'D	PART NO.	IDENTIFICATION
1	1	SEE BLANK INFO	P.C. BD. BLANK
2	1.0 OZ.	E2861	SEALANT
3	2	S14020-7	PLASTIC EXPANSION NUT

CAPACITORS = MFD / VOLTS
RESISTORS = OHMS/WATTS

NOTES:

- N.A. THIS AREA TO BE COVERED ON BOTH SIDES OF BOARD WITH ITEM 2 PRIOR TO ENCAPSULATION. MATERIAL MUST BE APPLIED THRU SLOTS FROM BOTTOM SIDE TO COMPLETELY FILL TO UNDERSIDE OF DEVICE ON COMPONENT SIDE.
- N.B. P.C. BOARD HOLES TO BE FREE OF ENCAPSULATION MATERIAL AND RTV FOR A DIAMETER OF .40 ON COMPONENT AND NON-COMPONENT SIDES OF BOARD (6 PLACES).
- N.C. DO NOT COAT WITH ENCAPSULATION MATERIAL.
- N.D. APPLY ITEM 2 AS SHOWN, ALL EXPOSED LEADS MUST BE COVERED. MATERIAL MUST BE APPLIED PRIOR TO ENCAPSULATION.
- N.E. APPLY ITEM 2 ON NON-COMPONENT SIDE OF BOARD PRIOR TO ENCAPSULATION. ALL EXPOSED PINS MUST BE COVERED.

MAKE PER E1911-ROHS
ENCAPSULATE WITH E1844
TEST PER E3647-I
SCHEMATIC REFERENCE: M19528-2B0

MANUFACTURED AS:
L11396-2B0
 IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

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MANUFACTURING TOLERANCE PER E2026 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± 5 OF A DEGREE MATERIAL TOLERANCE ("I") TO AGREE WITH PUBLISHED STANDARDS.	CONTROL: CLEVELAND DRAWN BY: ivory ENGINEER: APPROVED:	SCALE: 1:1 IF PRINTED @ A2 SIZE UNITS: INCH	EQUIPMENT TYPE: INVERTER WELDERS SUBJECT: INPUT P.C. BOARD ASSEMBLY MATERIAL DISPOSITION: UF	APPROVAL DATE: 2-8-2008 PROJECT NUMBER: CRM39233	PAGE 1 OF 1 DOCUMENT NUMBER: L11396-2 DOCUMENT REVISION: C

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.



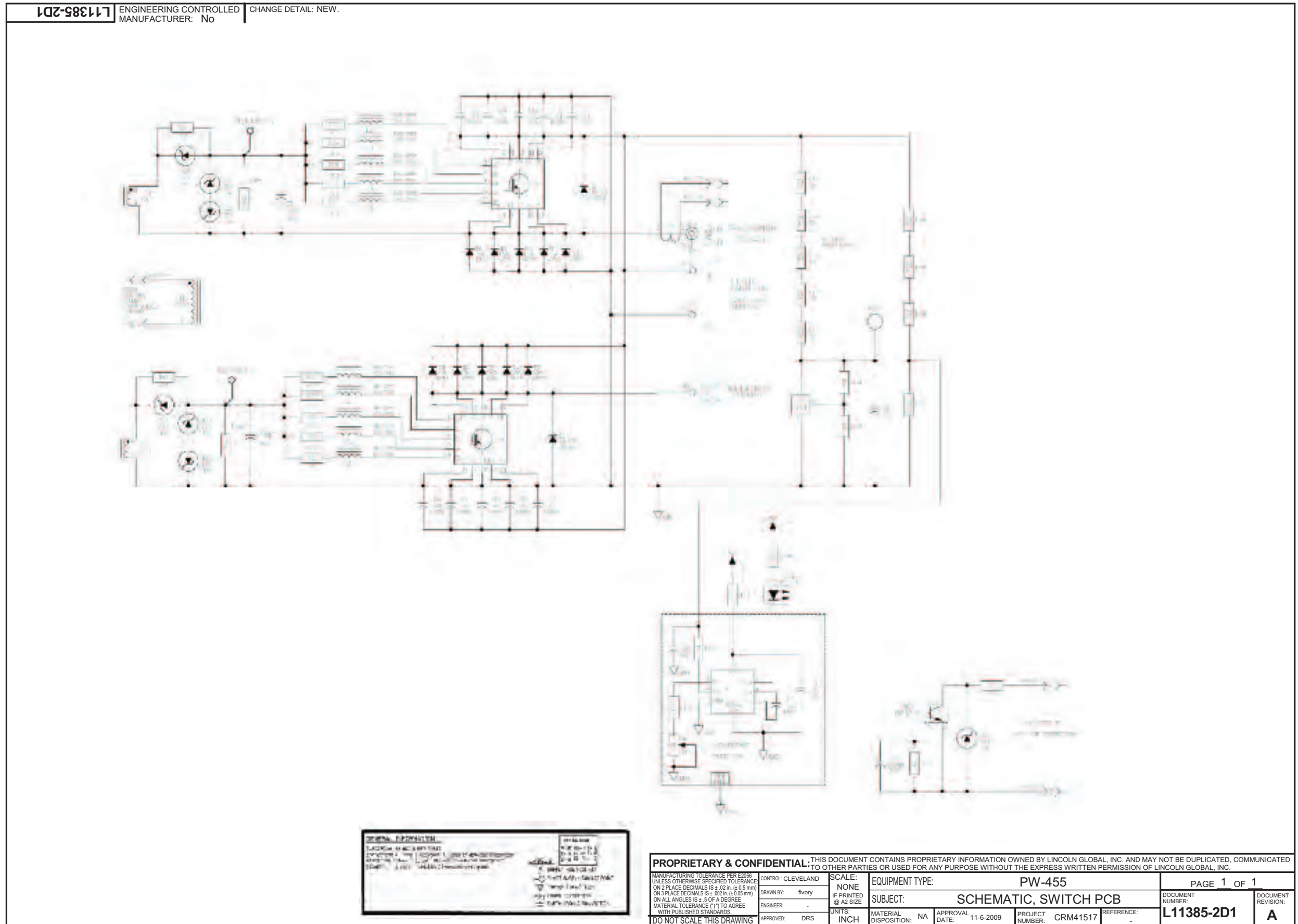
SCHEMATIC - SWITCH PC BOARD - (L11385)

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC



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

PC BOARD ASSEMBLY - SWITCH PC BOARD - (G3734)

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

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Return to Master TOC

Return to Section TOC
Return to Master TOC

ENGINEERING CONTROLLED
MANUFACTURER: No

CHANGE DETAIL: ADDED ITEM 6 AND NOTE N.Y.
REVISED MANUFACTURED AS, IDENTIFICATION CODE AND SCHEMATIC REFERENCE PART NUMBERS

NOTES:

N.A. CAUTION: THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

N.D. FEMALE EYELET TO BE AGAINST THE COPPER SIDE AS SHOWN. EYELET MUST NOT SPIN AFTER CLINCHING.

N.E. SOLDER EYELET SO THAT SOLDER COVERS ENTIRE EYELET AND ALL AROUND EYELET ON COPPER SIDE ONLY. NO ICICLES OR SOLDER BLOBS PERMITTED. MUST BE SMOOTH AND EVEN WITHIN .020" OVER SURFACE.

N.H. MOLEX CAVITIES AND AREA AROUND LOCKING TAB TO BE FREE OF ENCAPSULATION MATERIAL. MASK PER APPROPRIATE MANUFACTURING WORK INSTRUCTIONS.

N.J. ELECTRONIC MODULES TO BE ASSEMBLED, SOLDERED, AND SEALED TO PC BOARD PER E3875.

N.M. DO NOT COAT THE TOP SURFACES OR THE THREADS WITH ENCAPSULANT MATERIAL (1 TERMINAL). MASK PER APPROPRIATE MANUFACTURING WORK INSTRUCTIONS.

N.Q. BRACKET MUST HAVE FULL MATING CONTACT WITH POWER TERMINAL AND HAVE HOLES ALIGNED.

N.R. ELECTRONIC MODULES ON A COMMON P.C. BOARD ASSEMBLY TO HAVE THE SAME VENDOR CODE.

e.g. M21214-2 X XX XXX.....

VENDOR CODE
VCE(SAT)
VGE(TH)

N.S. AFTER SOLDERING, INSPECT TERMINAL CONNECTIONS PER E1880.

N.T. ENCAPSULATE COMPONENT SIDE OF P.C. BOARD TO A THICKNESS OF .30 +.12/-.00 IN AREA SHOWN.

N.U. ENCAPSULATE NON COMPONENT SIDE OF P.C. BOARD TO A THICKNESS OF .25 +.12/-.00.

N.V. ENCAPSULATION MATERIAL MUST EXTEND BEYOND EDGES OF P.C. BOARD. 12 +.12/-.00.

N.W. ENCAPSULATE OPPOSITE COMPONENT SIDE OF P.C. BOARD IN AREAS SHOWN TO A MAXIMUM THICKNESS OF .20.

N.X. BOTH P.C. BOARD SHIELDS SOLDER INTO THE SAME MOUNTING HOLES. ITEM 3 IS MOUNTED ON NON-COMPONENT SIDE OF P.C. BOARD.

N.Y. APPLY A BEAD OF ITEM 6 TO COVER R28, R29, R30, R31 AND R32.

EYELET DETAIL

P.C. BOARD BLANK REFERENCE INFORMATION

BUY COMPLETE AS G3734-E (4 LAYER BOARD PER E3281)

(SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)

MAKE PER E1911-ROHS
POT PER E1911-E-ROHS
TEST PER E3901-SW
SCHEMATIC REFERENCE: L11385-3E1

MANUFACTURED AS:

G3734-3E1

IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

FOR PARTS ORDERS OR SUBSIDIARY ORDERS INCLUDE ONE G3010PRINT, ONE M19661PRINT, ONE S25254PRINT AND ONE T12837-1.

ITEM (USED WITH)	QTY	PART NUMBER	DESCRIPTION
T	1	G3734-E	PC BOARD BLANK
N.D.	3	T9147-11	CONNECTOR EYELET POWER FEMALE
N.X.	1	S24869-2	PC BOARD SHIELD
4	280 g.	E2527	EPOXY ENCAPSULATING RESIN
5	1 oz.	S24869-1	PC BOARD SHIELD
6	1 oz.	E2861	SEALANT

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
A1, A2	2	M21214-2	ELECTRONIC MODULE 5-T12704-84 GBTS
B11, B19, B20	3	T9147-15	CONNECTOR EYELET POWER MALE
N.O.	1	S24868	BRACKET POWER HOLDER
N.Q.	1	S23096	CONNECTOR TERMINAL POWER
C1	1	S20500-14	CAPACITOR PPMF .022 100V BOX 5%
C2	1	S16668-11	CAPACITOR CEMO .0.1 50V 10%
C3	1	S16668-5	CAPACITOR CEMO .022 50V 20%
C4, C6, C7	3	S16668-6	CAPACITOR CEMO .4700pF 50V 10%
C5	1	S13490-93	CAPACITOR TAEL 27.35V 10%
C8, C9, C10, C11, C12, C13, C14, C15, C16, C17	10	S20500-1	CAPACITOR PPMF .0.1 1000V 10% BOX
D1, D2	2	T12705-44	DIODE AXLDS 1A 1000V FR 818
D3, D4, D5, D6, D7, D8, D9, D10, D11, D12	10	T12705-32	DIODE TO220 15A 600V FR MUR1560
DZ1	1	T12702-4	ZENER DIODE 1W 20V 5% 1N4747A
DZ2, DZ3, DZ5, DZ6	4	T12702-29	ZENER DIODE 1W 15V 5% 1N4744A
DZ4, DZ7	2	T12702-40	ZENER DIODE 1W 8.2V 5% 1N4735A
J40	1	S24020-6	CONNECTOR MOLEX MINI PCB 6-PIN TIN
L1, L2, L3, L4, L5, L6, L7, L8, L9, L10	10	T12218-15	CHOKER FERRITE BEAD 180 OHM
OC1	1	S15000-22	OPTOCOUPLER PHOTO Q 70V CNY17-3/VDE
R1	1	S16296-5	TRIMMER MT 1/2W 10K 10% LINEAR
R2	1	S19400-6811	RESISTOR MF 1/4W 6.81K 1%
R3, R8	2	S19400-1002	RESISTOR MF 1/4W 10.0K 1%
R4, R13, R14, R17, R18, R19, R20, R21, R23, R24, R25, R26, R27	13	S19400-10R0	RESISTOR MF 1/4W 10.0 1%
R5, R9	2	S19400-2001	RESISTOR MF 1/4W 2.00K 1%
R6	1	S19400-2213	RESISTOR MF 1/4W 221K 1%
R7	1	S19400-1000	RESISTOR MF 1/4W 100 1%
R10, R12, R15	3	S19400-1003	RESISTOR MF 1/4W 100K 1%
R11	1	S19400-6191	RESISTOR MF 1/4W 6.19K 1%
R16, R22	2	S19400-1001	RESISTOR MF 1/4W 1.00K 1%
R28, R29, R30, R31, R32	5	T14648-9	RESISTOR WW 5W 2.5K 5% SQ
T1	1	T12737-7	TRANSFORMER PULSE 3-WINDING
T2	1	M19612	CURRENT TRANSDUCER 125-TURN
X1	1	M13552-3	IC CONVERTER V/F 654
X2	1	S15128-10	VOLTAGE REF ADJ. PRECISION 4311

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MANUFACTURING TOLERANCE PER ASME Y14.5M UNLESS OTHERWISE SPECIFIED TOLERANCES: DIMENSIONS IN INCHES (IN PARENTHESES) DIMENSIONS IN MILLIMETERS (IN BRACKETS) ON ALL ANGLES IS 5 DEGREE UNLESS OTHERWISE SPECIFIED WITH PUBLISHED STANDARDS	CONTROL: CLEVELAND	DRAWN BY: EVERY	IF PRINTED @ A1 SIZE	DOCUMENT NUMBER: G3734-3
APPROVED: DRS	PROJECT NUMBER: CRM41517	SUBJECT: SWITCH P.C. BD ASSEMBLY	APPROVAL DATE: 11-6-2009	REVISION: E

SCHEMATIC - SPI / REMOTE CONTROL PC BOARD - (G4017)

Return to Section TOC

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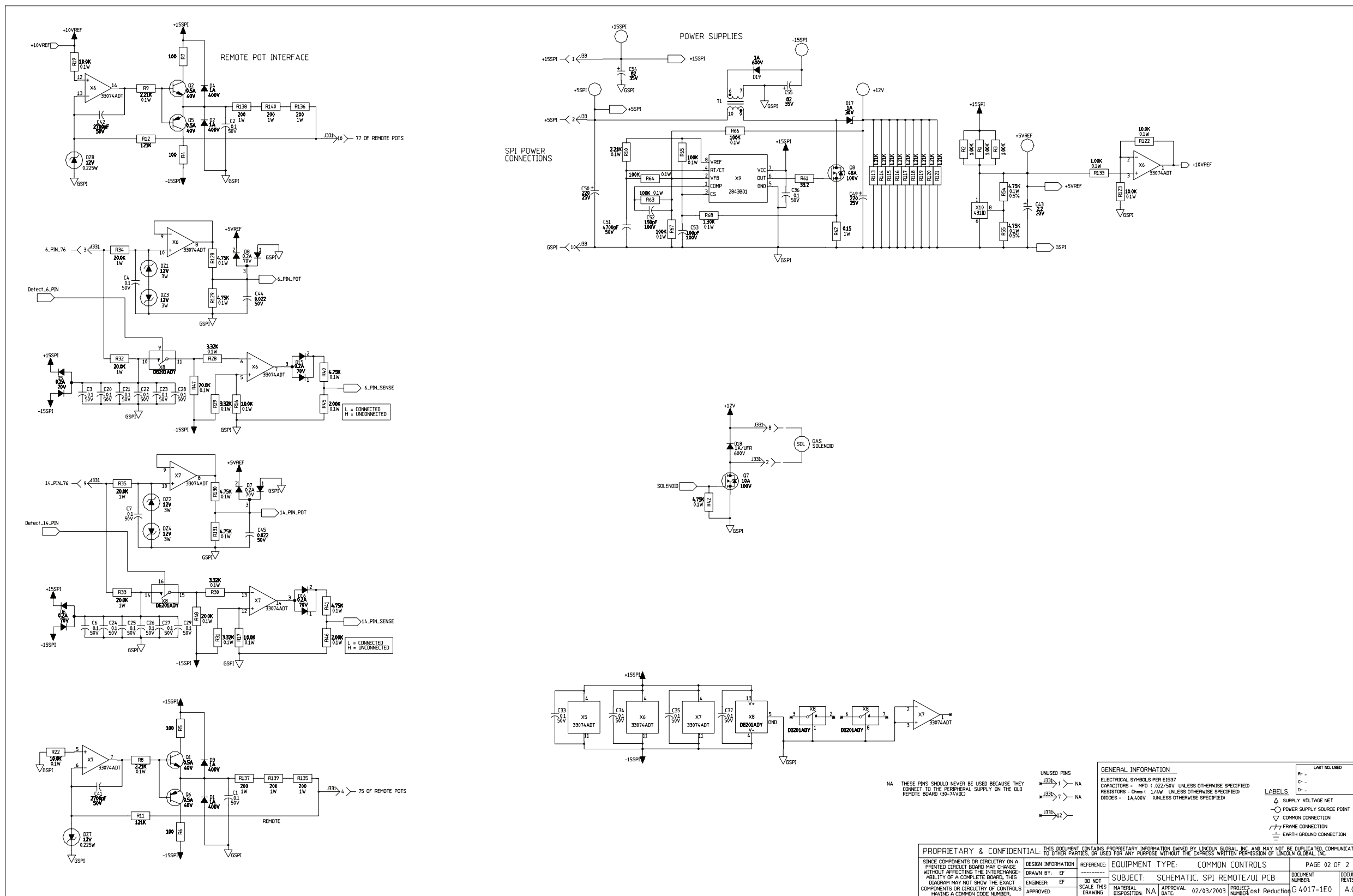
Return to Section TOC

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

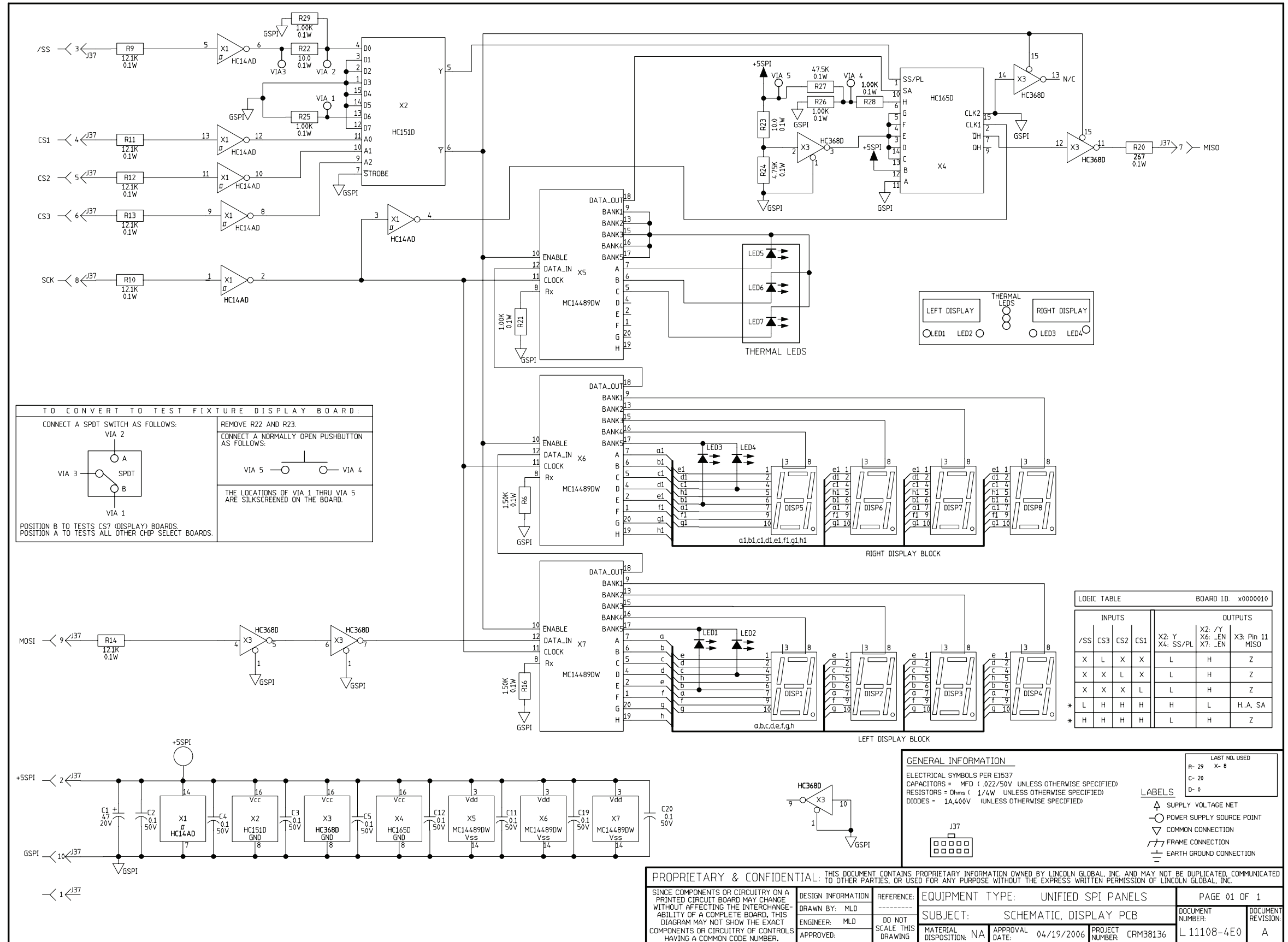
SCHEMATIC - DISPLAY PC BOARD - (L11108)

Return to Section TOC
Return to Master TOC

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Return to Master TOC

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Return to Master TOC



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

PC BOARD ASSEMBLY - DISPLAY PC BOARD - (L11130)

Return to Section TOC
Return to Master TOC

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Return to Master TOC

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Return to Master TOC

Return to Section TOC
Return to Master TOC

G-031117	ENGINEERING CONTROLLED MANUFACTURER: No	CHANGE DETAIL: REVISED NOTE N.D.	
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ITEM / REFERENCE DESIGNATORS	QTY	PART NUMBER	DESCRIPTION
1	1	L11757-F	P.C. BOARD BLANK
2	4	T15176-2	LED, SPACER, 0.140 HIGH
3	.01 OZ.	E3539	ELECTRICAL INSULATING COMPOUND
4	1	L11166-2	FLEX CIRCUIT
5	1	T15067-2	LABEL
FOR ITEMS BELOW REFER TO ELECTRONIC COMPONENTS DATABASE FOR COMPONENT SPECIFICATIONS			
C1	1	S25024-7SMT	CAPACITOR,SMD,TANTALUM,47MF,20V,10%,S7343
C2, C3, C4, C5, C11, C12, C19, C20	8	S25020-3SMT	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,X7R,S0805
N.A., N.D. DISP1, DISP2	2	S17395-9	LED,DISPLAY,7-SEGMENT,CC,4-DIGIT
J37	1	S18248-10	CONNECTOR,MOLEX,MINI,PCB,10-PIN
N.A. LED1, LED2, LED3, LED4	4	T13657-6	LED,T-1,RED,HLMP-K101
N.A. LED5, LED6, LED7	3	T13657-14	LED,T-1,3/4,AMBER,HIGH-INTENSITY
R6, R16	2	S25000-1501SMT	RESISTOR,SMD,METAL FILM,1/10W,1.50K,1%,S0805
R9, R10, R11, R12, R13, R14	6	S25000-1212SMT	RESISTOR,SMD,METAL FILM,1/10W,12.1K,1%,S0805
R20	1	S25000-2670SMT	RESISTOR,SMD,METAL FILM,1/10W,267OHMS,1%,S0805
R21, R25, R26, R28, R29	5	S25000-1001SMT	RESISTOR,SMD,METAL FILM,1/10W,1.00K,1%,S0805
R22, R23	2	S25000-10R0SMT	RESISTOR,SMD,METAL FILM,1/10W,10.0OHMS,1%,S0805
R24	1	S25000-4751SMT	RESISTOR,SMD,METAL FILM,1/10W,4.75K,1%,S0805
R27	1	S25000-4752SMT	RESISTOR,SMD,METAL FILM,1/10W,47.5K,1%,S0805
N.B. X1	1	S17900-8SMT	IC,SMD,CMOS,INVERTER,SCHMITT,HEX HC14A(SS)
N.B. X2	1	S17900-26SMT	IC,CMOS,SMD,MUX,DAT,8-INPUT,HC151(SS)
N.B. X3	1	S17900-28SMT	IC,SMD,CMOS,HEX INVERTING BUFFER,3-ST (SS)
N.B. X4	1	S17900-10SMT	IC,SMD,CMOS,REGISTER,SHFT,S-PI/SO,8-BIT(SS)
N.B. X5, X6, X7	3	S20496-1SMT	IC,SMD,CMOS,DRIVER,DISPLAY,LED,CC,MCU

NOTES:

N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.B. **CAUTION:** THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

N.C. USE **ITEM 2** TO STAND LED1, LED2, LED3 AND LED4 FROM THE P.C. BOARD. THERE MUST NOT BE MORE THAN .020 GAP BETWEEN SPACER AND P.C. BOARD OR BETWEEN SPACER AND LED. ENCAPSULATE P.C. BOARD, SPACER AND LOWER HALF OF LED. TOP 1/4 OF LED BODY MUST BE FREE OF ENCAPSULATION.

N.D. **DISP 1** AND **DISP 2** MUST ALWAYS BE MATCHED BY VENDOR NAME, AND EACH MUST HAVE THE SAME INTENSITY LETTER CODE (G, H, J, ETC.). **DO NOT** MIX DIFFERENT VENDORS ON THE SAME BOARD ASSEMBLY. ENCAPSULATE LEADS AND SOLDER CONNECTIONS OF DISPLAYS. FACE OF DISPLAYS MUST BE KEPT FREE OF ENCAPSULATION. ENCAPSULATION AROUND UPPER HALF OF DISPLAYS MUST NOT EXCEED .006 PER SIDE.

N.E. CONNECTOR MUST BE GREASED WITH **ITEM 3** PRIOR TO PLACING IN STOCK. MOUNT FLEX CABLE BETWEEN CONNECTOR AND BOARD ON SOLDER SIDE.

N.F. IDENTIFY FINISHED ASSEMBLY WITH SERIAL NUMBER AND MANUFACTURING CODE. PLACE LABEL ON NON-COMPONENT SIDE.

N.G. PRINT "L11130-5" ON **ITEM 5** AND PLACE OVER EXISTING PART NUMBER.

MAKE AS:

L11130-5F0

PART NO. IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253. TEST PER E3856-D

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<small>MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE: ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± 5 OF A DEGREE MATERIAL TOLERANCE ("1") TO AGREE WITH PUBLISHED STANDARDS</small>	<small>CONTROL: CLEVELAND DRAWN BY: ddieltz ENGINEER: APPROVED: -</small>	<small>SCALE: 1:1 IF PRINTED @ A2 SIZE UNITS: INCH</small>	<small>EQUIPMENT TYPE: MISCELLANEOUS SUBJECT: SPI DISPLAY PC BOARD ASSEMBLY MATERIAL DISPOSITION: UF APPROVAL DATE: 10/31/2008 PROJECT NUMBER: CRM39937 REFERENCE: L11130-4</small>
			<small>PAGE 1 OF 1 DOCUMENT NUMBER: L11130-5 DOCUMENT REVISION: D</small>

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.



SCHEMATIC - LED POTENTIOMETER PC BOARD - (S25258)

Return to Section TOC

Return to Section TOC

Return to Section TOC

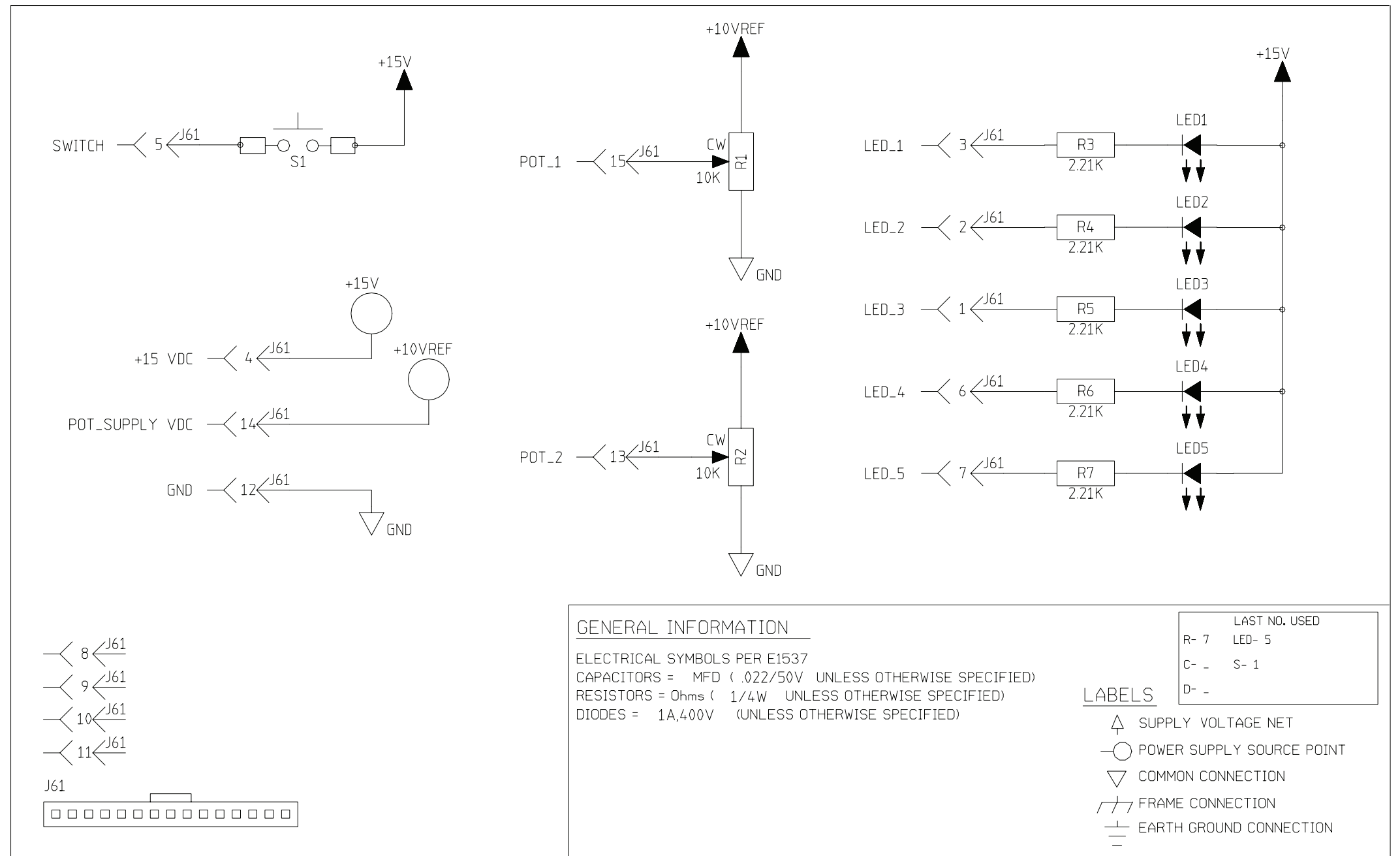
Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



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SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.	DESIGN INFORMATION	REFERENCE:	EQUIPMENT TYPE:	V350 LED/POT		PAGE 01 OF 1	
	DRAWN BY: MAB	-----	SUBJECT:	LED/POT PCB SCHEMATIC		DOCUMENT NUMBER:	DOCUMENT REVISION:
	ENGINEER: CH	DO NOT SCALE THIS DRAWING	MATERIAL DISPOSITION: NA	APPROVAL DATE: 02/27/2003	PROJECT NUMBER: 5000724	S 25258-1B0	A.01
	APPROVED:						

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

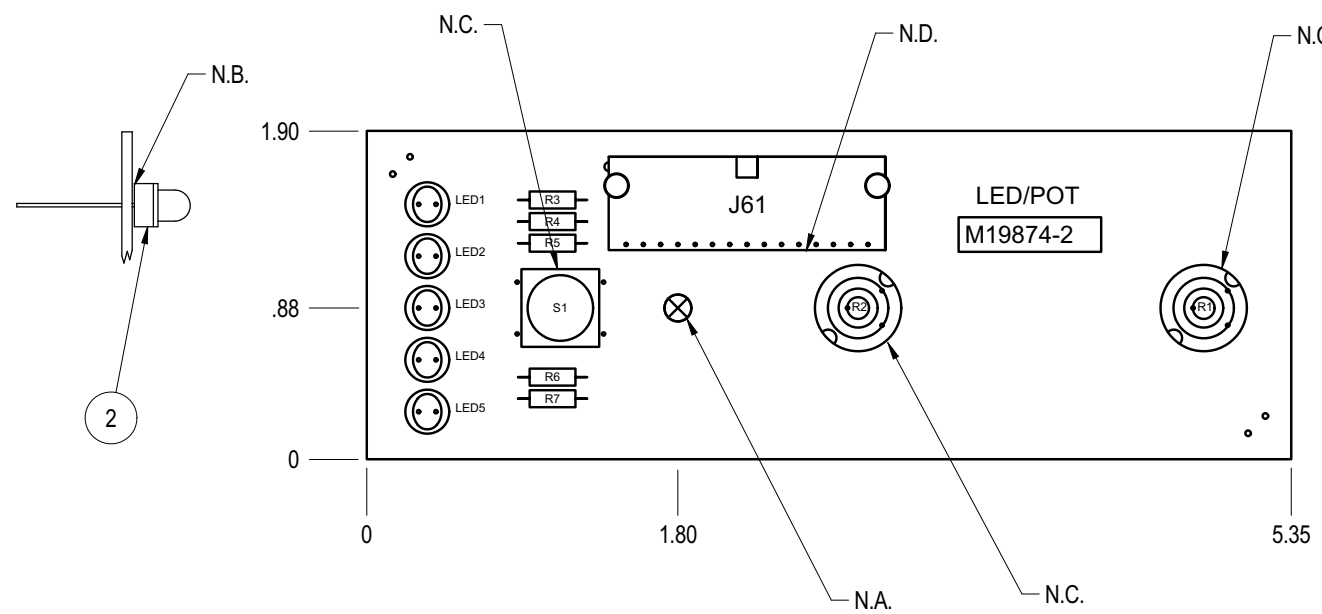
PC BOARD ASSEMBLY - LED POTENTIOMETER PC BOARD - (M19874)

M19874-2

ENGINEERING CONTROLLED CHANGE DETAIL: REVISED NOTE N.B. AND ADDED NOTE N.E.
 MANUFACTURER: No REVISED DETAIL GRAPHICS

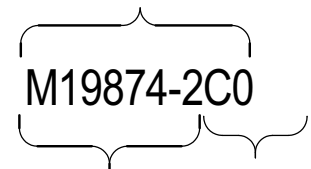
ITEM (USED WITH)*	QTY	PART NUMBER	DESCRIPTION
1	1	SEE BLANK INFO	PC BOARD BLANK
2 (LED1, LED2, LED3, LED4, LED5)*	5	T15176	LED, SPACER, 0.220 HIGH
REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW			
REFERENCES	QTY	PART NUMBER	DESCRIPTION
J61	1	S19365-15	CONNECTOR, PCB, WW, MALE, RT-L, 15-PIN
LED1, LED2, LED3, LED4, LED5	5	T13657-13	LED, T-1, 3/4, RED, HIGH-INTENSITY, OVAL
R1, R2	2	S19366-1	POT, SINGLE-TURN, 0.5W, 10K, 10%, LINEAR
R3, R4, R5, R6, R7	5	S19400-2211	RESISTOR, MF, 1/4W, 2.21K, 1%
S1	1	T13381-17	SWITCH, PUSHBUTTON, SPST, GREEN, W/BLACK EXTENDER

P.C. BOARD BLANK INFORMATION
 BUY COMPLETE AS M19874-C (2 LAYER BOARD PER E3281).
 (MAKES 18 BOARDS PER PANEL. SEE ELECTRONIC FILE
 FOR ADDITIONAL INFORMATION).



RESISTANCE = OHMS

MANUFACTURE AS:



PART NO.

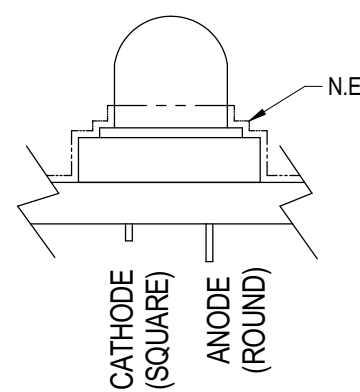
IDENTIFICATION CODE

ENCAPSULATE WITH E1844. (2 COATS)
 BRUSH COAT ACCEPTABLE

MAKE PER E1911-ROHS
 TEST PER E3964-MS

NOTES:

- N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.
- N.B. THERE MUST NOT BE MORE THAN A .010 GAP BETWEEN SPACER & LED, OR BETWEEN SPACER & P.C. BOARD. LEDS MUST BE PERPENDICULAR WITH P.C. BOARD AFTER ALL OPERATIONS ARE COMPLETE.
- N.C. ENCAPSULATE AROUND BASE OF COMPONENT
- N.D. COAT EXTERNAL PINS WITH ENCAPSULATION MATERIAL.
- N.E. ENCAPSULATE P.C. BOARD, SPACER AND LOWER HALF OF LED.



**ENLARGED DETAIL
 (LED ORIENTATION)**

SCHEMATIC REFERENCE: S25258-2C0

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

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	DRAWN BY: FEI	M19874-1	SUBJECT: LED POT P.C. BOARD ASSEMBLY		DOCUMENT NUMBER:
	ENGINEER:	SCALE: 1:1	MATERIAL DISPOSITION: UF	APPROVAL DATE: 4/5/2007	PROJECT NUMBER: CRM38610
	APPROVED: -				M19874-2

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.

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

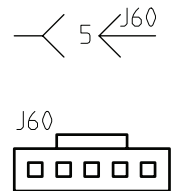
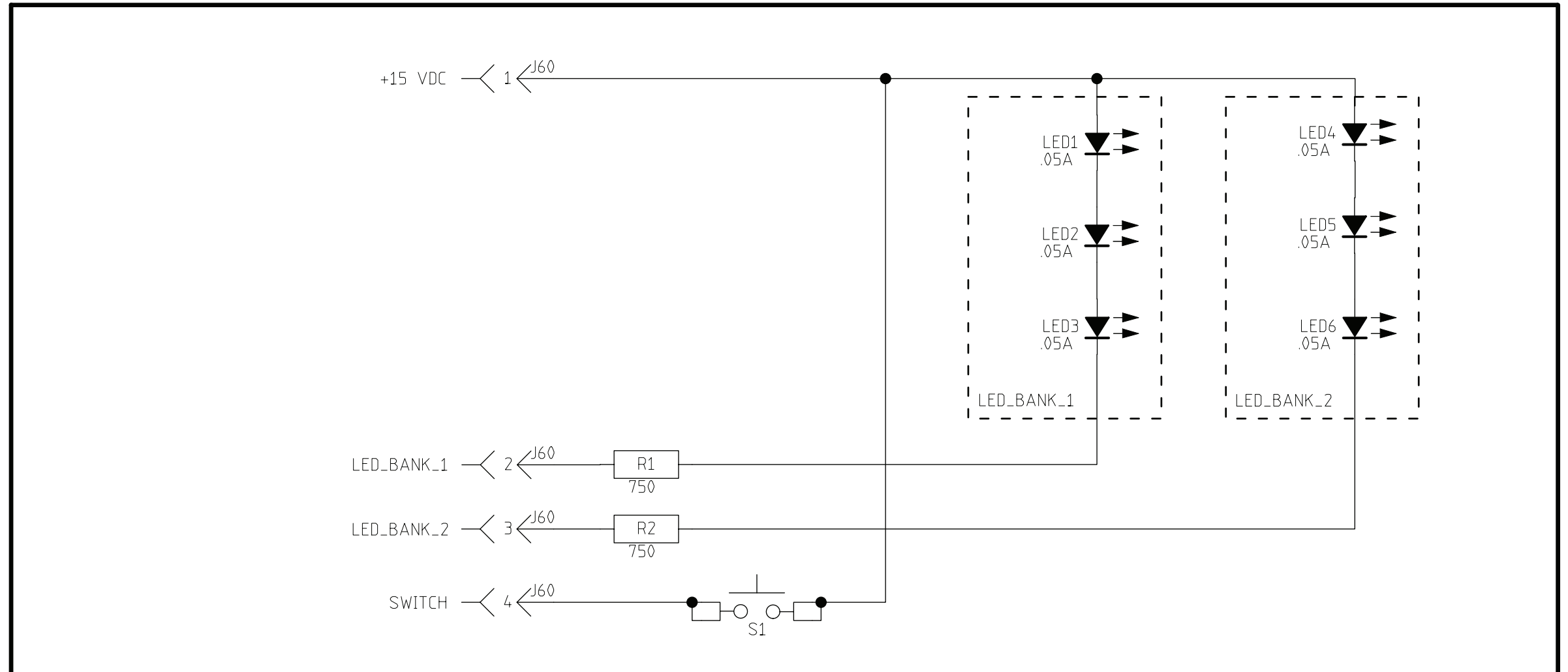
SCHEMATIC - LED SELECT PC BOARD - (S25259)

Return to Section TOC
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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



GENERAL INFORMATION		LAST NO. USED R- 2 LED- 6 C- - S- 1 D- -	
ELECTRICAL SYMBOLS PER E1537 CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED) RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED) DIODES = 1A,400V (UNLESS OTHERWISE SPECIFIED)			
LABELS		▲ SUPPLY VOLTAGE NET ○ POWER SUPPLY SOURCE POINT ▽ COMMON CONNECTION ≡ FRAME CONNECTION ⊥ EARTH GROUND CONNECTION	

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	DRAWN BY: MAB	-----	SUBJECT: SCHEMATIC, LED SELECT PCB	DOCUMENT NUMBER:	DOCUMENT REVISION:
	ENGINEER: CFH	DO NOT SCALE THIS DRAWING	MATERIAL DISPOSITION: NA	APPROVAL DATE: 8/9/2006	PROJECT NUMBER: CRM38150-A
APPROVED:					

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

PC BOARD ASSEMBLY - LED SELECT PC BOARD - (M19875)

M19875-2

ENGINEERING CONTROLLED
MANUFACTURER: No

CHANGE DETAIL: ADDED MAKE PER E1911-ROHS

P.C. BOARD BLANK INFORMATION
BUY COMPLETE AS M19875-C (2 LAYER BOARD PER E3281).
(MAKES 63 BOARDS PER PANEL. SEE ELECTRONIC FILE
FOR ADDITIONAL INFORMATION).

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	SEE BLANK INFO.	PC BOARD BLANK
2	1	CI001498	E3165-.25-.75-.20
REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW			
REFERENCES	QTY	PART NUMBER	DESCRIPTION
J60	1	S19365-5	CONNECTOR,PCB,WW,MALE,RT-L,5-PIN
LED1, LED2, LED3, LED4, LED5, LED6	6	T13657-13	LED,T-1,3/4,RED,HIGH-INTENSITY, OVAL
R1, R2	2	S19400-7500	RESISTOR,MF,1/4W,750,1%
S1	1	T13381-16	SWITCH,PUSHBUTTON,SPST

RESISTANCE = OHMS

MANUFACTURE AS:

M19875-2C0

PART NO. IDENTIFICATION CODE

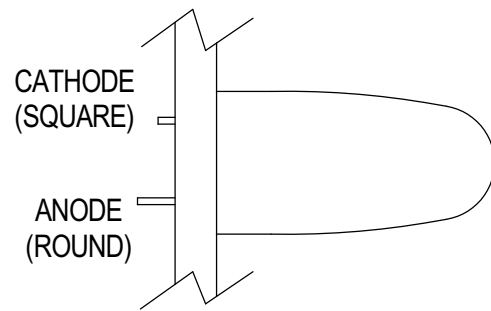
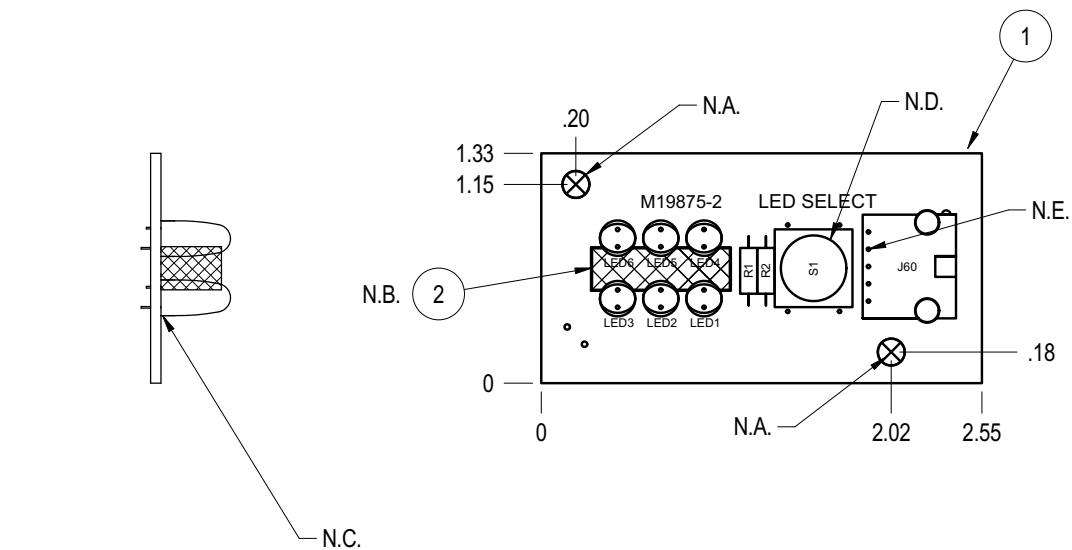
MAKE PER E1911-ROHS
ENCAPSULATE WITH E1844. (2 COATS)
BRUSH COAT ACCEPTABLE
TEST PER E3964-ST

NOTES:

- N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.
- N.B. INSERT ITEM 2 BETWEEN ROWS OF LED'S. ITEM 2 MUST BE FLUSH WITH LED BULB.
- N.C. ENCAPSULATE PC BOARD AND LOWER HALF OF LED.
- N.D. ENCAPSULATE AROUND BASE OF COMPONENT
- N.E. COAT EXTERNAL PINS WITH ENCAPSULATION MATERIAL.

SCHEMATIC REFERENCE: S25259-2C0

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.



ENLARGED DETAIL
(LED ORIENTATION)

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	DRAWN BY: FEI	M19875-1	INVERTER WELDERS	DOCUMENT NUMBER:	DOCUMENT REVISION:
ENGINEER:	SCALE:	1:1	SUBJECT:	M19875-2	B
APPROVED: -	MATERIAL DISPOSITION:	UF	APPROVAL DATE:	3/16/2007	PROJECT NUMBER:
					CRM34409

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.

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