LINCOLN ELECTRIC

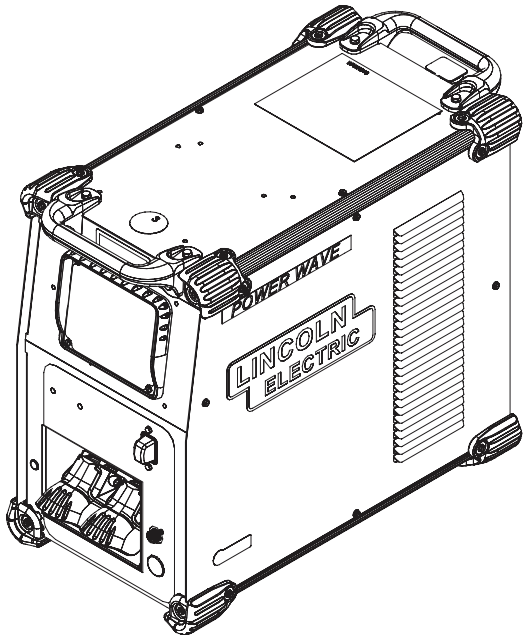
GENUINE LINCOLN PARTS™

POWER WAVE® S500

For use with machines having Code Numbers:

11813

SERVICE MANUAL



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SVM239-A | Issue Date 13-Oct

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⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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

FOR ENGINE powered equipment.

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

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

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

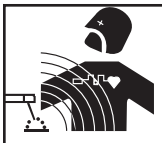
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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

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

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

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



ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

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

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

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

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ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS can burn.

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

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

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

FUMES AND GASES can be dangerous.

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

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

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

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

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

5.f. Also see item 1.b.

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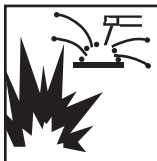

WELDING and CUTTING SPARKS can cause fire or explosion.

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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks or flame.

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

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

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

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

FOR ELECTRICALLY powered equipment.

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

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

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

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

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PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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Electromagnetic Compatibility (EMC)

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

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

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

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

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

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

b) radio and television transmitters and receivers;

c) computer and other control equipment;

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

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

f) equipment used for calibration or measurement

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

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

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Electromagnetic Compatibility (EMC)

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

Methods of Reducing Emissions

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

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

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

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

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

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

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

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TABLE OF CONTENTS-THEORY OF OPERATION SECTION

FIGURE E.1 BLOCK LOGIC DIAGRAM

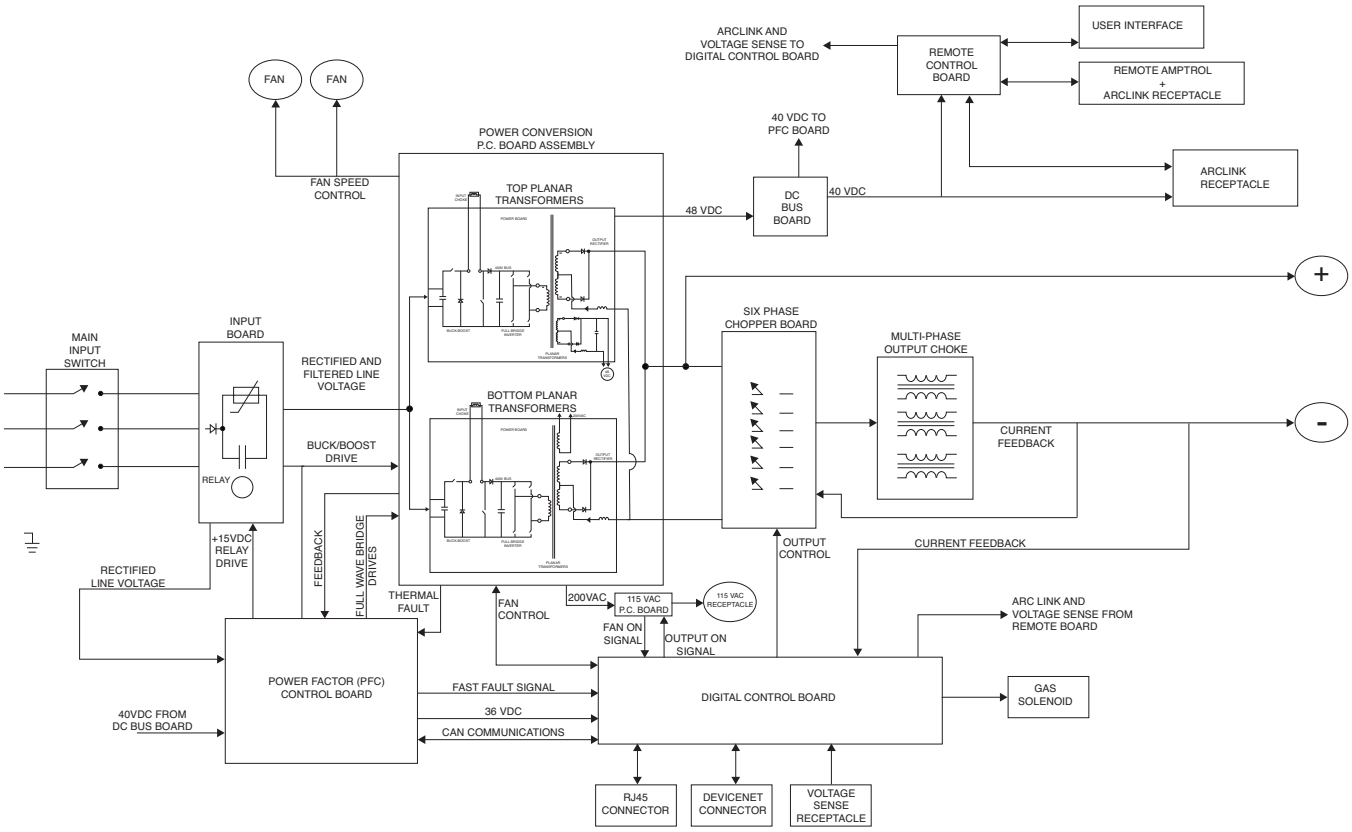
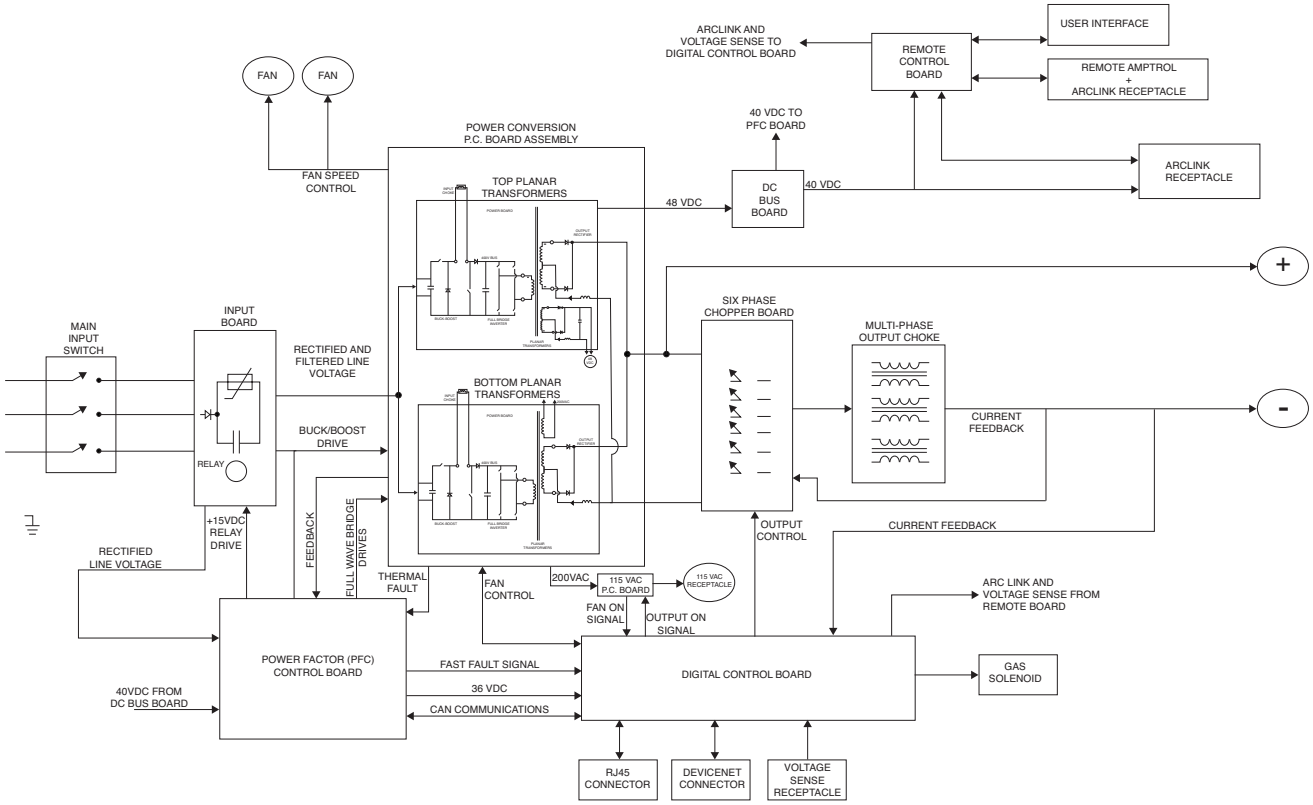


FIGURE E.2 - GENERAL DESCRIPTION

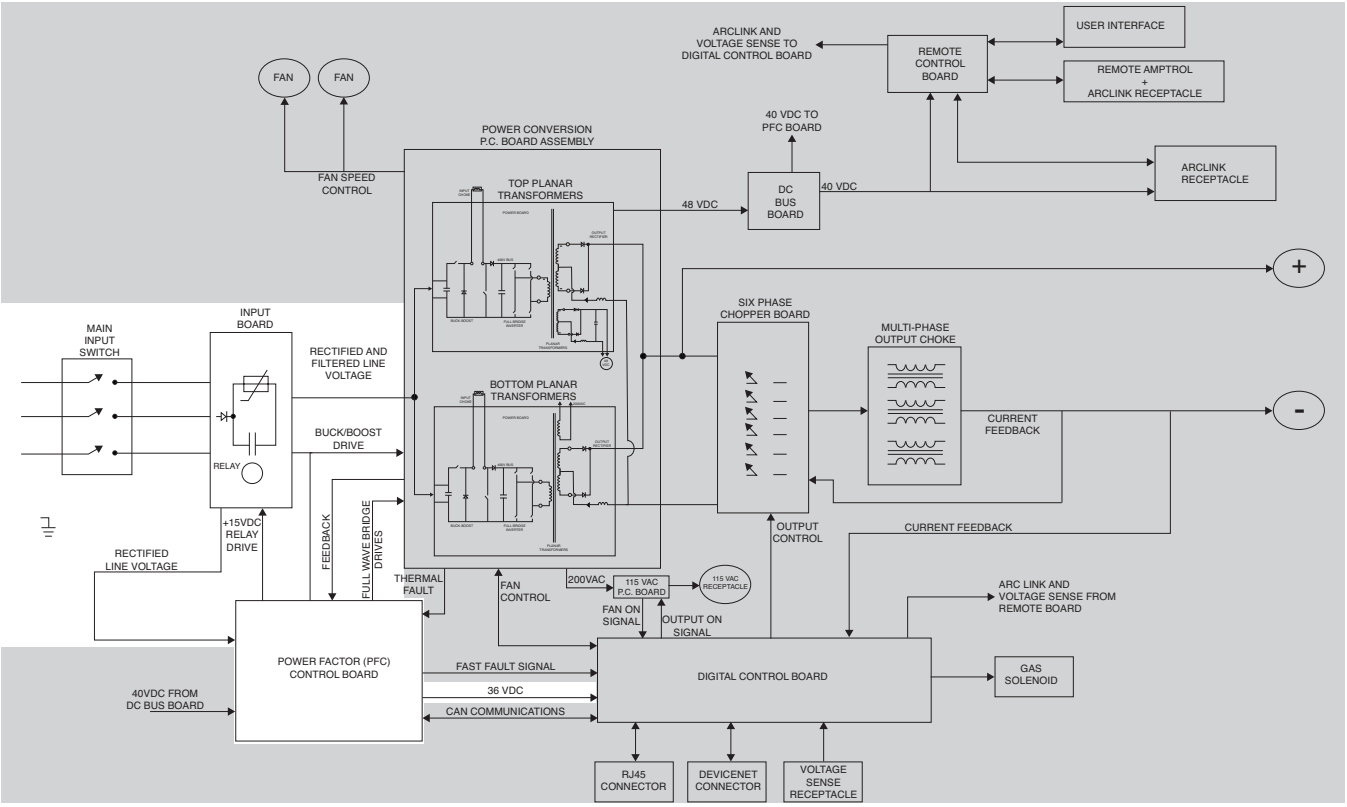


GENERAL DESCRIPTION

The Power Wave® S500 is a welder featuring an inverter type power source with Tribrid Converter Technology and Automatic PowerConnect Technology. It is a multi-process machine with high-end functionality capable of Stick, DC TIG, MIG, Pulsed MIG and Flux-Cored welding. The Power Wave® S500 regulates the current, voltage and power of the welding arc. It also provides premier welding performance solutions for specific areas such as aluminum, stainless and nickel especially where machines size and weight are considerations. This machine is designed to be a very flexible welding power source. Like all machines in the Power Wave product line the software based architecture allows for future upgradeability. An Ethernet port is standard which allows for effortless software upgrades through Powerwavesoftware.com. The Ethernet communication also gives the Power Wave® S500 the ability to run Production Monitoring™ 2. The Power Wave® S500 is recommended for semiautomatic welding and may also be suitable for basic hard automation applications. It is compatible with the current range of Power Feed™ systems including future versions of ArcLink feeders.

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

FIGURE E.3 - LINE SWITCH, INPUT BOARD AND POWER FACTOR CONTROL (PFC) BOARD



LINE SWITCH, INPUT BOARD AND POWER FACTOR CONTROL (PFC) BOARD

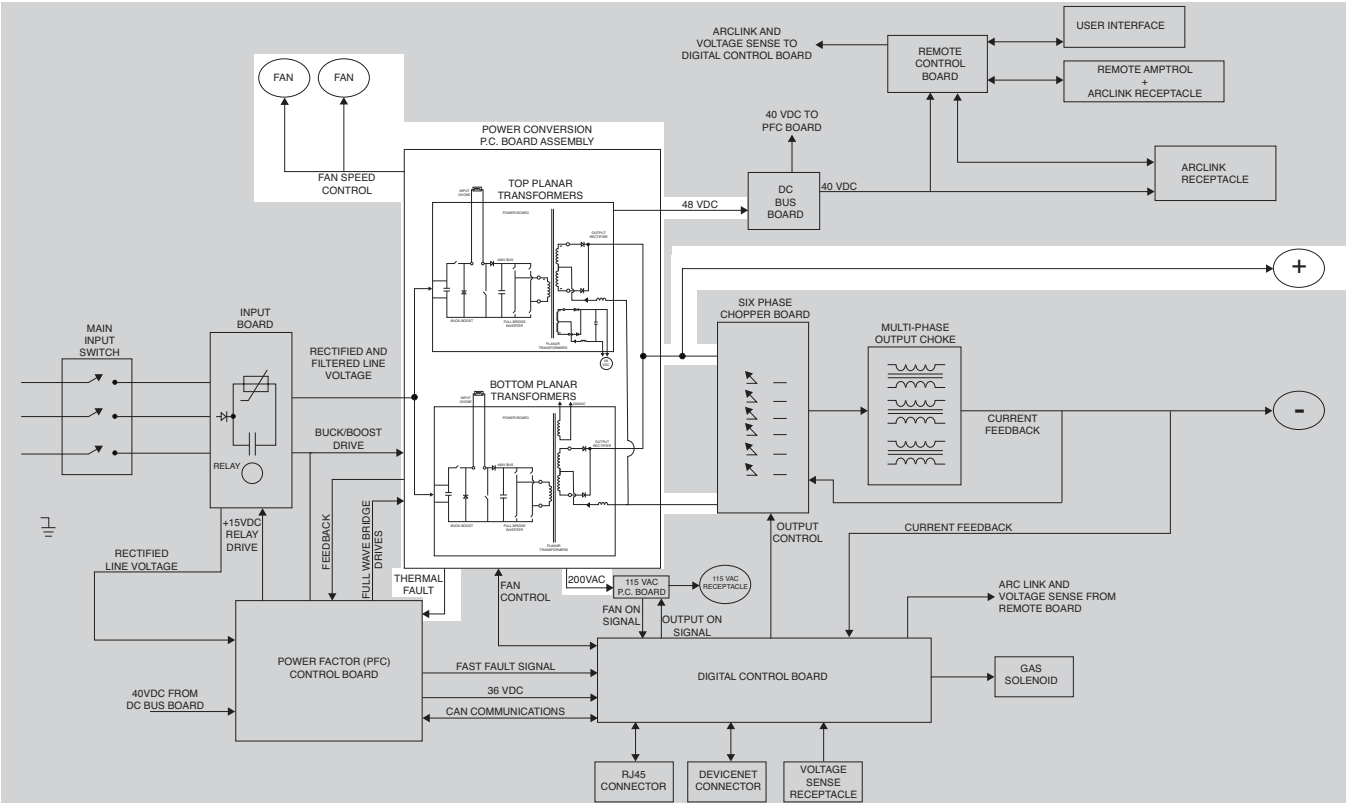
The Power Wave® S500 can be connected to a variety of both three-phase or single-phase AC input voltages. The Power Wave® S500 automatically adjusts to operate with different AC input voltages. No reconnect switch settings are required. The initial input power is applied through a line switch located on the front panel of the machine. This AC input voltage is applied to an input board where it is rectified to a DC voltage. The DC voltage is then applied to a soft-start circuit consisting of two PTC thermistors and two DC relays. This soft-start circuit limits the initial inrush current to the DC link capacitors to prevent damage to the input rectifier. Two seconds after the input line switch is activated the two relays, which are in parallel with the thermistors, are closed thus applying the full input potential to the DC link capacitor. The two DC relays are activated by the Power Factor Correction board.

The rectified input power is also connected to the Power Factor Correction board. The PFC board receives this unregulated DC voltage and converts it to several DC supplies that are used to power the electronics housed on the PFC board. A 36VDC supply is also connected to the Digital Control Board.

The PFC board receives feedback information in the form of buck-boost currents, the 400VDC bus voltage, the rectified AC input voltage, the full bridge inverter currents and power module temperatures. The electronic circuits and firmware on the PFC board generate Pulse Width Modulation (PWM) signals to regulate the 400VDC bus, drive the buck-boost circuit, shape the input current, drive the full bridge inverters and control the pre-charge relays.

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

FIGURE E.4 - POWER CONVERSION BOARD ASSEMBLY



POWER CONVERSION BOARD ASSEMBLY

Several circuits are located on the Power Conversion Board. They are the two interleaved buck-boost converters, two full-bridge inverters, two planar transformers and a fan control circuit.

Buck-Boost Converters: The two Buck-Boost converters operate at 25 KHz. These converters convert the input voltage to a 400VDC bus. The PFC board regulates the Buck-Boost circuits to attain a very high power factor. If the rectified input voltage is greater or less than 400VDC, either the “Buck” portion or the “Boost” portion of the circuitry will be active. The two Buck-Boost circuits are driven by separate PWM signals from the PFC board.

Full Bridge Inverters: The 400VDC bus is applied to the two Full Bridge Inverters. The inverters operate at 50KHz. and are driven by two separate PWM signals generated from the PFC board. This PWM signals provide the inverter switches with a 98% on time. The outputs of the Full Bridge Inverters are applied to the primaries of the two Planar Transformers.

Planar Transformers: The primaries of the two Planar Transformers are in parallel but are driven 90 degrees out of phase with each other. Both transformers have a 100 volt secondary winding for welding power. The outputs of these 100 volt windings are rectified and coupled to the six Phase Chopper Board. The lower Planar Transformer has a 200 volt secondary winding that is used to power the 115VAC inverter board. The upper Planar Transformer has a 48 volt secondary winding that is rectified and filtered and is applied to the DC Bus board. The 48VDC is also used to power the fan speed control circuit.

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

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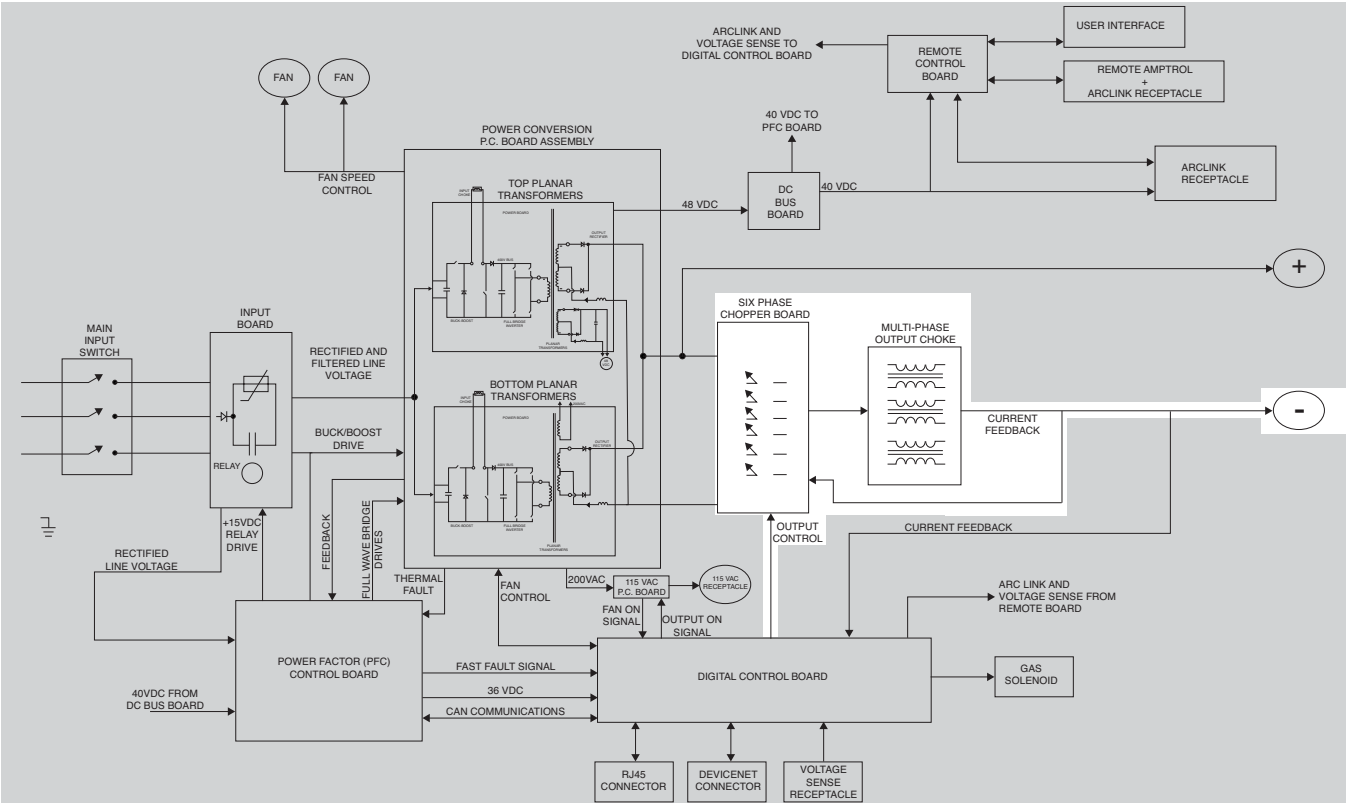
FIGURE E.5 - SIX PHASE CHOPPER BOARD AND MULTI-PHASE OUTPUT CHOKE

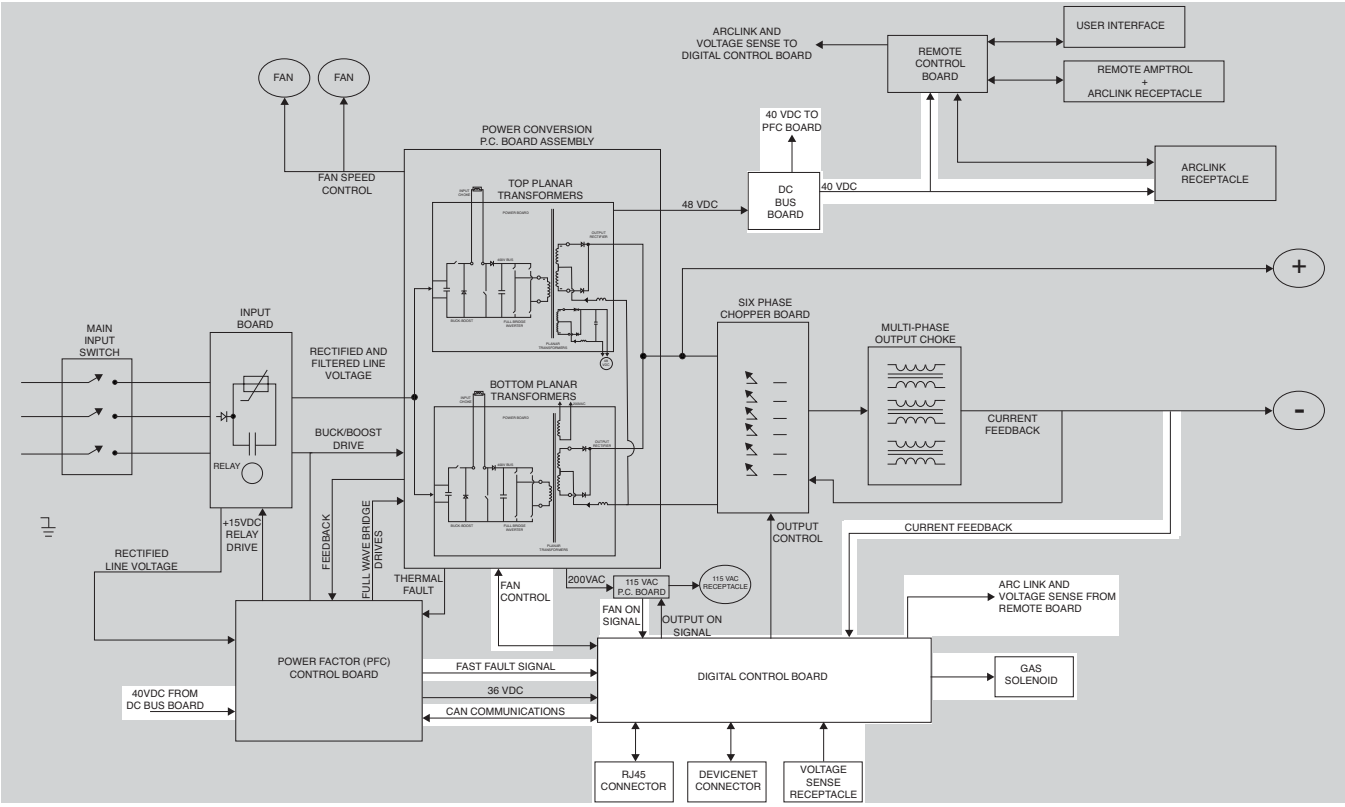


SIX PHASE CHOPPER BOARD AND MULTI-PHASE OUTPUT CHOKE

The Six Phase 20KHz. chopper is connected to the 100VDC bus that is generated by the two 100 volt secondary windings on the two planar transformers. The six high speed electronic switches are connected in parallel to the 100VDC bus. However, the gate drives are 60 degrees out of phase with independent PWMs drive signals received from the Digital Control Board. The system is equivalent to a 120KHz. chopper. The output of the Six Phase Chopper is connected to the Multi-Phase Output Choke. The Multi-Phase Output Choke consists of three independent chokes with two windings on each choke core. Each choke coil is connected to one phase of the Six-Phase Chopper. This coupled inductor acts like a transformer providing low ripple current and low output inductance to the welding circuit. The output of the Multi-Phase Choke is connected to the negative output terminal.

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

FIGURE E.6 - DC BUS BOARD AND DIGITAL CONTROL BOARD



DC BUS BOARD AND DIGITAL CONTROL BOARD

The DC Bus Board receives 48VDC from the upper planar transformer. The DC Bus Board regulates and controls that 48VDC to a constant 40VDC output supply. The 40VDC is applied to the PFC control board, the Arclink receptacle and the Remote Control board.

The Digital Control Board receives commands and feedback information via various channels. It receives digital communications and commands from the PFC control board, the Remote Control board, the Device Net connector and the RJ45 connector. The Digital Control Board also receives and processes output voltage and output current data. It receives and sends output ”on” and fan “on” signals from the 115Volt Inverter board. The Digital Control Board uses this feedback information and processes it with the digital commands it receives and sends the appropriate PWM signals to the Six Phase Chopper board to control the welding output. It also controls the optional gas solenoid and sends a signal to the Power Conversion board to control the speed of the two fans. The Digital Control Board houses the software welding tables and monitors the thermostat circuitry.

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

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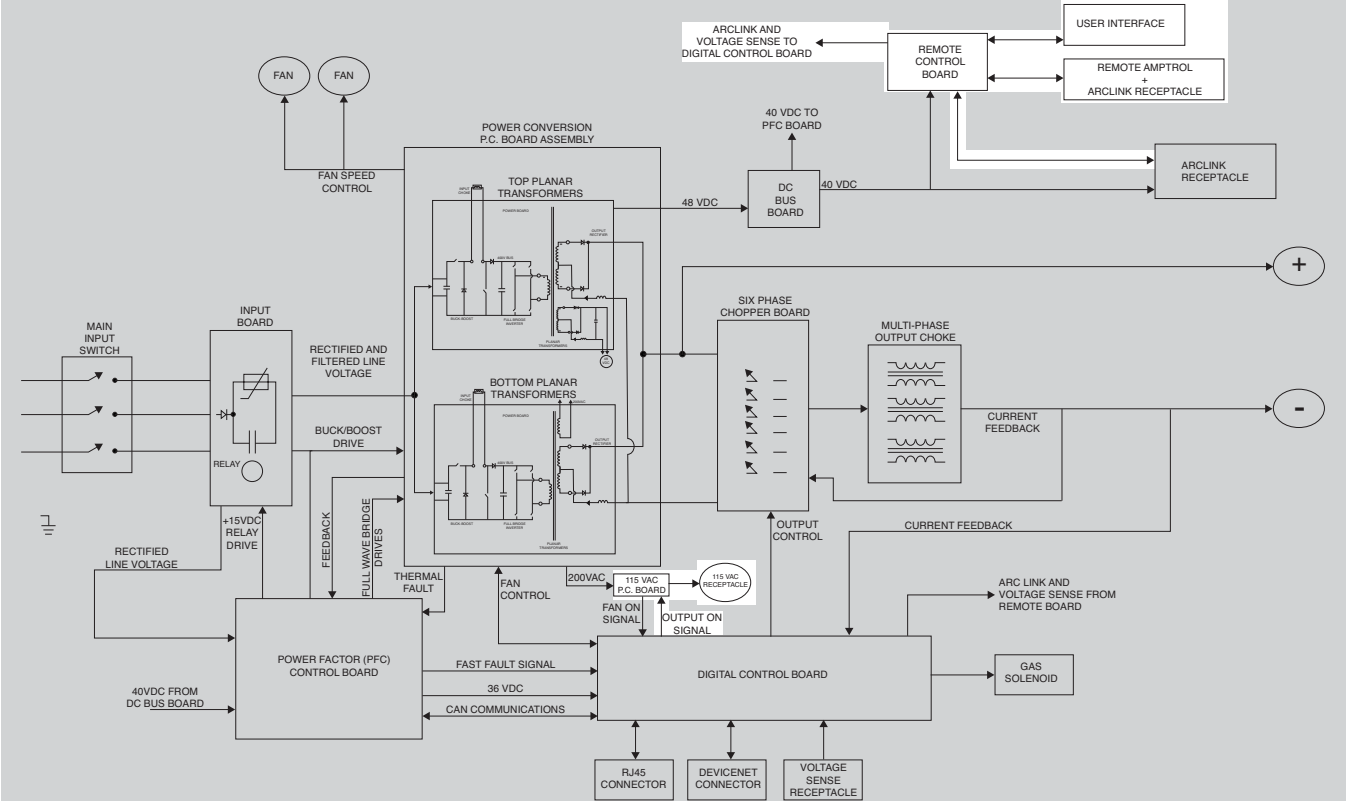
FIGURE E.7 - OPTIONAL REMOTE CONTROL BOARD AND 115VAC INVERTER BOARD



OPTIONAL REMOTE CONTROL BOARD AND 115VAC INVERTER BOARD

The Remote Control Board receives information from the User Interface Board, the 12 pin receptacle, the ArcLink receptacle and 40VDC from the DC Bus Board. The Remote Control Board is the interface between an Arclink wirefeeder and the Power Wave® S500 machine. Trigger signals, digital communications and the 40VDC supply are all connected to the Arclink wirefeeder through the Remote Control Board. A Remote Output Control or a Foot Amptrol can also be connected through the 12 pin receptacle to the Remote Control Board.

The 115VAC Inverter Board utilizes the 200VAC at 50KHz. received from the lower Planar Transformer to create and regulate the 115VAC at 60Hz. supply for the 115VAC receptacle.

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

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MACHINE PROTECTION

THERMAL PROTECTION

Three normally closed (NC) thermostats protect the machine from excessive operating temperatures. Two thermostats are located on the 115VAC heat sink and protect the 115VAC Inverter board from over-heating. The third thermostat is located and integrated into the Six Phase Chopper and is monitored by the Digital Control board. Excessive temperatures may be caused by a lack of cooling air or by 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 fans are operating normally, the power switch may be left on and the reset should occur within a 15-minute period. If the fans are not turning or the intake air louvers are obstructed, the power must be removed from the machine and the fan condition or air obstruction corrected.

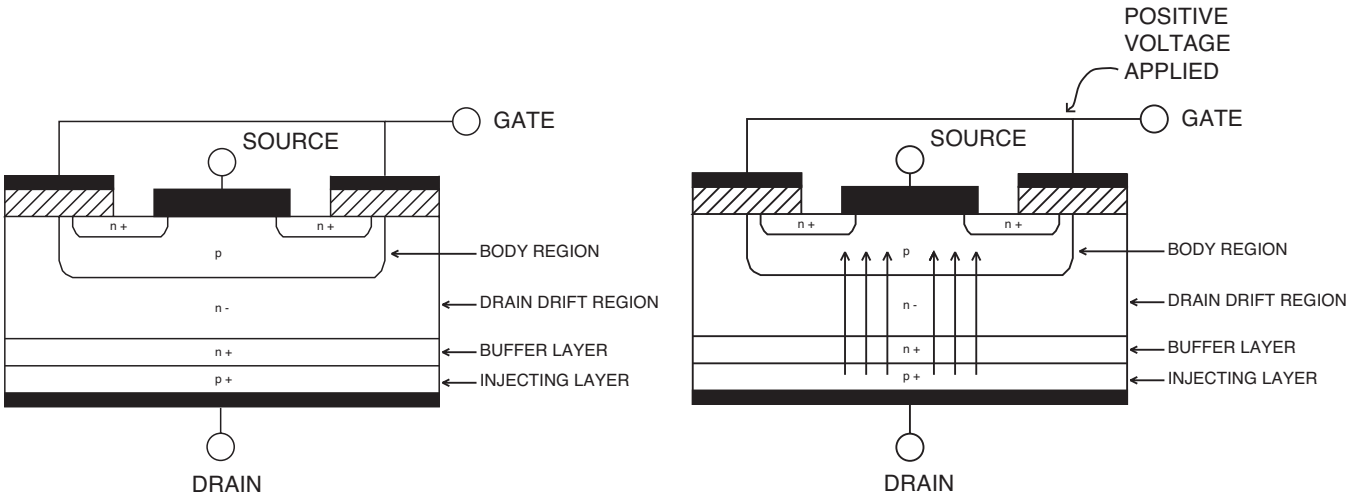
PROTECTIVE CIRCUITS

Protective circuits are designed into the Power Wave® S500 to sense trouble and shut down the machine before damage occurs to the machine's internal components. Error Codes will be flashed out by the light on the front of the machine and will help identify the reason for the shutdown. Fault codes can also be seen by using the Diagnostic Software. Various status lights located on the PC boards aid in determining component status and diagnosing problems. See the ***Troubleshooting*** section for more information regarding Error Codes.

OVER CURRENT PROTECTION

If the machine's welding output is shorted the Digital Control board will limit the current to 375 amps.

FIGURE E.8 - INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION



INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications. Drawing A shows an IGBT in a passive mode. There is no gate signal, (zero volts relative to the source) and therefore, no current flow. The drain terminal of the 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 in the OFF position.

Drawing B shows the IGBT in an active mode. When the gate signal, 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 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.

PULSE WIDTH MODULATION

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

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

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

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

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

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

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

⚠ CAUTION

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

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

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

⚠ CAUTION

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

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

PC board can be damaged by static electricity.

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

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

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

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

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

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

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

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

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

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

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

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the Power Wave® S500 case is removed.	1. Contact your local authorized Lincoln Electric Service Facility	1. Contact the Lincoln Electric Service Department at 1-888-935-3877.
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make certain the fuses or breakers are properly sized. 2. The welding procedure may be drawing too much input current or the duty cycle may be too high. Reduce the welding current and/or reduce the duty cycle. 3. Check for error codes. See ***Status LED Troubleshooting*** in this section.	1. Perform the ***Input Board Test***. 2. Perform the ***Power Conversion Assembly Test***. 3. Perform the ***PFC Control Board Test***.
The machine will not power up. No lights or displays. The machine appears to be off.	1. Make sure the proper input voltage is being applied to the machine (check fuses or breakers). 2. Make sure the input supply disconnect has been turned ON. 3. Make certain the input power line switch is in the ON position. 4. Check for error codes. See ***Status LED Troubleshooting*** in this section.	1. Check the input line switch for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check to make sure that 40VDC is being applied to the Optional User Interface Board at lead 52D(+) to lead 51D(-). See the Wiring Diagram. 3. Perform the ***40 Volt DC Bus Board Test***. 4. Perform the ***Input Board Test***. 5. Perform the ***PFC Control Board Test***.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The Power Wave® S500 does not have welding output.	1. If the symptom is accompanied by an error code see the ***Status LED Troubleshooting*** section. 2. There may be an external "short" in the external output circuitry. Remove all loads from the output terminals and restart the machine. 3. If the thermal LED is lit the unit may be overheated. Adjust the welding load and /or duty cycle to coincide with the output limits of the Power Wave® S500. Also see the symptom "The Thermal LED is ON" in this section.	1. Perform the ***Input Board Test***. 2. Perform the ***Power Conversion Assembly Test***. 3. Perform the ***Digital Control Board Test***. 4. Perform the ***40 Volt DC Bus Board Test***. 5. Perform the ***Optional User Interface Kit Test***. 6. Perform the ***Multi-Phase Output Choke Test***.
The Thermal LED is ON. The machine regularly overheats. There is no welding output.	1. The welding application may be exceeding the recommended duty cycle and/or current limits of the machine. 2. Dirt and dust may have clogged the cooling channels inside the machine. See the ***Maintenance Section*** of this manual. 3. The air intake and exhaust louvers may be blocked due to inadequate clearance around the machine. 4. Make sure the fans are functioning correctly. The fans will run at variable speeds dependent upon the temperature of the Buck/Boost heat sinks. The fans should also run at a high speed if a thermostat has tripped.	1. Check the thermostats and associated wiring for loose or faulty connections. See the Wiring Diagram. 2. Check the DC voltage being applied to the fans. There should be 48VDC at lead 351 (-) to lead 353 (+). See the Wiring Diagram.

⚠ CAUTION

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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The "Real Time Clock" no longer functions.	1. The Digital Control Board Battery may be faulty.	1. The Digital Control Board Battery may be faulty. Replace if necessary (Type BS2032). 2. The Digital Control Board may be faulty. 3. Perform the ***Digital Control Board Test***.
The Power Wave® S500 will not produce full output.	1. The input voltage may be too low. Check for error codes. See ***Status LED Troubleshooting*** in this section. 2. Make certain the three-phase input voltage is correct for the machine.	1. Perform the ***Current Transducer Test***. 2. Perform the ***Current and Voltage Calibration Procedure***. 3. Perform the ***Digital Control Board Test***. 4. Perform the ***Power Conversion Assembly Test***. 5. Perform the ***Multi-Phase Output Choke 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
WELDING PROBLEMS		
General degradation of the welding performance	1. Check for proper wire feeding. Make certain that the actual speed is the same as the preset. 2. Verify that the correct wire drive and gear ratio have been selected. 3. Check the welding cables for loose or faulty connections. 4. Check for adequate gas shielding. 5. Make sure the welding process is correct for the wire feed and voltage settings.	1. Perform the ***Current and Voltage Calibration Procedure***.
The wire burns back to the tip at the end of the weld.	1. Reduce the burnback time. 2. Reduce the workpoint.	N/A.
During a weld the machine shuts down.	1. The secondary current limit has been exceeded and the machine shuts down to protect itself. Adjust the procedure to reduce the load and lower the output current draw.	1. A non-recoverable internal fault will interrupt the welding output. This condition will also result in a status light blinking. Check for error codes. See ***Status LED Troubleshooting*** in this section.

⚠ CAUTION

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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The arc is excessively long and erratic.	1. In the wirefeeder make sure the correct wire drive and gear ratio have been selected for the welding process being used. 2. Make sure the shielding gas is correct for the welding process being used. Also make sure the flow rate is correct.	1. Perform the ***Current and Voltage Calibration Procedure***.
The welding starting is poor.	1. Make sure the driver roll tension on the wirefeeder is adjusted correctly. Also the welding wire should travel freely through wire feeding path. Check the welding tip for blockage. 2. Make sure the shielding gas flow is correct.	N/A.
The end of the weld is not acceptable.	1. Make sure all of the settings for Burnback and Crater states are set correctly for the welding process being used. Verify that the Burnback has a value other than 0. 2. Verify the burnback set points for workpoint, trim and wave values. 3. Make sure the shielding gas flow is adequate.	N/A.
The ArcLink wirefeeder will not power up.	1. Check the ArcLink cable connecting the Power Wave® S500 to the ArcLink wirefeeder.	1. Perform the ***40 Volt DC Bus 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
ETHERNET PROBLEMS		
The system will not connect.	1. Make sure that the correct patch cable or cross over cable is being used. 2. Make sure the software is not blocking the connection. See the on line Diagnostic Utility. 3. Verify that the cables are fully inserted into the bulk head connector. 4. Verify that the network device connected to the Power Wave is either a 10-baseT device or a 10/100-baseT device. 5. The LED located under the PC board Ethernet connector will be lit when the machine is connected to another network device.	1. Use Weld Manager (included on the Power Wave Utilities and available at **www.powerwavesoftware.com**) to verify the correct IP address information has been entered. 2. Verify that no duplicate IP addresses exist on the network
The Ethernet connection drops out while welding.	1. Make sure all of the connections are tight and secure.	1. Make certain that the network cable is not located next to any heavy current carrying conductors. This would include input power cables and welding output cables.

⚠ 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.

INPUT CONTROL BOARD

Error Code #	Indication	Type
331 Instantaneous Input Current Limit	Instantaneous input current limit has been exceeded. Typically indicates short term power overload.	Persistent
334 Startup Current Check Failure	Input current limit was exceeded during machine power-up.	Persistent
335 Startup Voltage Check Failure	Input voltage was too high or too low during machine power-up. Verify that the input voltage is between 200V and 650V.	Temporary
336 Thermal Fault	Thermostat on primary module is tripped. Typically caused by a fan malfunction or blocked air vent. Check for proper air flow around and through the system. Verify that the thermal circuit has not been damaged or disconnected.	Temporary
337 Precharge Timeout	The DC bus voltage was not charged to a certain level at end of precharge.	Persistent
338 Input Power Limit	The input power drawn by the machine exceeded a safe level.	Persistent
339 Current Imbalance Fault	The current through the power modules is out of balance. Could indicate a faulty connection to a power module or a malfunctioning power module.	Temporary
341 Input Voltage Dropout	The input voltage momentarily dropped out. Check connections and verify quality of input power.	Temporary
346 Transformer Primary Overcurrent	Transformer current too high. Typically indicates short-term power overload.	Persistent
347 Average Input Current Limit	Average input current limit has been exceeded. Typically indicates short term power overload.	Persistent
349 Bus Undervoltage	The DC bus voltage dropped below the allowable limit.	Temporary

Persistent errors require power to be cycled for the error to clear.
Temporary faults will go away on their own if the error condition is removed.

⚠ 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.

MAIN CONTROL BOARD ("STATUS" LIGHT)

Error Code #	Indication	Type
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. Check for proper air flow around and through the system. Verify that the thermal circuit has not been damaged or disconnected.	Temporary
45 Output Voltage High	Welding voltage exceeded allowable limit. Check sense lead connection, voltage feedback circuits and voltage calibration. Verify that the machine is programmed with the latest firmware.	Persistent
52 DSP ADC Load High	The control board DSP is experiencing a CPU overload. Verify that the machine is programmed with the latest firmware. If problem persists, perform the ***Control Board Removal And Replacement Procedure***.	Persistent
55 Communication with DSP Failed	Communication with the control board DSP failed. Verify that the machine is programmed with the latest firmware. If problem persists, perform the ***Control Board Removal And Replacement Procedure***.	Persistent
54 Secondary (Output) Overcurrent Error	The long-term average secondary (welding) current limit has been exceeded. **NOTE:** The long-term average secondary current limit is 325A (1 phase) or 575A (3 phase).	Temporary
56 Chopper Communication Error	Indicates communication link between main control board and chopper has errors. Check the communication link between the control board and the chopper board. Isolate the machine from high-frequency noise. Verify that the machine is programmed with the latest firmware. If problem persists, perform the ***Chopper Board Removal And Replacement Procedure***.	Temporary
58 Primary Fault	The PFC control board is not ready. Check that board for information on what error has occurred. Verify that the PFC board is connected to the control board. Verify that the machine is programmed with the latest firmware. If problem persists, perform the ***PFC Board Removal And Replacement Procedure***.	Temporary
71 Secondary (Output) Overpower Error	The long-term secondary (welding) power limit has been exceeded. **NOTE:** The long-term average secondary current limit is 14 kW (1 phase) or 25 kW (3 phase).	Temporary
73 FGEN ISR Overlap	The control board DSP is experiencing a CPU overload. Verify that the machine is programmed with the latest firmware. If problem persists, perform the ***Control Board Removal And Replacement Procedure***.	Temporary

⚠ 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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CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Case Covers and the discharging of the DC Link Capacitor.

MATERIALS NEEDED

5/16” Nutdriver
7/16” Wrench
25-1000 Ohm Resistor (25 Watts Minimum)
Volt/Ohmmeter
Insulated Gloves And Pliers

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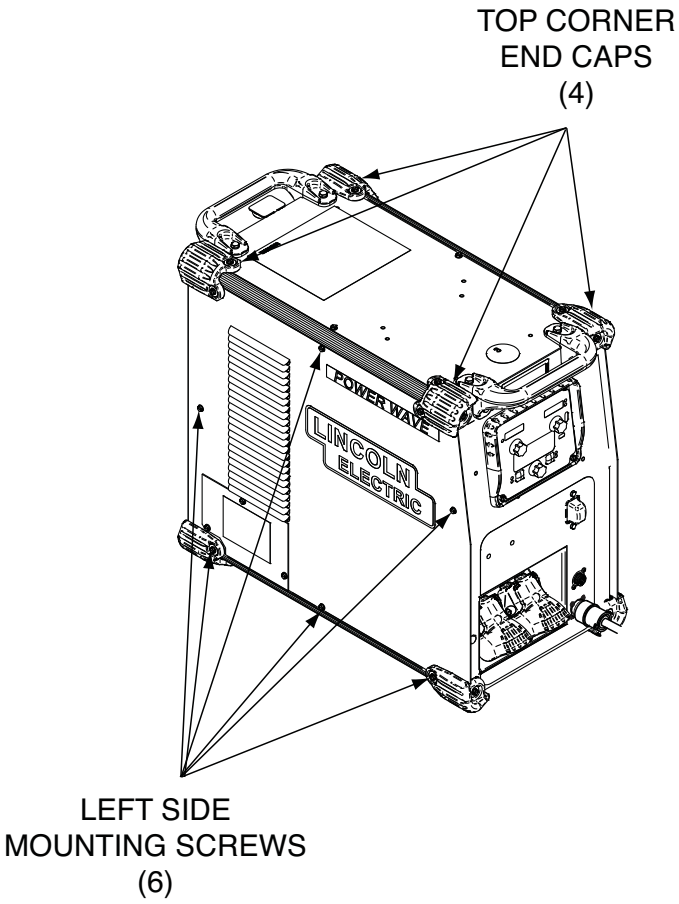
CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE (continued)

FIGURE F.1 – CASE COVER REMOVAL



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Using a 5/16" nutdriver, remove the four top corner end caps as shown in Figure F.1. Keep the screws and flat washers for reassembly.
3. Using a 5/16" nutdriver, remove the six remaining screws and washers from the left side to gain access to the left side internal components. See Figure F.1.
4. Locate the DC Link Capacitor and carefully check the voltage across it. The test probes should be carefully placed at the connection points B4 (+) and B5 (-). See ***Figure F.2***. If any voltage is present discharge the capacitor using the high wattage resistor (25-1000 ohms @25 watts minimum), electrically insulated gloves and pliers. **CAUTION:** Rectified and filtered input line voltage may be present. Hold the resistor terminals on the capacitor terminals for 10 seconds.

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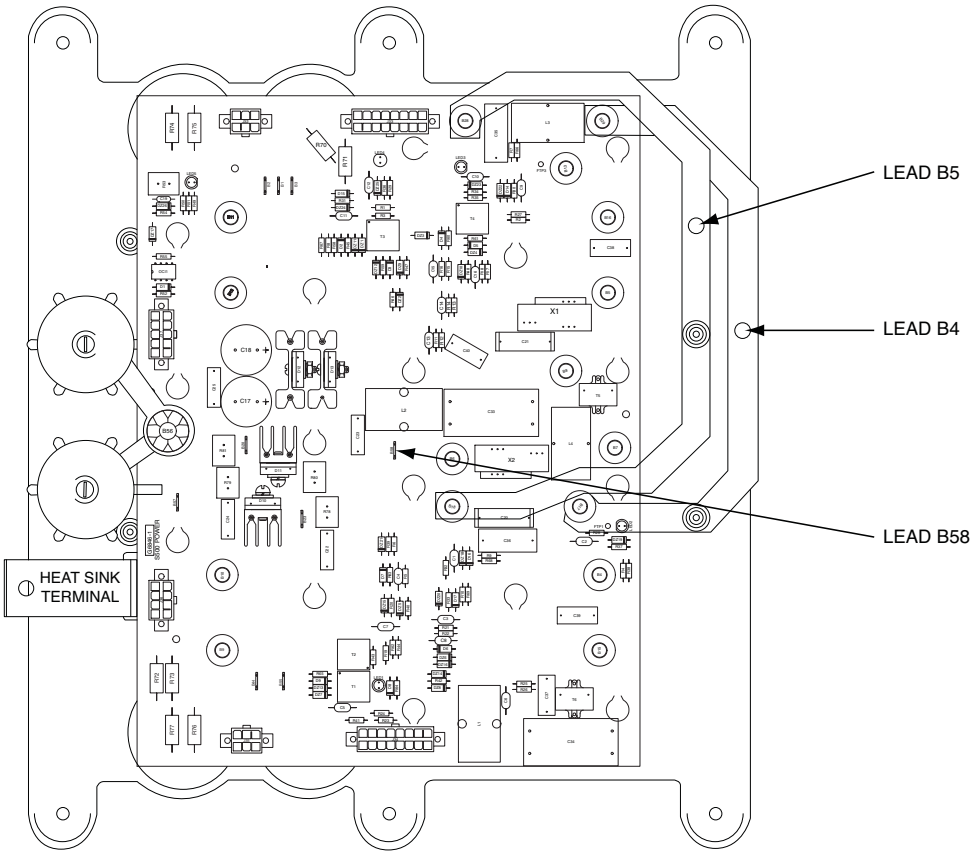
CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE (continued)

FIGURE F.2 – CAPACITOR DISCHARGE PROCEDURE



5. Recheck the voltage across the B4 and B5 terminals. The voltage should be zero. If any voltage remains repeat the procedure.

NOTE: Any voltage present after discharge has been performed is an abnormal condition and may indicate a problem.

6. Check the DC voltage from B58 (+) to connection point B5 (-). If any voltage is present use the high wattage resistor (25-1000 ohms @25 watts minimum), electrically insulated gloves and pliers to discharge the 400VDC bus line. B58 to B5. See Figure F.2.

7. Using a 5/16" nutdriver, remove the six remaining screws and washers from right cover to gain access to the right side portion of the unit.

8. Using a 7/16" wrench, remove the eight bolts from the lifting handles and remove the six screws to gain access to the top portion of the unit.

Return to Section TOC
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CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Using a 7/16” wrench, attach the eight bolts securing the lifting handles and attach the six screws to secure the top portion of the unit.
2. Using a 5/16” nutdriver, attach the six screws and washers securing the right side case cover.
3. Using a 5/16” nutdriver, attach the six screws and washers securing the left side case cover.
4. Using a 5/16” nutdriver, screws and flat washers previously removed, attach the four top corner end caps.

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Return to Master TOC

PFC CONTROL BOARD TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the PFC Control Board is functioning correctly. There are very high voltages present on the PFC Control Board. This test will be limited to LED and audio error codes and also resistance and diode checks with the input power removed from the machine. This test will not test all of the circuits on the board.

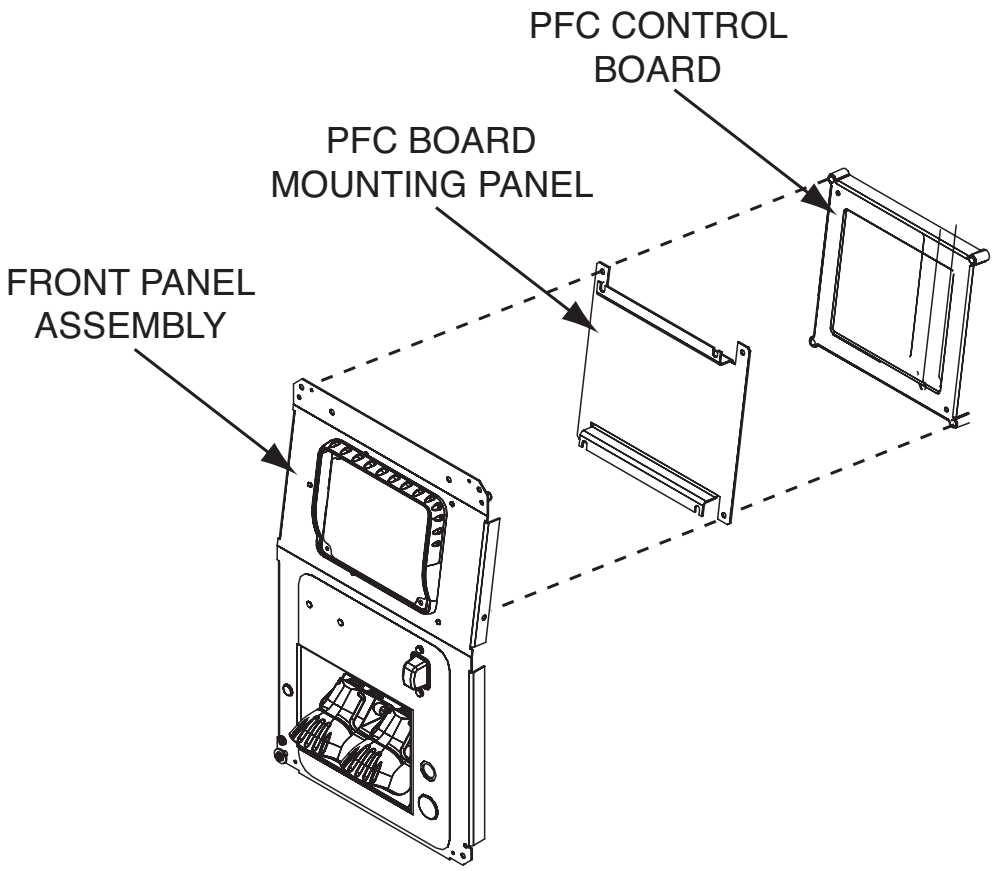
MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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

PFC CONTROL BOARD TEST (continued)

FIGURE F.3 – PFC CONTROL BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the PFC Control Board located on the inside of the front panel. See Figure F.3.
4. Carefully apply the correct input power to the Power Wave® S500 machine.
5. Check for the correct operation of the LED lights on the PFC Control Board. See ***Figure F.4*** and ***Tables F.1*** and ***F.2***.
6. Remove the input power to the Power Wave® S500 machine and perform the ***Capacitor Discharge Procedure***.
7. If further testing is required, perform the ***PFC Control Board Removal Procedure***.
8. Perform the resistance and diode checks per ***Table F.3, Table F.4*** and ***Figure F.4***.
9. When testing is complete, perform the ***PFC Control Board Replacement Procedure***.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform ***Retest After Repair Procedure***.

Return to Section TOC
Return to Master TOC

PFC CONTROL BOARD TEST (continued)

FIGURE F.4 – PFC CONTROL BOARD LED AND TEST POINTS

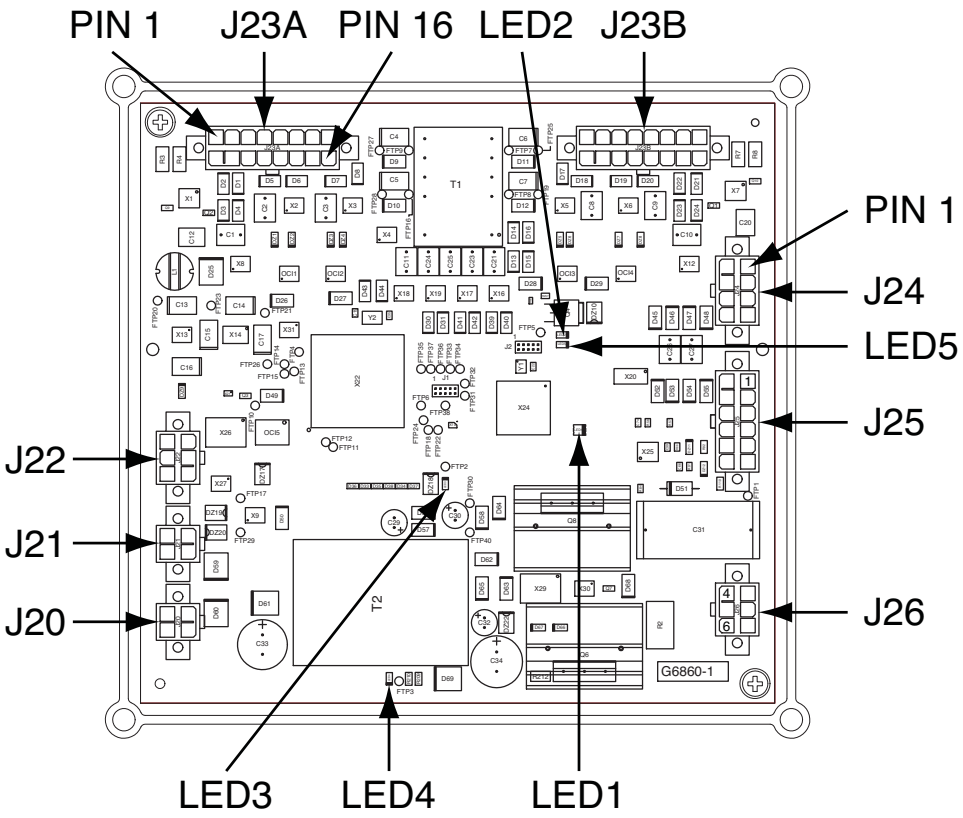


TABLE F.1 – PFC CONTROL BOARD LED DESCRIPTION AND FUNCTIONS

LED NUMBER	COLOR	FUNCTION
1	GREEN	Status is OK
1	RED / FLASHING	Error Code (Blinking)
2	RED	Fault on “B” side of bridge
3	GREEN	-15VDC present
4	GREEN	+15VDC present
5	RED	Fault on “A” side of bridge

TABLE F.2 – PFC CONTROL BOARD ERROR CODES

ERROR CODE NUMBER	EXPLANATION
331	Peak input current limit
334	Start up current check failure
335	Start up voltage check failure
336	Thermal fault
337	Precharge failure
338	Input power limit
341	Input voltage drop-out
346	Transformer primary overcurrent
347	Average input current limit
349	Bus undervoltage

Return to Section TOC
Return to Master TOC

PFC CONTROL BOARD TEST (continued)

TABLE F.3 – PFC CONTROL BOARD RESISTANCE CHECKS

DESCRIPTION	METER TEST POINTS AND POLARITY	EXPECTED READINGS	CONDITIONS
INPUT POWER CIRCUIT	PLUG J26 PIN 4 (+) TO PLUG J26 PIN 6 (–)	VERY HIGH RESISTANCE. GREATER THAN 20,000 OHMS	INPUT POWER REMOVED. PLUG J26 REMOVED FROM PFC BOARD
INPUT LINE SENSING	PLUG J25 PIN 1 (+) TO PLUG J26 PIN 6 (–)	VERY HIGH RESISTANCE. GREATER THAN 500,000 OHMS	IF LOWER REPLACE THE PFC BOARD

TABLE F.4 – PFC CONTROL BOARD DIODE CHECKS

DESCRIPTION	POSITIVE METER LEAD	NEGATIVE METER LEAD	EXPECTED READINGS +/– 10%*
MAIN BUCK DRIVE “A”	PLUG J23A PIN 8	PLUG J23A PIN 16	0.130VDC
AUX. BUCK DRIVE “A”	PLUG J23A PIN 6	PLUG J23A PIN 14	0.130VDC
MAIN BOOST DRIVE “A”	PLUG J23A PIN 12	PLUG J25 PIN 12	0.130VDC
MAIN BOOST DRIVE “A”	PLUG J23A PIN 4	PLUG J23A PIN 12	0.130VDC
AUX. BOOST DRIVE “A”	PLUG J23A PIN 11	PLUG J25 PIN 12	0.130VDC
AUX. BOOST DRIVE “A”	PLUG J23A PIN 3	PLUG J23A PIN 11	0.130VDC
FULL BRIDGE “A”	PLUG J24 PIN 7	PLUG J25 PIN 12	0.130VDC
FULL BRIDGE “A”	PLUG J23A PIN 3	PLUG J24 PIN 7	0.130VDC
FULL BRIDGE “A”	PLUG J24 PIN 3	PLUG J25 PIN 12	0.130VDC
FULL BRIDGE “A”	PLUG J23A PIN 3	PLUG J24 PIN 3	0.130VDC
MAIN BUCK DRIVE “B”	PLUG J23B PIN 1	PLUG J23B PIN 9	0.130VDC
AUX. BUCK DRIVE “B”	PLUG J23B PIN 3	PLUG J23B PIN 11	0.130VDC
MAIN BOOST DRIVE “B”	PLUG J23B PIN 13	PLUG J25 PIN 12	0.130VDC
MAIN BOOST DRIVE “B”	PLUG J23B PIN 5	PLUG J23B PIN 13	0.130VDC
AUX. BOOST DRIVE “B”	PLUG J23B PIN 14	PLUG J25 PIN 12	0.130VDC
AUX. BOOST DRIVE “B”	PLUG J23B PIN 6	PLUG J23B PIN 14	0.130VDC
FULL BRIDGE “B”	PLUG J24 PIN 6	PLUG J25 PIN 12	0.130VDC
FULL BRIDGE “B”	PLUG J23B PIN 6	PLUG J24 PIN 6	0.130VDC
FULL BRIDGE “B”	PLUG J24 PIN 2	PLUG J25 PIN 12	0.130VDC
FULL BRIDGE “B”	PLUG J23B PIN 6	PLUG J24 PIN 2	0.130VDC

NOTE: *An open or short indicates a faulty PFC Control Board.

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

DIGITAL CONTROL BOARD TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Digital Control Board is receiving the correct input voltage and if the board is functioning correctly. This test will not test all of the circuits on the board.

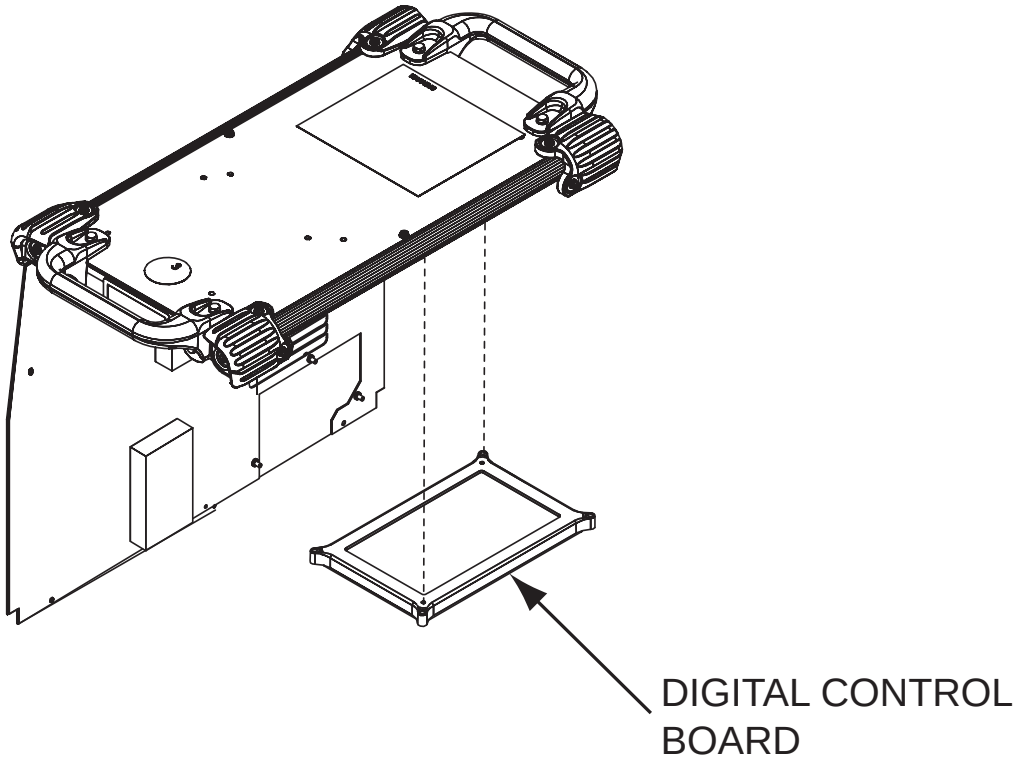
MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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

DIGITAL CONTROL BOARD TEST (continued)

FIGURE F.5 – DIGITAL CONTROL BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Digital Control Board located on the underside of the top case panel. See Figure F.5.
4. Locate Plugs J4, J5, J8, J9, J5 and J12 located on the Digital Control Board. See ***Figure F.6***. See Wiring Diagram.
5. Carefully apply the correct input voltage to the Power Wave® S500 machine.
6. Check for the correct operation of the LED lights on the Digital Control Board. See ***Figure F.6*** and ***Table F.5***.
7. Perform the voltage tests per ***Table F.6***. See ***Figure F.6***.
8. Remove the input power to the Power Wave® S500 machine and perform the resistance checks per ***Table F.7***.
9. If the correct input voltage is being applied to the Digital Control Board and the correct output voltages are not being generated, the Digital Control Board may be faulty.
10. If faulty, perform the ***Digital Control Board Removal And Replacement Procedure***.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform the ***Retest After Repair Procedure***.

Return to Section TOC
Return to Master TOC

DIGITAL CONTROL BOARD TEST (continued)

FIGURE F.6 – DIGITAL CONTROL BOARD LED AND TEST POINT LOCATIONS

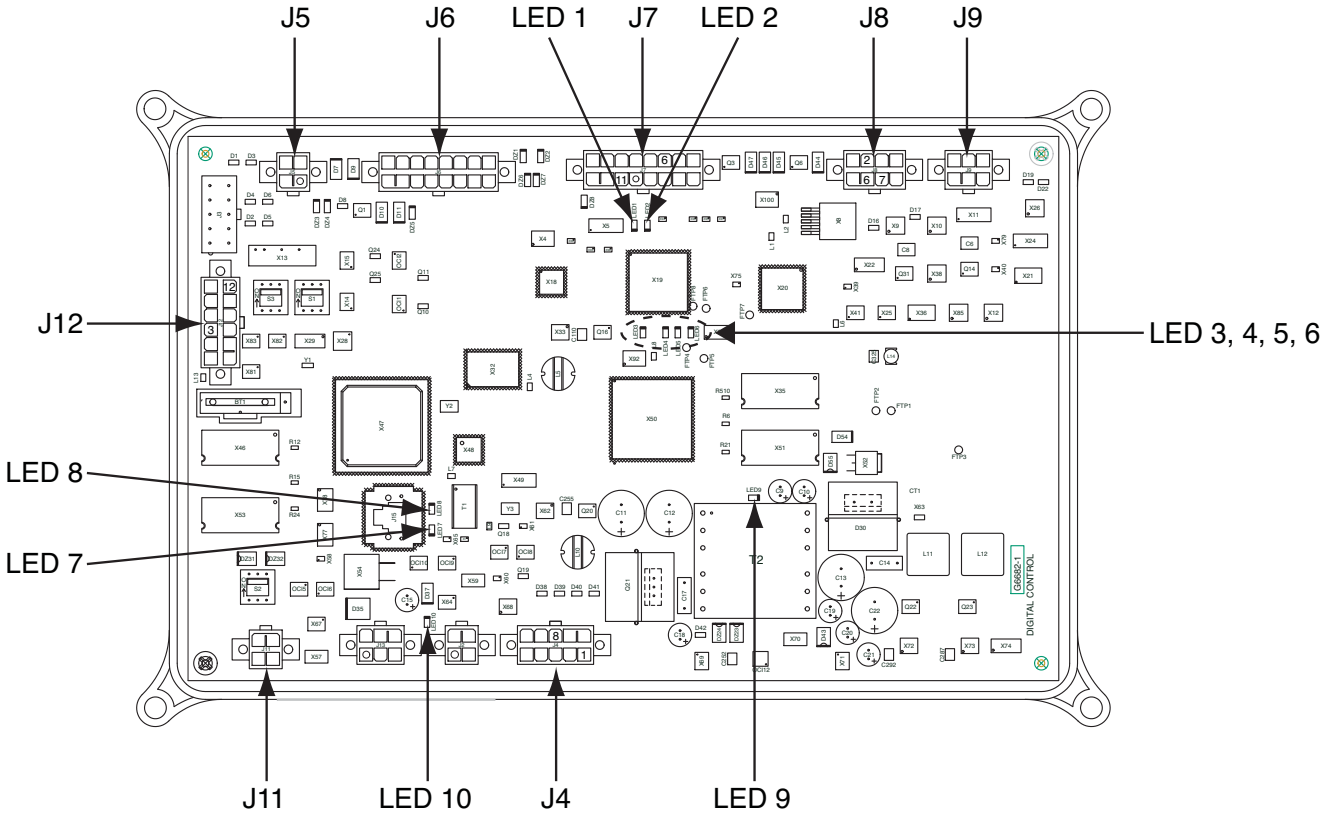


TABLE F.5 – DIGITAL CONTROL BOARD LED DESCRIPTION AND FUNCTIONS

LED NUMBER	COLOR	FUNCTION
1	GREEN	STATUS IS OK
2	RED	ERROR CODE (BLINKING)
3	GREEN	WELDING OUTPUT ENABLED
4	GREEN	SINGLE PHASE INPUT
5	GREEN	ELECTRODE SENSE
6	GREEN	WORK SENSE
7	GREEN	ETHERNET LINK / ACTIVITY STATUS
8	GREEN	ETHERNET SPEED STATUS
9	GREEN	INPUT SUPPLY STATUS (30VDC TO 50VDC)
10	GREEN	DEVICENET EXTERNAL 24VDC PRESENT

DIGITAL CONTROL BOARD TEST (continued)

TABLE F.6 – DIGITAL CONTROL BOARD VOLTAGE TEST POINTS AND EXPECTED READINGS

DESCRIPTION	TEST POINTS	LEAD NUMBERS	EXPECTED READING	CONDITIONS
INPUT SUPPLY FROM PFC BOARD	J4 PIN 2 TO J4 PIN 1	LEAD 356 (–) TO LEAD 358 (+)	40VDC	INPUT POWER APPLIED TO MACHINE
POWER FROM DIGITAL CONTROL BOARD TO CHOPPER BOARD	J12 PIN 12 TO J12 PIN 3	LEAD 348 (–) TO LEAD 344 (+)	5VDC	INPUT POWER APPLIED TO MACHINE
FAN CONTROL SIGNAL	J7 PIN 16 TO J7 PIN 6	LEAD 350 (–) TO LEAD 355 (+)	10VDC	INPUT POWER APPLIED AND FAN RUNNING
POWER SUPPLY TO CURRENT TRANSDUCER	J8 PIN 6 TO J8 PIN 2	LEAD 214 (–) TO LEAD 212 (+)	+15VDC	INPUT POWER APPLIED TO MACHINE
POWER SUPPLY TO CURRENT TRANSDUCER	J8 PIN 6 TO J8 PIN 3	LEAD 214 (–) TO LEAD 213 (+)	-15VDC	INPUT POWER APPLIED TO MACHINE
SUPPLY TO OPTIONAL INVERTER BOARD	J8 PIN 7 TO J4 PIN 8	LEAD 417 (–) TO LEAD 416 (+)	15VDC	INPUT POWER APPLIED TO MACHINE

TABLE F.7 – DIGITAL CONTROL BOARD RESISTANCE CHECKS AND EXPECTED READINGS

DESCRIPTION	TEST POINTS	LEAD NUMBERS	EXPECTED READING	CONDITIONS
CONNECTIONS TO OUTPUT TERMINALS	J9 PIN 3 TO NEGATIVE OUTPUT TERMINAL J9 PIN 1 TO POSITIVE OUTPUT TERMINAL	LEAD 202 TO NEGATIVE OUTPUT TERMINAL LEAD 206 TO POSITIVE OUTPUT TERMINAL	ZERO OHMS ZERO OHMS	NO INPUT POWER APPLIED TO MACHINE
CONNECTIONS TO NORMALLY CLOSED THERMOSTATS	J5 PIN 2 TO J5 PIN 3	LEAD 410 TO LEAD 409	ZERO OHMS	NO INPUT POWER APPLIED TO MACHINE

Return to Section TOC
Return to Master TOC

OPTIONAL USER INTERFACE KIT TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Optional User Interface Kit is receiving the correct input voltage and if the boards are functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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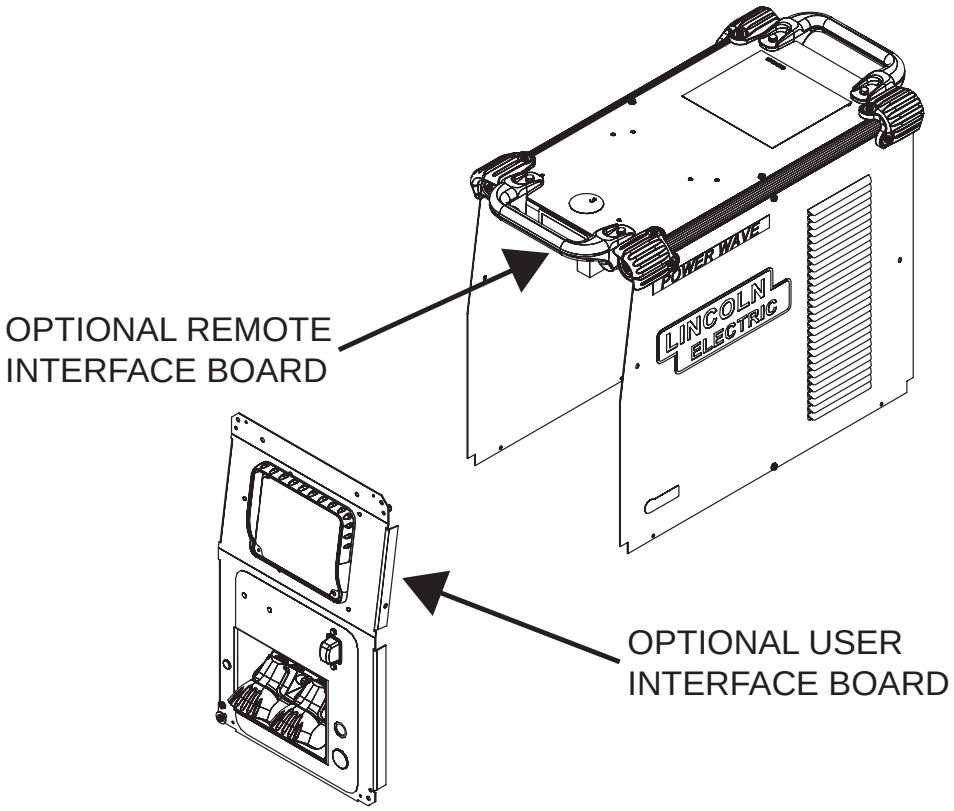
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OPTIONAL USER INTERFACE KIT TEST (continued)

FIGURE F.7 – USER INTERFACE AND REMOTE INTERFACE BOARD LOCATIONS



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Optional User Interface Kit Boards. The User Interface Board is located on the front panel of the machine. See Figure F.7. The Remote Interface Board is located on the underside of the roof panel.
4. Carefully apply the correct input power to the Power Wave® S500 machine.
5. Locate Plugs J114, J111, J112 and J115 on the Remote Interface Board. See ***Figure F.8***. Also locate Plug J115 on the User Interface Board. See ***Figure F.9***. See Wiring Diagram.
6. Carefully check for the expected voltages per ***Table F.8*** and ***Table F.9***.
7. If the correct input voltages are being applied to the Remote Interface Board and the correct outputs are not being generated, the Remote Interface Board may be faulty.
8. If faulty, replace the Remote Interface Board.
9. If the correct voltages are present remove the input power and perform the resistance tests per ***Table F.10***. Also see the Wiring Diagram.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform the ***Retest After Repair Procedure***.

Return to Section TOC
Return to Master TOC

OPTIONAL USER INTERFACE KIT TEST (continued)

FIGURE F.8 – REMOTE INTERFACE BOARD TEST POINTS

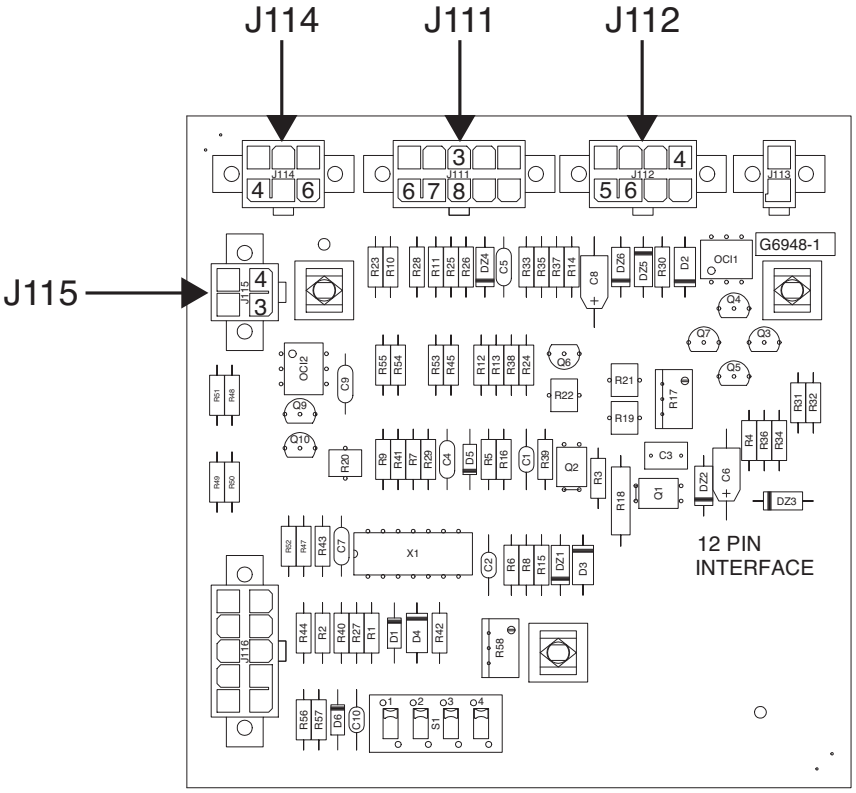
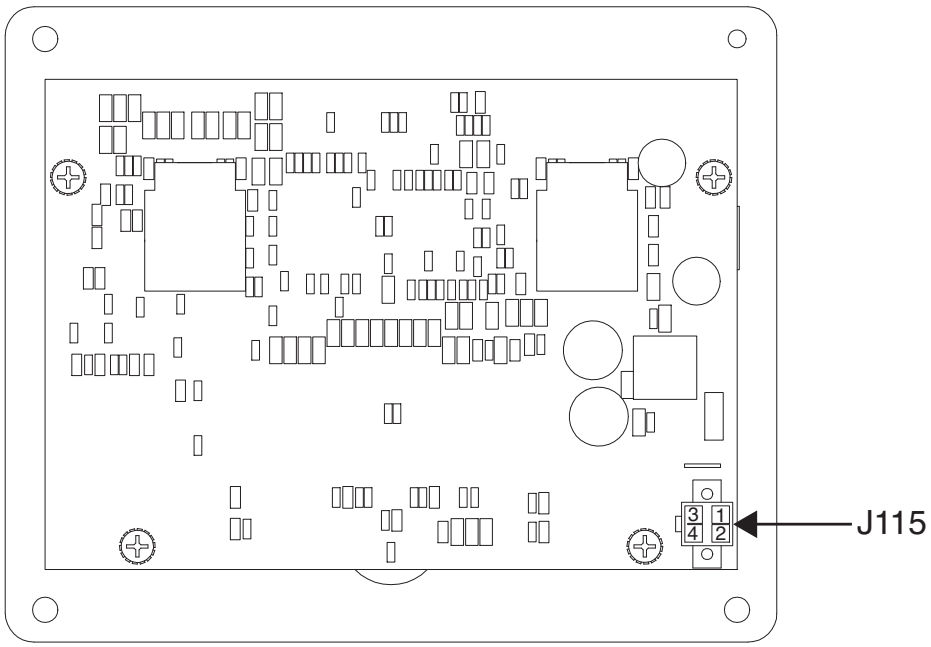


FIGURE F.9 – USER INTERFACE BOARD TEST POINTS



Return to Section TOC
Return to Master TOC

OPTIONAL USER INTERFACE KIT TEST (continued)

TABLE F.8 – VOLTAGE CHECKS ON REMOTE INTERFACE BOARD

DESCRIPTION	TEST POINT METER PROBE (+)	TEST POINT METER PROBE (–)	EXPECTED READING	CONDITIONS
40VDC BUS SUPPLY FROM DC BUSS BOARD	PLUG J114 PIN 6 (LEAD 52C)	PLUG J114 PIN 4 (LEAD 51C)	40VDC	CORRECT INPUT POWER APPLIED TO MACHINE
40VDC FROM REMOTE INTERFACE BOARD TO S1 REMOTE RECEPTACLE	PLUG J111 PIN 8 (LEAD 52F)	PLUG J111 PIN 7 (LEAD 51F)	40VDC	CORRECT INPUT POWER APPLIED TO MACHINE
40VDC FROM REMOTE INTERFACE BOARD TO THE USER INTERFACE BOARD	PLUG J115 PIN 4 (LEAD 52D)	PLUG J115 PIN 3 (LEAD 51D)	40VDC	CORRECT INPUT POWER APPLIED TO MACHINE
15VDC TRIGGER SUPPLY FROM THE DIGITAL CONTROL BOARD	PLUG J112 PIN 6 (LEAD 373)	PLUG J112 PIN 5 (LEAD 370)	12VDC	CORRECT INPUT POWER APPLIED TO MACHINE
15VDC TRIGGER SUPPLY FROM THE REMOTE BOARD	PLUG J111 PIN 6 (LEAD 2)	PLUG J111 PIN 3 (LEAD 4)	15VDC	TRIGGER NOT ACTIVATED (OPEN)
15VDC TRIGGER SUPPLY FROM REMOTE BOARD	PLUG J111 PIN 6 (LEAD 2)	PLUG J111 PIN 3 (LEAD 4)	0VDC	TRIGGER ACTIVATED (CLOSED)
15VDC TRIGGER SUPPLY FROM REMOTE BOARD	PLUG J112 PIN 4 (LEAD 372)	PLUG J112 PIN 5 (LEAD 370)	0VDC	TRIGGER NOT ACTIVATED (OPEN)
15VDC TRIGGER SUPPLY FROM REMOTE BOARD	PLUG J112 PIN 4 (LEAD 372)	PLUG J112 PIN 5 (LEAD 370)	15VDC	TRIGGER ACTIVATED (CLOSED)

TABLE F.9 – VOLTAGE CHECKS ON USER INTERFACE BOARD

DESCRIPTION	TEST POINT METER PROBE (+)	TEST POINT METER PROBE (–)	EXPECTED READING	CONDITIONS
40VDC SUPPLY FROM REMOTE BOARD	PLUG J115 PIN 4 (LEAD 52D)	PLUG J115 PIN 3 (LEAD 51D)	40VDC	CORRECT INPUT POWER APPLIED TO MACHINE

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

OPTIONAL USER INTERFACE KIT TEST (continued)

TABLE F.10 – RESISTANCE CHECKS

DESCRIPTION	TEST POINT METER PROBE	TEST POINT METER PROBE	EXPECTED READING	CONDITIONS
CONTINUITY CHECK FROM PLUG J111 TO 12 PIN S1 RECEPTACLE	PLUG J111 PIN 5 (LEAD 75)	S1 RECEPTACLE PIN C (LEAD 75)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J111 TO 12 PIN S1 RECEPTACLE	PLUG J111 PIN 4 (LEAD 76)	S1 RECEPTACLE PIN D (LEAD 76)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J111 TO 12 PIN S1 RECEPTACLE	PLUG J111 PIN 1 (LEAD 77)	S1 RECEPTACLE PIN E (LEAD 77)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J115 ON REMOTE BOARD TO PLUG J115 ON USER INTERFACE BOARD	PLUG J115 PIN 1 (LEAD 53D)	PLUG J115 PIN 1 (LEAD 53D)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J115 ON REMOTE BOARD TO PLUG J115 ON USER INTERFACE BOARD	PLUG J115 PIN 2 (LEAD 54D)	PLUG J115 PIN 2 (LEAD 54D)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J115 ON REMOTE BOARD TO PLUG J115 ON USER INTERFACE BOARD	PLUG J115 PIN 3 (LEAD 51D)	PLUG J115 PIN 3 (LEAD 51D)	ZERO OHMS	POWER TO MACHINE REMOVED
CONTINUITY CHECK FROM PLUG J115 ON REMOTE BOARD TO PLUG J115 ON USER INTERFACE BOARD	PLUG J115 PIN 4 (LEAD 52D)	PLUG J115 PIN 4 (LEAD 52D)	ZERO OHMS	POWER TO MACHINE REMOVED

Return to Section TOC
Return to Master TOC

NOTES

Return to Section TOC
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Return to Master TOC

POWER CONVERSION ASSEMBLY TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the “power section” of the Power Conversion Assembly is functioning correctly. This test will NOT indicate if the entire PC board is functional.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram
1/2" Wrench

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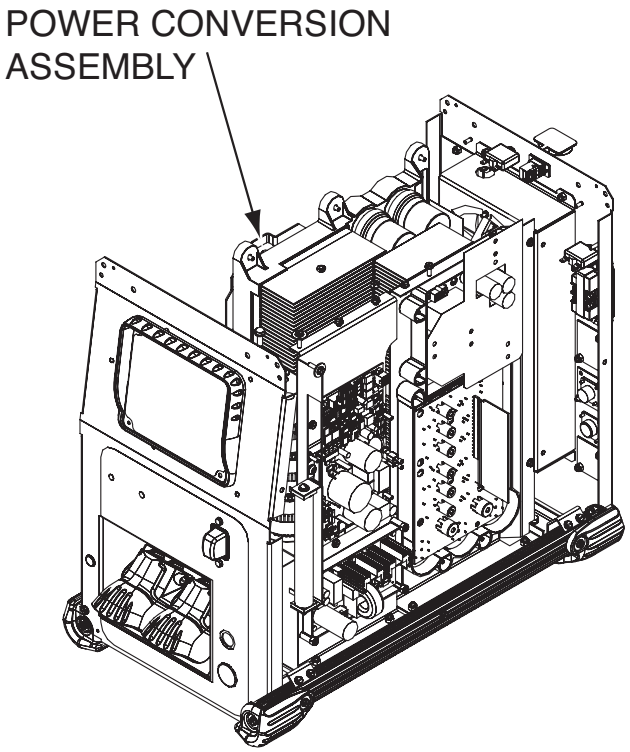
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

POWER CONVERSION ASSEMBLY TEST (continued)

FIGURE F.10 – POWER CONVERSION ASSEMBLY LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

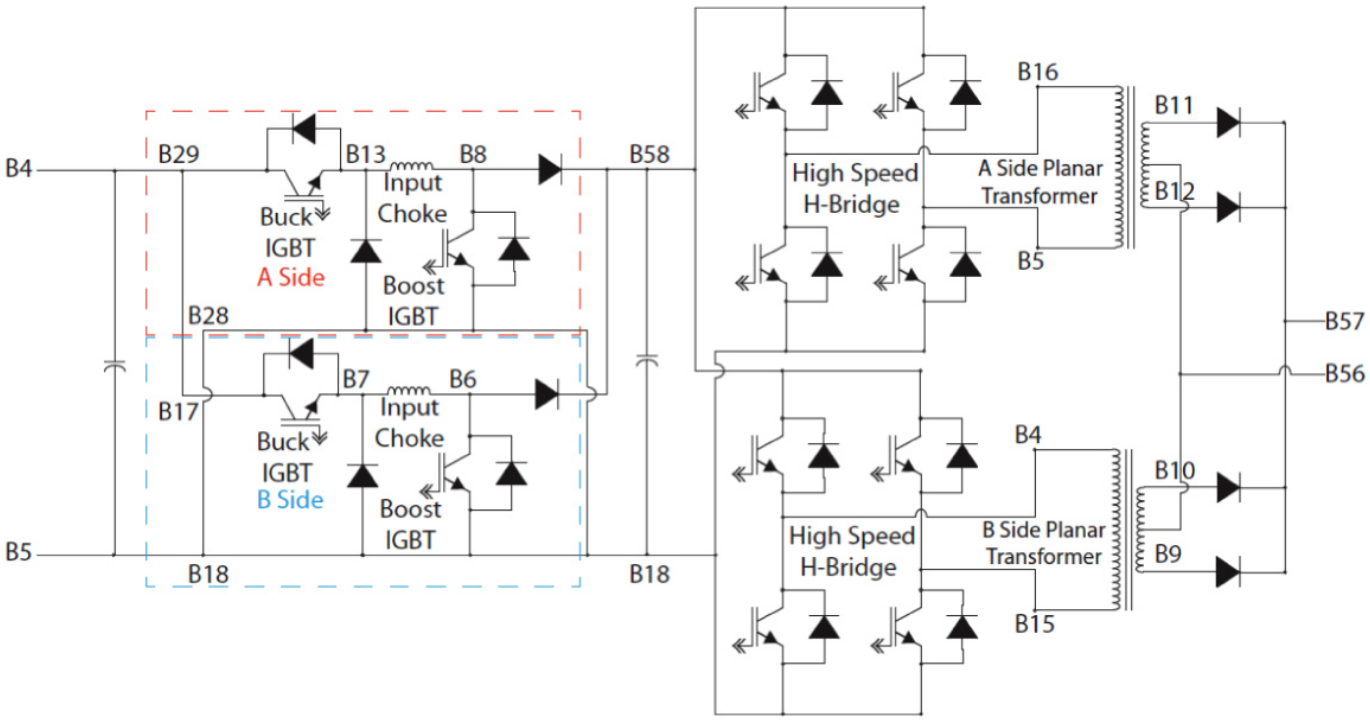
1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Power Conversion Assembly located on the left side of the machine. See Figure F.10.
4. Perform the Power Conversion diode tests per ***Table F.11*** and ***Figure F.11***. **When diode test is complete make sure all internal leads are connected before applying input power to the machine**.
5. Locate the five Green LEDs on the Power Conversion Assembly. See ***Figure F.12***.
6. Carefully apply the correct three phase input power to the Power Wave® S500 machine.
7. Check the Buck/Boost Circuits using the LED ***Table F.12***. See ***Figure F.12***.
8. Perform the voltage checks. See ***Table F.13*** and ***Figure F.12***.
9. Remove the input power to the Power Wave® S500 machine.
10. If any of the above test results are not correct the Power Conversion Assembly may be faulty.
11. If faulty, perform the ***Power Conversion Board Assembly Removal and Replacement Procedure***.
12. Perform the ***Case Cover Replacement Procedure***.
13. Perform the ***Retest After Repair Procedure***.

Return to Section TOC
Return to Master TOC

POWER CONVERSION ASSEMBLY TEST (continued)

TABLE F.11 – DIODE TESTS

NOTE: Make sure the input power is removed from the Power Wave® S500 and the three leads are removed from terminal B56 and electrically isolated from each other. See ***Figure F.11***. When test is complete reconnect the three leads to terminal B56.

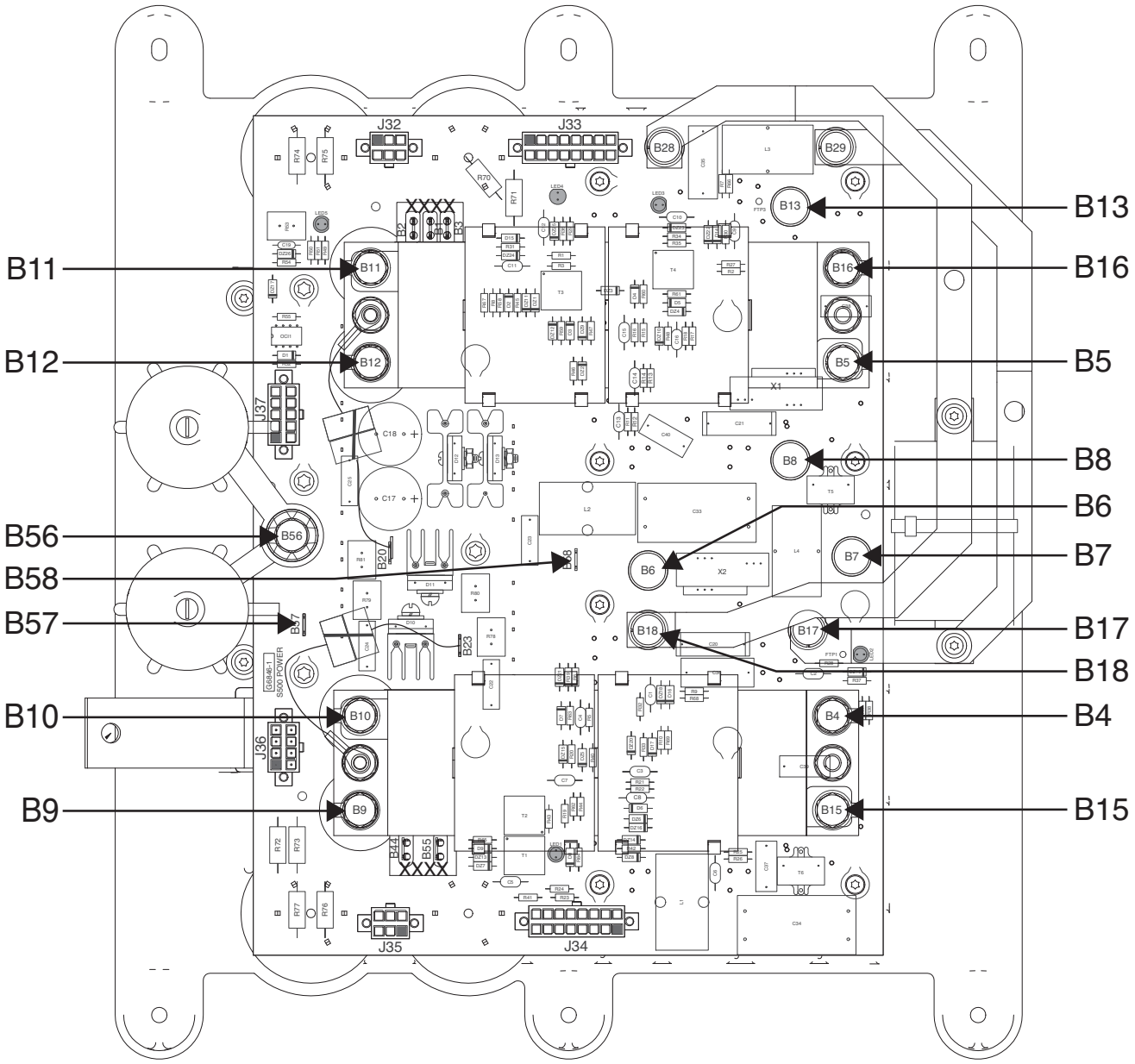


TEST DESCRIPTION	POSITIVE METER LEAD	NEGATIVE METER LEAD	MEASURED LEAD
SIDE A BUCK IGBT	B13	B29	0.395 (+/– 10%)
SIDE A BOOST IGBT	B28	B8	0.395 (+/– 10%)
SIDE A HIGH SPEED H-BRIDGE	B16	B58	0.395 (+/– 10%)
	B5	B58	0.395 (+/– 10%)
	B28	B16	0.395 (+/– 10%)
	B28	B5	0.395 (+/– 10%)
SIDE B BUCK IGBT	B7	B17	0.395 (+/– 10%)
SIDE B BOOST IGBT	B18	B6	0.395 (+/– 10%)
SIDE B HIGH SPEED H-BRIDGE	B4	B58	0.395 (+/– 10%)
	B15	B58	0.395 (+/– 10%)
	B18	B4	0.395 (+/– 10%)
	B18	B15	0.395 (+/– 10%)
OUTPUT RECTIFIER	B11	B57	0.335 (+/– 10%)
	B12	B57	0.335 (+/– 10%)
	B9	B57	0.335 (+/– 10%)
	B10	B57	0.335 (+/– 10%)

Return to Section TOC
Return to Master TOC

POWER CONVERSION ASSEMBLY TEST (continued)

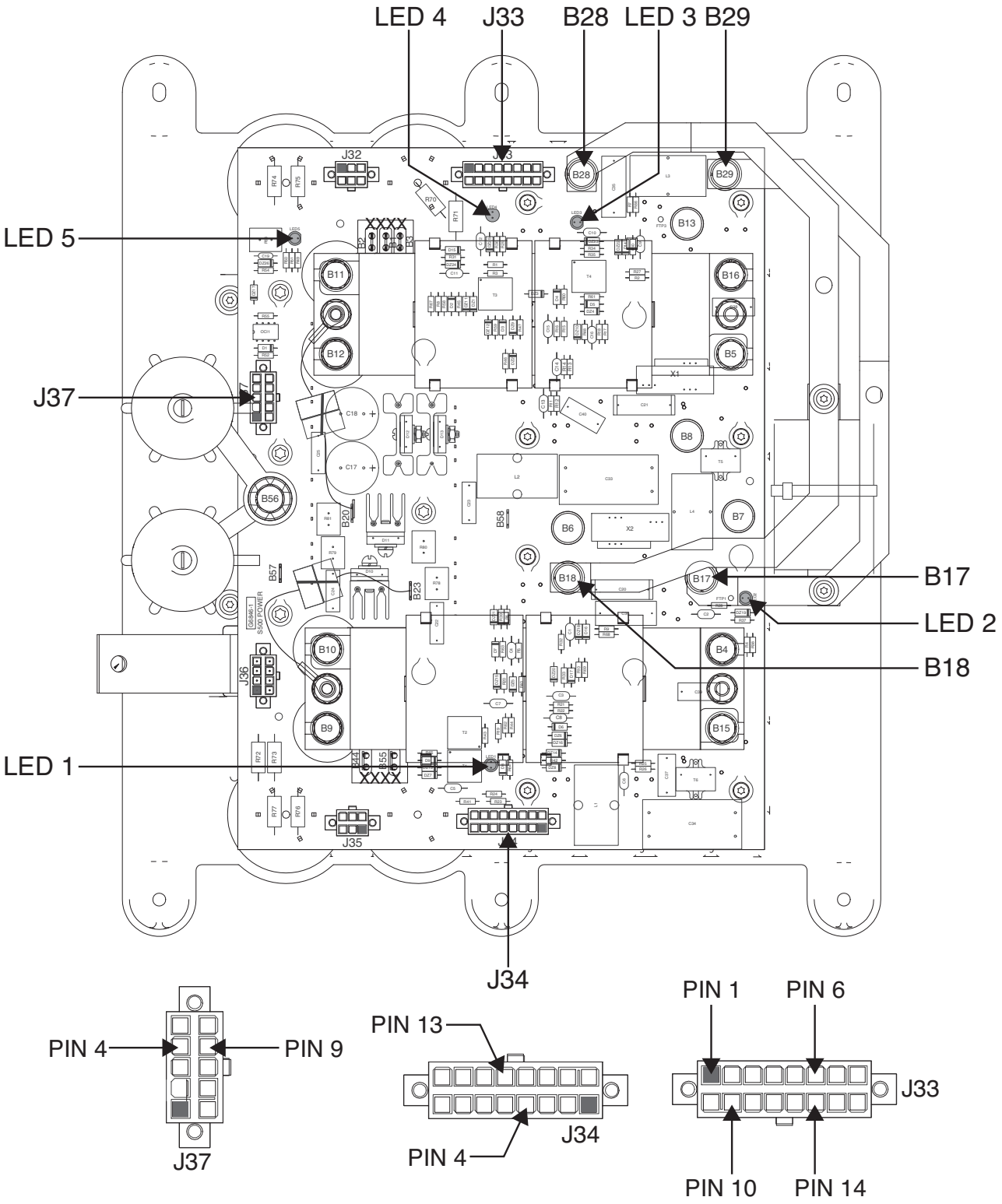
FIGURE F.11 – POWER CONVERSION ASSEMBLY DIODE TEST POINTS



Return to Section TOC
Return to Master TOC

POWER CONVERSION ASSEMBLY TEST (continued)

FIGURE F.12 – POWER CONVERSION ASSEMBLY VOLTAGE CHECK TEST POINTS



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POWER CONVERSION ASSEMBLY TEST (continued)

TABLE F.12 – POWER CONVERSION LED LEGEND

LED NUMBER	DESCRIPTION	CONDITIONS	LED STATUS
LED 1	BOTTOM BOOST IGBT DRIVE	INPUT POWER (472VAC) APPLIED AND MACHINE “ON”	OFF
LED 2	BOTTOM BUCK IGBT DRIVE	INPUT POWER (472VAC) APPLIED AND MACHINE “ON”	ON
LED 3	TOP BUCK IGBT DRIVE	INPUT POWER (472VAC) APPLIED AND MACHINE “ON”	ON
LED 4	TOP BOOST IGBT DRIVE	INPUT POWER (472VAC) APPLIED AND MACHINE “ON”	OFF
LED 5	+48VDC AUXILIARY	INPUT POWER (472VAC) APPLIED AND MACHINE “ON”	ON

LED NUMBER	DESCRIPTION	CONDITIONS	LED STATUS
LED 1	BOTTOM BOOST IGBT DRIVE	INPUT POWER (255VAC) APPLIED AND MACHINE “ON”	ON
LED 2	BOTTOM BUCK IGBT DRIVE	INPUT POWER (255VAC) APPLIED AND MACHINE “ON”	ON
LED 3	TOP BUCK IGBT DRIVE	INPUT POWER (255VAC) APPLIED AND MACHINE “ON”	ON
LED 4	TOP BOOST IGBT DRIVE	INPUT POWER (255VAC) APPLIED AND MACHINE “ON”	ON
LED 5	+48VDC AUXILIARY	INPUT POWER (255VAC) APPLIED AND MACHINE “ON”	ON

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POWER CONVERSION ASSEMBLY TEST (continued)

TABLE F.13 – POWER CONVERSION ASSEMBLY VOLTAGE TESTS

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	CONDITIONS
INPUT TO TOP BUCK/BOOST CIRCUIT	B29(+)	B28(–)	635VDC	472VAC INPUT AND MACHINE “ON”
INPUT TO BOTTOM BUCK/BOOST CIRCUIT	B17(+)	B18(–)	635VDC	472VAC INPUT AND MACHINE “ON”
OUTPUT OF BUCK/BOOST CIRCUITS	J33 PIN 1 (+)	J33 PIN 10 (–)	402VDC	472VAC INPUT AND MACHINE “ON”
SUPPLY FOR THE TOP BUCK/BOOST LEM	J33 PIN 6 (+)	J33 PIN 10 (–)	+15VDC	472VAC INPUT AND MACHINE “ON”
SUPPLY FOR THE TOP BUCK/BOOST LEM	J33 PIN 14 (+)	J33 PIN 10 (–)	–15VDC	472VAC INPUT AND MACHINE “ON”
SUPPLY FOR THE BOTTOM BUCK / BOOST LEM	J34 PIN 13 (+)	J33 PIN 10 (–)	+15VDC	472VAC INPUT AND MACHINE “ON”
SUPPLY FOR THE BOTTOM BUCK / BOOST LEM	J34 PIN 4 (+)	J33 PIN 10 (–)	–15VDC	472VAC INPUT AND MACHINE “ON”
SUPPLY FOR THE DC BUS BOARD	J37 PIN 4 (+)	J37 PIN 9 (–)	+48VDC	472VAC INPUT AND MACHINE “ON”

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MULTI-PHASE OUTPUT CHOKE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Multi-Phase Choke Coils are not open and that they are not ground or shorted together.

MATERIALS NEEDED

7/16" Wrench
Volt/Ohmmeter
Wiring Diagram

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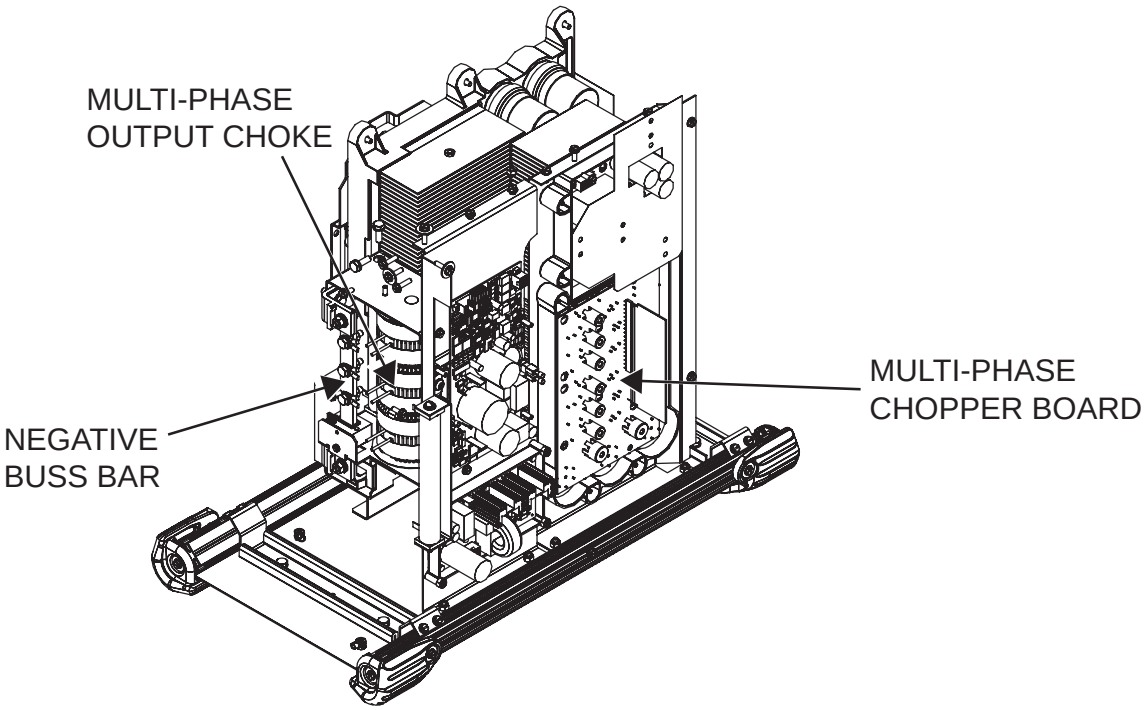
MULTI-PHASE OUTPUT CHOKE TEST (continued)

FIGURE F.13 – TEST COMPONENT LOCATIONS



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Multi-Phase Chopper Board located on the lower right side of the machine. See Figure F.13.
5. Using a 7/16" wrench, label and remove leads BL1, BL2, BL3, BL4, BL5 and BL6 from the Chopper Board. Save the bolts and lock washers for reassembly. See ***Figure F.14***. See Wiring Diagram.
6. Label and remove the six Output Choke leads from the negative bus bar located near the left side front of the machine. See Figure F.13. Note the choke leads are connected in pairs. The same lead pairs must be reconnected to each other on the bus bar. See the Wiring Diagram.
7. Check the continuity of each of the individual choke coils. See the Wiring Diagram. The resistance should be less than 0.5 ohms of resistance. Also when all the individual choke coils are separated they should NOT have continuity to each other. See the Wiring Diagram.

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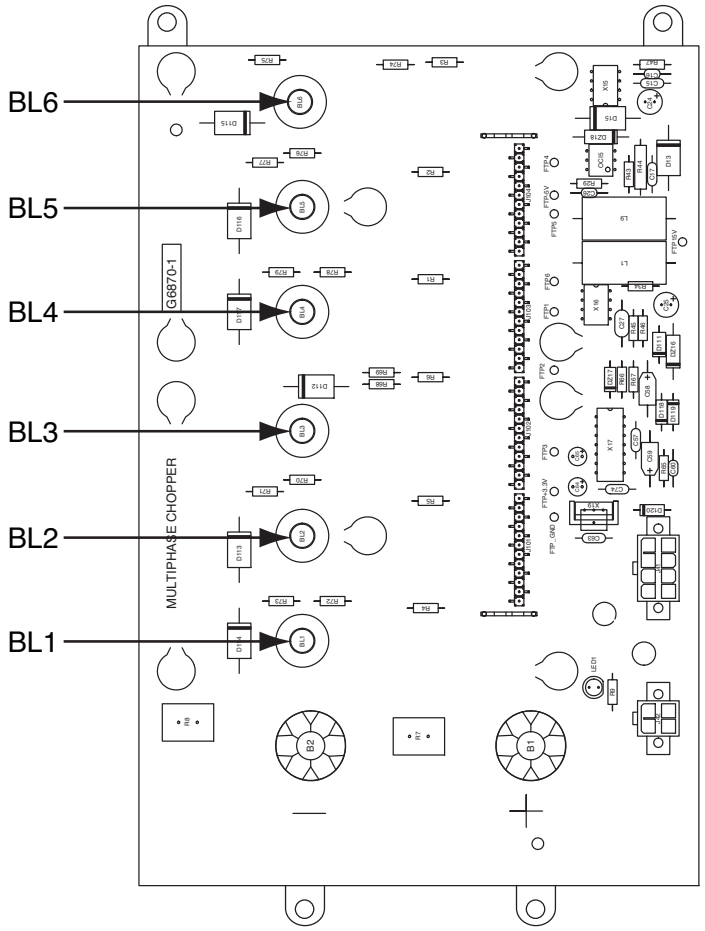
MULTI-PHASE OUTPUT CHOKE TEST (continued)

FIGURE F.14 – MULTI-PHASE OUTPUT CHOPPER BOARD LEAD LOCATIONS



8. Check the individual choke coils to ground. There should be a minimum of 500,000 ohms of resistance to ground.
9. When testing is complete reconnect all of the leads to the correct terminals and tighten securely.
10. Perform the ***Case Cover Replacement Procedure***.

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Return to Master TOC

CURRENT TRANSDUCER TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Current Transducers are receiving the correct input voltages and if they are producing the correct feedback voltages.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram
Laptop Computer
Power Wave Manager Software
Ethernet Cross Connect Cable (LE Co. #M19969-7)
Resistive Load Bank
Calibrated Ammeter

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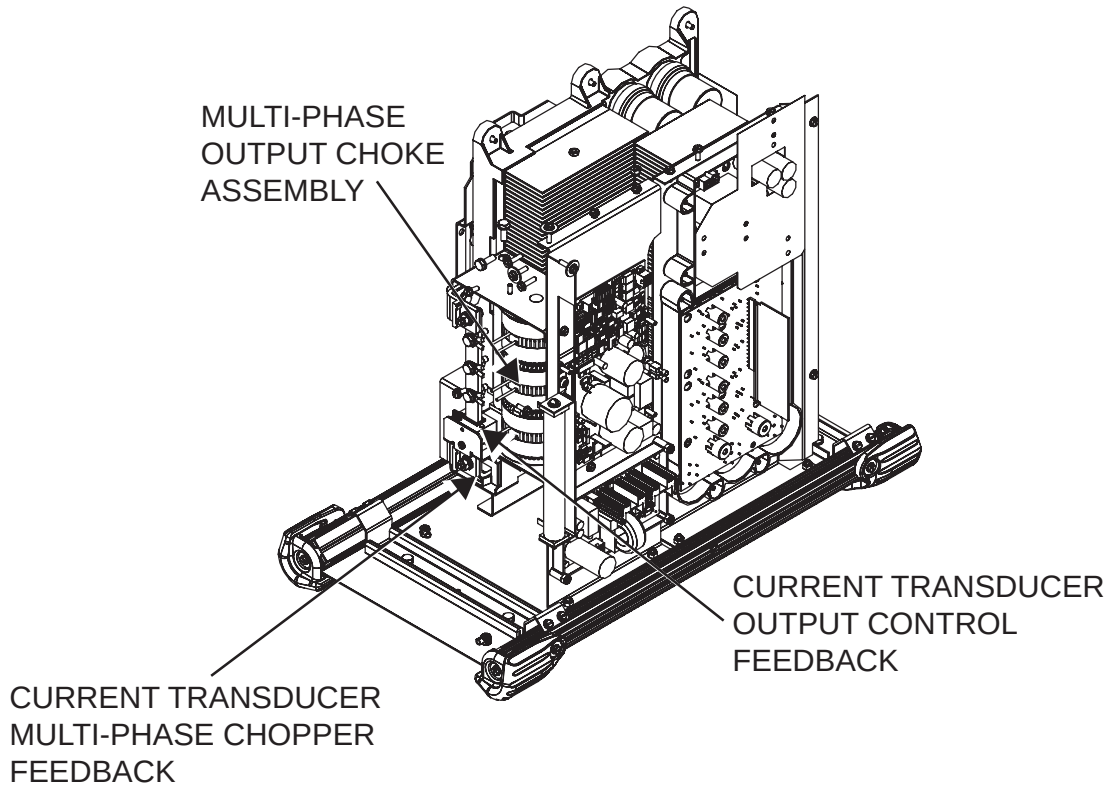
CURRENT TRANSDUCER TEST (continued)

FIGURE F.15 – CURRENT TRANSDUCER TEST COMPONENT LOCATIONS



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the output choke located on the left front side of the machine. See Figure F.15. Also locate the two Current Transducers that are part of the output choke assembly.
4. Locate plug J8 on the Digital Control Board. See ***Figure F.16***. See Wiring Diagram.
5. Locate plug J42 on the Mult-Phase Chopper Board. See ***Figure F.17***. See Wiring Diagram.
6. Carefully apply the correct input power to the Power Wave® S500.
7. To check for the correct supply voltages perform the voltage checks on ***Table F.14***.

NOTE: Do not attempt to check the voltages at the current transducers' connectors. The terminals are small and delicate and may be damaged if probed with meter leads.

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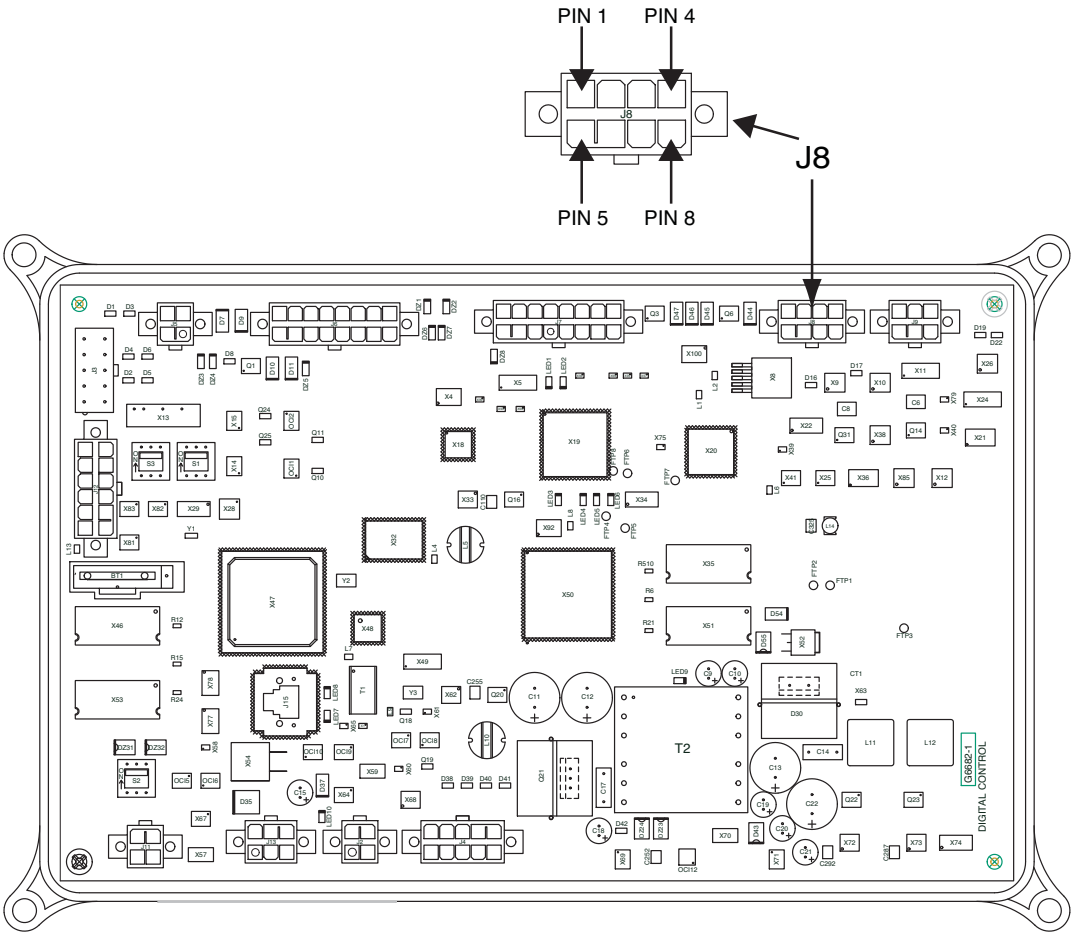
CURRENT TRANSDUCER TEST (continued)

FIGURE F.16 – DIGITAL CONTROL BOARD TEST POINTS



For the following steps refer to the information in the Diagnostic Utility found at Powerwavemanager.com.

8. Using a Ethernet Cross Connect cable, connect a laptop computer to the Power Wave® S500 via the Ethernet port located at the top rear of the machine.

9. Connect a resistive load bank (or 50 Ft. weld cable) to the positive and negative output terminals on the Power Wave® S500 machine.

10. Using the Diagnostic Utility Software:

    Establish communications with the Power Wave® S500.

    Select the “Calibrate” tab.

    Select the “50 amp” current set point.

    Select “Turn Output On”.

    Use an external calibrated ammeter that is not affected by inverter noise to read the actual current.

11. Check the current transducers’ feedback voltages. See ***Table F.15***.

12. Repeat the test at several other current levels. If the transducers’ feedback voltages’ are correct for the actual current, the transducers are functioning properly. If there is no feedback check the connections between the current transducers and the PC boards. See the Wiring Diagram.

⚠ CAUTION

If using a weld cable across the output terminals instead of a resistive load bank, do not exceed the current rating of the cable.

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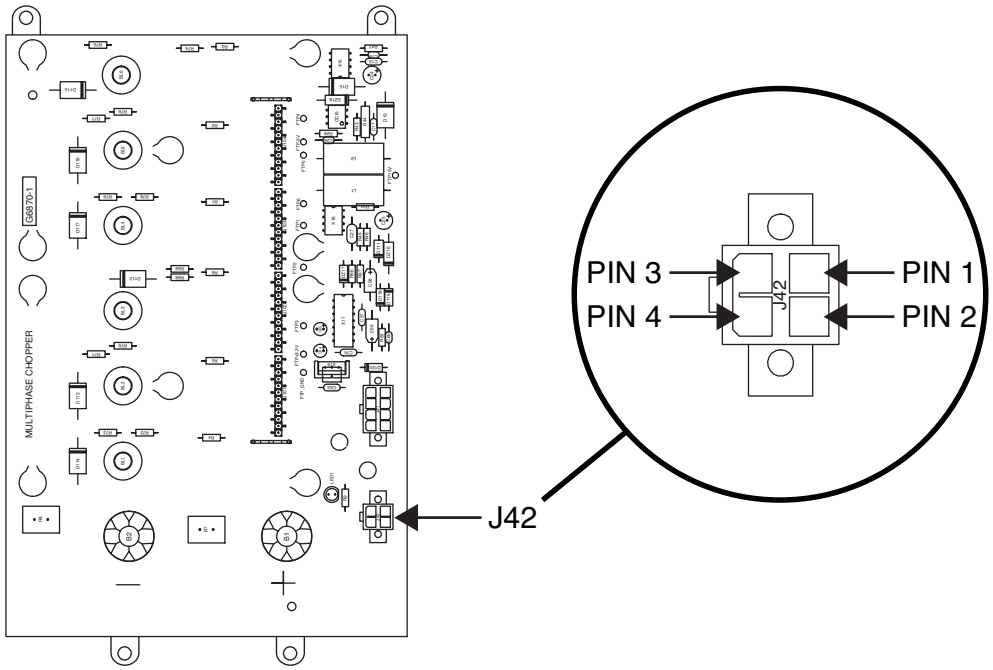
CURRENT TRANSDUCER TEST (continued)

FIGURE F.17 – MULTI-PHASE CHOPPER BOARD TEST POINTS



13. If the supply voltages are correct per ***Table F.14*** but the transducers' feedback voltages are incorrect the current transducer or wiring from the current transducer to the PC board may be faulty.
14. When testing is complete Click "Turn Output Off".
15. Disconnect the laptop computer.
16. Remove the input power to the Power Wave® S500 machine.
17. Perform the ***Case Cover Replacement Procedure***.

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CURRENT TRANSDUCER TEST (continued)

TABLE F.14 – CURRENT TRANSDUCERS SUPPLY VOLTAGE CHECKS

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	CONDITIONS
SUPPLY VOLTAGE TO MULTI-PHASE CHOPPER TRANSDUCER	J42 PIN 1 LEAD 216	J42 PIN 4 LEAD 218	+15VDC	MACHINE “ON”
SUPPLY VOLTAGE TO MULTI-PHASE CHOPPER TRANSDUCER	J42 PIN 2 LEAD 217	J42 PIN 4 LEAD 218	–15VDC	MACHINE “ON”
SUPPLY VOLTAGE TO OUTPUT CONTROL TRANSDUCER	J8 PIN 2 LEAD 212	J8 PIN 6 LEAD 214	+15VDC	MACHINE “ON”
SUPPLY VOLTAGE TO OUTPUT CONTROL TRANSDUCER	J8 PIN 3 LEAD 213	J8 PIN 6 LEAD 214	–15VDC	MACHINE “ON”

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CURRENT TRANSDUCER TEST (continued)

TABLE F.15 – CURRENT TRANSDUCERS FEEDBACK VOLTAGE CHECKS

MULTI-PHASE CHOPPER TRANSDUCER

OUTPUT CURRENT (AMPS)	TEST POINT	TEST POINT	EXPECTED READING
500	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	4.0VDC
450	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	3.6VDC
400	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	3.2VDC
350	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	2.8VDC
300	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	2.4VDC
250	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	2.0VDC
200	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	1.6VDC
150	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	1.2VDC
100	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	0.8VDC
50	J42 PIN 3 LEAD 215	J42 PIN 4 LEAD 218	0.4VDC

OUTPUT CONTROL TRANSDUCER

OUTPUT CURRENT (AMPS)	TEST POINT	TEST POINT	EXPECTED READING
500	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	4.0VDC
450	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	3.6VDC
400	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	3.2VDC
350	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	2.8VDC
300	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	2.4VDC
250	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	2.0VDC
200	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	1.6VDC
150	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	1.2VDC
100	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	0.8VDC
50	J8 PIN 1 LEAD 211	J8 PIN 6 LEAD 214	0.4VDC

40 VOLT DC BUS BOARD TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the 40 Volt DC Bus Board is receiving the correct input voltage and if the board is functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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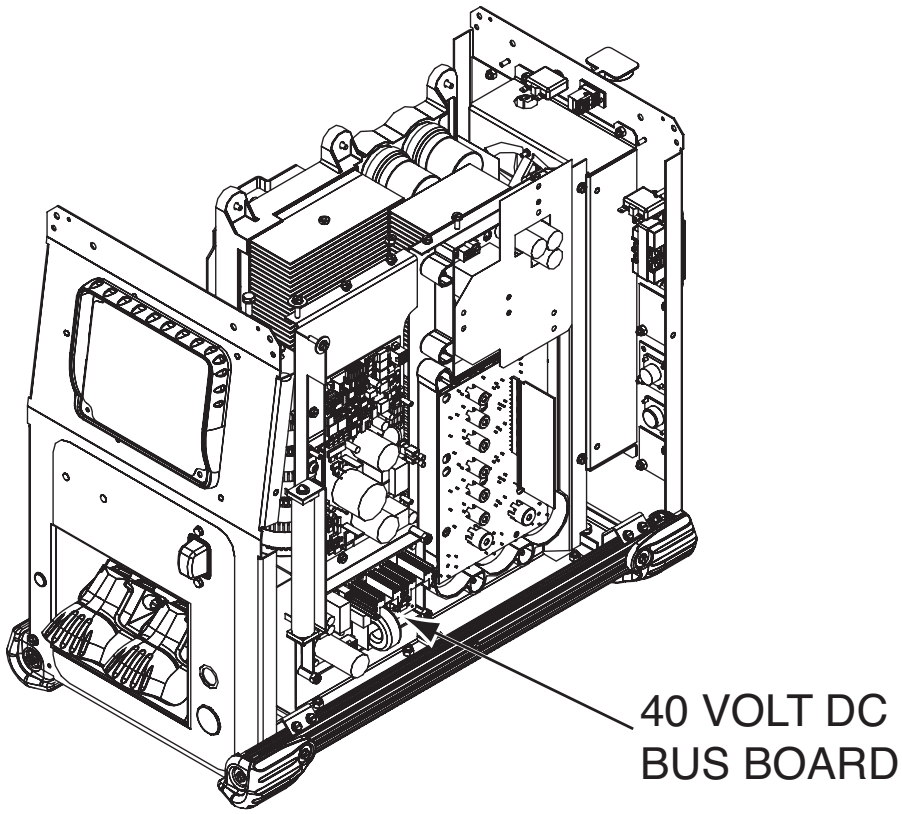
40 VOLT DC BUS BOARD TEST (continued)

FIGURE F.18 – 40 VOLT DC BUS BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the DC Bus Board located on the lower right side of the machine. See Figure F.18.
4. Carefully apply the correct input power to the Power Wave® S500 machine.
5. Locate the red LED on the DC Bus Board. See ***Figure F.19***. See Wiring Diagram.
6. If the red LED is lit, the DC Bus Board is receiving 48VDC voltage from the Power Conversion Assembly.
7. If the red LED is blinking, carefully remove plug J47 from the DC Bus Board. See ***Figure F.19***. If the blinking stops and the red LED stays lit and steady, this is an indication of a heavy load on the 40VDC output line. See the Wiring Diagram.
8. If the red LED is not lit check circuit breaker CB2 located on the case back. Reset if tripped.
9. Perform the voltage tests per ***Table F.16***. See ***Figure F.19***.
10. If the correct input voltage is being applied to the DC Bus Board and the correct output voltages are not being generated, the DC Bus Board is faulty.
11. If faulty, perform the ***40 Volt DC Bus Board Removal and Replacement Procedure***.
12. Perform the ***Case Cover Replacement Procedure***.
13. Perform the ***Retest After Repair Procedure***.

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40 VOLT DC BUS BOARD TEST (continued)

FIGURE F.19 – 40 VOLT DC BUS BOARD TEST POINTS

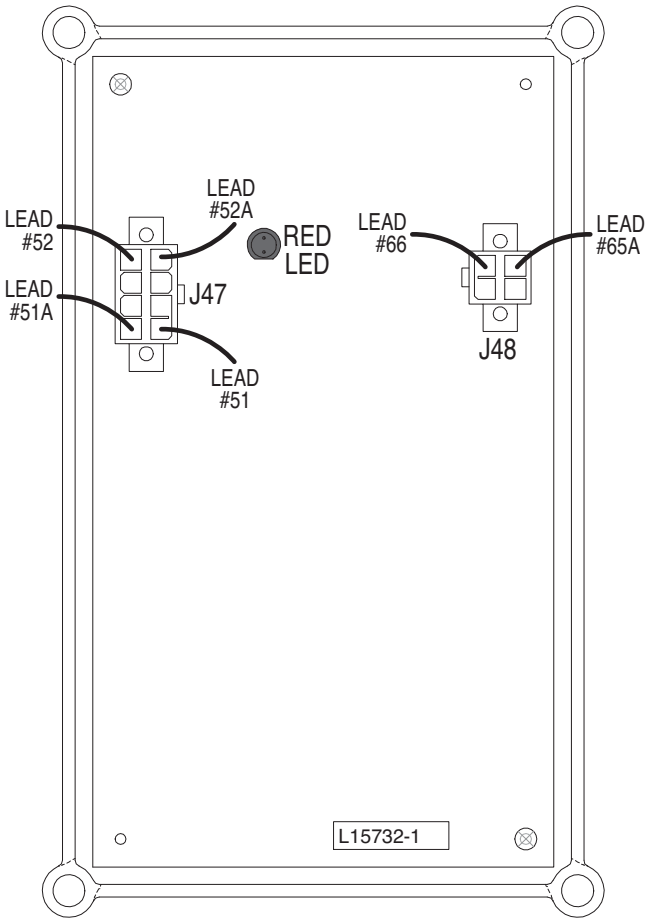

TABLE F.16 – 40 VOLT DC BUS BOARD TEST POINTS AND EXPECTED READINGS

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
INPUT FROM THE POWER CONVERSION ASSEMBLY	PLUG J48 PIN 1 (+) LEAD #65A	PLUG J48 PIN 3 (–) LEAD #66	48VDC
40VDC OUTPUT TO ArcLink RECEPTACLE	PLUG J47 PIN 8 (+) LEAD #52A	PLUG J47 PIN 1 (+) LEAD #51A	40VDC
40VDC OUTPUT TO PFC CONTROL BOARD	PLUG J47 PIN 4 (+) LEAD #52	PLUG J47 PIN 5 (+) LEAD #51	40VDC

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INPUT BOARD TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Input Board is receiving the correct input voltage and if the board is functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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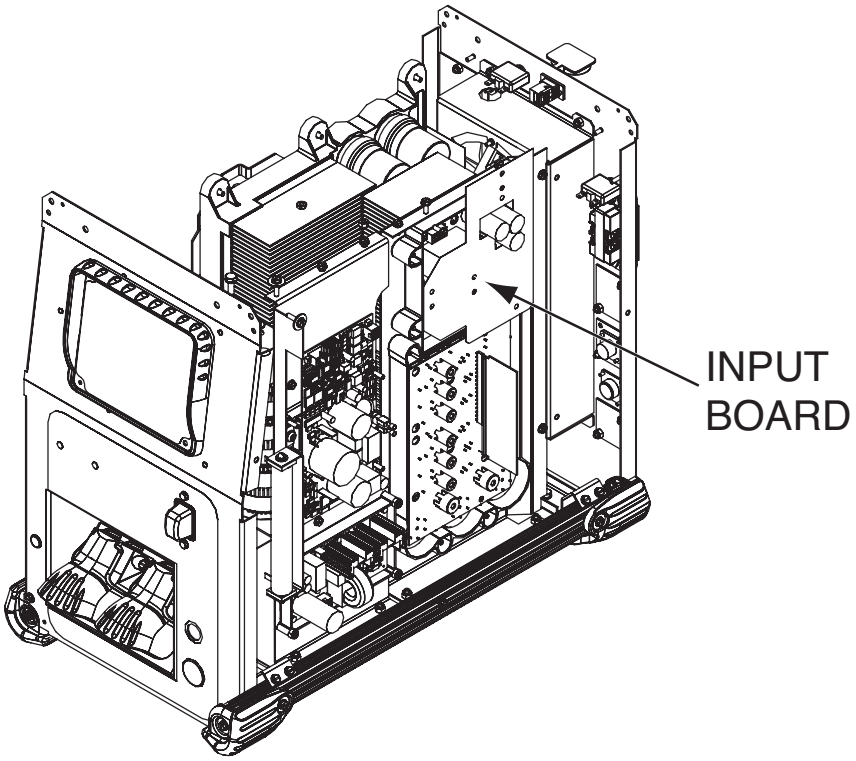
INPUT BOARD TEST (continued)

FIGURE F.20 – INPUT BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Input Board located on the upper right side of the machine. See Figure F.20.

NOTE: To gain access to the Input Board the insulating cover will have to be removed. Cut the three cable ties securing the insulating cover.

4. Perform the Input Board diode checks per ***Table F.17*** and ***Figure F.21***.
5. Locate the Green LED on the Input Board. See ***Figure F.21***. See Wiring Diagram.
6. Carefully apply the correct three phase input power to the Power Wave® S500 machine.
7. If the Green LED is lit, the Input Board is receiving input power. See ***Figure F.21***.
8. If the Green LED is not lit, the Input Board is not receiving input power.
9. Carefully perform the voltage tests per ***Table F.18***. See ***Figure F.21***.
10. If the correct input voltage is being applied to the Input Board and the correct output voltages are not being generated the Input Board may be faulty.
11. If faulty, perform the ***Input Board Removal and Replacement Procedure***. Be sure to replace the insulating cover on the Input Board.
12. Perform the ***Case Cover Replacement Procedure***.
13. Perform the ***Retest After Repair***.

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INPUT BOARD TEST (continued)

TABLE F.17 – INPUT BOARD DIODE CHECKS

DESCRIPTION	TEST POINT METER PROBE (+)	TEST POINT METER PROBE (–)	EXPECTED READING
SMALL 3-PHASE RECTIFIER	B1	J1 PIN 3 ON BOARD PLUG REMOVED	.578V
SMALL 3-PHASE RECTIFIER	B2	J1 PIN 3 ON BOARD PLUG REMOVED	.578V
SMALL 3-PHASE RECTIFIER	B3	J1 PIN 3 ON BOARD PLUG REMOVED	.578V
SMALL 3-PHASE RECTIFIER	J1 PIN 3 ON BOARD PLUG REMOVED	B1	OPEN
SMALL 3-PHASE RECTIFIER	J1 PIN 3 ON BOARD PLUG REMOVED	B2	OPEN
SMALL 3-PHASE RECTIFIER	J1 PIN 3 ON BOARD PLUG REMOVED	B3	OPEN
LARGER 3-PHASE BRIDGE	B1	B4	.511V
LARGER 3-PHASE BRIDGE	B2	B4	.511V
LARGER 3-PHASE BRIDGE	B3	B4	.511V
LARGER 3-PHASE BRIDGE	B4	B1	OPEN
LARGER 3-PHASE BRIDGE	B4	B2	OPEN
LARGER 3-PHASE BRIDGE	B4	B3	OPEN
LARGER 3-PHASE BRIDGE	B5	B1	.470V
LARGER 3-PHASE BRIDGE	B5	B2	.470V
LARGER 3-PHASE BRIDGE	B5	B3	.470V
LARGER 3-PHASE BRIDGE	B1	B5	OPEN
LARGER 3-PHASE BRIDGE	B2	B5	OPEN
LARGER 3-PHASE BRIDGE	B3	B5	OPEN

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INPUT BOARD TEST (continued)

FIGURE F.21 – INPUT BOARD TEST POINT LOCATION

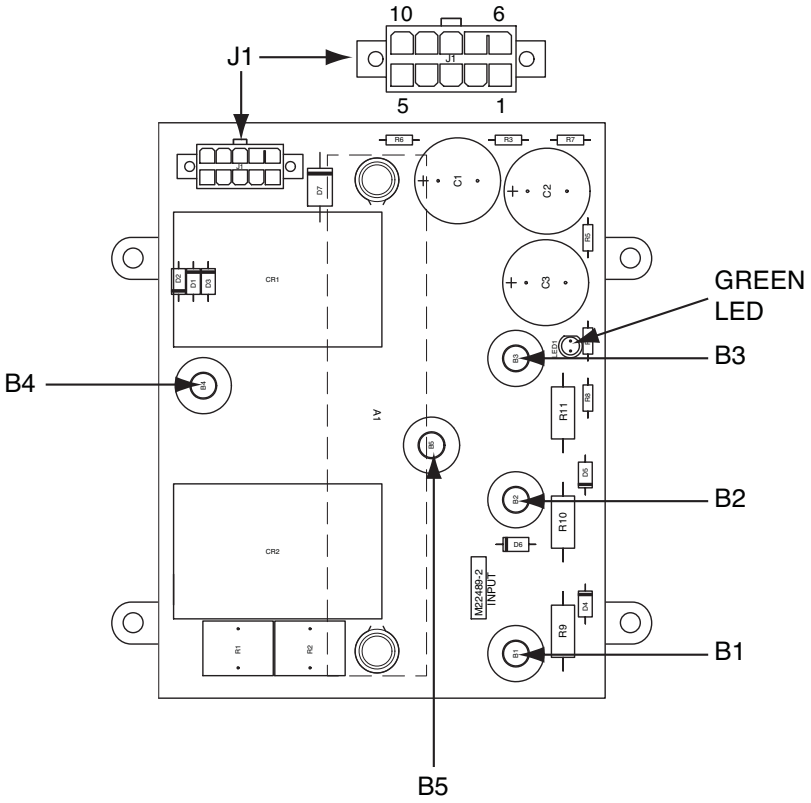

TABLE F.18 – INPUT BOARD VOLTAGE TEST POINTS AND EXPECTED READINGS (NOMINAL 460VAC APPLIED)

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
THREE-PHASE INPUT	B1	B2	AC LINE VOLTAGE (Ex. 470VAC)
THREE-PHASE INPUT	B2	B3	AC LINE VOLTAGE (Ex. 470VAC)
THREE-PHASE INPUT	B3	B1	AC LINE VOLTAGE (Ex. 470VAC)
DC TO POWER CONVERSION BOARD	B4(+)	B5(–)	AC LINE VOLTAGE X 1.414 +/–10% (Ex. 629VDC)
FILTERED DC TO PFC BOARD	PLUG J1 PIN 6 (LEAD 366) (+)	B5(–)	AC LINE VOLTAGE X 1.414 +/–10% (Ex. 648VDC)
RECTIFIED AC TO PFC BOARD	PLUG J1 PIN 3 (LEAD 369) (+)	B5(–)	AC LINE VOLTAGE X 1.414 +/–10% (Ex. 629VDC)
DC POWER TO RELAYS CR1 AND CR2 FROM PFC BOARD	PLUG J1 PIN 10 (LEAD 362) (+)	PLUG J1 PIN 5 (LEAD 367) (–)	15VDC

MULTI-PHASE CHOPPER BOARD TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Multi-Phase Chopper Board is receiving the correct input voltage and if the board is functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

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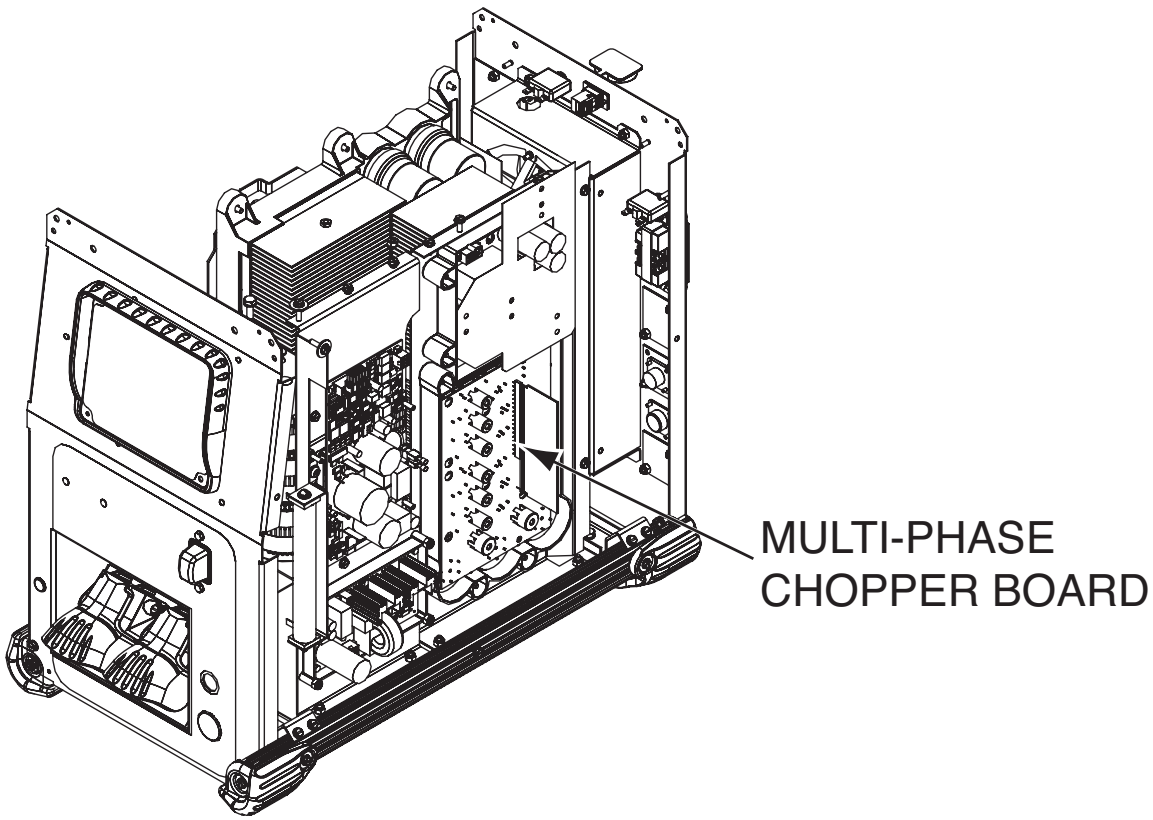
MULTI-PHASE CHOPPER BOARD TEST (continued)

FIGURE F.22 – MULTI-PHASE CHOPPER BOARD LOCATION



PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Multi-Phase Chopper Board located on the lower right side of the machine. See Figure F.22.
4. Perform the Multi-Phase Chopper Board diode checks per ***Table F.19*** and ***Figure F.23***.
5. Locate the Green LED on the Multi-Phase Chopper Board. See ***Figure F.23***. See Wiring Diagram.
6. Carefully apply the correct three phase input power to the Power Wave® S500 machine.
7. If the Green LED is lit, the Multi-Phase Chopper Board is receiving input power from the Power Conversion Assembly (100VDC). See ***Figure F.23***.
8. If the Green LED is not lit, the Multi-Phase Chopper Board may not be receiving the 100VDC from the Power Conversion Board. See the Wiring Diagram.

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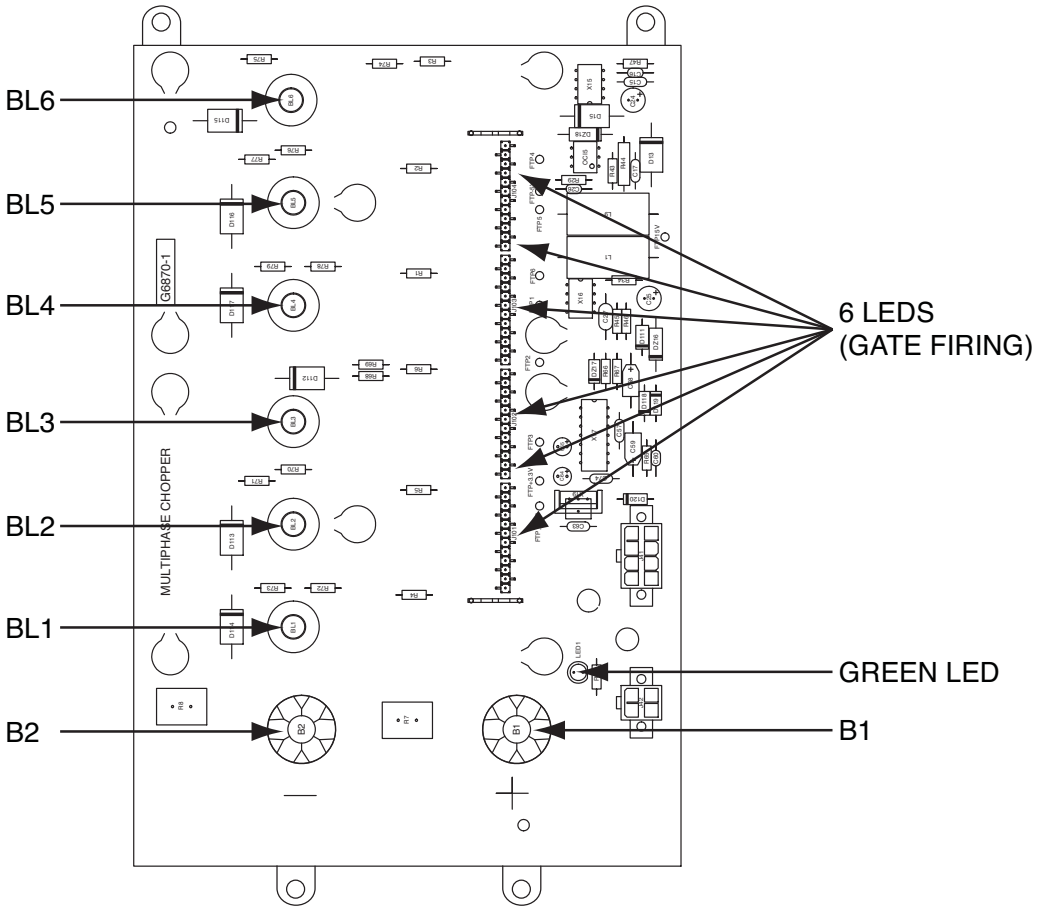
MULTI-PHASE CHOPPER BOARD TEST (continued)

FIGURE F.23 – MULTI-PHASE CHOPPER BOARD TEST POINTS



9. Energize the output of the Power Wave® S500 machine. Check to make sure the six LEDs on the Multi-Phase Control board are lit. This is an indication that the Multi-Phase Control board is receiving gate firing signals from the Control Board and the Multi-Phase board is providing gate driving signals to the Multi-Phase Chopper board. See Figure F.23.
10. Carefully perform the voltage tests per ***Table F.20***. See Figure F.23.
11. If the correct input voltage is being applied to the Multi-Phase Chopper Board and the correct output voltages are not being generated, the Multi-Phase Chopper Board may be faulty.
12. If faulty, perform the ***Chopper Board Removal and Replacement Procedure***.
13. Perform the ***Case Cover Replacement Procedure***.
14. Perform the ***Retest After Repair Procedure***.

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MULTI-PHASE CHOPPER BOARD TEST (continued)

TABLE F.19 – MULTI-PHASE CHOPPER BOARD DIODE CHECKS

NOTE: Prior to testing make sure the input power is removed from the Power Wave® S500 machine and that all leads are removed from terminals B1 and B2 on the Multi-Phase Chopper Board. See ***Figure F.23***.

DESCRIPTION	TEST POINT METER PROBE (+)	TEST POINT METER PROBE (–)	CONDITIONS	EXPECTED READING +/–10%
PHASE 3 DRIVER	B2	BL1	ALL LEADS REMOVED FROM B1 AND B2	.413V
PHASE 2 DRIVER	B2	BL2	ALL LEADS REMOVED FROM B1 AND B2	.413V
PHASE 1 DRIVER	B2	BL3	ALL LEADS REMOVED FROM B1 AND B2	.413V
PHASE 6 DRIVER	B2	BL4	ALL LEADS REMOVED FROM B1 AND B2	.413V
PHASE 5 DRIVER	B2	BL5	ALL LEADS REMOVED FROM B1 AND B2	.413V
PHASE 4 DRIVER	B2	BL6	ALL LEADS REMOVED FROM B1 AND B2	.413V

MULTI-PHASE CHOPPER BOARD TEST (continued)

TABLE F.20 – MULTI-PHASE CHOPPER BOARD VOLTAGE TEST POINTS AND EXPECTED READINGS

MODE	OPEN CIRCUIT VOLTAGE	TEST POINT (+)	TEST POINT (–)	EXPECTED READING (+/–10%)
TIG	24VDC	B1	B2	97VDC
TIG	24VDC	BL1	B2	73VDC
TIG	24VDC	BL2	B2	73VDC
TIG	24VDC	BL3	B2	73VDC
TIG	24VDC	BL4	B2	73VDC
TIG	24VDC	BL5	B2	73VDC
TIG	24VDC	BL6	B2	73VDC

MODE	OPEN CIRCUIT VOLTAGE	TEST POINT (+)	TEST POINT (–)	EXPECTED READING (+/–10%)
CV	70VDC	B1	B2	97VDC
CV	70VDC	BL1	B2	26VDC
CV	70VDC	BL2	B2	26VDC
CV	70VDC	BL3	B2	26VDC
CV	70VDC	BL4	B2	26VDC
CV	70VDC	BL5	B2	26VDC
CV	70VDC	BL6	B2	26VDC

MODE	OPEN CIRCUIT VOLTAGE	TEST POINT (+)	TEST POINT (–)	EXPECTED READING (+/–10%)
STICK	60VDC	B1	B2	97VDC
STICK	60VDC	BL1	B2	36VDC
STICK	60VDC	BL2	B2	36VDC
STICK	60VDC	BL3	B2	36VDC
STICK	60VDC	BL4	B2	36VDC
STICK	60VDC	BL5	B2	36VDC
STICK	60VDC	BL6	B2	36VDC

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CURRENT AND VOLTAGE CALIBRATION PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in checking and if necessary, adjusting the calibration of the Power Wave® S500.

Calibration should be checked as part of the ***Retest After Repair Procedure***.

MATERIALS NEEDED

Power Wave Manager Utilities Software (www.powerwavemanager.com)
Laptop or other Suitable Computer
Ethernet Cross Connect Cable (LECO #M19969-7)
Resistive Load Bank
Two (2) Welding Cables - 20ft. -4/0
Calibrated Ammeter and Voltmeter *

* Calibration inaccuracies due to external metering can and will effect weld performance. Use good quality digital meters that are **calibrated and traceable to National Standards.**

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CURRENT AND VOLTAGE CALIBRATION PROCEDURE (continued)

CALIBRATION SET-UP

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Load the Power Wave Manager Utility Software into the computer.
2. Use the Ethernet cable to connect the computer to the Power Wave® S500.
3. Connect a resistive load bank to the output studs.
4. Energize the Power Wave® S500.
5. Launch the Power Wave Manager Utility and establish communication with the Power Wave® S500 (Refer to the Software Documentation to determine proper connection).
6. Click on the "Calibration" Tab. A screen similar to ***Figure F.24*** should appear and you are ready to begin the calibration check.

NOTE: The Calibration Screen may look slightly different depending on the Software version.

Calibration can only be done under "Static Load" conditions. Do not attempt to calibrate while welding.

NOTE: Incorrect calibration can and will affect welding performance. It is strongly recommended to use the screen to run and save a "Snapshot" before making any calibration adjustments. This will allow returning to original settings if necessary. (Refer to the Software Documentation for instructions on using the Snapshot feature).

CALIBRATION PROCEDURE:

1. Once in the "Calibration" screen, make sure that the machine output is OFF (light is BLACK) and connect a resistive load bank to the output studs.
2. Set the load bank for 300 Amps.
3. On the Calibration screen, select the 300 Amps Current Set Point.

NOTE: If the meters on the load bank are not certified, connect calibrated and traceable meters to the machine output. (See ***Materials Needed*** at the beginning of this Section).

⚠ WARNING

The Output Studs of the Machine will be Electrically "HOT" during Steps 4 thru 7.

---

4. Click on the "Turn Output ON" button. The BLACK light on the screen will flash RED indicating that the weld output is turned ON. ***See Figure F.24.***
5. Adjust the load bank to 300 Amps at approximately 32 Volts as read on the external calibrated meters.
6. Using the "Calibration Adjustment" buttons: Adjust the current so that the external ammeter reads 300 Amps +/-2A. Adjust the voltage so that the "Output Voltage" display window reads the same as the external voltmeter +/-.3 volts.
7. Click on the "Turn Output OFF" button. Calibration is complete. (Also check at 300 Amps + 50 Amps).

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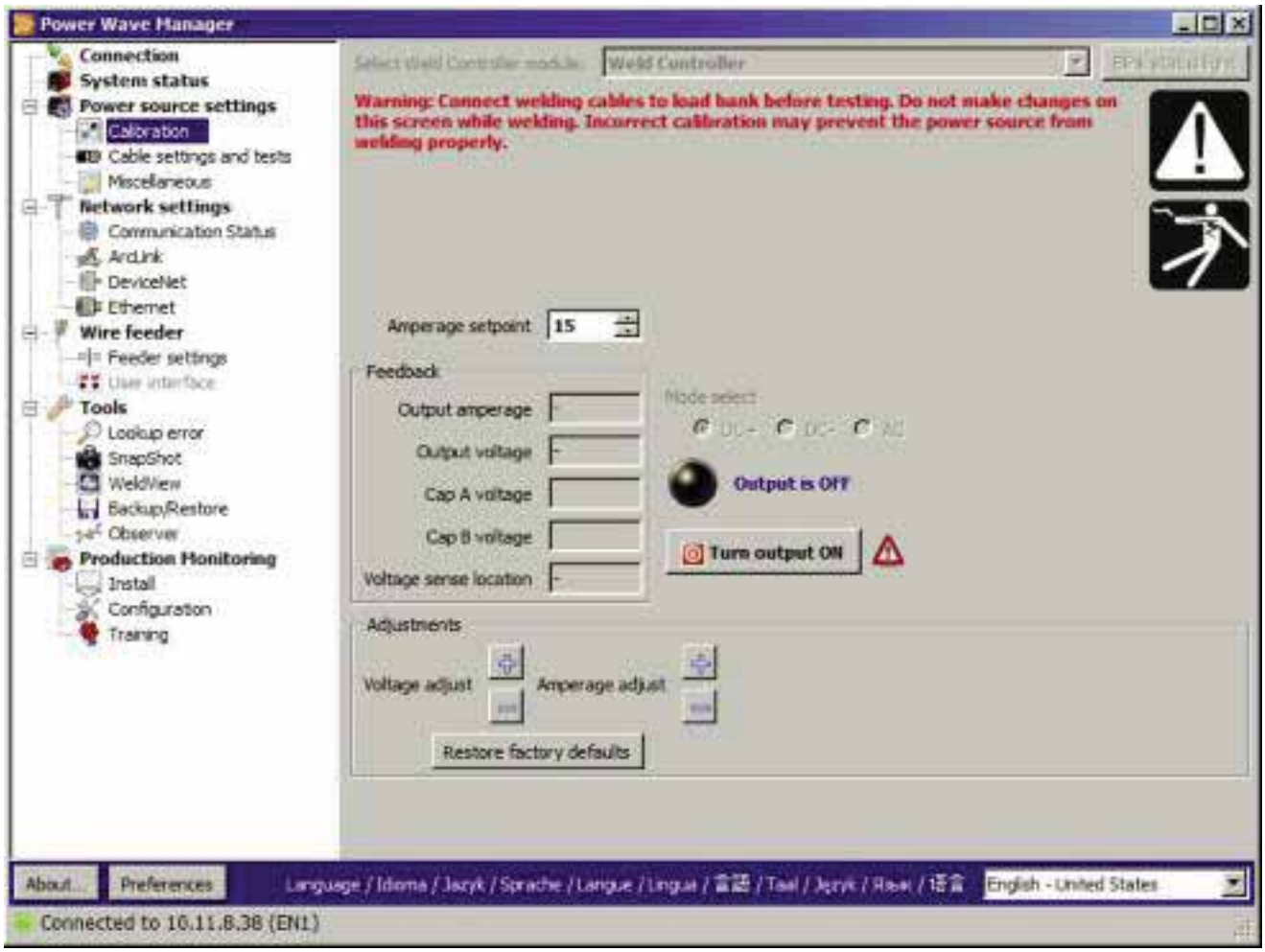
CURRENT AND VOLTAGE CALIBRATION PROCEDURE (continued)

FIGURE F.24 – CALIBRATION SCREEN



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PFC CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the PFC Control Board.

MATERIALS NEEDED

3/8” Wrench
Wiring Diagram

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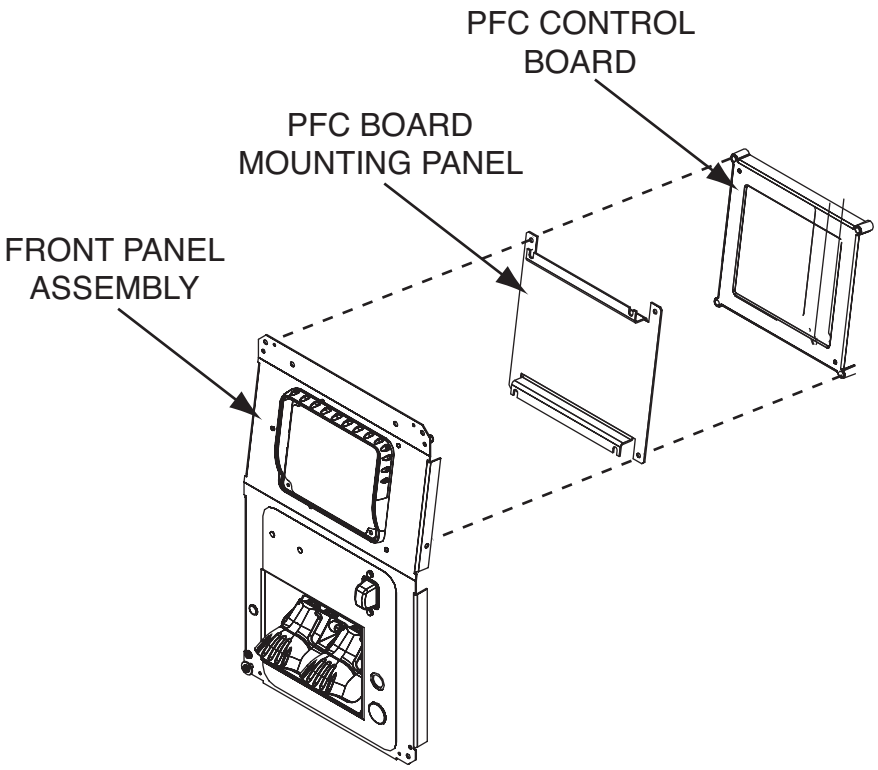
PFC CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.25 – PFC CONTROL BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

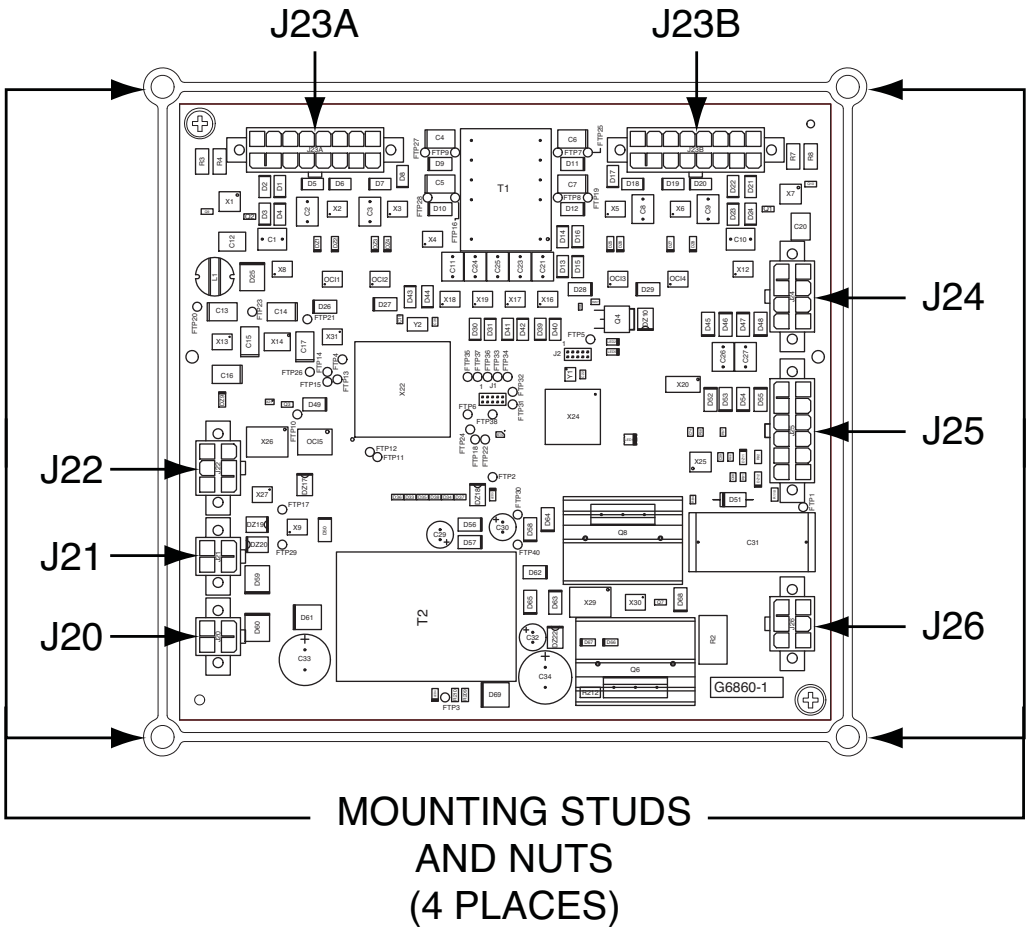
---

1. Remove input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and DC Link Capacitor Discharge Procedure***. Remove the right and left side case covers.
3. Locate the PFC Control Board. See Figure F.25.
4. Label and remove plugs J20, J21, J22, J23A, J23B, J24, J25 and J26. See ***Figure F.26***. See Wiring Diagram.
5. Using a 3/8” wrench, remove the four nuts securing the PFC Control Board to the PFC board mounting panel. See Figure F.25.
6. Carefully remove the PFC Control Board from the mounting studs. Cut any cable ties that may inhibit the removal.

Return to Section TOC
Return to Master TOC

PFC CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.26 – PFC CONTROL BOARD PLUG LOCATIONS



REPLACEMENT PROCEDURE

1. Place the new PFC Control Board onto the mounting studs.
2. Using a 3/8” wrench, attach the four nuts securing the PFC Control Board to the PFC board mounting panel.
3. Connect plugs J20, J21, J22, J23A, J23B, J24, J25 and J26 to the PFC Control Board. See Wiring Diagram.
4. Attach any cable ties that may have been removed.
5. Perform the ***Case Cover Replacement Procedure***.

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115 VOLT SUPPLY BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the 115 Volt Supply Board.

MATERIALS NEEDED

3/8” Wrench
Wiring Diagram

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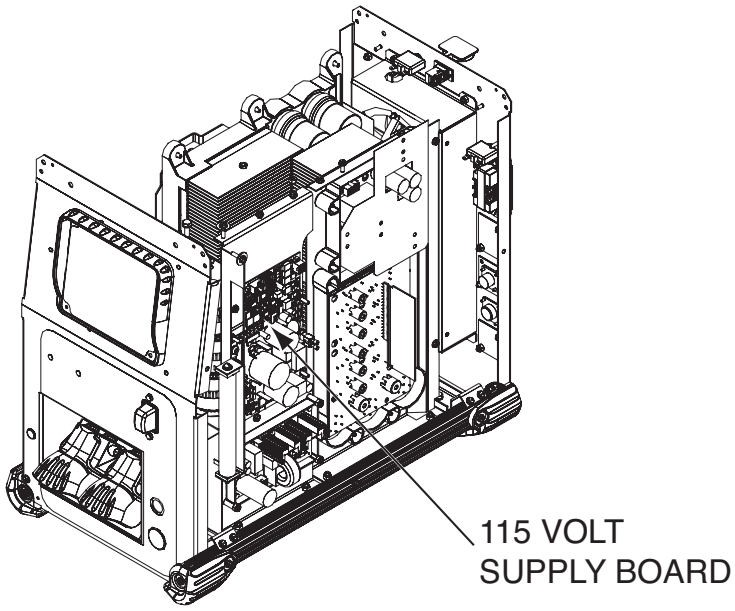
115 VOLT SUPPLY BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.27 – 115 VOLT SUPPLY BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and DC Link Capacitor Discharge Procedure***. Remove the right side case cover.
3. Locate the 115 Volt Supply Board. See Figure F.27.
4. Label and remove plugs J82 and J83. It is not necessary to remove plug J81. See ***Figure F.28***. See Wiring Diagram.
5. Label and disconnect the leads connected to tab terminals B5 and B6. See ***Figure F.28***. See Wiring Diagram.
6. Using a 3/8" nutdriver, remove the four nuts securing the 115 Volt Supply Board to the front divider panel. See ***Figure F.28***.
7. Carefully remove the 115 Volt Supply Board from the mounting studs. Cut any cable ties that may inhibit the removal.

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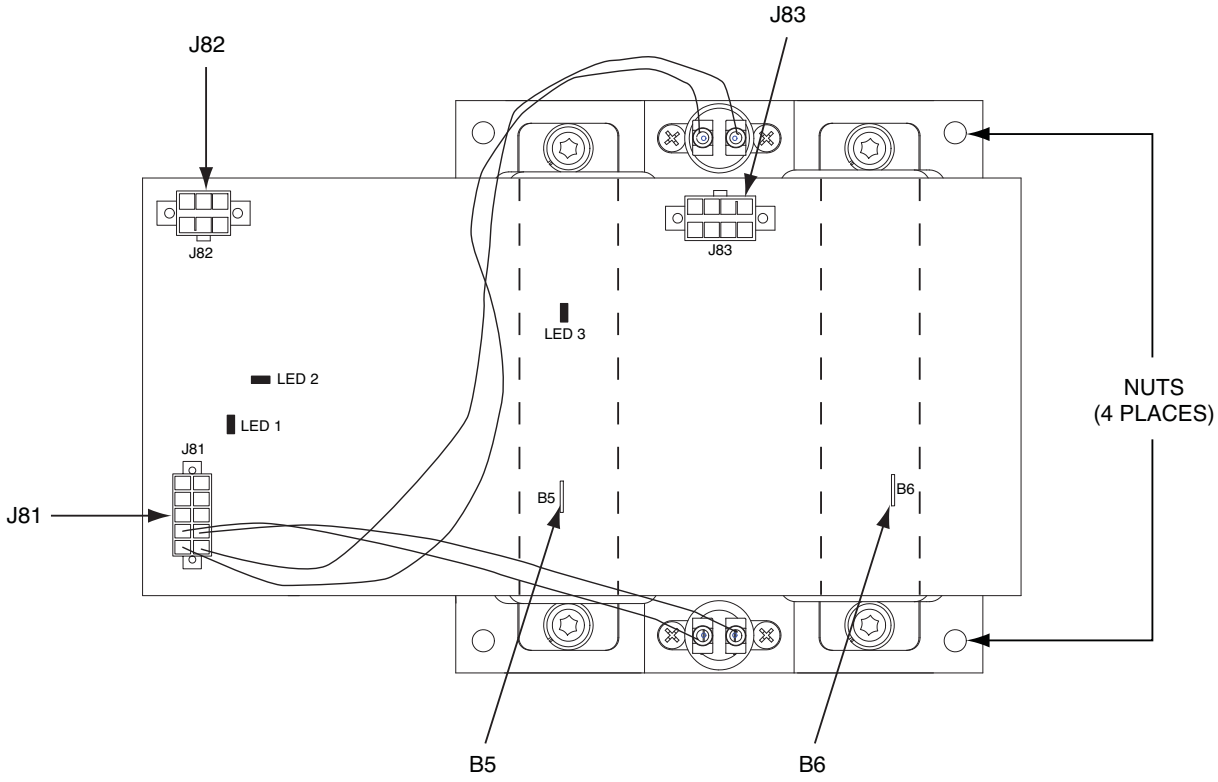
Return to Master TOC

115 VOLT SUPPLY BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.28 – 115 VOLT SUPPLY BOARD LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Place the new 115 Volt Supply Board onto the mounting studs.
2. Using a 3/8" nutdriver, attach the four nuts securing the 115 Volt Supply Board to the front divider panel.
3. Attach plugs J82 and J83 to the 115 Volt Supply Board. See Wiring Diagram.
4. Attach the leads previously removed to tab terminals B5 and B6. See Wiring Diagram.
5. Replace any cable ties that may have been removed.
6. Perform the ***Case Cover Replacement Procedure***.

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40 VOLT DC BUS BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the 40 Volt DC Bus Board.

MATERIALS NEEDED

3/8” Wrench
Wiring Diagram

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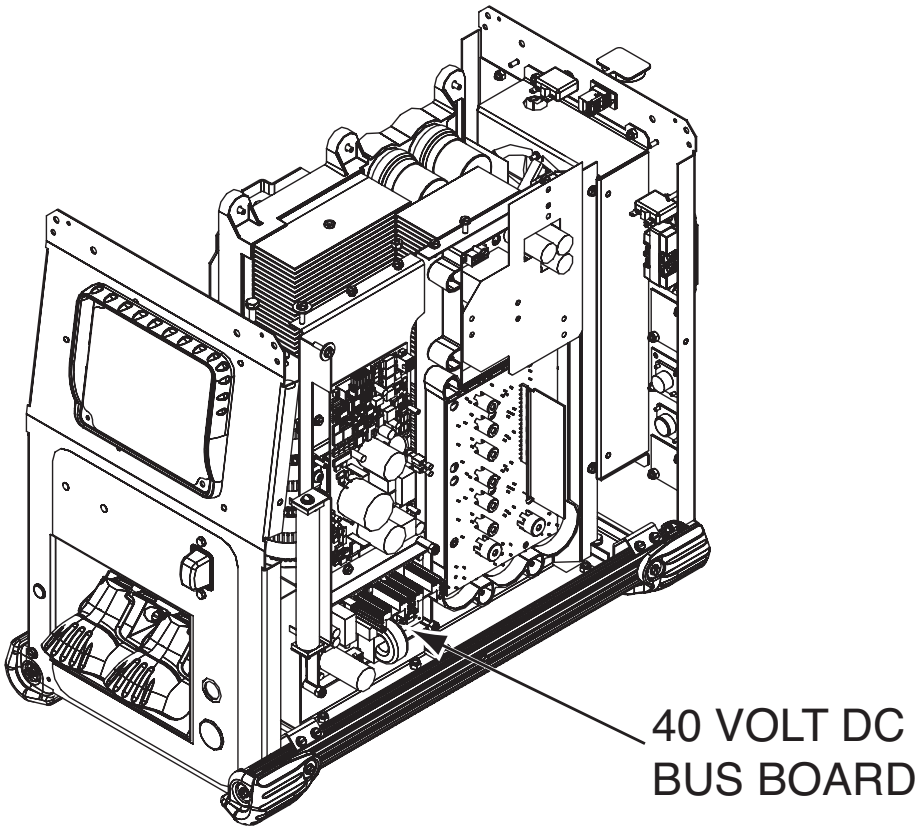
40 VOLT DC BUS BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.29 – 40 VOLT DC BUS BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and DC Link Capacitor Discharge Procedure***. Remove the right side case cover.
3. Locate the 40 Volt DC Bus Board. See Figure F.29.
4. Locate and remove plugs J46 and J47. See ***Figure F.30***. See Wiring Diagram.
5. Using a 3/8" nutdriver, remove the four nuts securing the 40 Volt DC Bus Board to the front divider panel. See ***Figure F.30***.
6. Carefully remove the 40 Volt DC Bus Board from the mounting studs.

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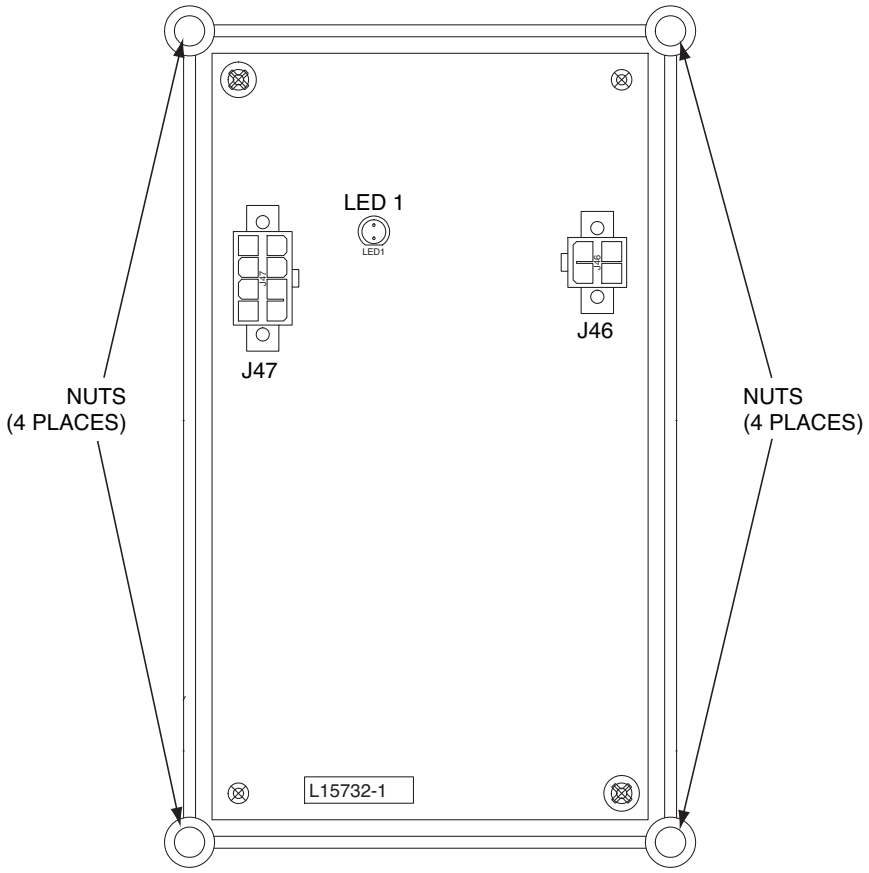
40 VOLT DC BUS BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.30 – 40 VOLT DC BUS BOARD MOUNTING NUT AND LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Place the new 40 Volt DC Bus Board onto the mounting studs.
2. Using a 3/8” nutdriver, attach the four nuts securing the 40 Volt DC Bus Board to the front divider panel.
3. Connect plugs J46 and J47 to the 40 Volt DC Bus Board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.

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LINE SWITCH
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Line Switch.

MATERIALS NEEDED

5/16” Nutdriver
Wiring Diagram
Electrical Tape
Slotted Screwdriver

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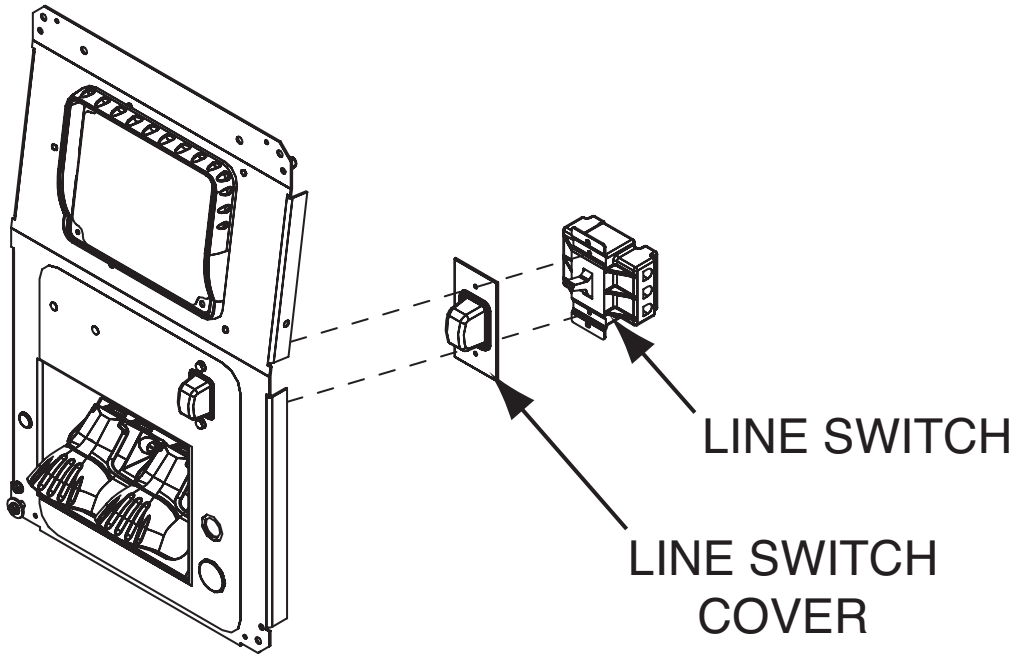
LINE SWITCH
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.31 – LINE SWITCH LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and DC Link Capacitor Discharge Procedure***. Remove the right side case cover.
3. Locate the Line Switch. See Figure F.31.
4. Using a 5/16” nutdriver, remove the two screws securing the Line Switch to the front panel. See Figure F.31.
5. Carefully remove the Line Switch from the front panel and slide it to the right side to gain access to the leads. Remove the electrical tape and take note of the line switch cover for reassembly.
6. Using a slotted screwdriver, label and remove leads L4A, L5A and L6A from the Line Switch. See the Wiring Diagram.
7. Using a slotted screwdriver, label and remove leads L4, L5 and L6 from the Line Switch. Take note of the MOV assembly for reassembly. See the Wiring Diagram.
8. Remove the Line Switch.

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Return to Master TOC

LINE SWITCH
REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Attach and securely tighten leads L4, L5 and L6 into the new Line Switch. Make sure the MOV assembly is also attached securely. See the Wiring Diagram.
2. Attach and securely tighten leads L4A, L5A and L6A into the new Line Switch. See the Wiring Diagram.
3. Replace the electrical tape with new tape as required.
4. Using a 5/16” nutdriver and the two mounting screws previously removed, mount the new Line Switch and switch cover onto the front panel.
5. Make sure all leads are cleared and the Line Switch cover is in place.
6. Perform the ***Case Cover Replacement Procedure***.

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Return to Master TOC

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INPUT BOARD
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Input Board.

MATERIALS NEEDED

3/8” Nutdriver
7/16” Wrench
Cable Ties
Wiring Diagram

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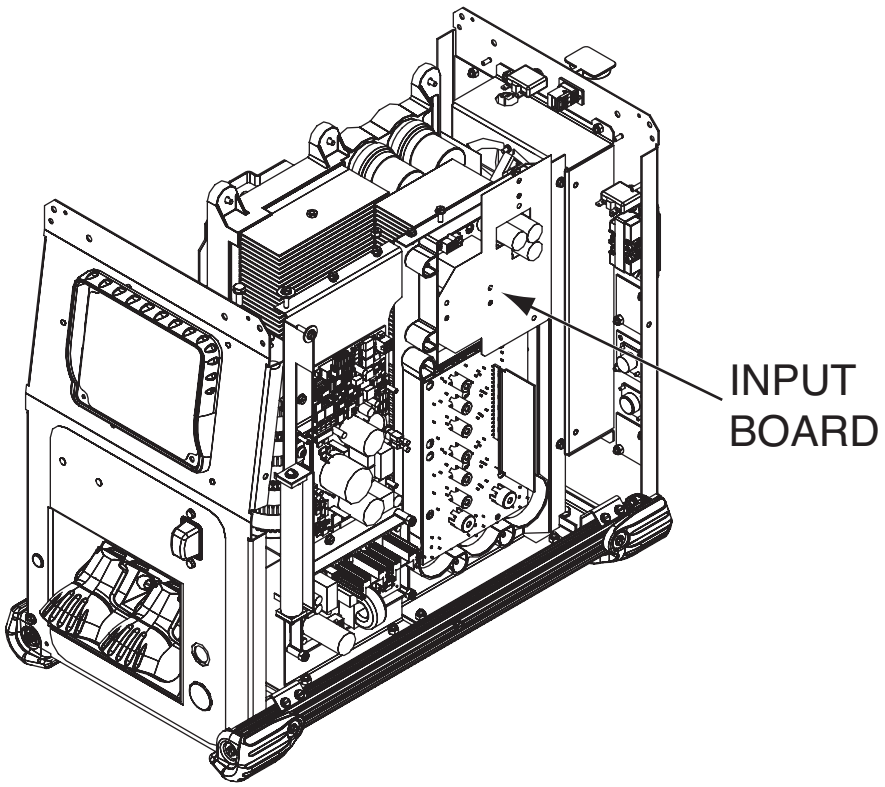
INPUT BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.32 – INPUT BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

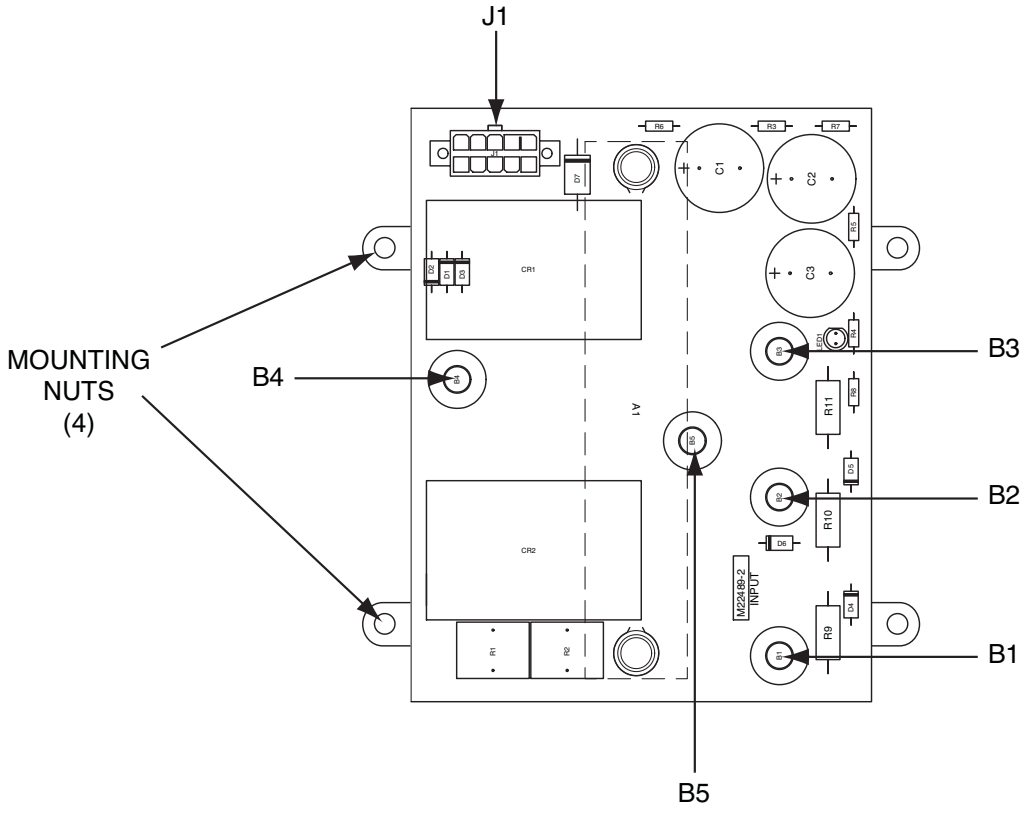
---

1. Remove the input voltage from the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Input Board. See Figure F.32.
4. Carefully remove the input board cover. Cut the three cable ties holding the input board cover in place.
5. Label and remove plug J1 from the Input Board. See ***Figure F.33***. See Wiring Diagram.
6. Using a 7/16” wrench, label and remove leads B1, B2 and B3 from the Input Board. See ***Figure F.33***. See Wiring Diagram.
7. Using a 7/16” wrench, label and remove leads B4 and B5 from the Input Board. See ***Figure F.33***. See Wiring Diagram.
8. Using a 3/8” nutdriver, remove the four nuts securing the Input Board to the mounting posts. See ***Figure F.33***.

Return to Section TOC
Return to Master TOC

INPUT BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.33 – INPUT BOARD LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Position the new Input Board and heat sink assembly onto the four mounting posts.
2. Using a 3/8” nutdriver, attach the four nuts securing the Input Board to the mounting posts.
3. Connect Plug J1 into the new Input Board.
4. Connect leads B4 and B5 onto the new Input Board. Torque to 50 to 60 Inch Pounds.
5. Using a 7/16” wrench, attach leads B1, B2 and B3 to the new Input Board. Torque to 50 to 60 Inch Pounds.
6. Replace the input board cover using three new cable ties.
7. Perform the ***Case Cover Replacement Procedure***.

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Return to Master TOC

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DIGITAL CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Digital Control Board.

MATERIALS NEEDED

3/8” Wrench
Wiring Diagram

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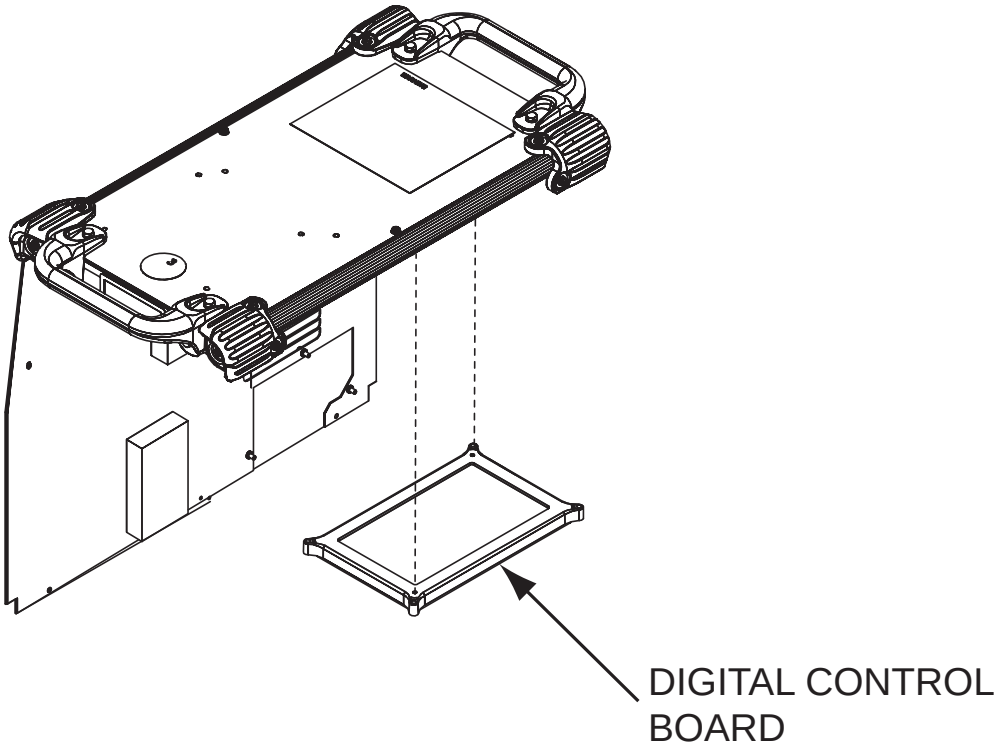
Return to Section TOC
Return to Master TOC

DIGITAL CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.34 – DIGITAL CONTROL BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and DC Link Capacitor Discharge Procedure***.
3. Carefully lift up the top case cover.
4. Locate the Digital Control Board. See Figure F.34.
5. Label and remove plugs J5, J6, J7, J8, J9, J12, J11 and J14. See ***Figure F.35***. See Wiring Diagram.
6. Label and remove the Ethernet cable from the board. See Wiring Diagram.
7. Using a 3/8" nutdriver, remove the four nuts securing the Digital Control Board to the top case cover. See ***Figure F.35***.
8. Carefully remove the Digital Control Board from the mounting studs.

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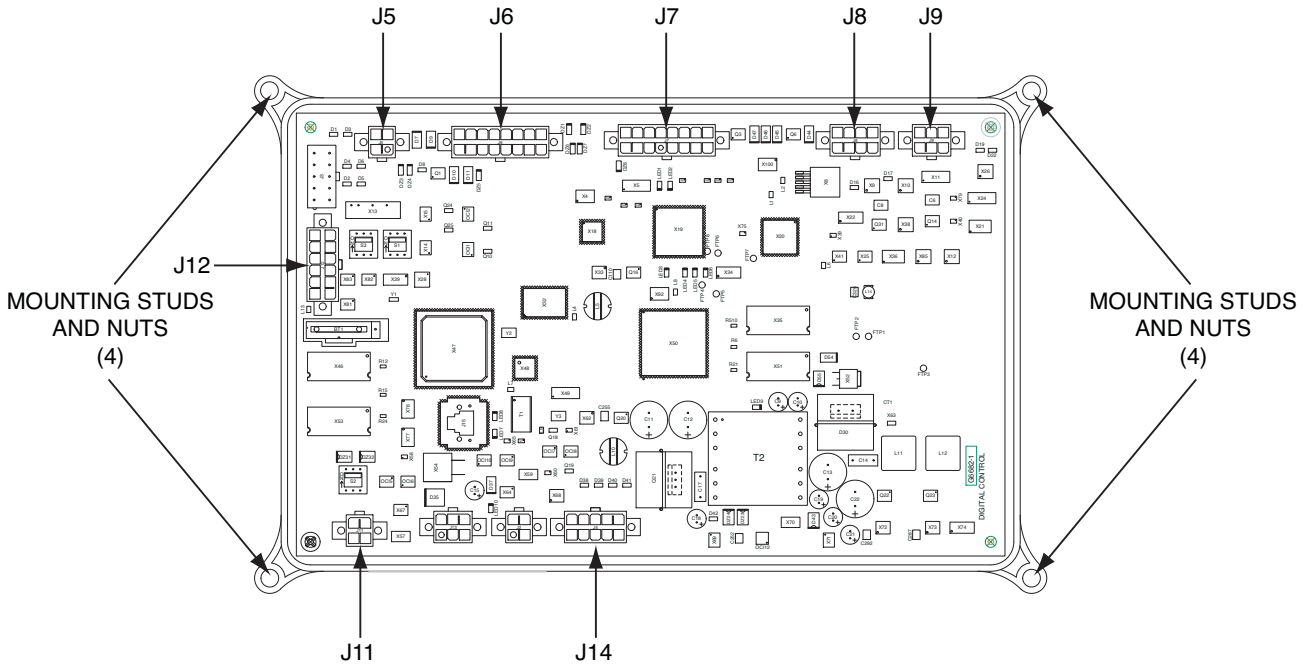
DIGITAL CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.35 – DIGITAL CONTROL BOARD LEAD LOCATIONS



REPLACEMENT PROCEDURE

1. Place the new Digital Control Board onto the mounting studs.
2. Using a 3/8” nutdriver, attach the four nuts securing the Digital Control Board to the top case cover.
3. Connect the Ethernet cable into the Digital Control Board.
4. Connect plugs J5, J6, J7, J8, J9, J12, J11 and J14 previously removed. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.

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FAN
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Fan Assembly.

MATERIALS NEEDED

5/16” Nutdriver
Screwdriver
Wiring Diagram

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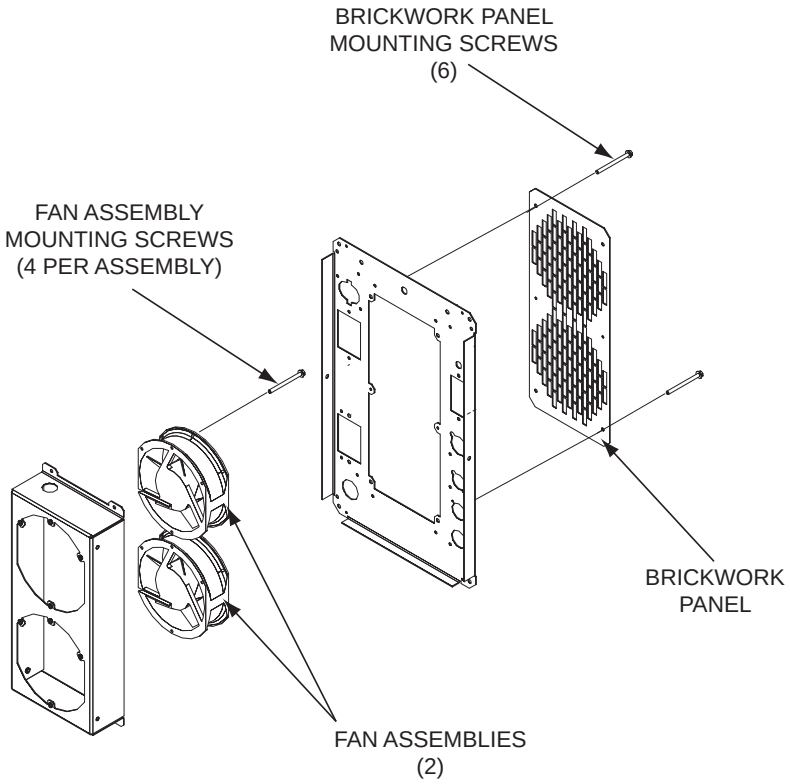
FAN
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.36 – FAN ASSEMBLY COMPONENT LOCATIONS



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove input power to the Power Wave® S500 machine.
2. Using a 5/16” nutdriver, remove the six screws from the brickwork panel located at the rear of the machine to gain access to the Fan Assembly. See Figure F.36.
3. Using a screwdriver, remove the four machine screws and associated lockwashers and flat-washers from the Fan Assembly to be replaced. See Figure F.36.
4. Carefully remove the Fan Assembly from the machine and disconnect the appropriate lead connection plug. (J55 or J56). See the Wiring Diagram. Cut any necessary cable ties.

Return to Section TOC
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FAN
REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Place the new Fan Assembly into position in the machine.
2. Connect the lead connection plug (J55 or J56). See the Wiring Diagram.
3. Replace any cable ties previously removed.
4. Using a screwdriver, attach the four machine screws, associated lockwashers and flatwashers to the Fan Assembly.
5. Make sure the fan spins freely without any obstruction.
6. Using a 5/16” nutdriver, attach the six screws securing the brickwork panel located at the rear of the machine.

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Return to Master TOC
Return to Section TOC
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POWER CONVERSION BOARD ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Power Conversion Board Assembly.

MATERIALS NEEDED

3/8” Nutdriver
7/16” Wrench
5/16” Nutdriver
Wiring Diagram

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Return to Master TOC
Return to Section TOC
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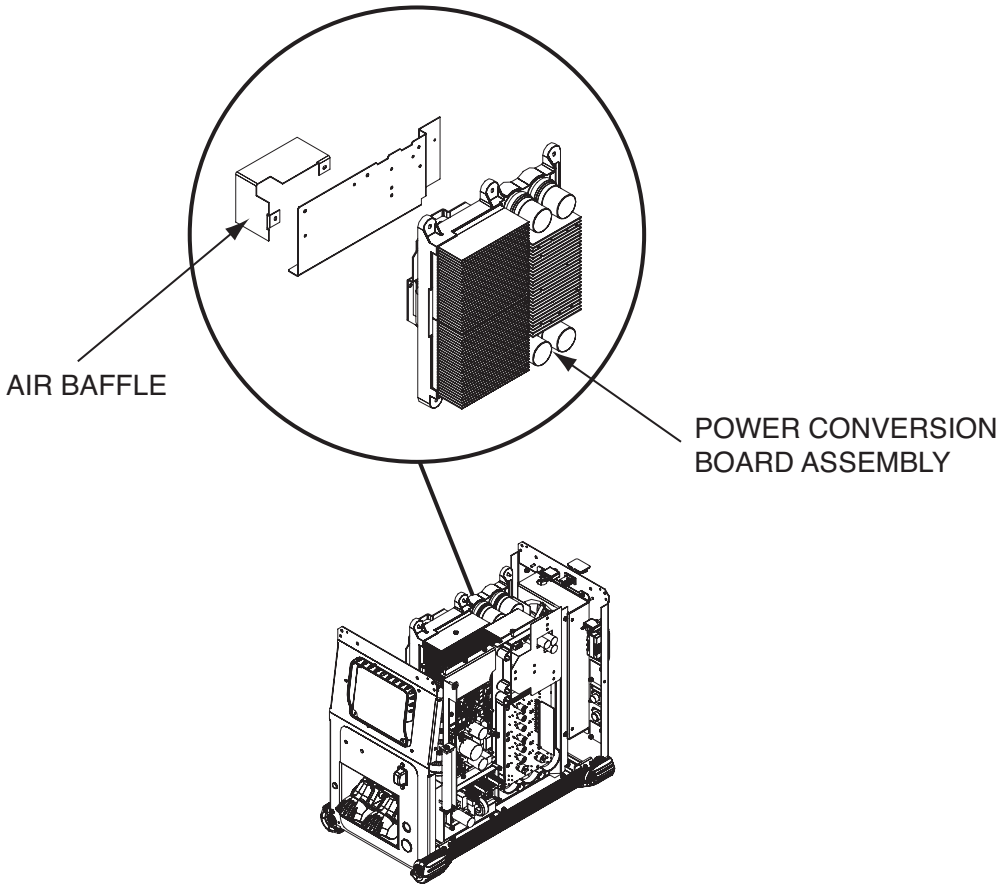
POWER CONVERSION BOARD ASSEMBLY
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.37 – POWER CONVERSION BOARD ASSEMBLY LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input voltage from the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Power Conversion Board Assembly. See Figure F.37.
4. Using a 5/16” and 3/8” nutdrivers, remove the air baffle. See Figure F.37.
5. Label and remove plugs J32, J33, J34, J35, J36 and J37 from the Power Conversion Board. See ***Figure F.38***. See Wiring Diagram.
6. Using a 7/16” wrench, label and remove the heavy lead B2 from terminal B56. See ***Figure F.38***. See Wiring Diagram. Save the bolt and washer for reassembly. Note chokes’ lead placement on terminal B56.
7. Using a 7/16” wrench, label and remove the heavy leads 901C and 901A from the heat sink terminal. Save the bolt, washers and nut for reassembly. See ***Figure F.38***. See Wiring Diagram.

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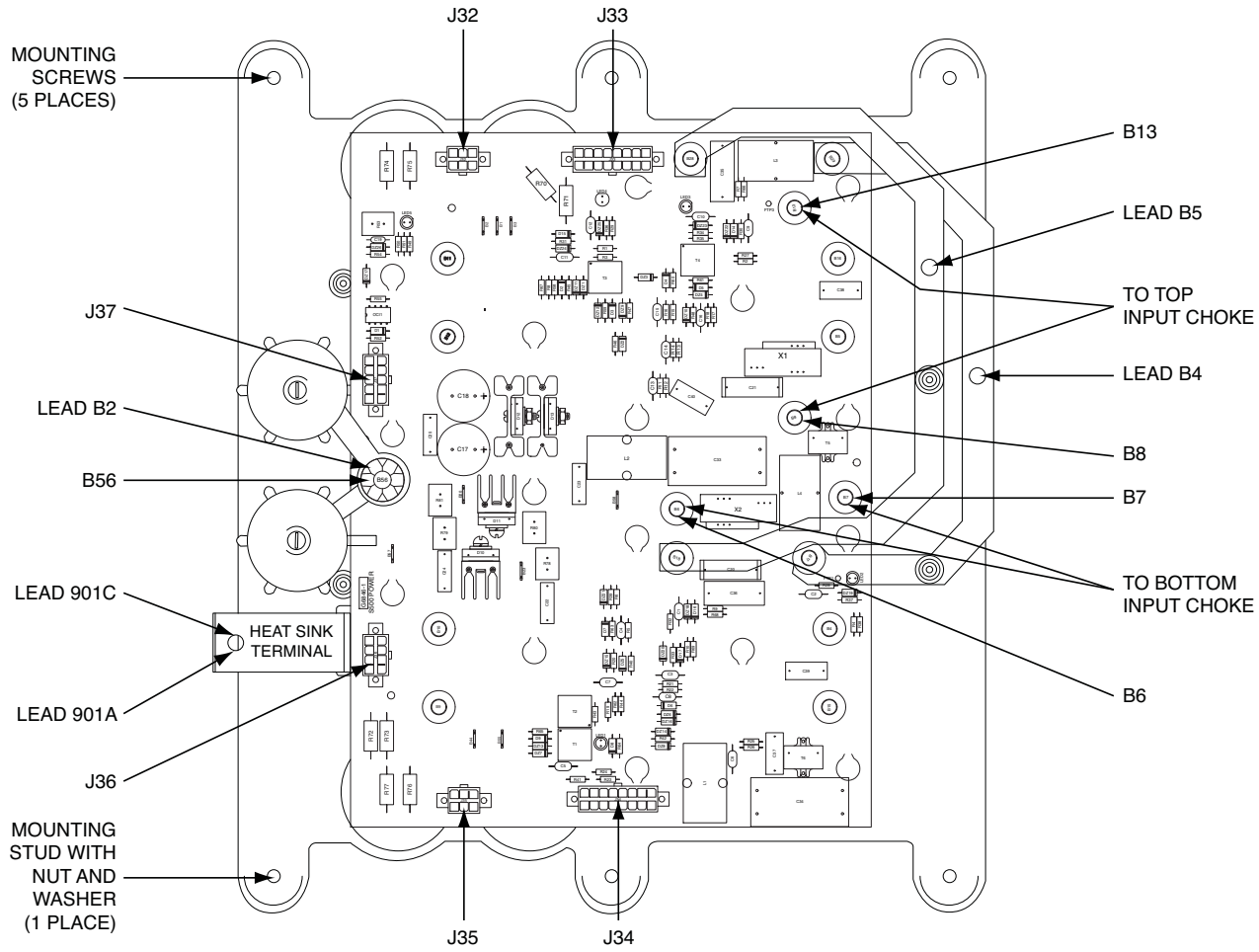
POWER CONVERSION BOARD ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.38 – POWER CONVERSION BOARD ASSEMBLY LEAD LOCATIONS



8. Using a 7/16” wrench, label and remove the top choke leads from terminals B13 and B8. Save the bolts and lock washers for reassembly. See Figure F.38. See Wiring Diagram.
9. Using a 7/16” wrench, label and remove the bottom choke leads from terminals B6 and B7. Save the bolts and lock washers for reassembly. See Figure F.38. See Wiring Diagram.
10. Using a 7/16” wrench, label and remove the leads B4 and B5 from the buss bars. Save the bolts, lock washers and nuts for reassembly. See Figure F.38. See Wiring Diagram.
11. Using a 5/16” nutdriver, remove the five screws securing the Power Conversion Board Assembly to the frame of the machine. See Figure F.38.
12. Using a 3/8” nutdriver, remove the nut and washer from the mounting post Lower left hand corner. See Figure F.38.
13. Clear all leads and carefully remove the Power Conversion Power Board Assembly with heat sink from the machine.

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POWER CONVERSION BOARD ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Position the new Power Conversion Board Assembly onto the mounting post.

NOTE: The top of the Power Conversion Board Assembly will have to be positioned into place first.

2. Using a nut and washer previously removed, Secure the new Power Conversion Board Assembly onto the mounting post. See ***Figure F.38***.
3. Using a 5/6" nutdriver, replace the five mounting screws and washers previously removed.
4. Attach leads B4 and B5 onto their respective bus bars. See ***Figure F.38***. See Wiring Diagram. Torque the bolts to between 50 and 60 inch pounds.
5. Attach the bottom choke leads to terminals B6 and B7. See ***Figure F.38***. See Wiring Diagram. Torque the bolts to between 50 and 60 inch pounds.
6. Attach the top choke leads to terminals B13 and B8. See ***Figure F.38***. See Wiring Diagram. Torque the bolts to between 50 and 60 inch pounds.
7. Attach the two heavy leads 901C and 901A to the heat sink terminal. See ***Figure F.38***. See Wiring Diagram. Torque the bolts to between 50 and 60 inch pounds.
8. Attach the heavy lead B2 to terminal B56. See ***Figure F.38***. See Wiring Diagram. Torque the bolts to between 50 and 60 inch pounds. Note chokes' lead placement.
9. Attach plugs J32, J33, J34, J35, J36 and J37. See ***Figure F.38***. See Wiring Diagram.
10. Attach the air baffle. See ***Figure F.37***.
11. Clear and position all leads.
12. Perform the ***Case Cover Replacement Procedure***.

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CHOPPER BOARD
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Chopper Board.

MATERIALS NEEDED

3/8” Nutdriver
7/16” Wrench
Cable Ties
Wiring Diagram

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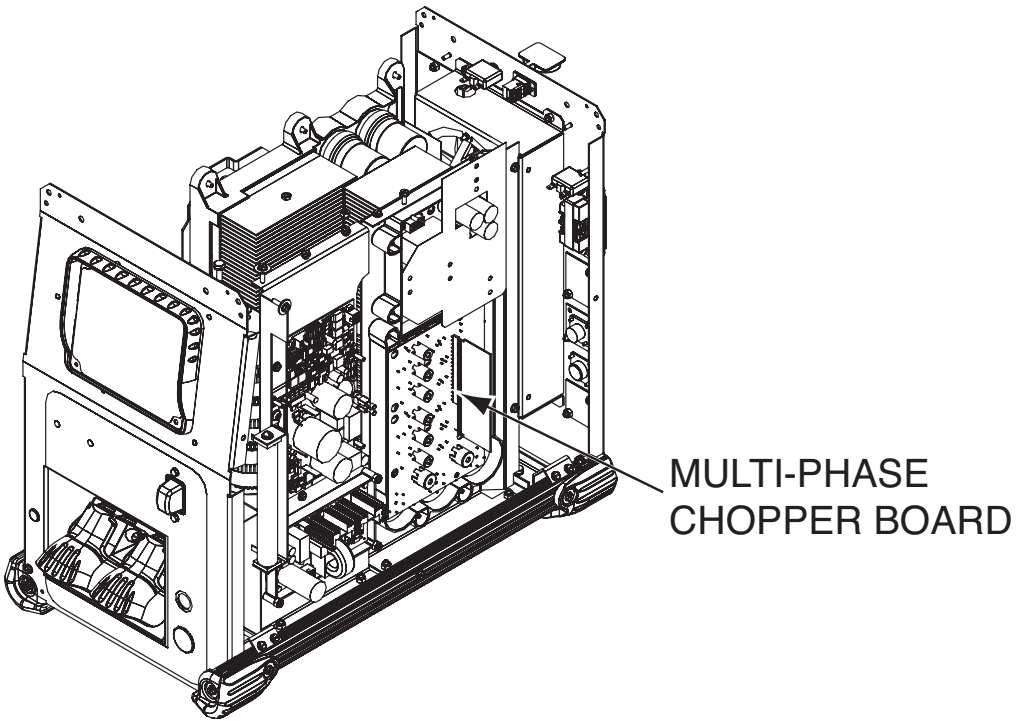
CHOPPER BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.39 – CHOPPER BOARD LOCATION



REMOVAL PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Remove the input voltage from the Power Wave® S500 machine.
2. Perform the ***Case Cover Removal and Capacitor Discharge Procedure***.
3. Locate the Chopper Board. See Figure F.39.
4. Locate and remove plugs J41 and J42 from the Chopper Board. See ***Figure F.40***. See Wiring Diagram.
5. Using a 7/16” wrench, label and remove leads BL1, BL2, BL3, BL4, BL5 and BL6 from the Chopper Board. Save the bolts and lock washers for reassembly. See ***Figure F.40***. See Wiring Diagram.
6. Using a 7/16” wrench, label and remove leads 901, 901C and 206A from terminal B1. Save the bolts and lock washers for reassembly. See ***Figure F.40***. See Wiring Diagram.

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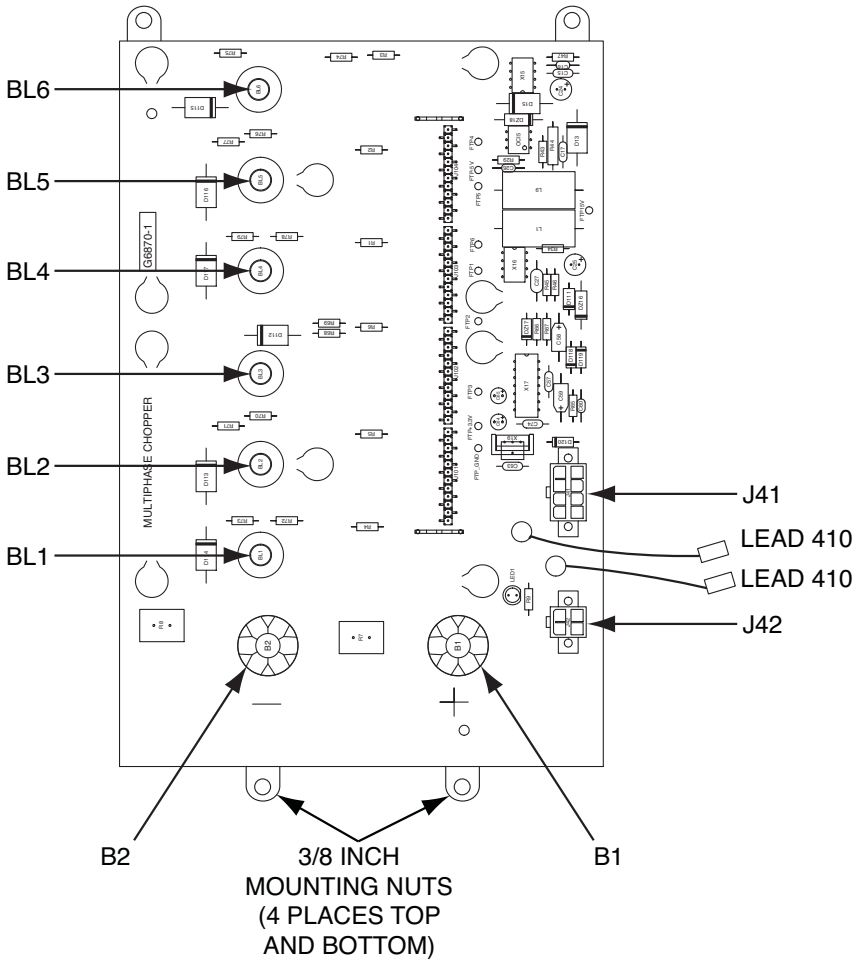
CHOPPER BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.40 – CHOPPER BOARD LEAD LOCATIONS



7. Using a 7/16” wrench, label and remove leads B2 and 207 from terminal B2. Save the bolts and lock washers for reassembly. See Figure F.40. See Wiring Diagram.
8. Label and disconnect the two thermostat leads 409 and 410. These leads can be disconnected at the two in-line push-on connectors. See Figure F.40. See Wiring Diagram.
9. Using a 3/8” nutdriver, remove the four nuts securing the Chopper Board Assembly to the mounting posts. See Figure F.40.
10. Carefully remove the Chopper Board Assembly (with heat sink) from the machine by clearing all leads and lifting the lower portion up and out first.

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CHOPPER BOARD
REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Position the new Chopper Board and heat sink assembly onto the four mounting posts.

NOTE: The bottom of the Chopper Board Assembly will have to be positioned into place first.

2. Using the four nuts previously removed, secure the new Chopper Board onto the mounting posts.
3. Connect Plugs J41 and J42 into the new Chopper Board. See Wiring Diagram.
4. Connect the thermostat leads 409 and 410. See Wiring Diagram.
5. Connect leads 901, 901C and 206A to terminal B1. Torque the bolts to between 50 to 60 inch pounds. See the Wiring Diagram.
6. Connect leads B2 and 207 to terminal B2. Torque the bolts to between 50 to 60 inch pounds. See the Wiring Diagram.
7. Connect the six output choke leads previously removed from terminals BL1, BL2, BL3, BL4, BL5 and BL6. Torque the bolts to between 50 to 60 inch pounds. See the Wiring Diagram.
8. Perform the ***Case Cover Replacement Procedure***.

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RETEST AFTER REPAIR PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in testing the Power Wave® S500 output after the repair or replacement of a part or PC board.

MATERIALS NEEDED

Power Wave Manager Utilities Software
Laptop or other Suitable Computer
Ethernet Cross Connect Cable (LE Co. #M19969-7)
Resistive Load Bank
Two (2) Welding Cables - 20ft. -4/0
Calibrated Ammeter and Voltmeter

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RETEST AFTER REPAIR PROCEDURE (continued)

PROCEDURE

⚠ WARNING

ELECTRIC SHOCK can kill.

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

---

1. Be certain that the machine is properly connected for the input voltage being applied.
2. Turn the Power Switch ON and see that it goes through the Start-up routine and the Status Light is steady Green.
3. Turn the Power Switch OFF and connect a resistive load across the Output Studs and a computer to the Ethernet. Perform the ***Current and Voltage Calibration Procedure*** to be sure that the machine will produce proper weld output.

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TABLE OF CONTENTS - DIAGRAM SECTION

*** NOTE:** Many PC Board Assemblies are now totally encapsulated, surface mounted and or multi-layered and are therefore considered to be unserviceable. Assembly drawings of these boards are provided for reference only.

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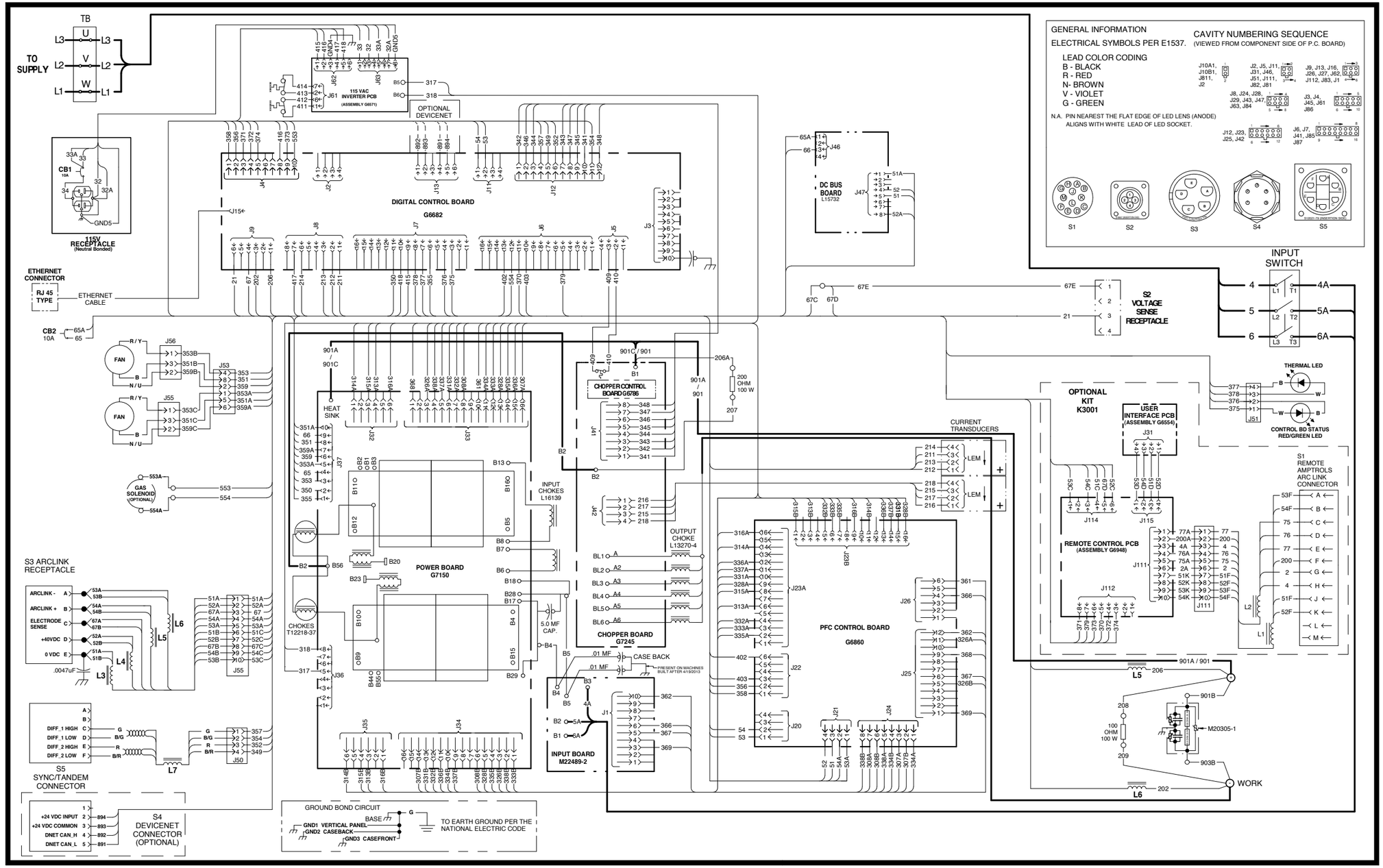
WIRING DIAGRAM - (G7188)

POWER WAVE S500



G7188 C

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

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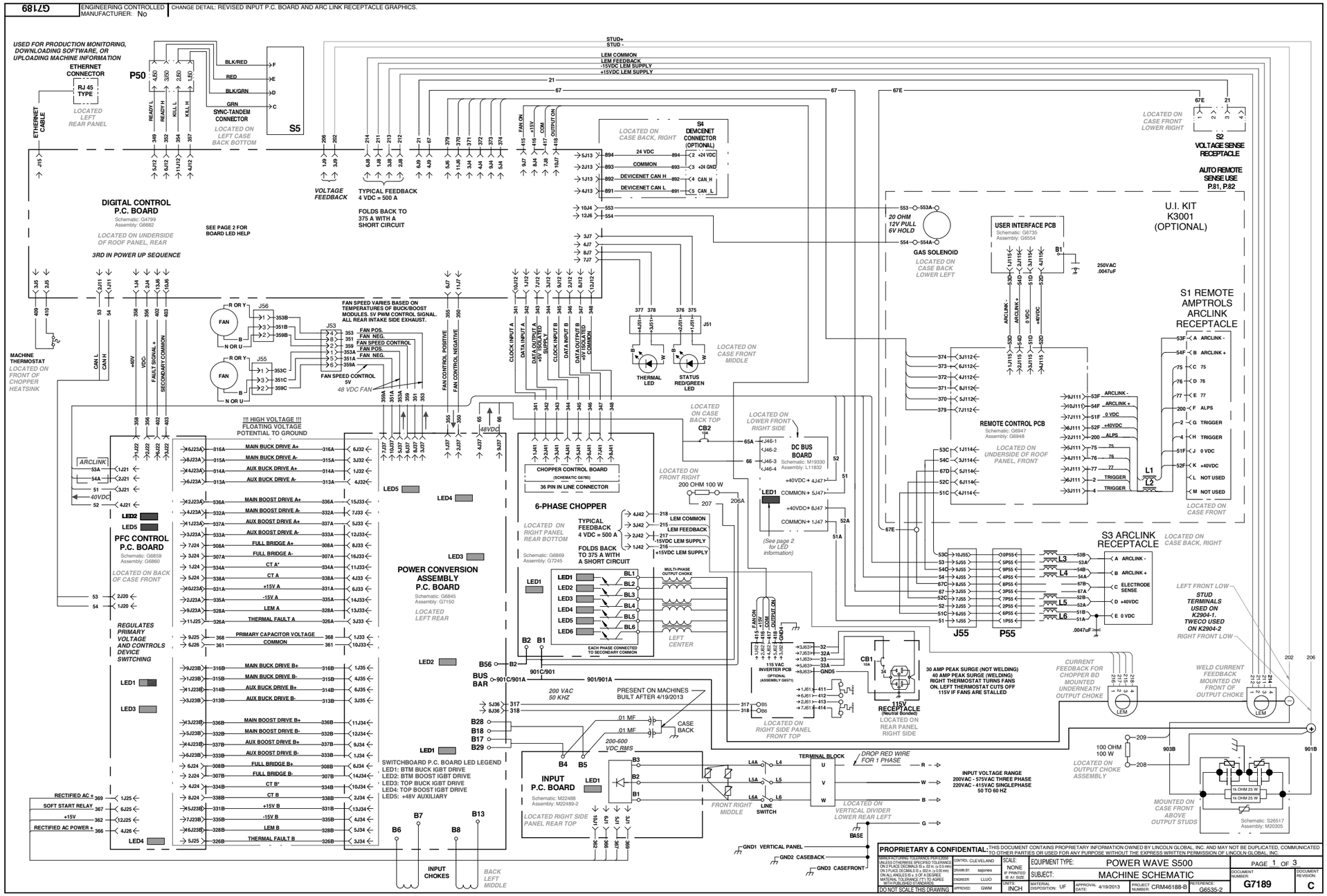
SCHEMATIC - (G7189 PG 1)

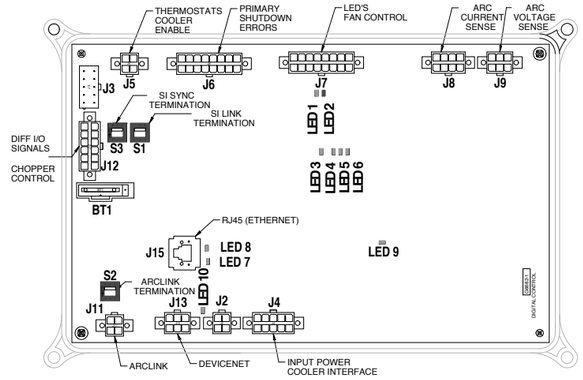


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - (G7189 PG 2)

G7189 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED INPUT P.C. BOARD AND ARC LINK RECEPTACLE GRAPHICS.

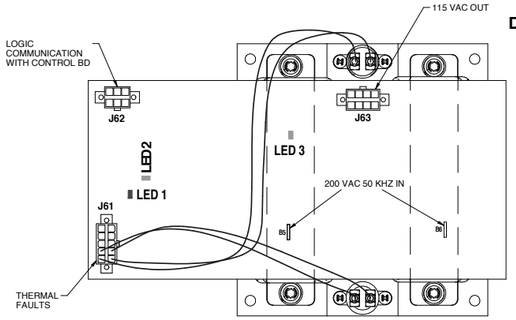
CONTROL P.C. BOARD



Description of LED functions on Power Wave S500 *For reference only*

G6682 CONTROL P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN	STATUS "OK"
2	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
3	GREEN	OUTPUT ENABLE
4	GREEN	SINGLE PHASE FAULT
5	GREEN	ELECTRODE SENSE
6	GREEN	WORK SENSE
7	GREEN	ETHERNET LINK/ACTIVITY STATUS
8	GREEN	ETHERNET SPEED STATUS
9	GREEN	INPUT SUPPLY 30 VDC TO 55 VDC
10	GREEN	DEVICENET EXTERNAL 24 VDC PRESENT

115VAC INVERTER P.C. BOARD

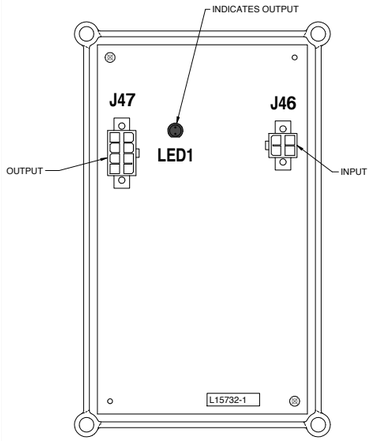


Description of LED functions on Power Wave S500 *For reference only*

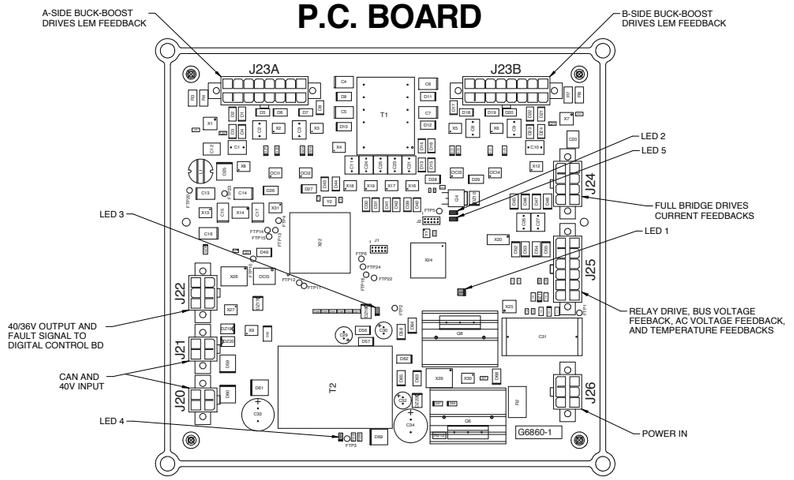
G6571 115 VAC INVERTER P.C. BOARD		
LED #	COLOR	FUNCTION
1	RED	ERROR CODE (LED WILL FLASH ERROR) SEE TABLE BELOW FOR DETAILS
2	GREEN	RECEPTACLE OUTPUT IS ON (115 VAC)
3	GREEN	INPUT POWER PRESENT. POWER SUPPLY ON

ERROR CODE	
ERROR	EXPLANATION
1	GROUND FAULT
2	THERMAL FAULT
3	15V CONTROL UNDERVOLTAGE
4	200V BUS UNDERVOLTAGE
5	OUTPUT OVER CURRENT
6	OUTPUT OVER VOLTAGE

+40 VDC BUS P.C. BOARD



PFC CONTROL P.C. BOARD



Description of LED functions on Power Wave S500 *For reference only*

G6860-1 PFC CONTROL P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN / RED	STATUS LIGHT AND ERROR CODE (LED WILL FLASH ERROR) SEE TABLE FOR DETAILS
2	RED	FAULT SIDE B
3	GREEN	-15 VOLT PRESENT
4	GREEN	+15 VOLT PRESENT
5	RED	FAULT SIDE A

ERROR CODE	
ERROR	EXPLANATION
331	PEAK INPUT CURRENT LIMIT
334	START UP CURRENT CHECK FAILURE
335	START UP VOLTAGE CHECK FAILURE
336	THERMAL FAULT (NO FIRST STAGE FAN)
337	PRECHARGE TIMEOUT
338	INPUT POWER LIMIT
341	INPUT VOLTAGE DROPOUT
346	TRANSFORMER PRIMARY OVERCURRENT
347	AVERAGE INPUT CURRENT LIMIT
349	BUS UNDERVOLTAGE

MANUFACTURING TOLERANCE PER ISO/DIS UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm). ON 3 PLACE DECIMALS IS ± .010 in. (± 0.25 mm). ON ALL ANGLES IS ± 0.5° A DEGREE. MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND	SCALE: NONE IF PRINTED @ A1 SIZE	EQUIPMENT TYPE:	POWER WAVE S500		PAGE 2 OF 3		
DRAWN BY: sajones		SUBJECT:	MACHINE SCHEMATIC		DOCUMENT NUMBER: G7189	DOCUMENT REVISION: C	
ENGINEER: LLUO	DATE: 4/19/2013	MATERIAL DISPOSITION: UF	APPROVAL DATE: 4/19/2013	PROJECT NUMBER: CRIM46188-B	REFERENCE: G6535-2		
APPROVED: GWM							

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

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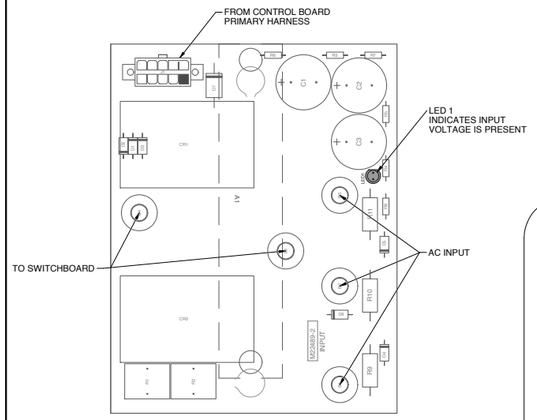
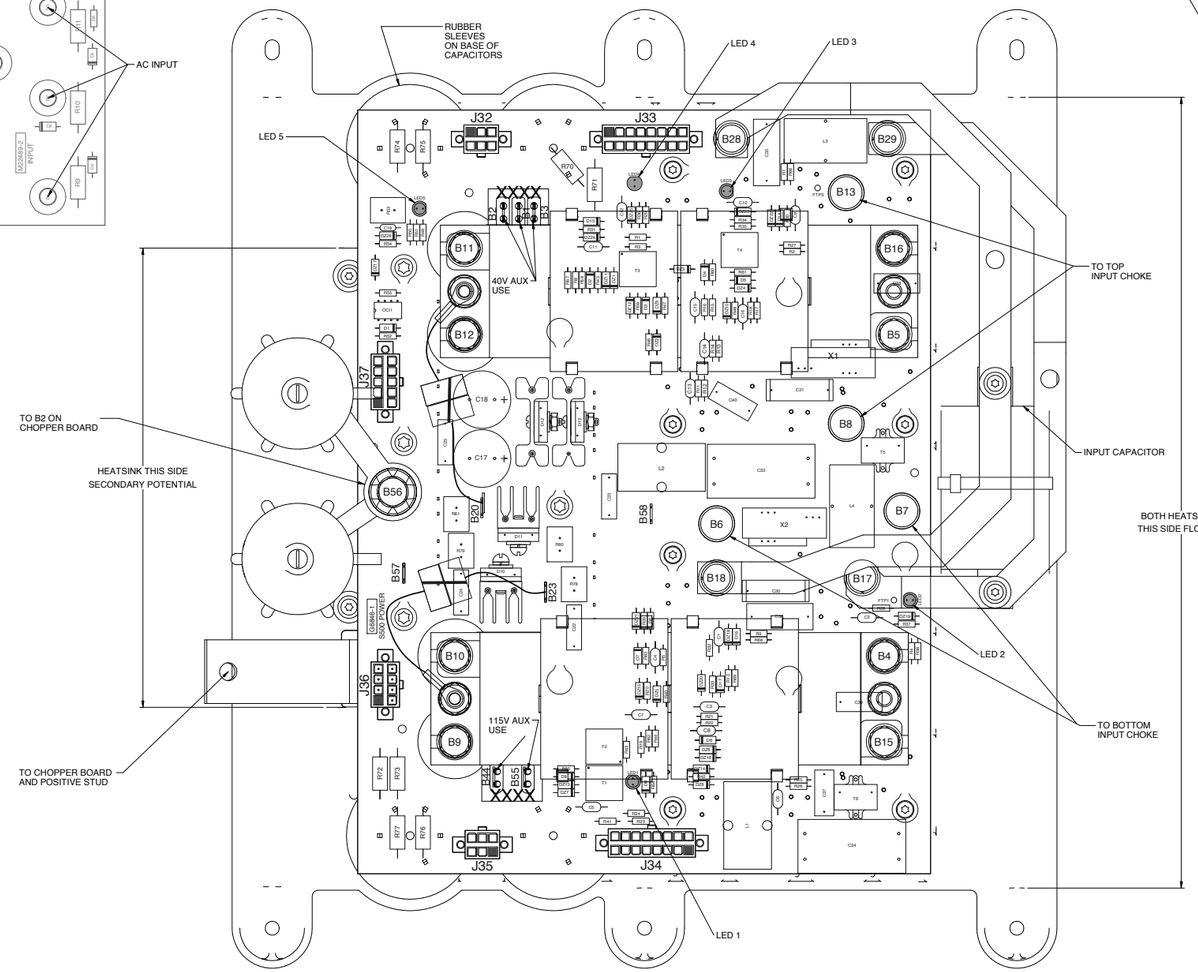
SCHEMATIC - (G7189 PG 3)

G7189 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED INPUT P.C. BOARD AND ARC LINK RECEPTACLE GRAPHICS.

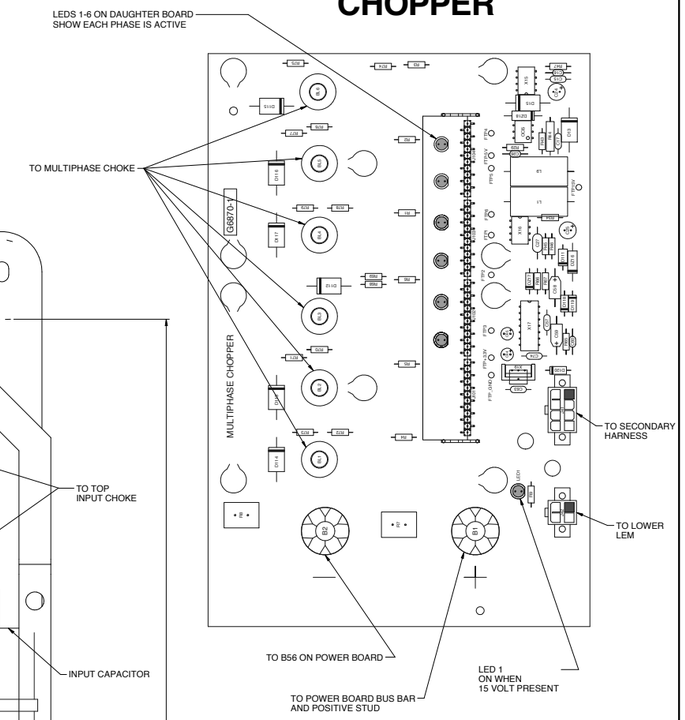
INPUT BOARD



3 STAGE INVERTER SWITCHBOARD P.C. BOARD



MULTIPHASE CHOPPER



■ = MOLEX PIN 1

Description of LED functions on Power Wave S500

For reference only

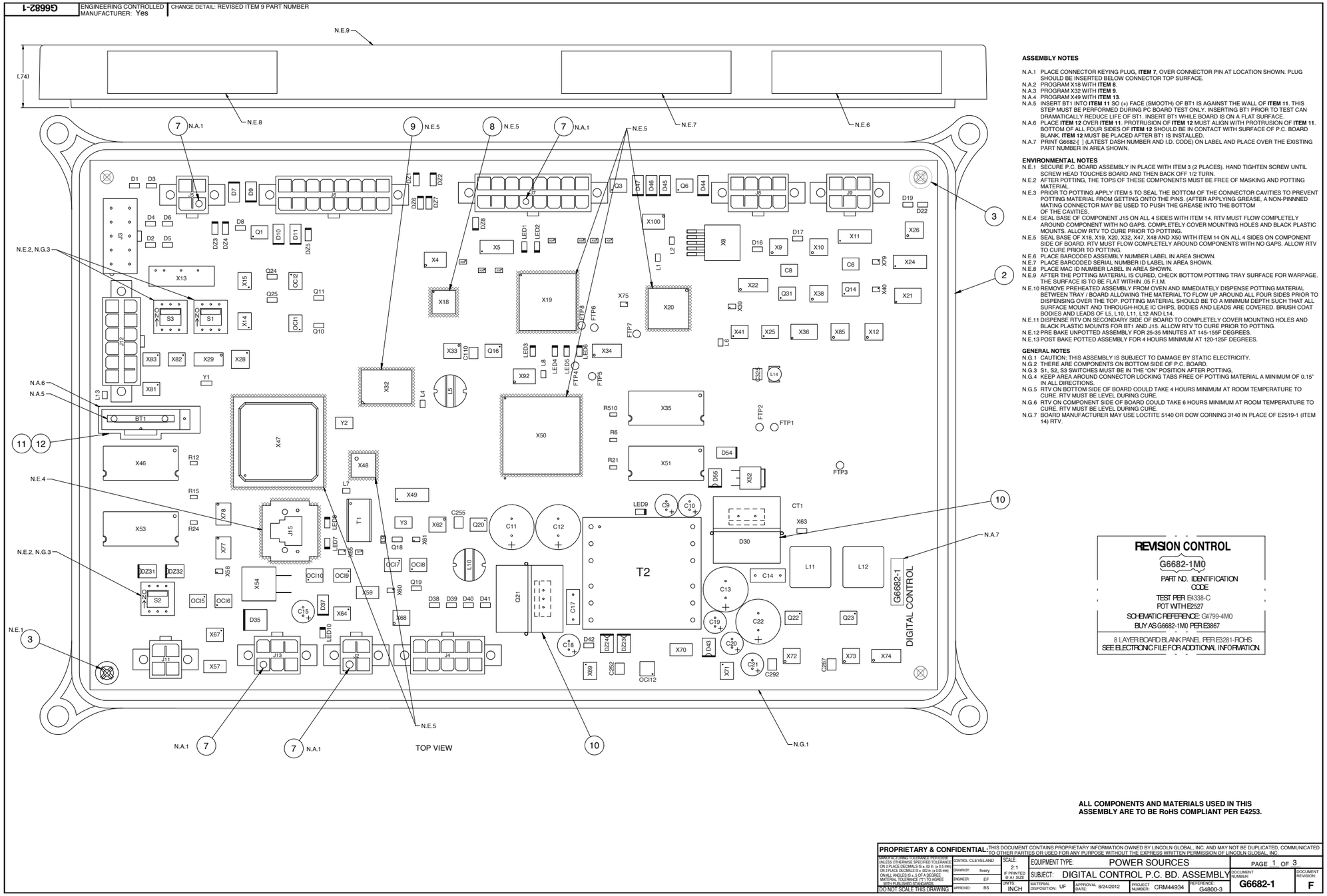
G7150 SWITCHBOARD P.C. BOARD		
LED #	COLOR	FUNCTION
1	GREEN	BTM BUCK IGBT DRIVE FUNCTIONING WHEN ON
2	GREEN	BTM BOOST IGBT DRIVE FUNCTIONING WHEN ON
3	GREEN	TOP BUCK IGBT DRIVE FUNCTIONING WHEN ON
4	GREEN	TOP BOOST IGBT DRIVE FUNCTIONING WHEN ON
5	GREEN	48 VDC AUXILIARY POWER FUNCTIONING WHEN ON

MANUFACTURING TOLERANCE PER ES2008 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 FRACTIONS IS ± 1/64 in. (± 0.4 mm) MATERIAL TOLERANCE P.T.S. TO AGREE WITH PUBLISHED STANDARD	CONTROL: CLEVELAND	SCALE: NONE IF PRINTED @ A1 SIZE	EQUIPMENT TYPE: POWER WAVE S500		PAGE 3 OF 3
	DRAWN BY: sajones		SUBJECT: MACHINE SCHEMATIC		DOCUMENT NUMBER: G7189 / DOCUMENT REVISION: C
	ENGINEER: LLUO		MATERIAL DISPOSITION: UF	APPROVAL DATE: 4/19/2013	PROJECT NUMBER: CRM46188-B / REFERENCE: G6535-2
DO NOT SCALE THIS DRAWING	APPROVED: GWM	UNITS: INCH			

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

Return to Section TOC
Return to Master TOC

CONTROL PC BOARD ASSEMBLY (G6682-1 PG 1)



ASSEMBLY NOTES

N.A.1 PLACE CONNECTOR KEYING PLUG, **ITEM 7**, OVER CONNECTOR PIN AT LOCATION SHOWN. PLUG SHOULD BE INSERTED BELOW CONNECTOR TOP SURFACE.
N.A.2 PROGRAM X18 WITH **ITEM 8**.
N.A.3 PROGRAM X32 WITH **ITEM 9**.
N.A.4 PROGRAM X49 WITH **ITEM 13**.
N.A.5 INSERT BT1 INTO **ITEM 11** SO (+) FACE (SMOOTH) OF BT1 IS AGAINST THE WALL OF **ITEM 11**. THIS STEP MUST BE PERFORMED DURING PC BOARD TEST ONLY. INSERTING BT1 PRIOR TO TEST CAN DRAMATICALLY REDUCE LIFE OF BT1. INSERT BT1 WHILE BOARD IS ON A FLAT SURFACE.
N.A.6 PLACE **ITEM 12** OVER **ITEM 11**. PROTRUSION OF **ITEM 12** MUST ALIGN WITH PROTRUSION OF **ITEM 11**. BOTTOM OF ALL FOUR SIDES OF **ITEM 12** SHOULD BE IN CONTACT WITH SURFACE OF P.C. BOARD BLANK. **ITEM 12** MUST BE PLACED AFTER BT1 IS INSTALLED.
N.A.7 PRINT G6682-[ ] (LATEST DASH NUMBER AND I.D. CODE) ON LABEL AND PLACE OVER THE EXISTING PART NUMBER IN AREA SHOWN.

ENVIRONMENTAL NOTES

N.E.1 SECURE P.C. BOARD ASSEMBLY IN PLACE WITH ITEM 3 (2 PLACES). HAND TIGHTEN SCREW UNTIL SCREW HEAD TOUCHES BOARD AND THEN BACK OFF 1/2 TURN.
N.E.2 AFTER POTTING, THE TOPS OF THESE COMPONENTS MUST BE FREE OF MASKING AND POTTING MATERIAL.
N.E.3 PRIOR TO POTTING APPLY ITEM 5 TO SEAL THE BOTTOM OF THE CONNECTOR CAVITIES TO PREVENT POTTING MATERIAL FROM GETTING ONTO THE PINS. (AFTER APPLYING GREASE, A NON-PINNNED MATING CONNECTOR MAY BE USED TO PUSH THE GREASE INTO THE BOTTOM OF THE CAVITIES.
N.E.4 SEAL BASE OF COMPONENT J15 ON ALL 4 SIDES WITH ITEM 14. RTV MUST FLOW COMPLETELY AROUND COMPONENT WITH NO GAPS. COMPLETELY COVER MOUNTING HOLES AND BLACK PLASTIC MOUNTS. ALLOW RTV TO CURE PRIOR TO POTTING.
N.E.5 SEAL BASE OF X18, X19, X20, X32, X47, X48 AND X50 WITH ITEM 14 ON ALL 4 SIDES ON COMPONENT SIDE OF BOARD. RTV MUST FLOW COMPLETELY AROUND COMPONENTS WITH NO GAPS. ALLOW RTV TO CURE PRIOR TO POTTING.
N.E.6 PLACE BARCODED ASSEMBLY NUMBER LABEL IN AREA SHOWN.
N.E.7 PLACE BARCODED SERIAL NUMBER ID LABEL IN AREA SHOWN.
N.E.8 PLACE MAC ID NUMBER LABEL IN AREA SHOWN.
N.E.9 AFTER THE POTTING MATERIAL IS CURED, CHECK BOTTOM POTTING TRAY SURFACE FOR WARPAGE. THE SURFACE IS TO BE FLAT WITHIN .05 F.I.M.
N.E.10 REMOVE PREHEATED ASSEMBLY FROM OVEN AND IMMEDIATELY DISPENSE POTTING MATERIAL BETWEEN TRAY / BOARD ALLOWING THE MATERIAL TO FLOW UP AROUND ALL FOUR SIDES PRIOR TO DISPENSING OVER THE TOP. POTTING MATERIAL SHOULD BE TO A MINIMUM DEPTH SUCH THAT ALL SURFACE MOUNT AND THROUGH-HOLE IC CHIPS, BODIES AND LEADS ARE COVERED. BRUSH COAT BODIES AND LEADS OF L5, L10, L11, L12 AND L14.
N.E.11 DISPENSE RTV ON SECONDARY SIDE OF BOARD TO COMPLETELY COVER MOUNTING HOLES AND BLACK PLASTIC MOUNTS FOR BT1 AND J15. ALLOW RTV TO CURE PRIOR TO POTTING.
N.E.12 PRE BAKE UNPOTTED ASSEMBLY FOR 25-35 MINUTES AT 145-155F DEGREES.
N.E.13 POST BAKE POTTED ASSEMBLY FOR 4 HOURS MINIMUM AT 120-125F DEGREES.

GENERAL NOTES

N.G.1 CAUTION: THIS ASSEMBLY IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY.
N.G.2 THERE ARE COMPONENTS ON BOTTOM SIDE OF P.C. BOARD.
N.G.3 S1, S2, S3 SWITCHES MUST BE IN THE "ON" POSITION AFTER POTTING.
N.G.4 KEEP AREA AROUND CONNECTOR LOCKING TABS FREE OF POTTING MATERIAL A MINIMUM OF 0.15" IN ALL DIRECTIONS.
N.G.5 RTV ON BOTTOM SIDE OF BOARD COULD TAKE 4 HOURS MINIMUM AT ROOM TEMPERATURE TO CURE. RTV MUST BE LEVEL DURING CURE.
N.G.6 RTV ON COMPONENT SIDE OF BOARD COULD TAKE 6 HOURS MINIMUM AT ROOM TEMPERATURE TO CURE. RTV MUST BE LEVEL DURING CURE.
N.G.7 BOARD MANUFACTURER MAY USE LOCTITE 5140 OR DOW CORNING 3140 IN PLACE OF E2519-1 (ITEM 14) RTV.

REVISION CONTROL

G6682-1M0
PART NO. IDENTIFICATION CODE
TEST PER E4338-C
POT WITH E2527
SCHEMATIC REFERENCE: G4799-4M0
BUY AS G6682-1M0 PER E3867
8 LAYER BOARD BLANK PANEL PER E3281-ROHS
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION.

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

MANUFACTURING TOLERANCES - PER ESP02
UNLESS OTHERWISE SPECIFIED TOLERANCE
ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm)
ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm)
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND
DRAWN BY: Ivory
ENGINEER: EF
APPROVED: BS

SCALE 2:1 IF PRINTED @ A1 SIZE
UNITS: INCH

EQUIPMENT TYPE: POWER SOURCES
SUBJECT: DIGITAL CONTROL P.C. BD. ASSEMBLY
MATERIAL DISPOSITION: UF
APPROVAL DATE: 8/24/2012
PROJECT NUMBER: CRM44934
REFERENCE: G4800-3

PAGE 1 OF 3
DOCUMENT NUMBER: G6682-1
DOCUMENT REVISION: F

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

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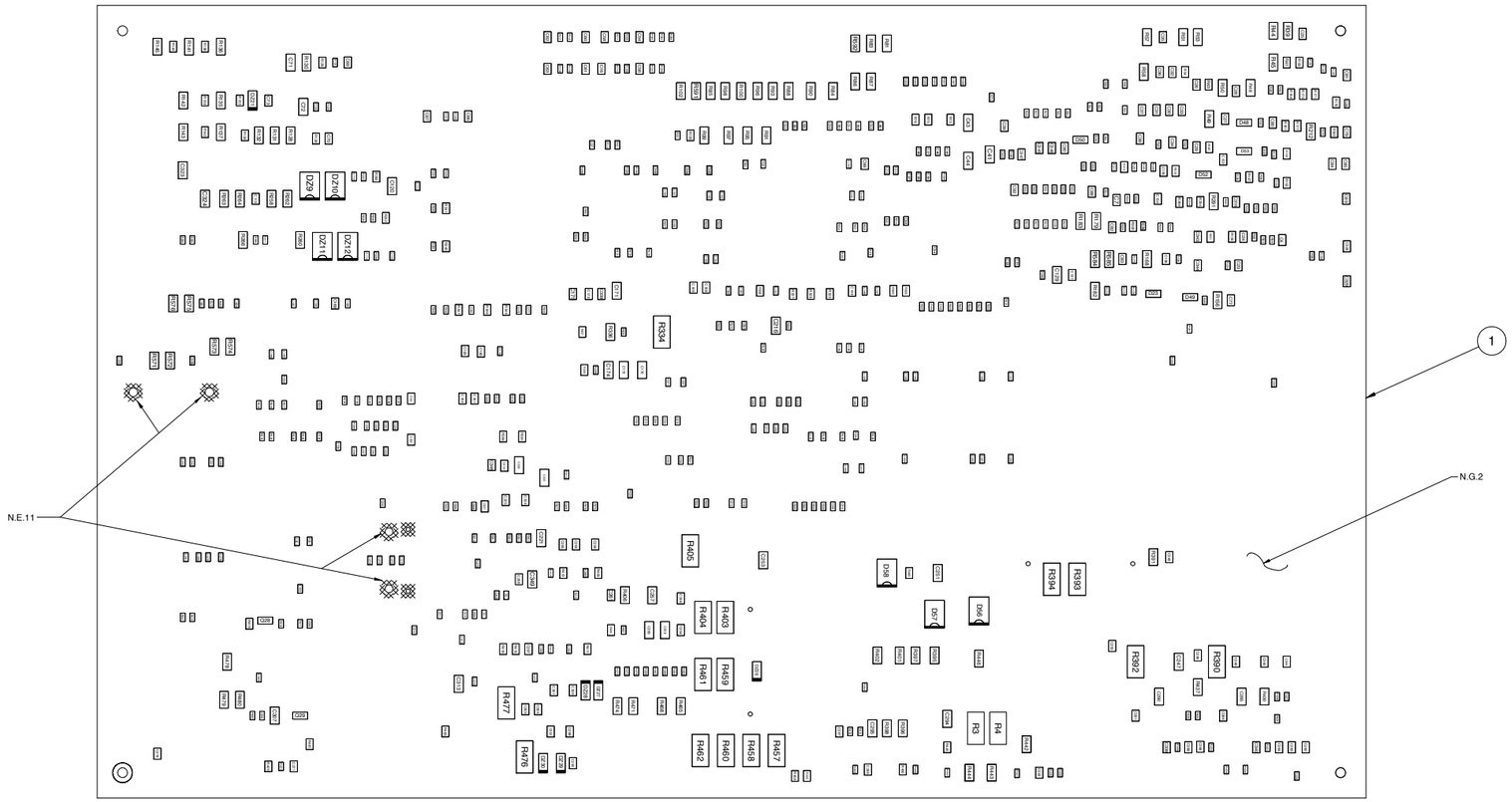
CONTROL PC BOARD ASSEMBLY (G6682-1 PG 2)

G6682-1 | ENGINEERING CONTROLLED MANUFACTURER: Yes | CHANGE DETAIL: REVISED ITEM 9 PART NUMBER



BOTTOM VIEW

PROPRIETARY & CONFIDENTIAL: THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OWNED BY LINCOLN GLOBAL, INC. AND MAY NOT BE DUPLICATED, COMMUNICATED TO OTHER PARTIES OR USED FOR ANY PURPOSE WITHOUT THE EXPRESS WRITTEN PERMISSION OF LINCOLN GLOBAL, INC.						
MANUFACTURING TOLERANCES PER ES2008 UNLESS OTHERWISE SPECIFIED TOLERANCES ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .005 in. (± 0.05 mm) ON ALL ANGLES IS ± 3 OF A DEGREE MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS DO NOT SCALE THIS DRAWING	CONTROL: CLEVELAND DRAWN BY: fivory ENGINEER: EF APPROVED: BS	SCALE: 2:1 IF PRINTED IS A1 SIZE UNITS: INCH	EQUIPMENT TYPE: POWER SOURCES SUBJECT: DIGITAL CONTROL P.C. BD. ASSEMBLY MATERIAL DISPOSITION: UF APPROVAL DATE: 8/24/2012 PROJECT NUMBER: CRM44934 REFERENCE: G4800-3	PAGE 2 OF 3 DOCUMENT NUMBER: G6682-1 DOCUMENT REVISION: F		

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

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Return to Section TOC
Return to Master TOC

CONTROL PC BOARD ASSEMBLY (G6682-1 PG 3)

G6682-1

ENGINEERING CONTROLLED MANUFACTURER: Yes

CHANGE DETAIL: REVISED ITEM 9 PART NUMBER

ITEM USED WITH *	QTY	PART NUMBER	DESCRIPTION
1	1	G4800-M	PC BOARD BLANK
2	1	M19436-14	POTTING TRAY
3	2	S8025-80	SELF TAPPING SCREW
4	10.2 oz	E2527	EPOXY ENCAPSULATING RESIN
5	0.16 oz	E3539	ELECTRICAL INSULATING COMPOUND
6	0.18 oz	E2861	RTV COMPOUND
7	4	S24671	PLUG, KEYING PLUG
8 (X18)*	1	Y00556-2	FIRMWARE FOR CPLD
9 (X32)*	1	S26773-12	SOFTWARE FOR FLASH
10 (D30, Q21)*	2	S20590-6	HEAT SINK,CLIP-ON,STAND-UP,FOR TO-220
11 (BT1)*	1	S25125-2	BATTERY HOLDER,VERTICAL 20mm COINCELL,SLIMLINE
12 (BT1)*	1	S27541	BATTERY COVER
13 (X49)*	1	Y01310	FIRMWARE FOR CLOCK GENERATOR
14	.25 oz	E2519-1	RTV COMPOUND

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
BT1	1	S25125-3	BATTERY,LITHIUM,PLOYCMF,20MM COIN,3V,190MAH
C4, C7, C70, C83, C175, C261	6	S25020-2SMT	CAPACITOR,SMD,CERAMIC,0.022MF,50V,10%,X7R,S0805
C6, C8	2	S25030-2SMT	CAPACITOR,SMD,METAL FILM,0.1MF,50V,5%,,PPS
C9, C10, C15, C18, C19, C20, C21	7	S13490-197	CAPACITOR,ALEL,82.36V,20%,,LOW-ESR
C11, C12	2	S13490-184	CAPACITOR,ALEL,330,100V,20%
C13, C22	2	S13490-198	CAPACITOR,ALEL,1000,35V,20%,LOW-ESR
C14, C17	2	S20500-16	CAPACITOR,PPMF,0.0033,630V,5%,BOX
C16, C54, C58, C60, C62, C63, C66, C67, C69	9	S25020-4SMT	CAPACITOR,SMD,CERAMIC,820pF,50V,5%,COG,S0805
C23, C24, C27, C28, C33, C34, C35, C36, C37, C38, C79, C81, C82, C84, C85, C88, C89, C119, C134, C135, C138, C149, C249, C267, C268, C271, C282, C298, C300, C301, C302, C328, C329, C343, C344	35	S25020-27SMT	CAPACITOR,SMD,CER,0.1MF,50V,-20%+80%,Z5U,S0805
C25, C26, C29, C32, C293	5	S25020-5SMT	CAPACITOR,SMD,CERAMIC,2700pF,50V,5%,,X7R,S0805
C30, C31, C169, C256, C283, C286, C288, C291	8	S25020-3SMT	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,,X7R,S0805
C39, C90, C92, C99, C131, C180, C183, C185, C188, C223, C227, C228, C244, C304, C348	15	S25020-32SMT	CAPACITOR,SMD,CERAMIC,10MF,6.3V,20%,,X5R,S0805
C40, C42, C45, C46, C47, C48, C50, C51, C52, C53, C57, C91, C93, C94, C95, C96, C97, C98, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C111, C112, C113, C114, C130, C133, C141, C142, C143, C144, C145, C146, C147, C148, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C177, C178, C179, C182, C186, C187, C189, C190, C191, C193, C195, C196, C197, C198, C200, C201, C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213, C215, C217, C218, C219, C220, C229, C230, C231, C232, C233, C234, C235, C236, C237, C238, C239, C240, C241, C242, C243, C262, C264, C266, C269, C270, C272, C273, C274, C278, C279, C280, C281, C305, C306, C309, C310, C311, C312, C314, C315, C320, C321, C322, C327, C335, C336, C337, C359, C360, C361, C362, C363, C364, C365, C366, C367	144	S25020-30SMT	CAPACITOR,SMD,CERAMIC,0.22MF,10V,10%,X7R,S0603
C41, C43, C44, C71, C72, C171, C174, C216, C251, C257, C285, C290	12	S25020-24SMT	CAPACITOR,SMD,CERAMIC,1.0MF,25V,10%,,X7R,S1206
C56, C61, C168, C246, C250, C254, C284, C289, C345, C346, C347	11	S25020-10SMT	CAPACITOR,SMD,CERAMIC,4700pF,50V,10%,,X7R,S0805
C73, C181, C184, C263, C265, C316, C317	7	S25020-15SMT	CAPACITOR,SMD,CERAMIC,22PF,50V,5%,COG,S0805
C77, C132, C296, C299, C303	5	S25020-13SMT	CAPACITOR,SMD,CERAMIC,150pF,100V,5%,COG,S0805
C80	1	S25020-41SMT	CAPACITOR,SMD,CERAMIC,560pF,50V,5%,COG,S0805
C110, C255, C287, C292, C325	5	S25020-29SMT	CAPACITOR,SMD,CERAMIC,10MF,25V,20%,X5R,S1210
C120, C129, C247, C294, C307, C313, C323, C324	8	S25020-33SMT	CAPACITOR,SMD,CERAMIC,10MF,10V,20%,X5R,S1206
C170, C258	2	S25020-38SMT	CAPACITOR,SMD,CERAMIC,100MF,6.3V,20%,X5R,S1206
C172, C221, C222, C226, C253, C260, C349	7	S25020-22SMT	CAPACITOR,SMD,CERAMIC,0.01MF,200V,20%,X7R,S1206
C173, C259, C338, C339, C340	5	S25020-14SMT	CAPACITOR,SMD,CERAMIC,330pF,100V,5%,COG,S0805
C224, C225	2	S25020-31SMT	CAPACITOR,SMD,CERAMIC,270pF,100V,5%,COG,S0805
C245, C248	2	S25020-8SMT	CAPACITOR,SMD,CERAMIC,0.056MF,50V,10%,,X7R,S0805
C252	1	S25020-25SMT	CAPACITOR,SMD,CERAMIC,4.7MF,16V,10%,,X7R,S1210
C295	1	S25020-6SMT	CAPACITOR,SMD,CERAMIC,4700pF,50V,5%,COG,S1206
C297	1	S25020-12SMT	CAPACITOR,SMD,CERAMIC,100pF,100V,5%,COG,S0805
D1, D2, D3, D4, D5, D6, D8, D38, D39, D40, D41, D48, D53	13	S25040-5SMT	DIODE,SMD,DUAL,0.200A,70V,UFR
D7, D9, D10, D11, D37, D44, D45, D46, D47, D54	10	S25040-2SMT	DIODE,SMD,1A,400V,DO-214BA/AC
D16, D17, D22, D23, D50	5	S25040-6SMT	DIODE,SMD,DUAL,0.200A,70V,UDR,CC,,SOT-23
D19, D49, D52	3	S25049-4SMT	DIODE,SMD,SCHOTTKY,DUAL,0.200A,30V,SOT-23
D30	1	T12705-63	DIODE,SCHOTTKY,TO220,8A,100V,MBR10H100
D35	1	S25049-3SMT	DIODE,SMD,SCHOTTKY,3A,40V,CASE 403-3
D42	1	S25040-4SMT	DIODE,SMD,DUAL,0.200A,70V,UFR
D43, D55, D56, D57, D58	5	S25040-11SMT	DIODE,SMD,1A,600V,S403A,ULTRA-FAST RECOVERY
DZ1, DZ2, DZ3, DZ4, DZ5, DZ6, DZ7, DZ8, DZ21	9	S25046-1SMT	ZENER DIODE,SMD,0.5W,5.1V, 5%,SOD123
DZ9, DZ10, DZ11, DZ12, DZ31, DZ32	6	S25044-9SMT	ZENER DIODE,SMD,3W,6.2V,5%, SMB
DZ23	1	S25044-7SMT	ZENER DIODE,SMD,3W,.56V,5%, SMB
DZ24	1	S25044-12SMT	ZENER DIODE,SMD,3W,3.3V,5%, SMB
DZ26, DZ27, DZ28, DZ29, DZ30	5	S25046-3SMT	ZENER DIODE,SMD,0.5W,.18V, 5%,SOD123
J2, J5, J11	3	S24020-4	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
J3	1	S18248-10	CONNECTOR,MOLEX,MINI,PCB,10-PIN
J4	1	S24020-10	CONNECTOR,MOLEX,MINI,PCB,10-PIN,TIN
N.E.3 J6, J7	2	S24020-16	CONNECTOR,MOLEX,MINI,PCB,16-PIN,TIN
J8	1	S24020-8	CONNECTOR,MOLEX,MINI,PCB,8-PIN,TIN
J9, J13	2	S24020-6	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
J12	1	S24020-12	CONNECTOR,MOLEX,MINI,PCB,12-PIN,TIN
N.E.4 J15	1	S25104-1	CONNECTOR,MODULAR,HIGH-SPEED,VERTICAL,INTERNAL-SHIELD,8/8
L1, L2, L4, L6, L7, L8, L9, L13	8	S25083-6SMT	CHOKE,SMD,RF,FERRITE_BEAD,600 OHMS
L5, L10	2	S25083-8SMT	CHOKE,SMD,POWER,27UH,10%,1.75A
L11, L12	2	S25083-7SMT	CHOKE,SMD,POWER,18UH,20%,3.9A,LS127-180-RM
L14	1	S25083-4SMT	CHOKE,SMD,POWER,10UH,10%,1.02A,
LED1, LED3, LED4, LED5, LED6, LED7, LED8, LED9, LED10	9	S25080-2SMT	LED,SMD,GREEN,CLEAR,S1206
LED2	1	S25080-1SMT	LED,SMD,RED,CLEAR,S1206
OC11, OC12	2	S15000-36SMT	OPTOCOUPLER,SMD,TTL-OUT,DUAL,HIGH-SPEED
OC15	1	S15000-28SMT	OPTOCOUPLER,SMD,TTL-OUT,HI-SPD,HI-CMR
OC16, OC17, OC18	3	S15000-35SMT	OPTOCOUPLER,SMD,3.3V,HIGH-SPEED,HCPL060L,SO8
OC19, OC110	2	S15000-32SMT	OPTOCOUPLER,SMD,CMOS,HIGH SPEED,HIGH CMR,SO-8(SS)
OC112	1	S15000-34SMT	IC,SMD,OPTOCOUPLER,HMA124
Q1, Q3, Q6, Q14, Q31	5	S25051-7SMT	TRANSISTOR,SMD,NMF,SO-8,3A,,50V
Q10, Q11, Q18, Q19, Q24, Q25, Q28, Q29	8	S25050-2SMT	TRANSISTOR,SMD,PNP,SOT23,0.5A, 40V,MMBT4403LT1
Q16, Q20, Q22, Q23	4	S25051-1SMT	TRANSISTOR,SMD,NMF,7.3A,30V,SO-8
Q21	1	S18395-55	HEAT SINK ASSEMBLY,T12704-110 & S20590-6 (SS)
R1, R206, R207, R448	4	S25012-4751SMT	RESISTOR,SMD,METAL FILM,1/16W,4.75K,1%,S0603
R2, R428, R564, R655, R566, R567, R568, R598, R599, R600, R601, R602, R803	13	S25012-1301SMT	RESISTOR,SMD,METAL FILM,1/16W,1.30K,1%,S0603
R3, R476, R477	3	S25003-2000SMT	RESISTOR,SMD,1W,200OHMS,1%
R4	1	S25003-1210SMT	RESISTOR,SMD,1W,121OHMS,1%
R6, R12, R15, R21, R24, R510	6	S25013-1SMT	RESISTOR,ARRAY,SMD,MF,1/16W,,22OHM,8-PIN
R30, R33, R61, R65, R124, R125, R196, R210, R302, R307, R335, R354, R407, R432, R439, R529, R530, R586, R687	19	S25012-1002SMT	RESISTOR,SMD,METAL FILM,1/16W,10.0K,1%,S0603
R31, R38, R62, R64, R150, R312	6	S25012-1503SMT	RESISTOR,SMD,METAL FILM,1/16W,150K,1%,S0603
R32, R36, R52, R55, R152, R158, R172, R174, R175, R178, R290, R293, R299, R303, R305, R309, R433, R453	18	S25012-1003SMT	RESISTOR,SMD,METAL FILM,1/16W,100K,1%,S0603
R34, R313, R378, R379, R380, R382, R385, R387, R429, R436, R464, R467, R470, R473, R594, R595, R609, R610, R611	19	S25012-1000SMT	RESISTOR,SMD,METAL FILM,1/16W,100OHMS,1%,S0603
R35, R71, R89, R92, R94, R106, R107, R110, R192, R211, R213, R214, R216, R218, R219, R220, R221, R222, R223, R224, R225, R227, R230, R231, R232, R233, R234, R238, R239, R321, R322, R343, R348, R349, R350, R352, R353, R355, R375, R376, R377, R383, R386, R389, R426, R475, R496, R497, R498, R499, R500, R501, R513, R514, R515, R516, R517, R518, R519, R520, R521, R522, R523, R524, R525, R527, R569, R606, R607, R608, R613	71	S25012-3321SMT	RESISTOR,SMD,METAL FILM,1/16W,3.32K,1%,S0603
R39, R44, R45, R48, R49, R50, R51, R53	8	S25001-5622SMT	RESISTOR,SMD,56.2K,1/4W,1206,1%,,TR
R41, R43, R47, R54	4	S25000-4751SMT	RESISTOR,SMD,METAL FILM,1/10W,4.75K,1%,S0805
R42, R162	2	S25012-1004SMT	RESISTOR,SMD,METAL FILM,1/16W,1.00M,1%,S0603
R46, R167	2	S25012-6191SMT	RESISTOR,SMD,METAL FILM,1/16W,6.19K,1%,S0603
R56, R203, R440	3	S25012-2001SMT	RESISTOR,SMD,METAL FILM,1/16W,2.00K,1%,S0603
R57, R58, R336, R406	4	S25001-1000SMT	RESISTOR,SMD,100OHMS,1/4W,1206,1%,TR
R59, R200	2	S25012-3322SMT	RESISTOR,SMD,METAL FILM,1/16W,33.2K,1%,S0603
R60, R63, R235, R236, R237, R248, R414, R418	8	S25012-6811SMT	RESISTOR,SMD,METAL FILM,1/16W,6.81K,1%,S0603
R73	1	S25000-6812SMT	RESISTOR,SMD,METAL FILM,1/10W,68.1K,1%,S0805
R75	1	S25000-1003SMT	RESISTOR,SMD,METAL FILM,1/10W,100K,1%,S0805
R78	1	S25000-2212SMT	RESISTOR,SMD,METAL FILM,1/10W,22.1K,1%,S0805
R81, R83, R85, R93, R96, R98, R100, R260, R266, R479, R584, R585, R591	13	S25001-2210SMT	RESISTOR,SMD,221OHMS,1/4W,1206,1%,TR
R84, R86, R87, R88, R90, R102, R128, R132, R592	9	S25001-4750SMT	RESISTOR,SMD,475OHMS,1/4W,1206,1%,TR
R91, R95	2	S25001-1211SMT	RESISTOR,SMD,1.21K,1/4W,1206,1%,TR
R97, R99, R183	3	S25001-2211SMT	RESISTOR,SMD,2.21K,1/4W,1206,1%,TR
R101, R191, R288, R431, R438	5	S25012-4750SMT	RESISTOR,SMD,METAL FILM,1/16W,475OHMS,1%,S0603
R103	1	S25000-2672SMT	RESISTOR,SMD,METAL FILM,1/10W,26.7K,1%,S0805
R108, R109, R115, R116, R120, R127, R204, R319, R329, R332, R333, R338, R367, R368, R369, R370, R371, R410, R413, R417, R483, R502, R503, R504, R505, R506, R507, R508, R509, R526, R557, R577, R578, R579, R580, R581, R582, R583	38	S25012-1001SMT	RESISTOR,SMD,METAL FILM,1/16W,1.00K,1%,S0603
R111, R112, R117, R118, R121, R209, R388, R427, R434	9	S25012-2212SMT	RESISTOR,SMD,METAL FILM,1/16W,22.1K,1%,S0603
R128	1	S25000-4753SMT	RESISTOR,SMD,METAL FILM,1/10W,475K,1%,S0805
R129	1	S25000-2211SMT	RESISTOR,SMD,METAL FILM,1/10W,2.21K,1%,S0805
R130, R136	2	S25001-47R5SMT	RESISTOR,SMD,47.5OHMS,1/4W,1206,1%,TR
R131	1	S25001-4751SMT	RESISTOR,SMD,4.75K,1/4W,1206,1%,TR
R133, R134, R138, R139, R140, R144	6	S25000-1000SMT	RESISTOR,SMD,METAL FILM,1/10W,100OHMS,1%,S0805
R135, R137, R141, R142, R143, R145	6	S25001-3320SMT	RESISTOR,SMD,332OHMS,1/4W,1206,1%,TR
R147, R201, R294, R320, R323	5	S25000-5620SMT	RESISTOR,SMD,METAL FILM,1/10W,562OHMS,1%,S0805
R155	1	S25000-3741SMT	RESISTOR,SMD,METAL FILM,1/10W,3.74K,1%,S0805
R156, R291, R571, R572, R573, R574, R575, R576	8	S25001-26R7SMT	RESISTOR,SMD,26.7OHMS,1/4W,1206,1%,TR
R159, R160, R289, R800	4	S25000-3921SMT	RESISTOR,SMD,METAL FILM,1/10W,3.92K,1%,S0805
R164, R165, R171, R173, R176, R177, R180, R181	8	S25007-1002SMT	RESISTOR,SMD,PREC,MF,1/10W,10.0K,0.1%,S0805
R168, R212, R443, R444	4	S25001-1501SMT	RESISTOR,SMD,1.5K,1/4W,1206,1%,TR
R169, R170, R208, R345, R441, R570	6	S25012-2671SMT	RESISTOR,SMD,METAL FILM,1/16W,2.67K,1%,S0603
R179, R182	2	S25001-2000SMT	RESISTOR,SMD,200OHMS,1/4W,1206,1%,TR
R189	1	S25012-1502SMT	RESISTOR,SMD,METAL FILM,1/16W,15.0K,1%,S0603
R215	1	S25012-2000SMT	RESISTOR,SMD,METAL FILM,1/16W,200OHMS,1%,S0603
R240, R241, R243, R252, R411, R412, R419	7	S25000-2000SMT	RESISTOR,SMD,METAL FILM,1/10W,200OHMS,1%,S0805
R258, R262, R263, R264, R478, R480	6	S25001-1500SMT	RESISTOR,SMD,150OHMS,1/4W,1206,1%,TR
R298, R449	2	S25012-5111SMT	RESISTOR,SMD,METAL FILM,1/16W,5.11K,1%,S0603
R310	1	S25000-6811SMT	RESISTOR,SMD,METAL FILM,1/10W,6.81K,1%,S0805
R324	1	S25000-1501SMT	RESISTOR,SMD,METAL FILM,1/10W,1.50K,1%,S0805
R325, R326, R327, R328, R481	5	S25000-4750SMT	RESISTOR,SMD,METAL FILM,1/10W,475OHMS,1%,S0805
R334, R390, R392, R393, R394, R405	6	S25003-15R0SMT	RESISTOR,SMD,1W,15.0OHMS,1%
R337, R408	2	S25000-5621SMT	RESISTOR,SMD,METAL FILM,1/10W,5.62K,1%,S0805
R340	1	S25000-1372SMT	RESISTOR,SMD,METAL FILM,1/10W,13.7K,1%,S0805
R344	1	S25000-9091SMT	RESISTOR,SMD,METAL FILM,1/10W,9.09K,1%,S0805
R346, R347, R455, R456	4	S25000-10R0SMT	RESISTOR,SMD,METAL FILM,1/10W,10.0OHMS,1%,S0805
R381, R384	2	S25000-47R5SMT	RESISTOR,SMD,METAL FILM,1/10W,47.5OHMS,1%,S0805
R391, R465, R468, R471, R474	5	S25001-2671SMT	RESISTOR,SMD,2.67K,1/4W,1206,1%,TR
R395, R397, R401, R402	4	S25001-4752SMT	RESISTOR,SMD,47.5K,1/4W,1206,1%,TR
R396, R398	2	S25001-3321SMT	RESISTOR,SMD,3.32K,1/4W,1206,1%,TR
R400	1	S25000-3321SMT	RESISTOR,SMD,METAL FILM,1/10W,3.32K,1%,S0805
R403, R404, R459, R461	4	S25003-0R10SMT	RESISTOR,SMD,1W,0.1OHMS,1%
R409	1	S25000-2802SMT	RESISTOR,SMD,METAL FILM,1/10W,28.0K,1%,S0805
R415	1	S25000-3570SMT	RESISTOR,SMD,METAL FILM,1/10W,357OHMS,1%,S0805
R416	1	S25000-2210SMT	RESISTOR,SMD,METAL FILM,1/10W,221OHMS,1%,S0805
R420, R445	2	S25000-5110SMT	RESISTOR,SMD,METAL FILM,1/10W,511OHMS,1%,S0805
R421, R447, R454	3	S25012-1501SMT	RESISTOR,SMD,METAL FILM,1/16W,1.50K,1%,S0603
R430, R437	2	S25001-15R0SMT	RESISTOR,SMD,15.0OHMS,1/4W,1206,1%,TR
R435, R451	2	S25012-2211SMT	RESISTOR,SMD,METAL FILM,1/16W,2.21K,1%,S0603
R442, R446	2	S25001-1821SMT	RESISTOR,SMD,1.82K,1/4W,1206,1%,TR
R450	1	S25000-2430SMT	RESISTOR,SMD,METAL FILM,1/10W,243OHMS,1%,S0805
R452	1	S25012-3162SMT	RESISTOR,SMD,METAL FILM,1/16W,31.6K,1%,S0603
R457, R458, R460, R462	4	S25003-20R0SMT	RESISTOR,SMD,1W,20.0OHMS,1%
R463, R466, R469, R472	4	S25012-6810SMT	RESISTOR,SMD,METAL FILM,1/16W,681OHMS,1%,S0603
R485	1	S25000-7500SMT	RESISTOR,SMD,METAL FILM,1/10W,750OHMS,1%,S0805
N.G.3, N.E.2 S1, S2, S3	3	S19869-43	SWITCH, SLIDE, 3PSTX1
T1	1	S25067-13SMT	IC,SMD,TRANSFORMER MODULE,10/100BASE-T LAN MAGNETICS
T2	1	S20375-24	TRANSFORMER,PWM,FLYBACK,ICE-1S13
X1	1	S25065-12SMT	IC,SMD,CMOS,BUFFER,SINGLE-BUS(SS)
X4, X92, X100	3	S25072-2SMT	IC,SMD,ACT,BUFFER,OCTAL,3-STATE,TSSOP-20(SS)
X5	1	M15102-4SMT	IC,SMD,ARRAY,DRIVER,PERIPHERAL,NPN,DARLINGTON
X8	1	S25068-24SMT	IC,SMD,REGULATOR,1.2V-5V,TPS7250(SS)
X9, X10, X12, X26, X38, X85	6	S15128-28SMT	IC,OP-AMP,SMT,QUAD,HIGH-PERF,33074ADT
X11	1	S25067-2SMT	IC,SMD,CMOS,MULTILPLEXER,DIFF,4-1 CHANNEL
X13	1	S24841-3	IC,MODULE,CONVERTER,DC-DC,5V/0.15A-OUT,5.25V-IN
X14, X15, X67	3	S20353-4SMT	IC,SMD,CMOS,XCVR,EIA485(SS)
N.A.2 X18	1	S25070-22SMT	IC,SMD,CMOS,CPLD,XC9572XL,BGA-48(SS)
X19	1	S25070-20SMT	IC,SMD,FPGA,EP1C6F256I8,256-PIN,BGA(SS)
X20	1	S25073-5SMT	IC,SMD,CMOS,DSP,32-BIT,179-PIN BGA,TMS320F2812(SS)
X21, X36	2	S25057-5SMT	POT,SMD,DIGITAL,,20K,QUAD,TSSOP-24
X22, X34, X74	3	S15128-11SMT	IC,SMD,COMPARATOR,QUAD,2901D
X24	1	S15018-11SMT	IC,SMD,CMOS,SWITCH,ANALOG,QUAD,201(SS)
X25	1	S15128-13SMT	IC,SMD,OP-AMP,SINGLE,PRECISION,OP-27GS8,SOIC-8
X28	1	S25069-22SMT	IC,SMD,CMOS,EEPROM,SERIAL,512K,2.7V,SOIC-8MI(SS)
X29	1	S25069-21SMT	IC,SMD,CMOS,NVRAM,256MB,SOIC-14(SS)
N.A.3 X32	1	S25069-19SMT	IC,SMD,3V,MEMORY, FLASH,128Mb,BGA64,(SS)
X33, X62, X72, X73	4	S25068-23SMT	IC,SMD,VOLTAGE REGULATOR,4.5V-20V,TPS54350
X35, X46, X51, X53	4	S25069-18SMT	IC,SMD,CMOS,SDRAM,64MB,TSOP54(SS)
X39, X40, X65, X79	4	S25065-6SMT	IC,SMD,CMOS,INVERTER,SCHMITT,DUAL(SS)
X41, X71	2	S15128-10SMT	IC,SMD,VOLTAGE REF,ADJ, PRECISION,431I,SOIC-8
X47	1	S25073-6SMT	IC,SMD,CMOS,MCU,32-BIT,BGA,388-PIN(SS)
X48	1	S25070-21SMT	IC,SMD,CMOS,TRANSCEIVER,ETHERNET,P8GA-64(SS)
N.A.4 X49	1	S25070-18SMT	IC,SMD,EPROM,CLOCK-GENERATOR,CY2292(SS)
X50	1	S25073-10SMT	IC,SMD,CMOS,DSP,BGA,288-PIN,TMS320C6413(SS)
X52	1	S25068-10SMT	IC,SMD,VOLTAGE REGULATOR,FIXED,3-TERMINAL,0.5A,-15V
X54	1	S15128-5SMT	IC,VOLT REG,SMD,FIXED,3-T,(+),1A,5V
X57, X59, X70	3	S25068-16SMT	IC,SMD,VOLT REGULATOR,ADJ,0.8A,LM1117(SS)
X58, X60, X61	3	S25065-5SMT	IC,SMD,CMOS,INVERTER,SCHMITT,SINGLE(SS)
X63	1	S25068-25SMT	IC,SMD,VOLTAGE-REFERENCE,1.2V,0.2%,,SOT-23(SS)
X64	1	S25068-4SMT	IC,SMD,TRANSCEIVER,CAN,UC5350,SOIC-8
X68	1	S25065-4SMT	IC,SMD,CMOS,TRANSCEIVER,3V-5.5V,MAX3221,(SS)
X69	1	M15458-4SMT	IC,SMD,PWM-CONTROLLER,I-MODE,2842A, SOIC-8
X75	1	S25065-7SMT	IC,SMD,CMOS,INVERTER,SINGLE(SS)
X77, X78	2	S25072-3SMT	IC,SMD,ACT,BUFFER,OCT,3-STATE,3.3V,TSSOP-20(SS)
X81, X82, X83	3	S20353-7SMT	IC,SMD,CMOS,XCVR,ADM1485(SS)
X93, X94, X95, X96, X97, X98, X99	7	S25065-10SMT	IC,SMD,CMOS,AND,SINGLE,2-INPUT(SS)
Y1	1	S25082-6SMT	CRYSTAL,SMD,32.768kHZ
Y2, Y3	2	S25082-7SMT	CRYSTAL,SMD, 12MHZ

UNLESS OTHERWISE SPECIFIED:
CAPACITANCE = MFD/VOLTS
INDUCTANCE = HENRIES
RESISTANCE = OHMS

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

CONTROL: CLEVELAND	SCALE: 2:1 IF PRINTED IR A1 SIZE	EQUIPMENT TYPE: POWER SOURCES	PAGE 3 OF 3
DRAWN BY: fivory		SUBJECT: DIGITAL CONTROL P.C. BD. ASSEMBLY	DOCUMENT NUMBER: G6682-1 / DOCUMENT REVISION: F
ENGINEER: EF	UNITS: INCH	MATERIAL DISPOSITION: UF / APPROVAL DATE: 8/24/2012	PROJECT NUMBER: CRM44934 / REFERENCE: G4800-3
APPROVED: BS			

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

LINCOLN ELECTRIC

PFC CONTROL BOARD ASSEMBLY (G6860-1 PG 1)

G6860-1	ENGINEERING CONTROLLED MANUFACTURER: Yes

CHANGE DETAIL: ADDED TABLE AND NOTES PER TABLE. REVISED NOTE N.E.1

REVISION CONTROL

G6860-1D3

PART NO. IDENTIFICATION CODE

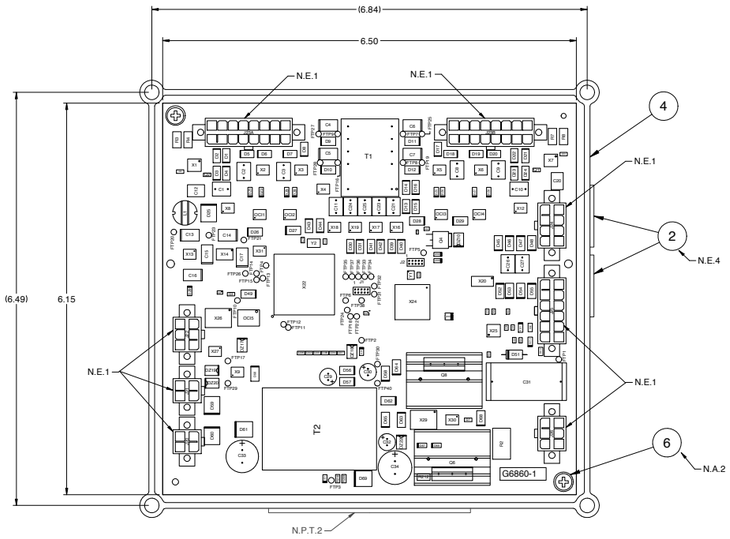
TEST PER E4734-IC
POT WITH E2527

SCHEMATIC REFERENCE: G6859-1D3

MAKE DETAIL

MANUFACTURE PER E1911-RoHS
BUY BLANK COMPLETE
(4 BOARDS PER PANEL)

4 LAYER BOARD BLANK PANEL
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION.



COMPONENT SIDE

SCALE = 1:1

ASSEMBLY NOTES:

N.A.2 SECURE P.C. BOARD ASSEMBLY IN PLACE WITH **ITEM 6** (2 PLACES). TIGHTEN UNTIL SCREW HEAD TOUCHES BOARD AND THEN BACK OFF 1/2 TURN.

N.A.3 PROGRAM X24 WITH **ITEM 7** (AFTER ASSEMBLY).

N.A.4 PROGRAM X22 WITH **ITEM 8** (AFTER ASSEMBLY).

ENVIRONMENTAL NOTES:

N.E.1 PRIOR TO POTTING, CONNECTORS MUST BE GREASED WITH **ITEM 5**.

N.E.3 DISPENSE POTTING MATERIAL TO A MINIMUM DEPTH SUCH THAT ALL COMPONENT LEADS ARE COVERED.

N.E.4 PLACE BAR CODED ASSEMBLY NUMBER AND BAR CODED SERIAL NUMBER IDENTIFICATION IN AREA SHOWN.

GENERAL NOTES:

N.G.1. CAUTION: THIS ASSEMBLY IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING. THIS ASSEMBLY IS NO LONGER ESD SENSITIVE AFTER POTTING.

NOTES PER TABLE:

N.P.T.1. MAKE G6860-[LATEST VERSION]HPT BY TESTING PER SPECIAL TEST INSTRUCTIONS PER E4734-IC.

N.P.T.2. PRINT "FOR PARTS ORDERS ONLY" ON E3768-4 LABEL AND PLACE ON SIDE OF POTTING TRAY AS SHOWN.

PART NO.	TABLED NOTES
G6860-1D3HPT	N.P.T.1., N.P.T.2.
G6860-1	

	ITEM	QTY	PART NUMBER	DESCRIPTION
	1	1	G6860-D	PC BOARD BLANK
N.E.4	2	2	E3768-4	LABEL 0.25 X 2.50
N.E.3	3	224 g.	E2527	EPOXY ENCAPSULATING RESIN
	4	1	M19436-24	POTTING TRAY
N.E.1	5	7 g.	E2543	ELECTRICAL INSULATING COMPOUND
N.A.2	6	2	S8025-80	#6 SELF TAPPING SCREW
N.A.3	7	1	Y00562-02	SOFTWARE
N.A.4	8	1	Y01623-03	SOFTWARE

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
C1, C2, C3, C8, C9, C10, C11, C21, C23, C24, C25, C26, C27	13	S13490-173	CAPACITOR,PEMF,1.0,63V,10%
C4, C5, C6, C7	4	S25024-9SMT	CAPACITOR,SMD,TANTALUM,100MF,20V,20%,S7343
C12, C20	2	S25020-1SMT	CAPACITOR,SMD,CERAMIC,0.022MF,50V,1%,C0G,S1825
C13, C15, C17	3	S25026-2SMT	CAPACITOR,SMD,TANTALUM,100MF,16V,20%,S7343,LOW-ESR,SURGE
C14, C16	2	S25024-10SMT	CAPACITOR,SMD,TANTALUM,22MF,25V,10%,S7343
C18, C28, C36, C37, C38, C42, C43, C44, C45, C46, C47, C48, C54, C55, C56, C57, C58, C59, C62, C63, C72, C76, C77, C78, C79, C82, C83, C84, C89, C90, C91, C92, C93, C94, C100, C119, C120, C125, C128, C131, C132, C136, C141, C142, C143, C145, C146, C147, C149	49	S25020-3SMT	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,X7R,S0805
C19, C35, C150	3	S25020-15SMT	CAPACITOR,SMD,CERAMIC,22PF,50V,5%,C0G,S0805
C22, C41, C49, C73, C81, C121, C138, C139	8	S25020-2SMT	CAPACITOR,SMD,CERAMIC,0.022MF,50V,10%,X7R,S0805
C29, C30, C32	3	S13490-197	CAPACITOR,ALEL,82.35V,20%,LOW-ESR
C31	1	S20500-1	CAPACITOR,PPMF,0.1,1000V,10%,BOX
C33	1	S13490-230	CAPACITOR,ALEL,220,63V,20%
C34	1	S13490-198	CAPACITOR,ALEL,1000,35V,20%,LOW-ESR
C39, C66, C74, C75	4	S25020-27SMT	CAPACITOR,SMD,CER,0.1MF,50V,-20%+80%,Z5U,S0805
C40, C50, C64, C65, C67, C68, C69, C70, C71, C122, C151	11	S25020-6SMT	CAPACITOR,SMD,CERAMIC,4700pF,50V,5%,C0G,S1206
C51, C53, C60, C61, C148	5	S25020-14SMT	CAPACITOR,SMD,CERAMIC,330pF,100V,5%,C0G,S0805
C52	1	S25020-22SMT	CAPACITOR,SMD,CERAMIC,0.01MF,200V,20%,X7R,S1206
C80, C101, C130	3	S25020-12SMT	CAPACITOR,SMD,CERAMIC,100pF,100V,5%,C0G,S0805
C85, C86, C87, C88, C95, C96, C97, C98, C99, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C113, C114, C115, C116, C117, C118, C124, C126, C133, C135, C155, C156, C157, C158	33	S25020-30SMT	CAPACITOR,SMD,CERAMIC,0.22MF,10V,10%,X7R,S0603
C123, C127	2	S25020-33SMT	CAPACITOR,SMD,CERAMIC,10MF,10V,20%,X5R,S1206
C129	1	S25024-8SMT	CAPACITOR,SMD,TANTALUM,10MF,16V,10%,S6032
C137, C140, C144	3	S25020-13SMT	CAPACITOR,SMD,CERAMIC,150pF,100V,5%,C0G,S0805
C152, C153	2	S25020-24SMT	CAPACITOR,SMD,CERAMIC,1.0MF,25V,10%,,X7R,S1206
C154	1	S25020-35SMT	CAPACITOR,SMD,CERAMIC,680pF,50V,5%,C0G,S0805
C159, C160, C161	3	S25020-10SMT	CAPACITOR,SMD,CERAMIC,4700pF,50V,10%,XR7,S0805
C162, C163	2	S25020-43SMT	CAPACITOR,SMD,CERAMIC,2.2MF,10V,10%,X7R,S0805
D1, D2, D3, D4, D5, D6, D7, D8, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D30, D31, D39, D40, D41, D42, D43, D44	28	S25049-2SMT	DIODE,SMD,SCHOTTKY,1A,30V,SMA
D9, D10, D11, D12, D26, D27, D28, D29, D45, D46, D47, D48, D49, D50, D52, D53, D54, D55, D56, D57, D58, D65, D68	23	S25040-1SMT	DIODE,SMD,1A,400V,FAST RECOVERY,DO-214BA
D25	1	S25049-3SMT	DIODE,SMD,SCHOTTKY,3A,40V,CASE 403-3
D32, D66, D67	3	S25049-1SMT	DIODE,SMD,SCHOTTKY,0.5A,30V,SOD-123
D33, D34, D35, D36, D37, D38	6	S25049-4SMT	DIODE,SMD,SCHOTTKY,DUAL,0.200A,30V,SOT-23
D51	1	T12705-58	DIODE,D204AL,1A,1500V
D59, D60, D61, D69	4	S25040-8SMT	DIODE,SMD,3A,600V,D0-214AB,ULTRA-FAST RECOVERY
D62, D63, D64	3	S25040-18SMT	DIODE,SMD,1A,1300V,DO-214BA
DZ1, DZ2, DZ3, DZ4, DZ5, DZ6, DZ7, DZ8, DZ9	9	S25046-1SMT	ZENER DIODE,SMD,0.5W,5.1V, 5%,SOD123
DZ10, DZ17, DZ18, DZ22	4	S25044-5SMT	ZENER DIODE,SMD,3W,18V,5%, SMB
DZ11, DZ12	2	S25046-4SMT	ZENER DIODE,SMD,0.5W,12V,5%,SOD-123
DZ19, DZ20	2	S25044-9SMT	ZENER DIODE,SMD,3W,6.2V,5%, SMB
J1, J2	2	S26770-10SMT	CONNECTOR,SMD,SOCKET,LOW-PROFILE,10-PIN
N.E.1 J20, J21	2	S24020-4	CONNECTOR,MOLEX, MINI-PCB,4-PIN,TIN
N.E.1 J22, J26	2	S24020-6	CONNECTOR,MOLEX, MINI-PCB,6-PIN,TIN
N.E.1 J24	1	S24020-8	CONNECTOR,MOLEX, MINI-PCB,8-PIN,TIN
N.E.1 J25	1	S24020-12	CONNECTOR,MOLEX, MINI-PCB,12-PIN,TIN
N.E.1 J23A, J23B	2	S24020-16	CONNECTOR,MOLEX, MINI-PCB,16-PIN,TIN
L1	1	S25083-3SMT	CHOKE,SMD,POWER,47UH,10%,1.25A,
LED1	1	S25080-4SMT	LED,SMD,BI-COLOR,RED/GREEN,HSMF-C655
LED2, LED5	2	S25080-1SMT	LED,SMD,RED,CLEAR,S1206
LED3, LED4	2	S25080-2SMT	LED,SMD,GREEN,CLEAR,S1206
OCI1, OCI2, OCI3, OCI4	4	S15000-28SMT	OPTOCOUPLER,SMD,TTL-OUT,HI-SPD,HI-CMR
OCI5	1	S15000-22SMT	OPTOCOUPLER,SMD,PHOTO-TRANSISTOR,70V,CNY173SSD
Q1, Q2, Q3, Q9, Q10	5	S25051-4SMT	TRANSISTOR,SMD,NMF,SOT-23,0.115A,60V,700ZLTI(SS)
Q4	1	S25051-6SMT	TRANSISTOR,SMD,NMF,DPAK,TO-252,10A,100V(SS)
Q6, Q8	2	S27524	HEAT SINK ASSEMBLY,TI2704-117 & S20590-3 (SS)
Q7	1	S25050-2SMT	TRANSISTOR,SMD,PNP,SOT23,0.5A, 40V,MMBT4403LT1
R1, R10, R19, R21, R22, R24, R35, R36, R37, R41, R42, R43, R51, R52, R58, R59, R65, R66, R67, R69, R82, R83, R85, R89, R113, R114, R137	27	S25012-3321SMT	RESISTOR,SMD,METAL FILM,1/16W,3.32K,1%,S0603
R2	1	S25014-0R10SMT	RESISTOR,SMD,METAL-STRIP,5W,0.1OHM,1%
R3, R4, R7, R8	4	S25003-1210SMT	RESISTOR,SMD,1W,121OHMS,1%
R5, R6, R13, R17	4	S25001-1210SMT	RESISTOR,SMD,121OHMS,1/4W,1206,1%,TR
R9, R74, R117, R151	4	S25012-1001SMT	RESISTOR,SMD,METAL FILM,1/16W,1.00K,1%,S0603

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
R11, R12, R18, R20, R25, R26, R38, R39, R53, R55, R61, R62, R63, R64, R87, R88, R109	17	S25012-4752SMT	RESISTOR,SMD,METAL FILM,1/16W,47.5K,1%,S0603
R14, R16, R27, R44, R92, R110	6	S25001-5110SMT	RESISTOR,SMD,511OHMS,1/4W,1206,1%,TR
R15, R30, R47, R50, R222	5	S25001-1501SMT	RESISTOR,SMD,1.5K,1/4W,1206,1%,TR
R23, R54	2	S25001-2210SMT	RESISTOR,SMD,221OHMS,1/4W,1206,1%,TR
R28, R31, R45, R48	4	S25001-1002SMT	RESISTOR,SMD,10K,1/4W,1206,1%,TR
R29, R32, R46, R49, R138, R139, R140, R141	8	S25001-4750SMT	RESISTOR,SMD,475OHMS,1/4W,1206,1%,TR
R33, R34, R165	3	S25001-1000SMT	RESISTOR,SMD,100OHMS,1/4W,1206,1%,TR
R40, R60	2	S25000-1821SMT	RESISTOR,SMD,METAL FILM,1/10W,1.82K,1%,S0805
R56, R68	2	S25000-1001SMT	RESISTOR,SMD,METAL FILM,1/10W,1.00K,1%,S0805
R57, R84, R86, R91, R119, R134, R154, R169, R170	9	S25000-1002SMT	RESISTOR,SMD,METAL FILM,1/10W,10.0K,1%,S0805
R70, R94, R125, R142	4	S25012-4751SMT	RESISTOR,SMD,METAL FILM,1/16W,4.75K,1%,S0603
R72, R95	2	S25012-2671SMT	RESISTOR,SMD,METAL FILM,1/16W,2.67K,1%,S0603
R73, R96, R111, R112	4	S25000-2431SMT	RESISTOR,SMD,METAL FILM,1/10W,2.43K,1%,S0805
R75, R76, R77, R78, R79, R80, R81, R153, R155, R156, R157, R158, R160, R161	14	S25001-15R0SMT	RESISTOR,SMD,15.0OHMS,1/4W,1206,1%,TR
R90	1	S25000-2212SMT	RESISTOR,SMD,METAL FILM,1/10W,22.1K,1%,S0805
R93, R98, R145, R146	4	S25012-1503SMT	RESISTOR,SMD,METAL FILM,1/16W,150K,1%,S0603
R97, R123, R131, R143, R147	5	S25012-1000SMT	RESISTOR,SMD,METAL FILM,1/16W,100OHMS,1%,S0603
R99, R100, R101, R102, R103, R104, R126, R127	8	S25001-26R7SMT	RESISTOR,SMD,26.7OHMS,1/4W,1206,1%,TR
R105	1	S25000-5622SMT	RESISTOR,SMD,METAL FILM,1/10W,56.2K,1%,S0805
R106, R207, R208	3	S25000-3322SMT	RESISTOR,SMD,METAL FILM,1/10W,33.2K,1%,S0805
R107, R132, R133, R206, R209, R210	6	S25001-2211SMT	RESISTOR,SMD,2.21K,1/4W,1206,1%,TR
R108, R221	2	S25000-2672SMT	RESISTOR,SMD,METAL FILM,1/10W,26.7K,1%,S0805
R115, R116, R252, R253, R254, R255	6	S25012-1002SMT	RESISTOR,SMD,METAL FILM,1/16W,10.0K,1%,S0603
R118, R120, R121, R135	4	S25012-1501SMT	RESISTOR,SMD,METAL FILM,1/16W,1.50K,1%,S0603
R124, R152	2	S25012-1212SMT	RESISTOR,SMD,METAL FILM,1/16W,12.1K,1%,S0603
R128, R159, R162, R163, R164, R202	6	S25001-1503SMT	RESISTOR,SMD,150K,1/4W,1206,1%,TR
R129, R130, R214	3	S25001-1001SMT	RESISTOR,SMD,1K,1/4W,1206,1%,TR
R136	1	S25000-1500SMT	RESISTOR,SMD,METAL FILM,1/10W,150OHMS,1%,S0805
R148, R149	2	S25000-2801SMT	RESISTOR,SMD,METAL FILM,1/10W,2.80K,1%,S0805
R166, R223, R224, R225, R226, R227, R228, R229, R230, R231, R232, R233, R234, R235, R236, R237, R238, R239, R240, R241, R242, R243, R244, R245, R246	25	S25001-2213SMT	RESISTOR,SMD,221K,1/4W,1206,1%,TR
R167, R168, R171, R172	4	S25000-47R5SMT	RESISTOR,SMD,METAL FILM,1/10W,47.5OHMS,1%,S0805
R173, R174, R175, R217	4	S25001-2001SMT	RESISTOR,SMD,2K,1/4W,1206,1%,TR
R176, R211	2	S25000-4751SMT	RESISTOR,SMD,METAL FILM,1/10W,4.75K,1%,S0805
R177	1	S25012-2212SMT	RESISTOR,SMD,METAL FILM,1/16W,22.1K,1%,S0603
R178, R212	2	S25006-10R0SMT	RESISTOR,SMD,METAL FILM,1/2W,10OHMS, 1%, S2010
R185, R189	2	S25012-5111SMT	RESISTOR,SMD,METAL FILM,1/16W,5.11K,1%,S0603
R186, R187	2	S25001-1211SMT	RESISTOR,SMD,1.21K,1/4W,1206,1%,TR
R197, R199, R200, R201	4	S25012-1213SMT	RESISTOR,SMD,METAL FILM,1/16W,121K,1%,S0603
R198, R204	2	S25012-1502SMT	RESISTOR,SMD,METAL FILM,1/16W,15.0K,1%,S0603
R203, R205	2	S25001-1213SMT	RESISTOR,SMD,121K,1/4W,1206,1%,TR
R213	1	S25001-3321SMT	RESISTOR,SMD,3.32K,1/4W,1206,1%,TR
R215	1	S25000-4753SMT	RESISTOR,SMD,METAL FILM,1/10W,475K,1%,S0805
R216, R218	2	S25000-5111SMT	RESISTOR,SMD,METAL FILM,1/10W,5.11K,1%,S0805
R219	1	S25000-3922SMT	RESISTOR,SMD,METAL FILM,1/10W,39.2K,1%,S0805
R220	1	S25000-6811SMT	RESISTOR,SMD,METAL FILM,1/10W,6.81K,1%,S0805
R248, R249, R250, R251	4	S25000-2210SMT	RESISTOR,SMD,METAL FILM,1/10W,221OHMS,1%,S0805
R256, R257, R258, R259	4	S25000-2670SMT	RESISTOR,SMD,METAL FILM,1/10W,267OHMS,1%,S0805
T1	1	S13000-123	TRANSFORMER,GATE-DRIVE,PCB,58P60
T2	1	S20375-40	TRANSFORMER,FLYBACK,AF5175
X1, X7, X25	3	S15128-28SMT	IC,OP-AMP,SMT,QUAD,HIGH-PERF,33074ADT
X2, X3, X5, X6, X16, X17, X18, X19	8	S15018-21SMT	IC,SMD,CMOS,DRIVER,MOSFET,4451, SOIC-8(SS)
X4, X8, X12	3	S25068-40SMT	IC,SMD,DRIVER,DUAL,LOW-SIDE,4424YM,SOIC-8(SS)
X9	1	S25068-6SMT	IC,SMD,VOLT REG,FIXED,3-T,(+),0.1A,5V,SOIC-8
X10	1	S25084-5SMT	TEMPERATURE SENSOR,SMD,TMP20
X13	1	S25068-12SMT	IC,SMD,VOLTAGE REGULATOR,3A,+5V,SO8
X14	1	S25068-39SMT	IC,SMD,VOLTAGE REGULATOR,DUAL OUTPUT,TPS70102
X20	1	S15128-11SMT	IC,SMD,COMPARATOR,QUAD,2901D
X21	1	S25065-5SMT	IC,SMD,CMOS,INVERTER,SCHMITT,SINGLE(SS)
N.A.4 X22	1	S25073-27SMT	IC,SMD,CMOS,DSP,32-BIT,176-PIN POFP,TMS320F28235(SS)
N.A.3 X24	1	S25070-26SMT	IC,SMD,CMOS,CPLD,EPM570T100I5(SS)
X26	1	S25070-35SMT	IC,SMD,CMOS,ISOLATOR,DIGITAL,2201(SS)
X27	1	S20353-4SMT	IC,SMD,CMOS,XCVR,EIA485(SS)
X29	1	S25068-38SMT	IC,SMD,CMOS,DRIVER,MOSFET,2213S,SOIC-16(SS)
X30	1	M15458-15SMT	IC,SMD,PWM-CONTROLLER,I-MODE,28C44D,SOIC-8
X31	1	S25069-17SMT	IC,SMD,CMOS,EEPROM,SERIAL,SPI,16KX8,2.7V,SOIC-8
Y1	1	S25082-9SMT	OSCILLATOR,SMD,20.000MHZ
Y2	1	S25082-11SMT	CRYSTAL,SMD,30MHZ

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

APPLICABLE DRAWING INFORMATION INDEX	
PAGE 1	PRODUCTION DRAWING
PAGE 2	PRODUCTION DRAWING
M23003-26	SLIDE LINE WORK INSTRUCTIONS
M23003-27	PROGRAMMING INSTRUCTIONS

MANUFACTURING TOLERANCES PER 12000
UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .010 in. (± 0.25 mm) ON ALL ANGLES IS ± 0.5 DEGREE. MATERIAL TOLERANCE IT 11 TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL: CLEVELAND	SCALE: SEE ABOVE IF PRINTED @ A1 SIZE	EQUIPMENT TYPE:	POWER WAVE S500		PAGE 1 OF 2		
DRAWN BY: tsado		SUBJECT:	PFC CONTROL PC BOARD ASSEMBLY		DOCUMENT NUMBER: G6860-1	DOCUMENT REVISION: D	
ENGINEER: LLUO	UNITS: INCH	MATERIAL DISPOSITION: UF	APPROVAL DATE: 1/12/2013	PROJECT NUMBER: CRM46440	REFERENCE: -		
APPROVED: GWM							

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

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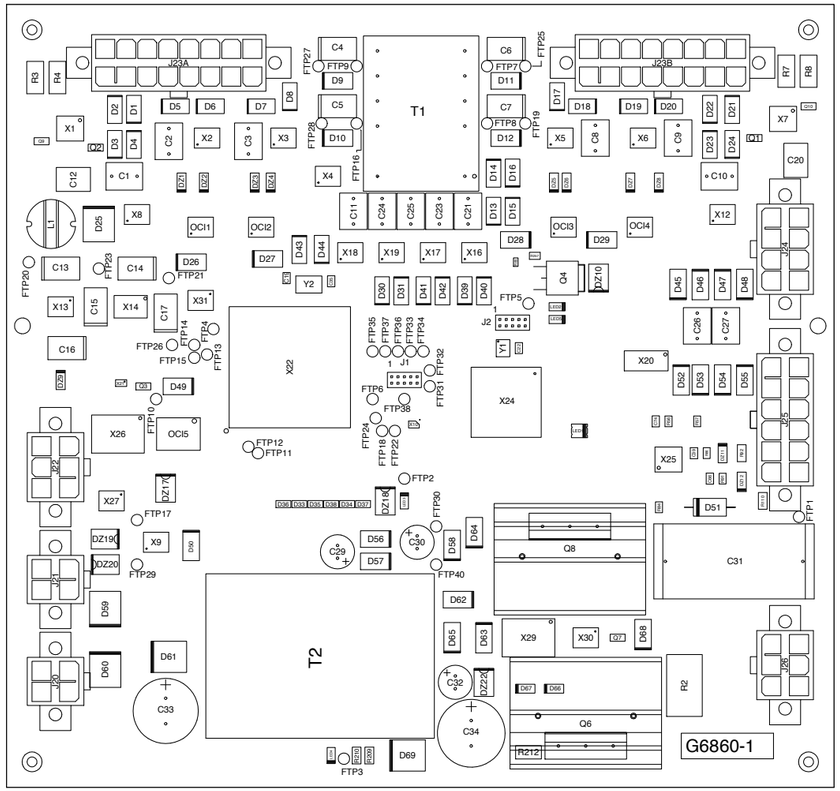
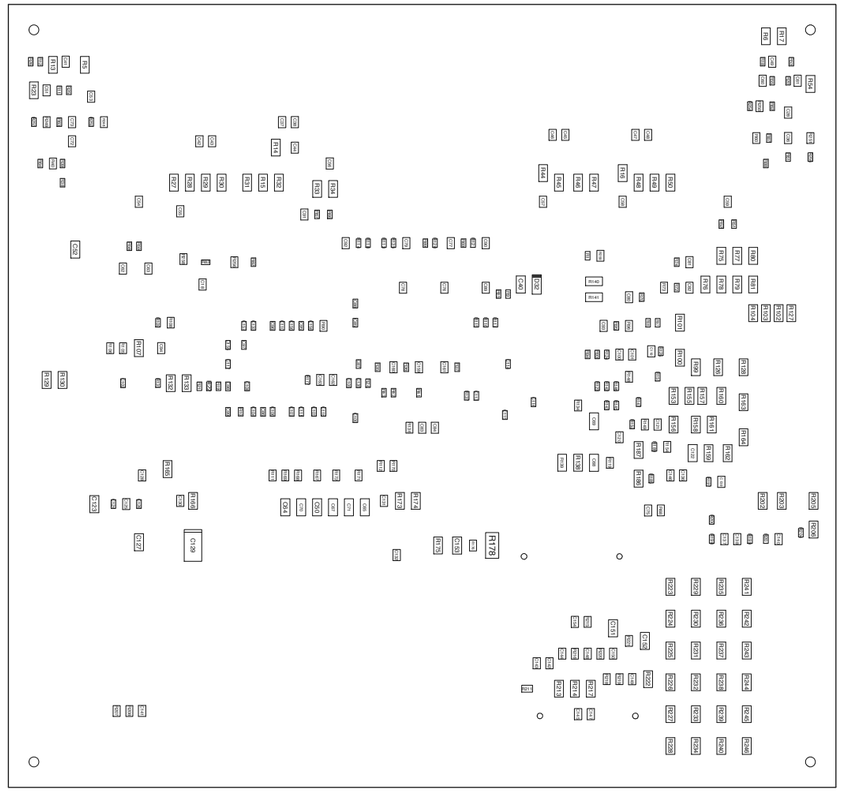
PFC CONTROL BOARD ASSEMBLY (G6860-1 PG 2)

G6860-1 | ENGINEERING CONTROLLED MANUFACTURER: Yes | CHANGE DETAIL: ADDED TABLE AND NOTES PER TABLE. REVISED NOTE N.E.1





SCALE = 2:1

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MANUFACTURING TOLERANCE PER ES2058 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 SUBSTITUTIONS TO AGREE WITH PUBLISHED STANDARD. DO NOT SCALE THIS DRAWING	CONTROL: CLEVELAND	SCALE: SEE ABOVE IF PRINTED @ A1 SIZE	EQUIPMENT TYPE: POWER WAVE S500				PAGE 2 OF 2
	DRAWN BY: tsado		SUBJECT: PFC CONTROL PC BOARD ASSEMBLY			DOCUMENT NUMBER: G6860-1	DOCUMENT REVISION: D
	ENGINEER: LLUO	UNITS: INCH	MATERIAL DISPOSITION: UF	APPROVAL DATE: 1/12/2013	PROJECT NUMBER: CRM46440	REFERENCE: -	
	APPROVED: GWM						

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