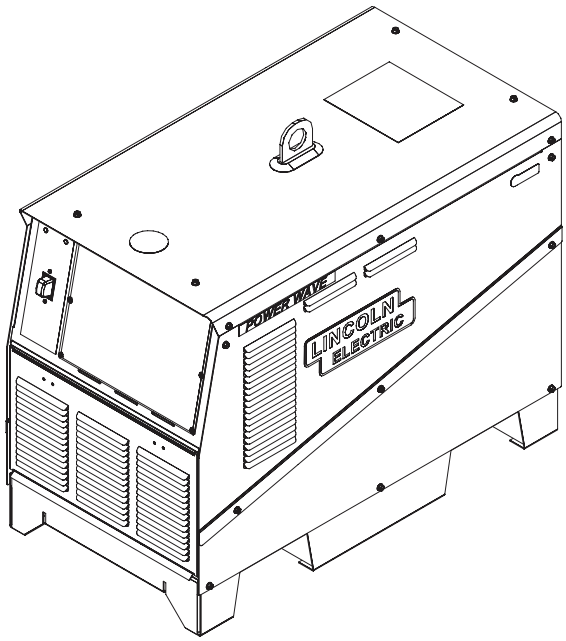
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

POWER WAVE® S700

For use with machines having Code Numbers:
11957

SERVICE MANUAL



Need Help? Call 1.888.935.3877
to talk to a Service Representative

Hours of Operation:
8:00 AM to 6:00 PM (ET) Mon. thru Fri.

After hours?
Use “Ask the Experts” at lincolnelectric.com
A Lincoln Service Representative will contact you no later than the following business day.

For Service outside the USA:
Email: globalservice@lincolnelectric.com

SVM247-A | Issue Date 13-Oct

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.
Phone: +1.216.481.8100 • www.lincolnelectric.com

THANK YOU FOR SELECTING A QUALITY LINCOLN ELECTRIC PRODUCT.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, Claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

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

⚠ WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

⚠ CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

READ and obey the Material Safety Data Sheet (MSDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

ALSO, WEAR SAFETY GLASSES IN WORK AREA AT ALL TIMES.

SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

ADDITIONAL PRECAUTIONARY MEASURES

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

DIESEL ENGINES

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

GASOLINE ENGINES

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

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

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

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

FOR ENGINE POWERED EQUIPMENT.

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

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

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

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

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

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

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

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

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

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

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

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

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

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

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

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

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

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

ELECTRIC SHOCK CAN KILL.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS CAN BURN.

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

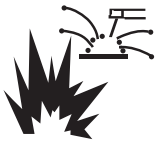
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

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-I, "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.

Welding Safety Interactive Web Guide for mobile devices

Get the free mobile app at
http://gettag.mobi

As a rule of thumb, for many mild steel electrode, if the air is visibly clear and you are comfortable, then the ventilation is generally adequate for your work. The most accurate way to determine if the worker exposure does not exceed the applicable exposure limit for compounds in the fumes and gases is to have an industrial hygienist take and analyze a sample of the air you are breathing. This is particularly important if you are welding with stainless, hardfacing or Special Ventilation products. All Lincoln MSDS have a maximum fume guideline number. If exposure to total fume is kept below that number, exposure to all fume from the electrode (not coatings or plating on the work) will be below the TLV.

There are steps that you can take to identify hazardous substances in your welding environment. Read the product label and material safety data sheet for the electrode posted in the work place or in the electrode or flux container to see what fumes can be reasonably expected from use of the product and to determine if special ventilation is needed. Secondly, know what the base metal is and determine if there is any paint, plating, or coating that could expose you to toxic fumes and/or gases. Remove it from the metal being welded, if possible. If you start to feel uncomfortable, dizzy or nauseous, there is a possibility that you are being overexposed to fumes and gases, or suffering from oxygen deficiency. Stop welding and get some fresh air immediately. Notify your supervisor and co-workers so the situation can be corrected and other workers can avoid the hazard. Be sure you are following these safe practices, the consumable labeling and MSDS to improve the ventilation in your area. Do not continue welding until the situation has been corrected.

NOTE: The MSDS for all Lincoln consumables is available on Lincoln's website: www.lincolnelectric.com

Before we turn to the methods available to control welding fume exposure, you should understand a few basic terms:

Natural Ventilation is the movement of air through the workplace caused by natural forces. Outside, this is usually the wind. Inside, this may be the flow of air through open windows and doors.

Mechanical Ventilation is the movement of air through the workplace caused by an electrical device such as a portable fan or permanently mounted fan in the ceiling or wall.

Source Extraction (Local Exhaust) is a mechanical device used to capture welding fume at or near the arc and filter contaminants out of the air.

The ventilation or exhaust needed for your application depends upon many factors such as:

- Workspace volume
- Workspace configuration
- Number of welders
- Welding process and current
- Consumables used (mild steel, hardfacing, stainless, etc.)
- Allowable levels (TLV, PEL, etc.)
- Material welded (including paint or plating)
- Natural airflow

Your work area has adequate ventilation when there is enough ventilation and/or exhaust to control worker exposure to hazardous materials in the welding fumes and gases so the applicable limits for those materials is not exceeded. See chart of TLV and PEL for Typical Electrode Ingredients, the OSHA PEL (Permissible Exposure Limit), and the recommended guideline, the ACGIH TLV (Threshold Limit Value), for many compounds found in welding fume.

Ventilation

There are many methods which can be selected by the user to provide adequate ventilation for the specific application. The following section provides general information which may be helpful in evaluating what type of ventilation equipment may be suitable for your application. When ventilation equipment is installed, you should confirm worker exposure is controlled within applicable OSHA PEL and/or ACGIH TLV. According to OSHA regulations, when welding and cutting (mild steels), natural ventilation is usually considered sufficient to meet requirements, provided that:

1. The room or welding area contains at least 10,000 cubic feet (about 22' x 22' x 22') for each welder.
2. The ceiling height is not less than 16 feet.
3. Cross ventilation is not blocked by partitions, equipment, or other structural barriers.
4. Welding is not done in a conned space.

Spaces that do not meet these requirements should be equipped with mechanical ventilating equipment that exhausts at least 2000 CFM of air for each welder, except where local exhaust hoods or booths, or air-line respirators are used.

Important Safety Note:

When welding with electrodes which require special ventilation such as stainless or hardfacing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce hazardous fumes, keep exposure as low as possible and below exposure limit values (PEL and TLV) for materials in the fume using local exhaust or mechanical ventilation. In conned spaces or in some circumstances, for example outdoors, a respirator may be required if exposure cannot be controlled to the PEL or TLV. (See MSDS and chart of TLV and PEL for Typical Electrode Ingredients.) Additional precautions are also required when welding on galvanized steel.

BIBLIOGRAPHY AND SUGGESTED READING

ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection, American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

Arc Welding and Your Health: A Handbook of Health Information for Welding. Published by The American Industrial Hygiene Association, 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031-4319.

NFPA Standard 51B, Cutting and Welding Processes, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9146, Quincy, MA 02269-9959.

OSHA General Industry Standard 29 CFR 1910 Subpart Q. OSHA Hazard Communication Standard 29 CFR 1910.1200. Available from the Occupational Safety and Health Administration at http://www.osha.org or contact your local OSHA office.

The following publications are published by The American Welding Society, P.O. Box 351040, Miami, Florida 33135. AWS publications may be purchased from the American Welding society at http://www.aws.org or by contacting the AWS at 800-443-9353.

ANSI, Standard Z49.1, Safety in Welding, Cutting and Allied Processes. Z49.1 is now available for download at no charge at http://www.lincolnelectric.com/community/safety/ or at the AWS website http://www.aws.org.

AWS F1.1, Method for Sampling Airborne Particulates Generated by Welding and Allied Processes.

AWS F1.2, Laboratory Method for Measuring Fume Generation Rates and Total Fume Emission of Welding and Allied Processes.

AWS F1.3, Evaluating Contaminants in the Welding Environment: A Strategic Sampling Guide.

AWS F1.5, Methods for Sampling and Analyzing Gases from Welding and Allied Processes.

AWS F3.2, Ventilation Guide for Welding Fume Control.

AWS F4.1, Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances.

AWS SHF, Safety and Health Facts Sheets. Available free of charge from the AWS website at http://www.aws.org.

LISTED BELOW ARE SOME TYPICAL INGREDIENTS IN WELDING ELECTRODES AND THEIR TLV (ACGIH) GUIDELINES AND PEL (OSHA) EXPOSURE LIMITS

INGREDIENTS	CAS No.	TLV mg/m$_3$	PEL mg/m$_3$
Aluminum and/or aluminum alloys (as Al)*****	7429-90-5	10	15
Aluminum oxide and/or Bauxite*****	1344-28-1	10	5**
Barium compounds (as Ba)*****	513-77-9	****	****
Chromium and chromium alloys or compounds (as Cr)*****	7440-47-3	0.5(b)	.005(b)
Fluorides (as F)	7789-75-5	2.5	2.5
Iron	7439-89-6	10*	10*
Limestone and/or calcium carbonate	1317-65-3	10	15
Lithium compounds (as Li)	554-13-2	10*	10*
Magnesite	1309-48-4	10	15
Magnesium and/or magnesium alloys and compounds (as Mg)	7439-95-4	10*	10*
Manganese and/or manganese alloys and compounds (as Mn)*****	7439-96-5	0.2	5.0(c)
Mineral silicates	1332-58-7	5**	5**
Molybdenum alloys (as Mo)	7439-98-7	10	10
Nickel*****	7440-02-0	1.5	1
Silicates and other binders	1344-09-8	10*	10*
Silicon and/or silicon alloys and compounds (as Si)	7440-21-3	10*	10*
Strontium compounds (as Sr)	1633-05-2	10*	10*
Zirconium alloys and compounds (as Zr)	12004-83-0	5	5

Supplemental Information:

(*) Not listed. Nuisance value maximum is 10 milligrams per cubic meter. PEL value for iron oxide is 10 milligrams per cubic meter. TLV value for iron oxide is 5 milligrams per cubic meter.

(**) As respirable dust.

(*****) Subject to the reporting requirements of Sections 311, 312, and 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40CFR 370 and 372.

(b) The PEL for chromium (VI) is .005 milligrams per cubic meter as an 8 hour time weighted average. The TLV for water-soluble chromium (VI) is 0.05 milligrams per cubic meter. The TLV for insoluble chromium (VI) is 0.01 milligrams per cubic meter.

c) Values are for manganese fume. STEL (Short Term Exposure Limit) is 3.0 milligrams per cubic meter. OSHA PEL is a ceiling value.

(****) There is no listed value for insoluble barium compounds. The TLV for soluble barium compounds is 0.5 mg/m3.

TLV and PEL values are as of April 2006. Always check Material Safety Data Sheet (MSDS) with product or on the Lincoln Electric website at http://www.lincolnelectric.com

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- THEORY OF OPERATION SECTION -

Figure E.1 - Block logic diagram

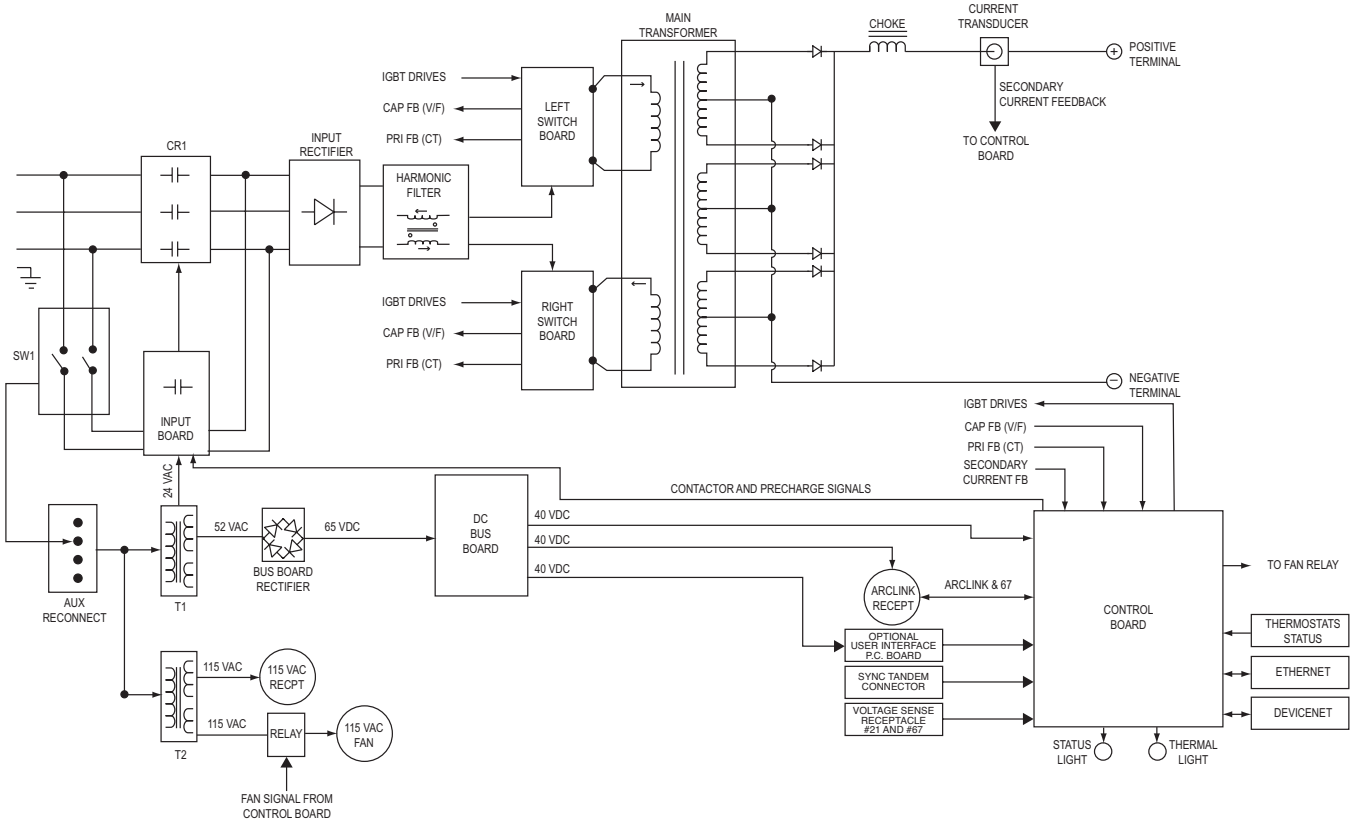
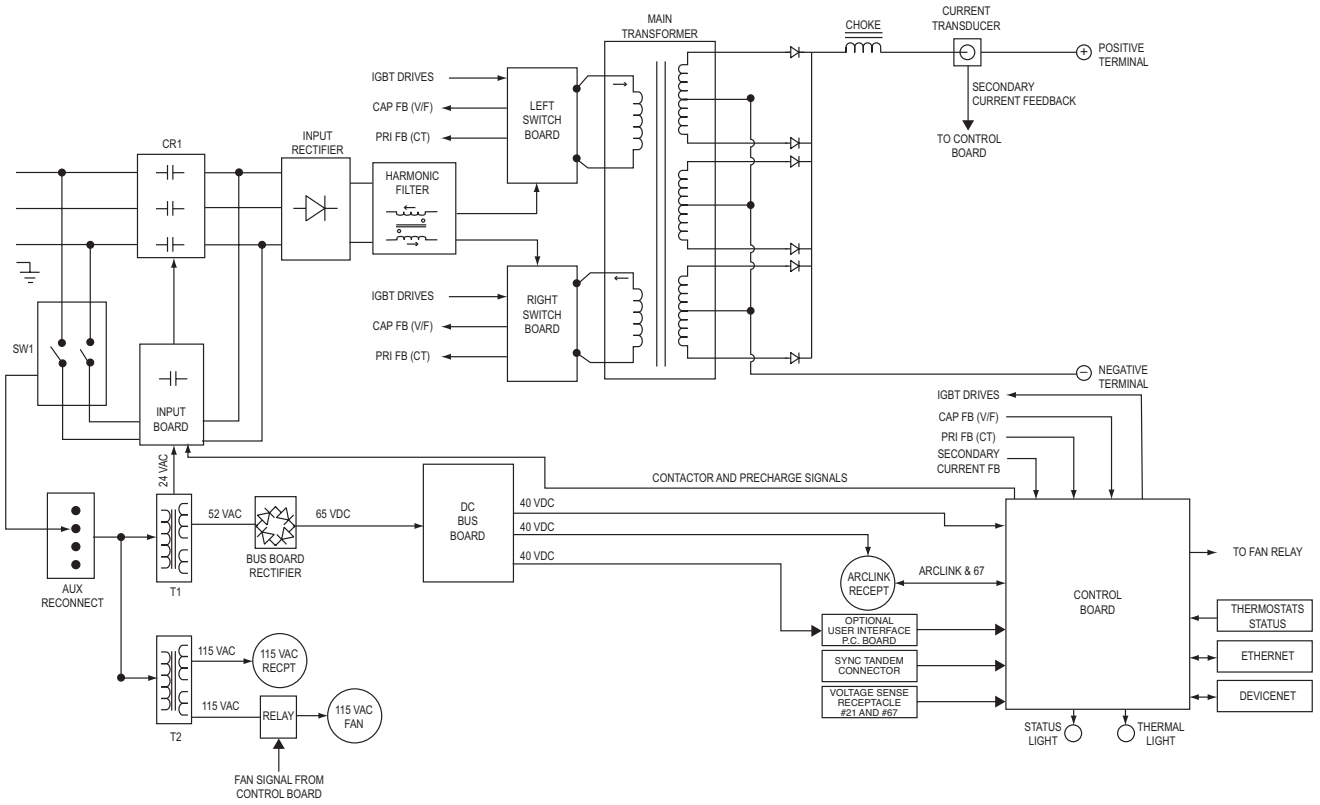


Figure E.2 - General description



GENERAL DESCRIPTION

The Power Wave S700 is an advanced-process DC inverter and is rated for 700 amps, 44 volts at a 100% duty cycle or 900 amps, 44 volts at a 60% duty cycle. It operates on 380V-415V, 440V-460V, 500V or 575V 50 Hz or 60 Hz, 3 phase power, so that it can be used worldwide. However, a CE filter upgrade is required for CE compliance. Switching between input voltages is made simple by use of a single reconnect panel. A duplex 10A, 115V receptacle is located on the case back for auxiliary power.

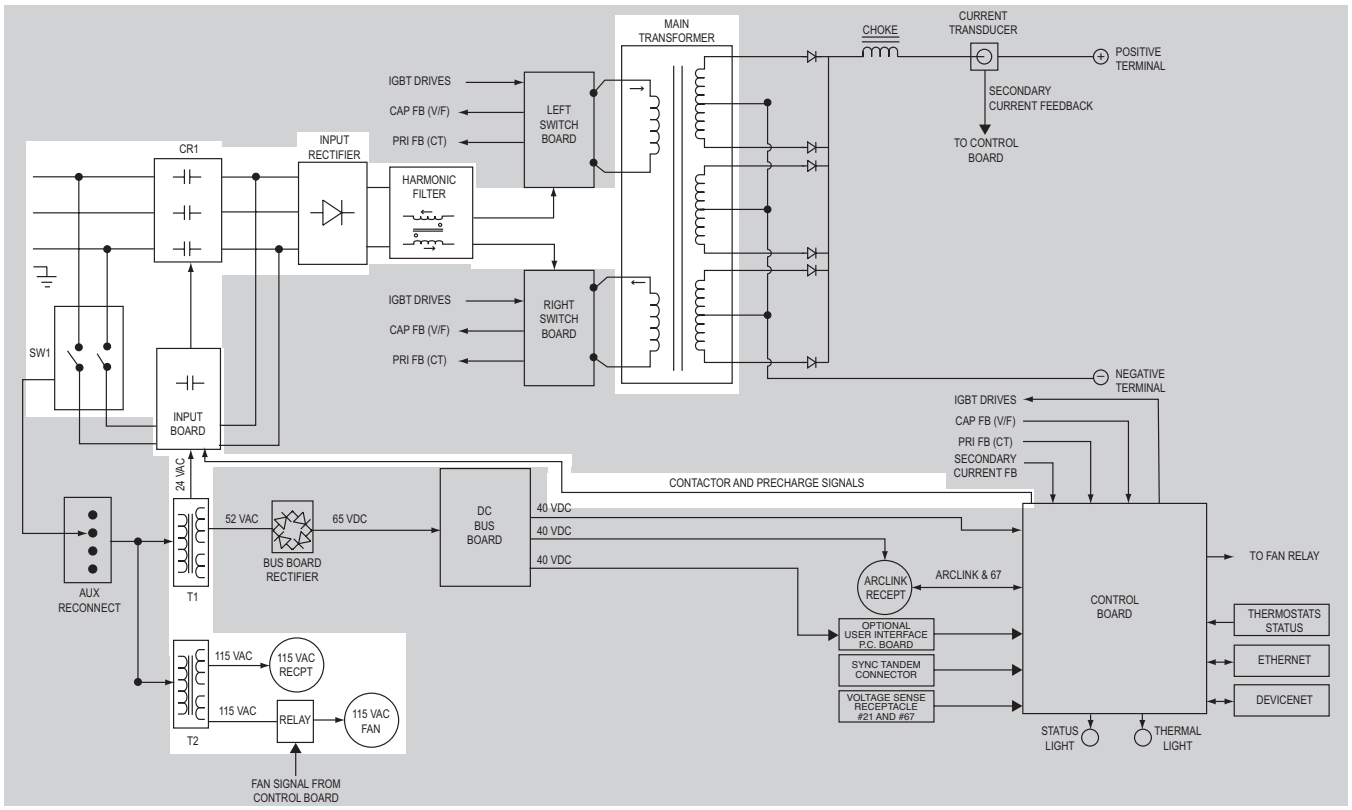
The Power Wave S700 is designed to be compatible with the current range of ArcLink compatible wire feeders and accessories, such as the Power Feed series wire feeders via connectivity through a 5-pin circular connector on the case back. Other Lincoln wire feeders and non-Lincoln wire feeders cannot be used. The machine comes equipped with an Ethernet connector useful for software upgrades and access to Power Wave software tools like Checkpoint and Production Monitoring. It also comes standard with a DeviceNet CAN connector for PLC interfacing.

Each machine is factory preprogrammed with multiple welding procedures, typically including GMAW, GMAW-P, FCAW, SMAW, CAC and GTAW for a variety of materials, including mild steel, stainless steel, cored wires and aluminum. All welding programs and procedures are configured through software for the Power Waves available at (http://powerwavesoftware.com). For tandem robotic welding, 6-pin sync connector comes standard on the Power Wave S700. When connected with the proper accessories, this will allow for unlocking of additional tandem weld modes.

With the proper configuration, Fanuc robots equipped with RJ-3 or RJ-3iB controllers may communicate directly to the Power Wave via ArcLink or DeviceNet. Proper configuration and options allow other equipment such as PLCs or computers to interface with a Power Wave through a DeviceNet, ArcLink or Ethernet interfaces. In some cases, interface kits may be required for analog control.

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

Figure E.3 - Input voltage, precharge, auxiliary transformers, harmonic filter, input board, input rectifier and CR1 contactor



INPUT VOLTAGE, PRECHARGE, AUXILIARY TRANSFORMERS, HARMONIC FILTER, INPUT BOARD, INPUT RECTIFIER AND CR1 CONTACTOR

The Power Wave S700 can be connected for a variety of three-phase input voltages of 380 volts and higher. See ***Technical Specifications***.

The initial input power is applied to the Power Wave S700 through a line switch located on the front of the machine. Two phases of the three-phase input power are applied to the Input Board and to the two auxiliary transformers. The two secondary voltages developed by transformer T1 are applied to the input board (24VAC) and the DC Bus Rectifier (52VAC).

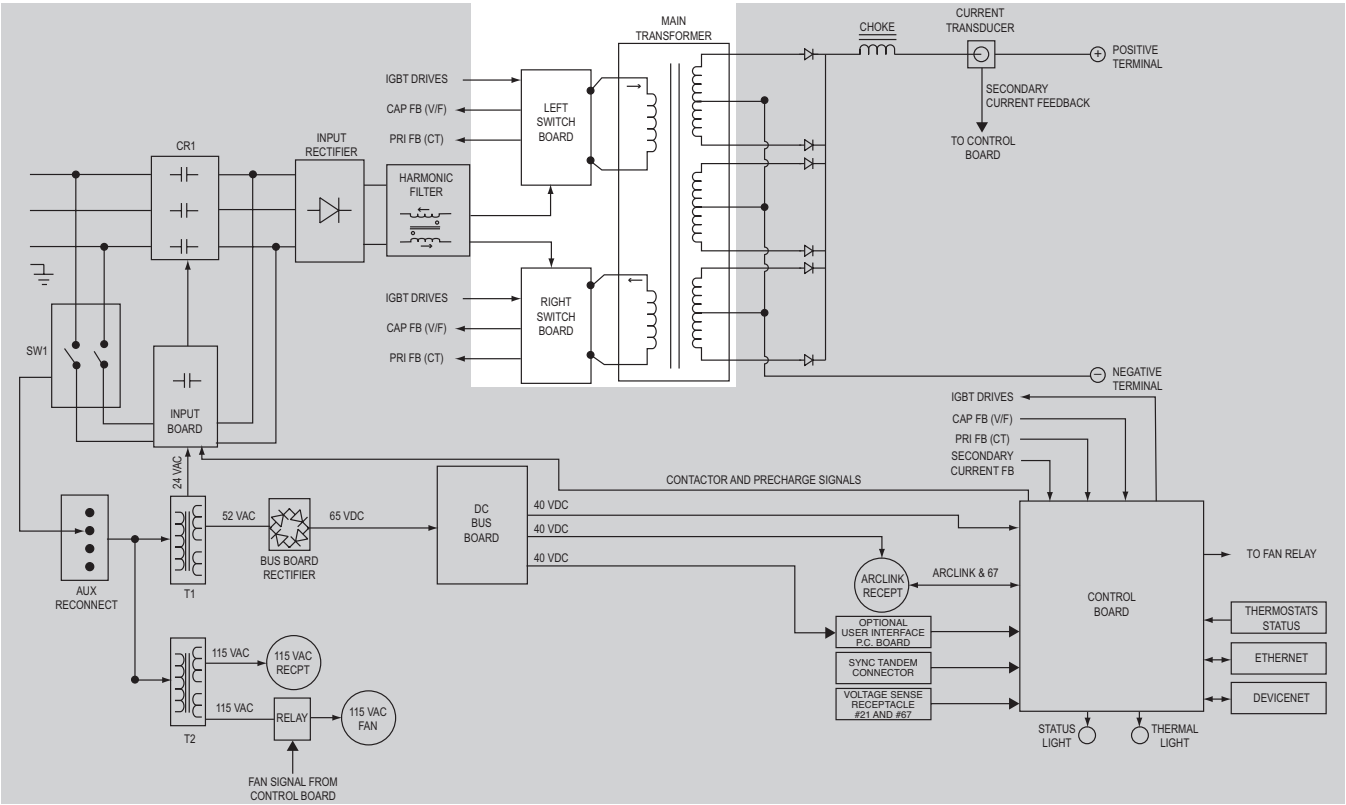
Two voltages are developed by the secondaries of auxiliary transformer T2. The 115VAC is applied to the 115VAC receptacle. The other 115VAC is applied, via a fan relay to the cooling fan.

The Harmonic Filter is an inductor that passively corrects the power factor to 95%. It also reduces harmonic distortion within the machine.

The two phases that are connected to the Input Board, through the input line switch SW1, are connected to the input rectifier at the load side of the CR1 contactor. During the precharge or “soft start” sequence, these two phases are current-limited by the Input Board. The AC input voltage is rectified and the resultant DC voltage is applied through the harmonic filter to the input capacitors located on the right and left switch boards. The Control Board monitors the voltage across the capacitors via a V/F (voltage to frequency) converter.

When the capacitors have charged to an acceptable level, the Control Board signals the Input Board to energize the main input contactor CR1, making all three phases of input power available (without current limiting) to the input capacitors. At this point, the Power Wave S700 is in the “Run Mode” of operation. If the capacitors become undervoltaged, overvoltaged or unbalanced, the Control Board will signal the Input Board to de-energize the main input contactor (CR1), thus disabling the Power Wave S700. The Input Board not only provides “soft start” and control of the 24VAC to the CR1 contactor coil, but it also sends a single phase input detect signal to the control board to disable the output.

Figure E.4 - Switch boards and main transformer



SWITCH BOARDS AND MAIN TRANSFORMER

There are two switch boards in the Power Wave S700 machine. Each board contains two input capacitors and two insulated gate bipolar transistor (IGBT) switching circuits. See Wiring Diagram and machine diagram for details. These two circuits on each switch board are connected in parallel. This paralleled board arrangement (left switch board) is permanently connected in series with an identical paralleled switch board arrangement on the right side. There are no reconnect switches in this power source configuration; reconnect involves only the auxiliary transformer tap configurations.

When the switch board input capacitors are fully charged (Run Mode), they act as power supplies for the switch board IGBT switching circuits. The insulated gate bipolar transistors switch the DC power from the input capacitors “on and off,” thus supplying pulsed DC current (effectively AC) to the main transformer primary windings. See ***IGBT Operation*** in this section.

This pulsed DC is varied (via signals from the Control Board) to produce Waveforms and power for optimum welding characteristics. This control takes place in the primary stage of the transformer.

Each switch board IGBT circuit feeds current to a separate, oppositely wound primary winding in the Main Transformer. See ***Main Coaxial Transformer*** design in this section. The reverse directions of current flow through the main transformer primaries and the offset timing of the switch boards, induce an AC square wave output signal at the secondary winding of the main transformer. Current transformers located near the switch boards monitor the primary currents. If the primary currents become abnormally high, the Control Board will shut off the IGBTs, thus disabling the machine’s output. The DC current flow through each primary winding is clamped back to each respective input capacitor when the IGBTs are turned off. This action is needed due to the inductance of the transformer primary windings. The firing of the two switch boards occurs during halves of a 25 microsecond interval, creating a constant 40 KHz output per primary half. Gate firing signals are generated on the Control Board.

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

DC BUS BOARD AND CONTROL BOARD

The DC Bus Board receives approximately 65VDC from the Bus Rectifier circuit. The DC Bus Board regulates the 65VDC into three 40VDC supplies. One 40VDC supply is applied to the control board. The other 40VDC supply is connected to the Arc Link receptacle. This 40VDC is used to power the Power Wave Series external wirefeeders that are connected to the Arc Link receptacle. The third 40VDC supply is connected to the optional user interface.

The Control Board performs the primary interfacing functions to establish and maintain output control of the Power Wave S700 machine. The function generator and weld files exist within the Control Board hardware and software. Digital user command signals and feedback information is received and processed at the Control Board. Software within the Control Board processes the command and feedback information and sends the appropriate pulse width modulation (PWM) signals (see ***Pulse Width Modulation*** at the end of this section) to the switch board IGBTs. In this manner, the digitally controlled high-speed welding waveform is created.

In addition, the Control Board performs the following functions:

- Monitors output current.
- Monitors the thermostats.
- Monitors and balances the main capacitors on the switch boards (upper section).
- Monitors the main transformer primary currents (toroid sense).
- Monitors input filter capacitor voltages by a Voltage to Frequency (V to F) converter circuit. “Normal” for a 460VAC input is about 2600 Hz. indicating approximately 325VDC on each capacitor.
- Interfaces with the sync/tandem connector.
- Interfaces with the optional user interface P.C. board.

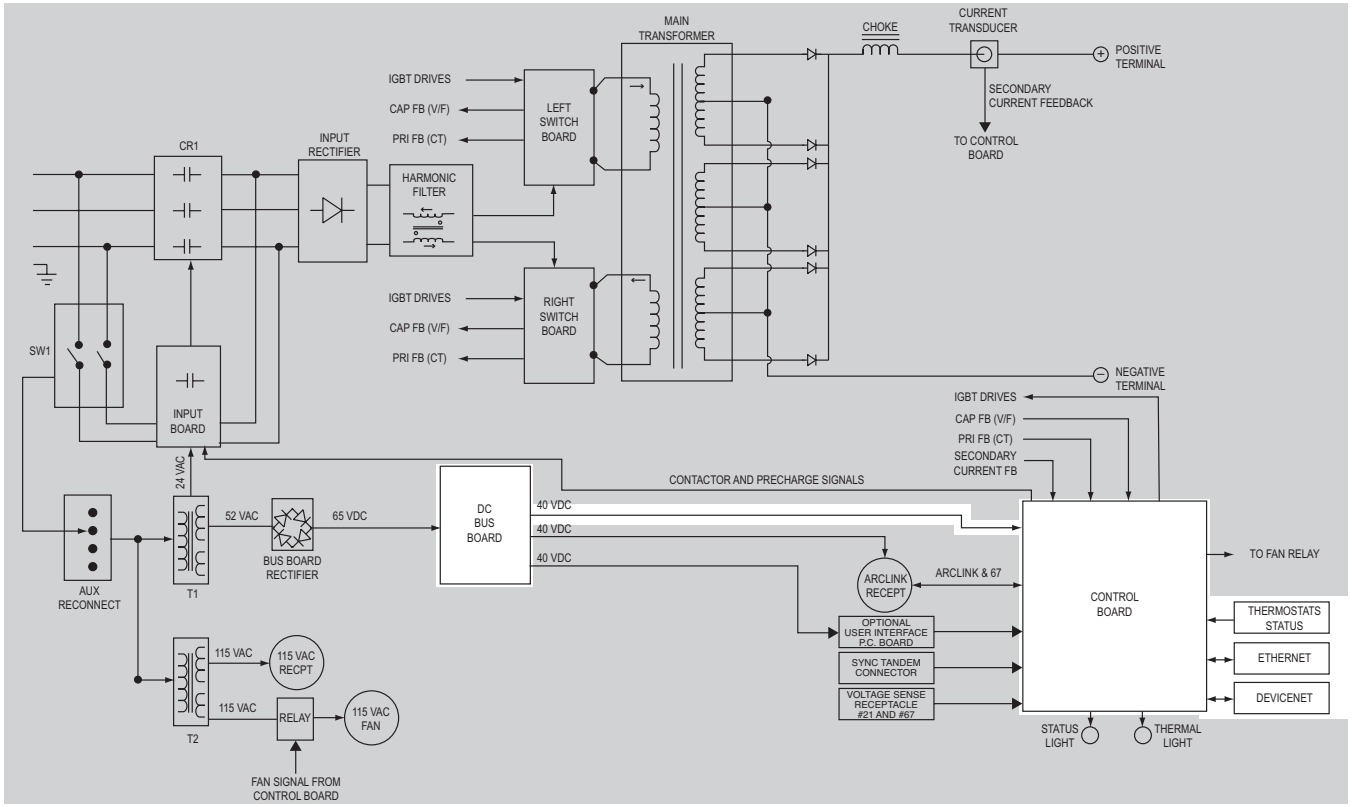
Depending on the fault condition, the Control Board will activate the thermal light and/or the status light and will disable or reduce the machine output accordingly. In some conditions, the input contactor will be de-energized and the control board will generate error codes.

The Power Wave S700 is capable of communicating via three different digital communication protocols. The Control Board receives and processes these various communication platforms. Internally the Power Wave S700 utilizes the Arc Linc protocol. Externally the Power Wave S700 can interface with industry standard DeviceNet or Ethernet protocols.

(See ***Figure E.5*** on next page.)

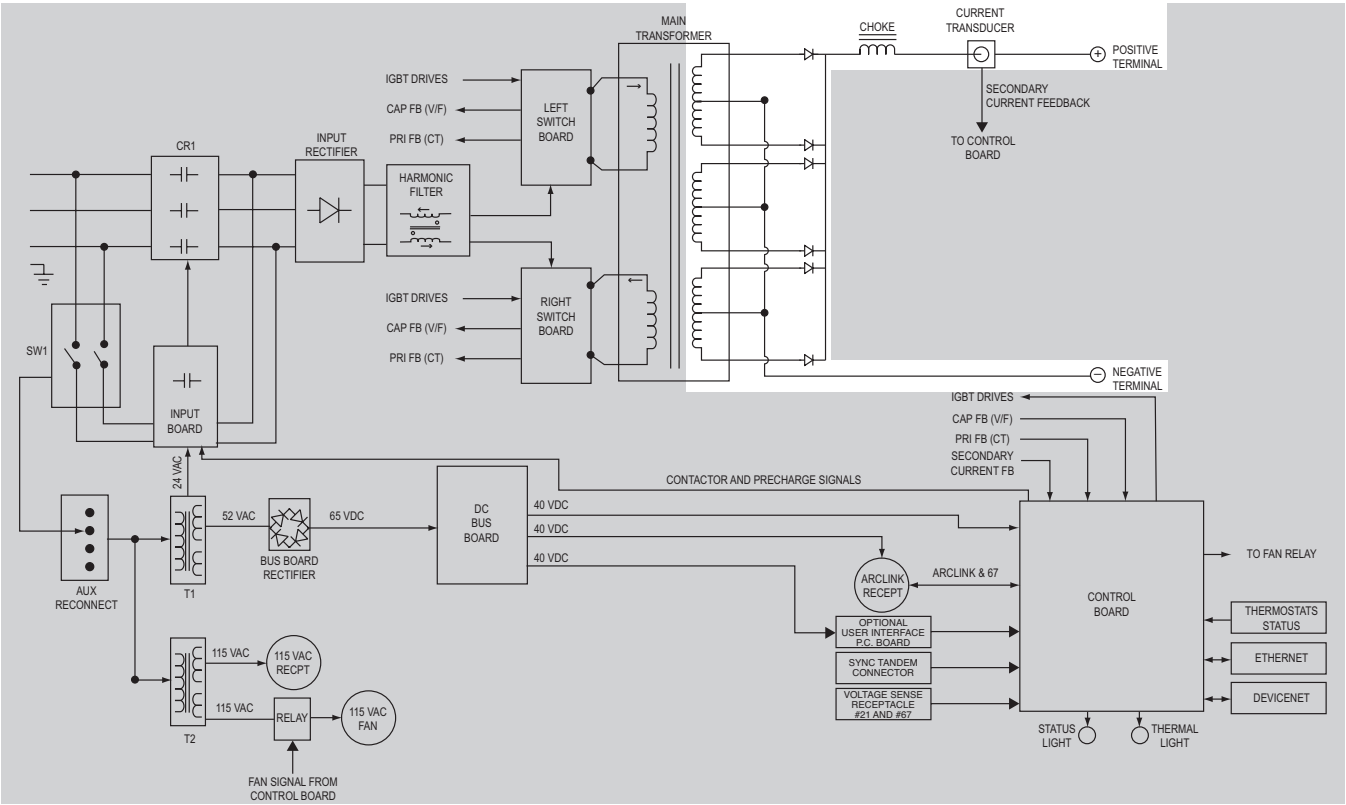
NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion

Figure E.5 - DC bus board and control board



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

Figure E.6 - Output rectifier and choke



OUTPUT RECTIFIER

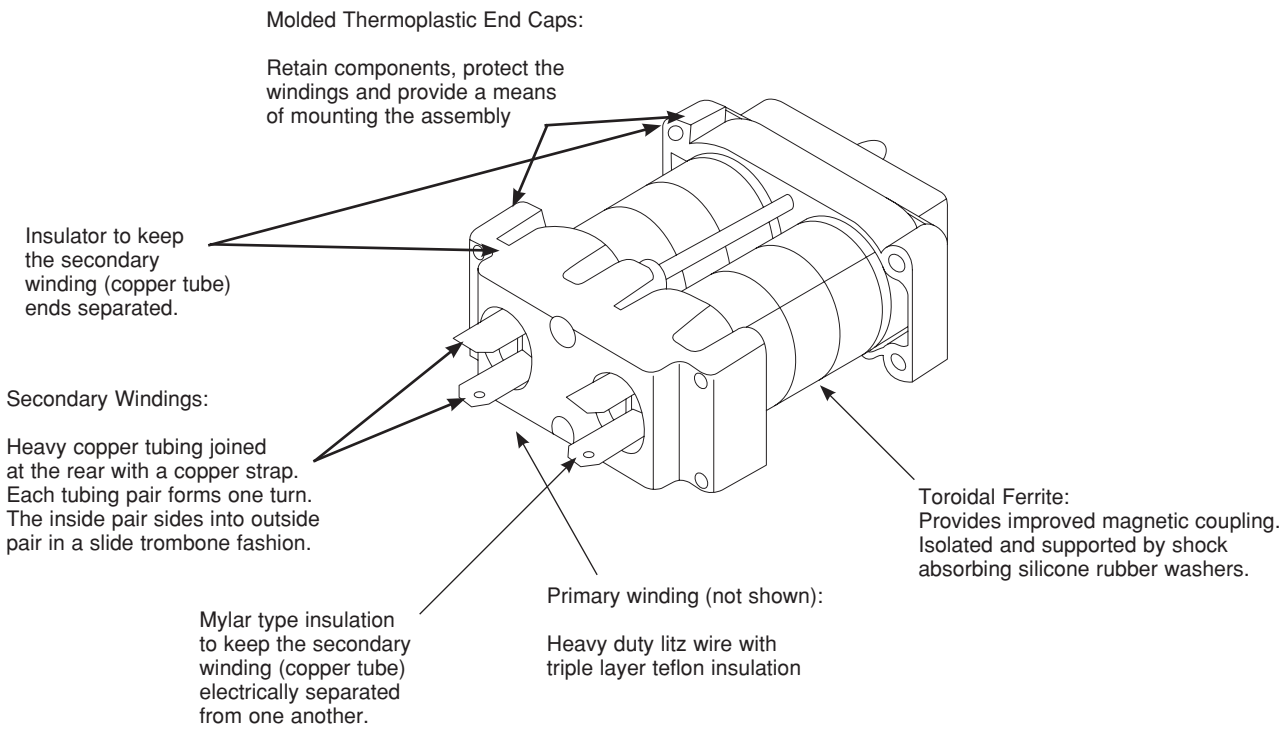
The Output Rectifier receives the AC output from the main transformer secondary winding (resultant @ 80 Khz.) and rectifies it to a DC voltage level. The DC weld current is also sent through the Current Transducer. The high welding current is transformed to a low voltage feedback signal and is sent to the control board. The transducer feedback signal is used for the regulation of the welding current.

CHOKE

Since the output choke is in series with the positive leg of the output rectifier and also in series with the weld load, a filtered DC output is applied to the machine output terminal.

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

Figure E.7 - Main coaxial transformer



MAIN COAXIAL TRANSFORMER

The Power Wave S700 utilizes newer coaxial-type main transformers. They utilize the same principle as standard transformers, but are constructed in a different manner. Part of this difference is that the secondary conductors are oriented in a tubular fashion (not in a traditional winding). One tube pair is equal to one turn of secondary winding. See Figure E.7.

The primary windings are wound through the center of the tubular secondary windings (tubes). This coaxial design provides the following benefits for the Power Wave S700:

- Reduction of magnetic losses
- Boost in machine efficiency
- Cooler operating temperatures
- Opportunity for the physical unit to be smaller in size

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

THERMAL PROTECTION

Two normally closed (N.C.) thermostats protect the machine from excessive operating temperatures. These thermostats are connected to the control board. One of the thermostats is located on the heat sink of the DC bus board mounting. The other thermostat is located on the output rectifier heat sink.

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. If this condition occurs, the yellow thermal light, located on the front of the machine, will be illuminated. The thermostats are self-resetting once the machine cools to a sufficient level.

If the thermostat shutdown is caused by excessive output or duty cycle (and if the fan is operating normally), the power switch may be left on and the reset should occur within a 15-minute period. However, if the fan is not turning or if the intake air louvers are obstructed, the power must be removed from the machine — and the fan condition or air obstruction must be corrected. It should be noted that the cooling fan runs only when necessary. The F.A.N. (Fan As Needed) system is controlled by the Control Board via a solid state relay.

PROTECTIVE CIRCUITS

Protective circuits are designed into the Power Wave S700 to sense trouble and shut down the machine before damage occurs to the machine's internal components. See Error Codes in the ***Troubleshooting*** section of this manual to help better understand this important feature.

OVER CURRENT PROTECTION

Both average and peak currents are monitored throughout the weld process. If either parameter is exceeded for the maximum allowable time, the weld will stop. An error code will also be indicated by the Status LED on the Power Wave and an event will be logged in the system. These events can be seen by using the Powerwavemanager. See the Error Code information in the ***Troubleshooting*** section.

UNDER/OVER VOLTAGE PROTECTION

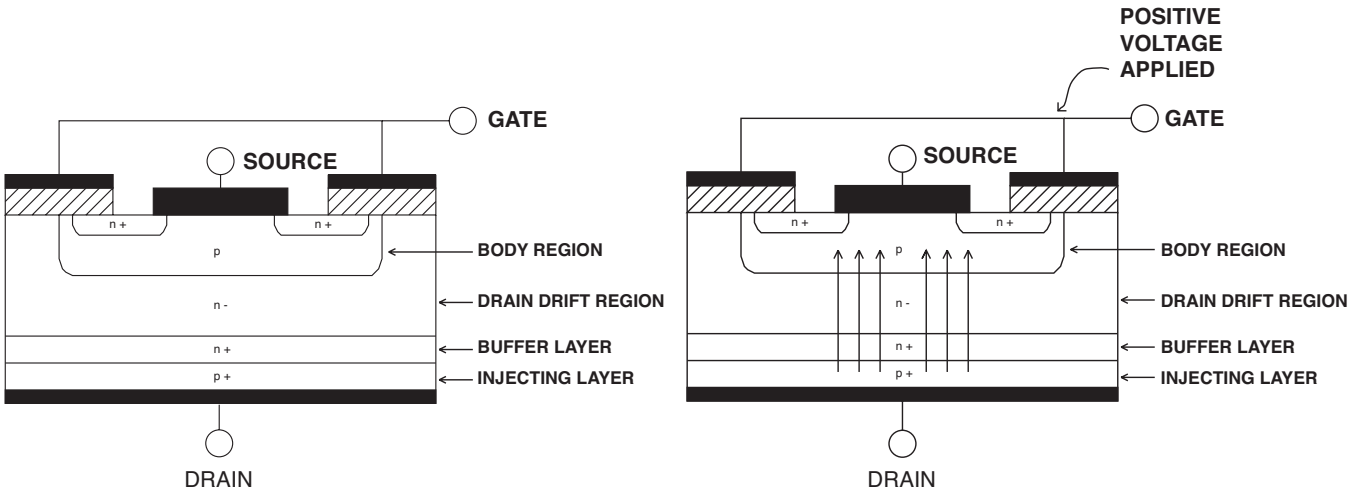
A protective circuit is designed into the Control Board to monitor the voltage across the input capacitors. In the event that a capacitor voltage is too high, too low or becomes unbalanced side-to-side, the protection circuit will automatically de-energize the CR1 input contactor. If this event occurs, the welding machine output will be disabled and the "soft start" mode will be repeated.

The protection circuit will prevent output if any of the following circumstances occur:

1. **Capacitor Imbalance**. Capacitor voltage between Switch Boards must be within 100VDC.
2. **Voltage across a capacitor exceeds 467 VDC max**. This could be a result of high input line surges or improper input voltage connections.
3. **Voltage across a capacitor is under 200 volts**. This would be due to improper input voltage connections.
4. **Internal component damage**.

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

Figure E.8 - Insulated gate bipolar transistor (IGBT) operation



INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

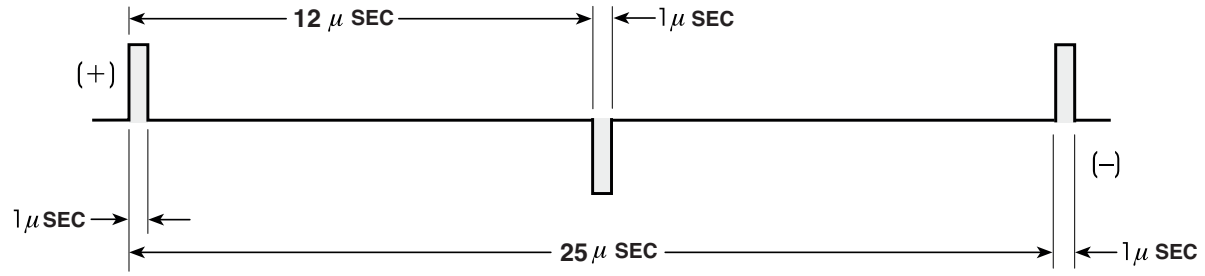
An IGBT is a type of transistor. IGBT are semiconductors well suited for high frequency switching and high current applications.

Examples A in Figure E.8 shows an IGBT in passive mode. There is no gate signal, zero volts relative to the source and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned OFF like a light switch.

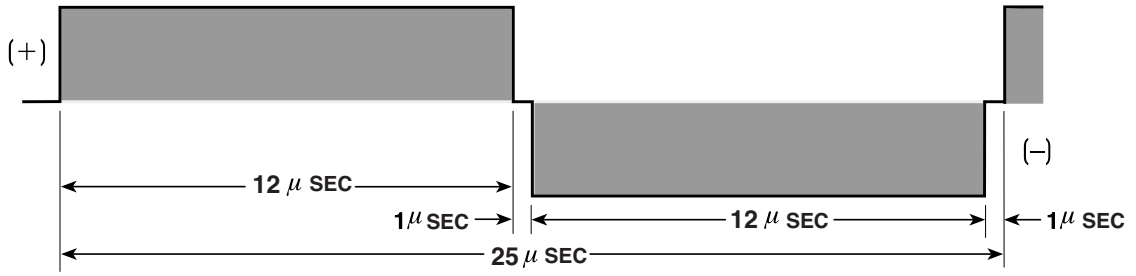
Example B shows the IGBT in an active mode. When the gate signal, a positive DC voltage relative to the source is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to the circuit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

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

Figure E.9 - Typical IGBT outputs



MINIMUM OUTPUT



MAXIMUM OUTPUT

PULSE WIDTH MODULATION

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

MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing above shows the minimum output signal possible over a 12.5 microsecond time period.

The shaded portion of the signal represents one IGBT group[1], conducting for 1 microsecond. The negative portion is the other IGBT group. The dwell time (off time) is 12 microseconds (both IGBT groups off). Since only 2 microseconds of the 25 microsecond time period are devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 12 microseconds each and allowing only 2 microseconds of dwell or off time (one microsecond during each half cycle) during the 25 microsecond cycle, the output is maximized. The darkened area under the minimum output curve can be compared to the area under the maximum output curve. The more darkened area, the more power is present.

[1]An IGBT group consists of the sets of IGBT modules grouped onto one switch board.

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

TABLE OF CONTENTS
- TROUBLESHOOTING AND REPAIR SECTION -

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, welding and arc quality problems, devicenet problems and ethernet 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.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal covers are removed.		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. The input fuses or breakers may be improperly sized. 2. The auxiliary reconnect panel may not be configured properly for the applied voltage.	1. Check to make sure the correct input voltage is being applied to the Power Wave S700. See the ***Technical Specifications*** page.
The input fuses fail or the input breakers trip when the CR1 input contactor is energized.	1. The input fuses or breakers may be improperly sized.	1. Perform the following tests. 2. Perform the ***Input Rectifier Test***. 3. Perform the ***Switch Board Test***. 4. Perform the ***Input Board Test***.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The Power Wave S700 is dead. There are no lights and no output. The machine appears to have no input power.	1. Make sure the input power switch SW1 is in the ON position. 2. Make sure the correct three phase input power is being applied to the machine. 3. Check the CB1 circuit breaker located in the case back area. Reset if tripped. 4. Check the 10 amp fuse (F1) located on the reconnect panel.	1. Check the input power switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. If the 10 amp (F1) fuse repeatedly fails perform the ***Auxiliary Transformer Tests***. 3. The Bus Rectifier may be faulty. Check the rectifier and the associated leads. See the Wiring Diagram. 4. Perform the ***DC Bus Board Test***. 5. Perform the ***Control Board Test***.
The auxiliary receptacle is “dead”. No 120VAC present at the receptacle.	1. Check the CB2 circuit breaker. Reset if tripped. 2. Make sure all three phases of input power are being applied to the machine. 3. Check fuse F1 in the reconnect area.	1. Check the 120VAC receptacle and associated wiring for loose or faulty connections. See the Wiring Diagram. 2. Perform the ***Auxiliary Transformer Test for T2 Transformer***.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The Power Wave S700 does not have welding output. The main input contactor (CR1) does not activate.	1. This problem will normally be accompanied by an error code. Error codes are displayed as a series of red and green flashes of the status LED. See the Status LED section. If an error code is indicated the Power Wave Manager may help. Go to http://powerwavemanager.com 2. The input voltage may be too high or too low. 3. The auxiliary reconnect panel may be configured incorrectly. 4. There may be a “short circuit” in the external welding circuit. Remove all external leads from the machine. If the input contactor (CR1) activates, the problem is in the external welding or control leads.	1. The DC Bus Rectifier may be faulty. Check the rectifier and associated leads. See the Wiring Diagram. 2. Perform the ***Input Contactor Test***. 3. Perform the ***Input Board Test***. 4. Perform the ***Auxiliary Transformer Tests***. 5. Perform the ***Input Rectifier Test***. 6. Perform the ***Switch Board Test***. 7. Perform the ***DC Bus Board Test***. 8. Perform the ***Control Board Test***. 9. Perform the ***Output Rectifier 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.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The thermal light is ON. The machine regularly "overheats".	1. The welding output may be exceeding the recommended 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/or exhaust louvers may be blocked or restricted due to inadequate clearance around the machine. 4. Make sure the fan is functioning correctly. The Power Wave S700 is equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled and will continue running for approximately 5 minutes after the output is disabled. 5. Check for an excessive load on the 40VDC supply. There may be a feeder problem and/or a short in the external feeder cable causing the DC Bus Board to overheat.	1. Check the two thermostats and the associated wiring for loose or faulty connections. See the Wiring Diagram. 2. Temporarily jumper out the thermostat circuits at the control board. See the Wiring Diagram. If the machine does NOT reset and the thermal light does NOT go out, the control board may be faulty. Replace. If the machine does reset and the thermal light does goes out, then perform the ***Thermostat Circuit Test***. 3. If the fan does NOT function correctly, temporarily jump around the fan relay contacts to test the fans. Caution the fans operate on 120VAC. See the Wiring Diagram. If the fan does run when the relay contacts are jumper out the relay may be faulty. Make certain the fan relay is receiving the correct "command" signal (15VDC) from the control board. See the Wiring Diagram.
The Power Wave S700 will not produce full welding output.	1. Make sure the correct three phase input power is being applied to the machine. 2. The welding cables may be too long, coiled, or have loose or faulty connections. 3. Perform the ***Calibration Check***.	1. Perform the ***Current Transducer Test***. 2. Perform the ***Output Rectifier Test***. 3. Perform the ***Switch Board Test***. 4. Perform the ***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.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING AND ARC QUALITY PROBLEMS		
The machine often "noodle welds" when running a particular process.	1. Make sure the welding cables are in good condition and properly sized for the welding current.	1. Perform the ***Current Transducer Test***. 2. Perform the ***Control Board Test***.
There is a general degradation of the welding performance.	1. Make sure the welding parameters are correct for the welding process. 2. Make sure the wire feed speed is correct and consistent.	1. Perform the ***Calibration Test***. 2. Perform the ***Output Choke Test***. 3. Perform the ***Current Transducer Test***.
The electrode wire burns back to the tip when the arc is initiated.	1. Make certain the sense leads are configured and connected properly. 2. Make sure the wire feed speed is correct and consistent.	1. Perform the ***Output Choke Test***. 2. Perform the ***Current Transducer Test***.
The machine shuts down during a weld. No output.	1. Power Wave Manager Utilities can be used to check the event log to determine the cause of the shut down. www.powerwavesoftware.com. Go to Powerwaveutilities and then Powerwavemanager. 2. There may be a secondary over-current condition. Adjust the welding parameters to minimize momentary shorting of the welding arc.	1. Perform the ***Switch 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.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
DEVICENET PROBLEMS		
There is no connection on DeviceNet.	1. The Mac ID may not be correct. To view the DeviceNet connection status in the Power Wave and to configure any Power Wave DeviceNet items, use Lincoln's Power Wave Manager Software. This is available in the Power Wave Utilities download found at http://www.powerwavesoftware.com. Go to Powerwaveutilities and then Powerwavemanager.	1. Verify that the DeviceNet bus power supply can supply sufficient current for the devices on the network. 2. Verify that Led10 (on the control board) is on indicating the 24V supply is present. 3. Verify that the DeviceNet MAC ID is correct. The MAC ID is set via Lincoln's Power Wave Manager Software. After making a connection with this software, select the "DeviceNet" item the left side of screen, then select the Configuration tab. 4. Verify that the DeviceNet Baud rate is correct. The Baud rate is set via Lincoln's Power Wave Manager Software. See above on how to access this item. 5. Make sure the correct EDS (Electronic Data Sheet) file is loaded if needed. Lincoln's EDS files are part of the Power Wave Utilities download. The Status tab on the DeviceNet item for Power Wave Manager shows the machines Product Code and Vendor Revision, which are then used to specify which EDS file to use.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
DEVICENET PROBLEMS		
The DeviceNet connections are intermittent.	1. For more information on this topic see the technical paper "DeviceNet Planning and Installation Manual" and also the Troubleshooting Guides found at http://www.odva.org in the DeviceNet Library section.	1. Verify that the DeviceNet bus is terminated correctly. 2. Verify that all connections are securely fastened. 3. Verify that the maximum cable length and drop lengths meet DeviceNet specifications. 4. Verify that the DeviceNet cables are not running next to welding current carrying conductors. 5. Verify that the DeviceNet cable shielding is correctly grounded at the bus power supply. The shield should be tied into the bus ground at only one point.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ETHERNET PROBLEMS		
No connection.	1. Make sure the correct patch cable or cross over cable is being used. (See local IT department for assistance.) 2. Verify that the cables are fully inserted into the connector on the upper case back. 3. Verify that the network device connected to the Power Wave S700 is either a 10-baseT device or a 10/100 base T device. 4. Use the Power Wave Manager Software to verify that the correct IP address information is entered. 5. Verify that the PC has the correct IP address information. 6. Make sure that another device on the network is not already using the IP address entered into the Power Wave Manager utility software.	1. Check LED 7 on the control board. It should be lit when Ethernet is connected to a network or PC. 2. Check for loose or faulty connections between the control board and the RJ45 type Ethernet connector. See the Wiring Diagram. 3. Perform the ***Control Board Test***.
The Ethernet connection drops while welding.	1. Make certain that the network cable is NOT located next to any high current carrying conductors such as input power cables and welding output cables.	1. Check for loose or faulty connections between the control board and the RJ45 type Ethernet connector. 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.

USING THE STATUS LED LIGHT TO TROUBLESHOOT SYSTEM PROBLEMS

The Power Wave is equipped with a status light. If a problem occurs it is important to note the condition of the status light. **Therefore, prior to cycling power to the system, check the power source status light for error sequences as noted below**.

Included in this section is information about the power source Status LED and some basic troubleshooting charts for both machine and weld performance.

TROUBLESHOOTING THE POWER WAVE USING THE STATUS LED

The **STATUS LIGHT** is a two color light that indicates system errors. Normal operation is a steady green light. Error conditions are indicated in the following chart.

Status lights

LIGHT CONDITION	MEANING
	MAIN CONTROL BOARD STATUS LIGHT AND INPUT CONTROL BOARD
Steady Green	System OK. Power source is operational and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset and indicates the Power Wave S700 is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on or if the system configuration is changed during operation.
Alternating Green and Red	Non-recoverable system fault. If the Status lights are flashing any combination of red and green, errors are present. **Read the error code(s) before the machine is turned off**. **Error Code interpretation** through the Status light is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. Only active error conditions will be accessible through the Status Light. To clear the active error(s), turn power source off and back on to reset.
Steady Red	Not Applicable.
Blinking Red	Not Applicable.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

ERROR CODES FOR THE POWER WAVE S700

The following is a list of possible error codes that the Power Wave can output via the status light (see "Troubleshooting the Power Wave System Using the Status LED").

MAIN CONTROL BOARD ("STATUS" LIGHT)		
ERROR CODE #	**DESCRIPTION**	**INDICATION**
31	Primary overcurrent error.	Excessive Primary current present. May be related to a switch board or output rectifier failure.
32	Capacitor "A" under voltage (Left side facing machine)	Low voltage on the main capacitors. May be caused by improper input configuration or an open/short circuit in the primary side of the machine.
33	Capacitor "B" under voltage (Right side facing machine)	
34	Capacitor "A" over voltage (Left side facing machine)	Excess voltage on the main capacitors. May be caused by improper input configuration, excessive line voltage or improper capacitor balance (see Error 43).
35	Capacitor "B" over voltage (Right side facing machine)	
36	Thermal error	Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
37	Softstart error	Capacitor precharge failed. Usually accompanied by codes 32-35.
41	Secondary overcurrent error	The secondary (weld) current limit has been exceeded. When this occurs the machine output will phase back to 100 amps, typically resulting in a condition referred to as "noodle welding".
43	Capacitor delta error	The maximum voltage difference between the main capacitors has been exceeded. May be accompanied by errors 32-35. May be caused by an open or short in the primary or secondary circuit(s).
49	Single phase error	Indicates machine is running on single phase input power. Usually caused by the loss of the middle leg (L2).
Other		A complete list of error codes is included with Power Wave Utilities available from http://www.powerwavesoftware.com. Contact the Service Department for any errors not listed in the "Lookup Error" section of Power Wave Manager.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

CASE COVER 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

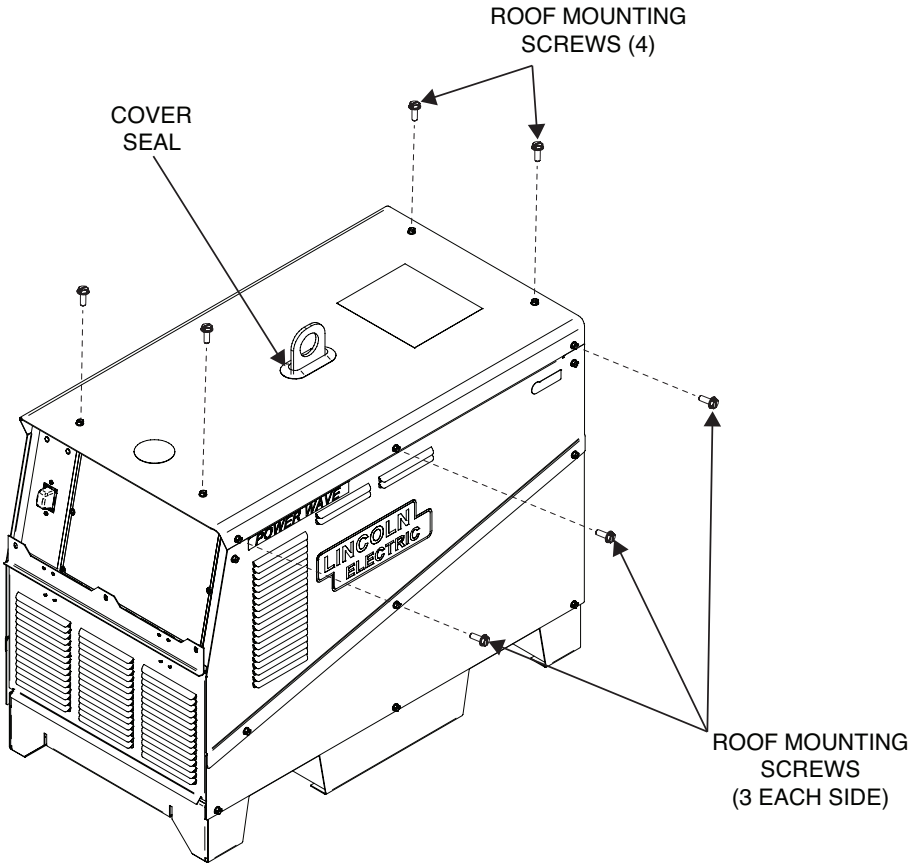
This procedure will aid the technician in the removal and replacement of the Case Covers.

MATERIALS NEEDED

3/8” Nutdriver

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.1 – Roof mounting screw locations



REMOVAL PROCEDURE

1. Remove the input power to the Power Wave S700.

Roof Removal:

1. Using a 3/8" nutdriver, remove the ten bolts (four on the top and three on each side) securing the roof to the machine. See Figure F.1.

2. Gently slide cover seal off of lift bale. See Figure F.1. This will allow the roof to be removed.

Right Top Case Side:

1. Using a 3/8" nutdriver, remove the five bolts securing the right top side case cover. See ***Figure F.2***.

Input Power Door:

1. Using a 3/8" nutdriver, remove the two bolts securing the input power door to the machine. See ***Figure F.3***.

Left Top Case Side:

1. Using a 3/8" nutdriver, remove the four bolts securing the left top case side. See ***Figure F.4***.

Bottom Case Side:

1. Using a 3/8" nutdriver, remove the three bolts (6 total) securing each bottom case side panel. See ***Figure F.5***.

2. Perform the ***Input Filter Capacitor Discharge Procedure***.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.2 – Right top case side mounting screw locations

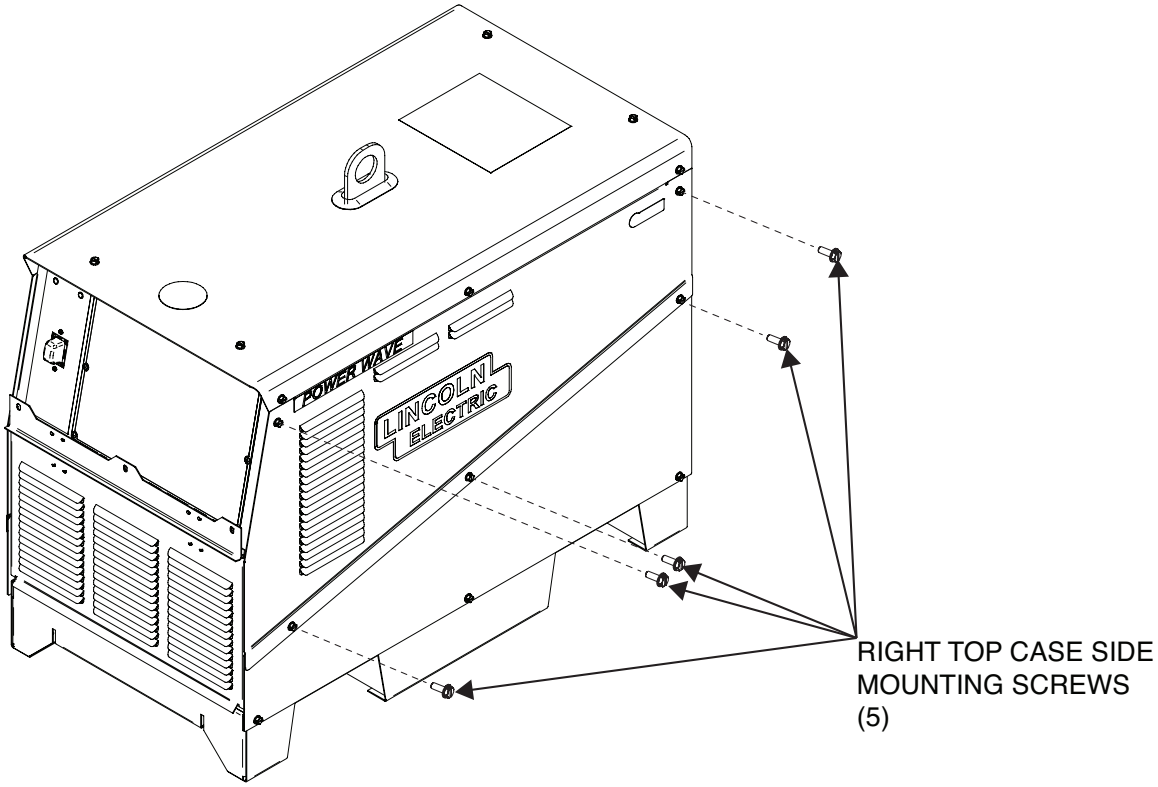
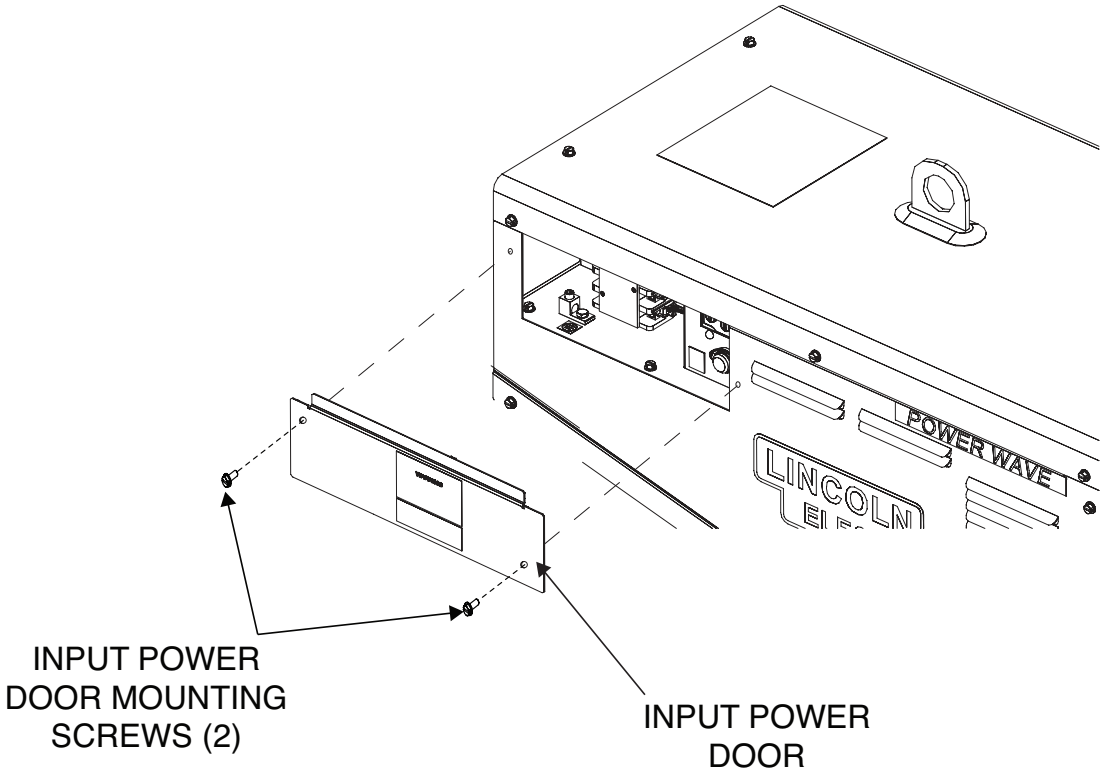


Figure F.3 – Input power door mounting screw locations



CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.4 – Left top case side mounting screw locations

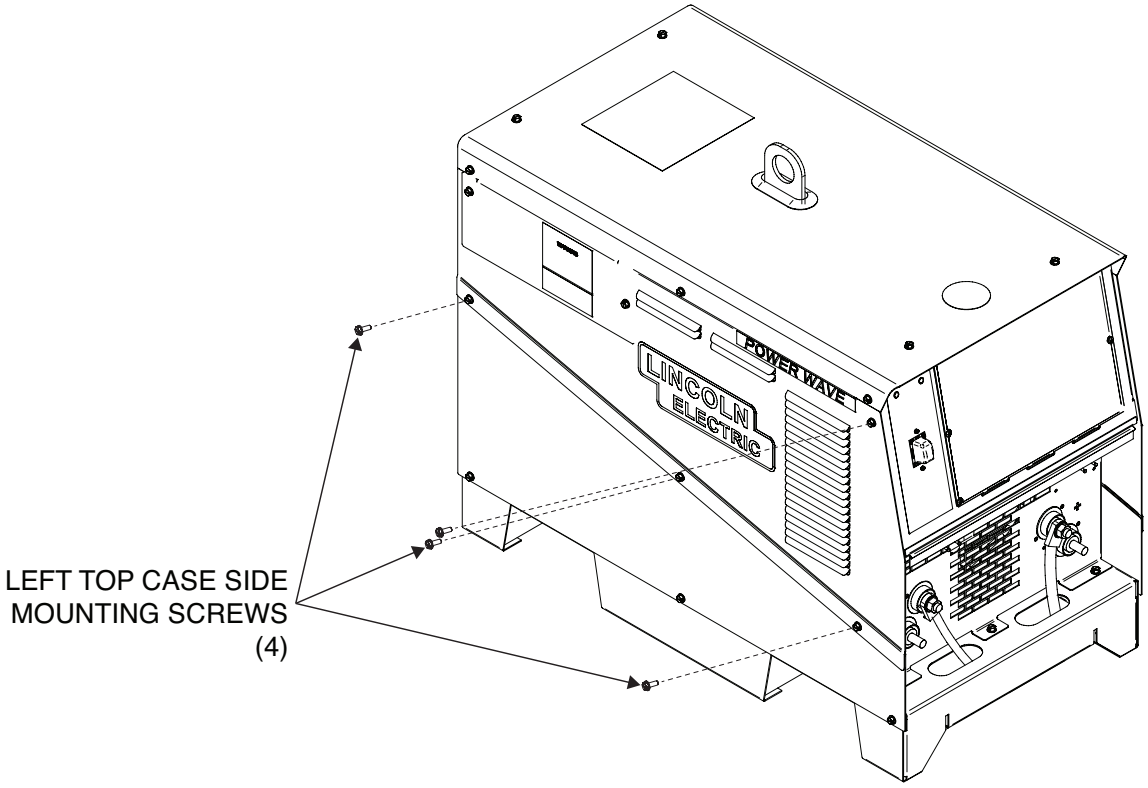
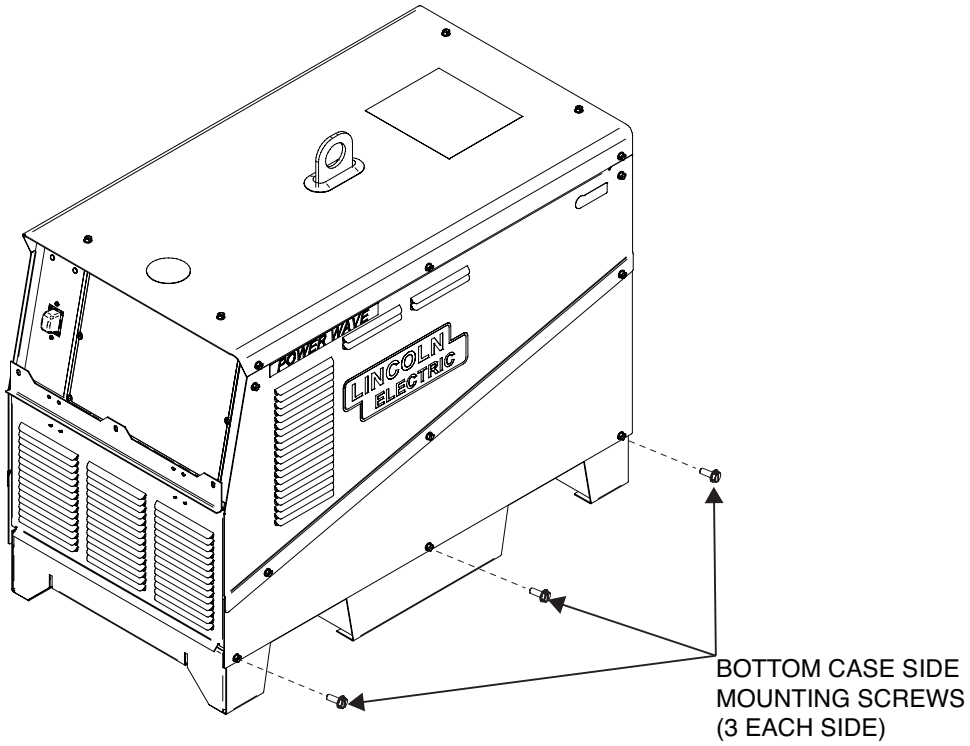


Figure F.5 – Bottom case side mounting screw locations



CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

Bottom Case Side:

1. Using a 3/8” nutdriver, attach the three bolts (6 total) securing each bottom case side panel.

Left Top Case Side:

1. Using a 3/8” nutdriver, attach the four bolts securing the left top case side.

Input Power Door:

1. Using a 3/8” nutdriver, attach the two bolts securing the input power door to the machine.

Right Top Case Side:

1. Using a 3/8” nutdriver, attach the five bolts securing the right top side case cover.

Roof:

1. Carefully slide roof into position on machine.
2. Gently slide cover seal onto the lift bale.
3. Using a 3/8” nutdriver, attach the ten bolts (four on the top and three on each side) securing the roof to the machine.

INPUT FILTER 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

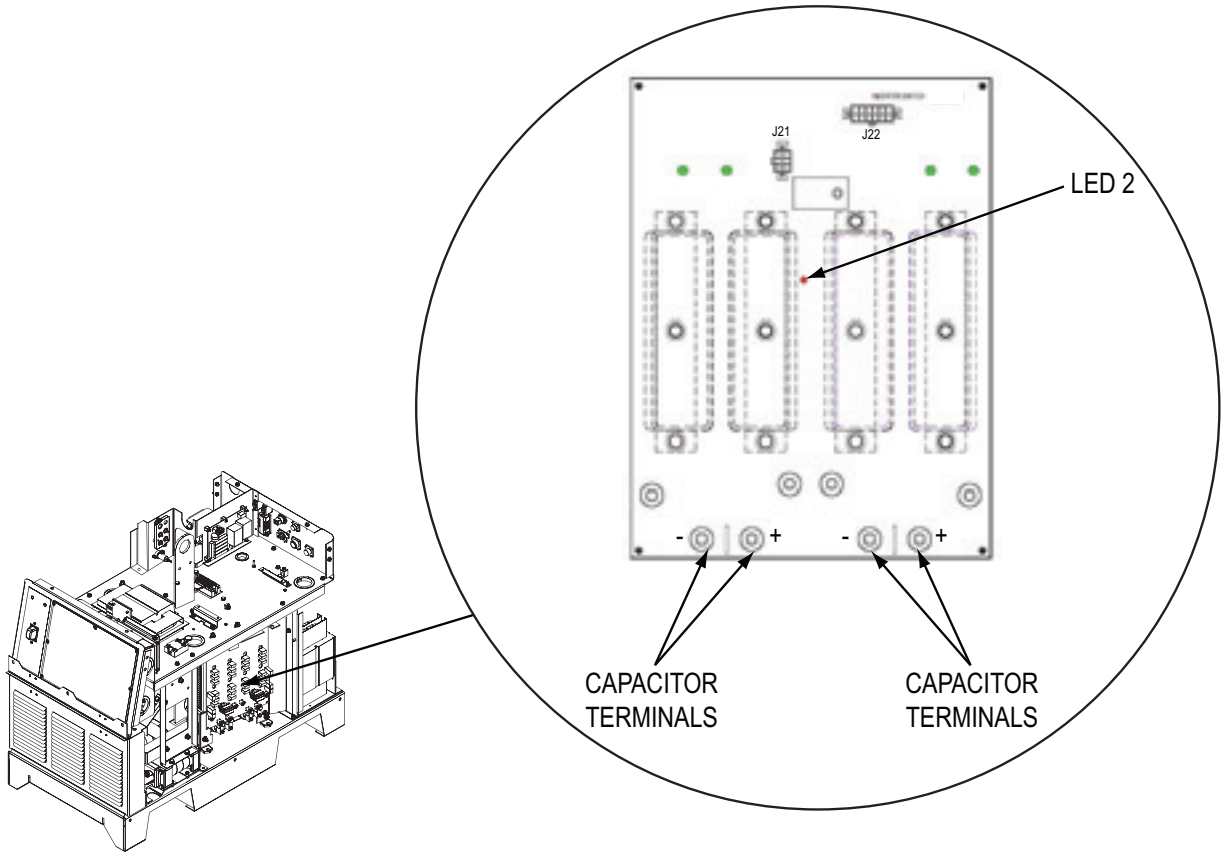
This procedure should be performed before any internal maintenance or repair procedures are attempted on the Power Wave S700.

MATERIALS NEEDED

3/8” Wrench
Volt/Ohmmeter
Resistor (25-1000 Ohms @ 25 Watts (Minimum))
Electrically Insulated Gloves And Pliers

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE (continued)

Figure F.6 – Switch board



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 S700.
2. Using the 3/8” wrench, remove the left and right metal case sides. See ***Case Cover Removal Procedure***.
3. Take note of the red LEDs #2 located on both switch boards (left and right sides). See Figure F.6. If either of the red LEDs #2 are ON, this is an indication of a voltage greater than 2.0 VDC on the filter capacitors.

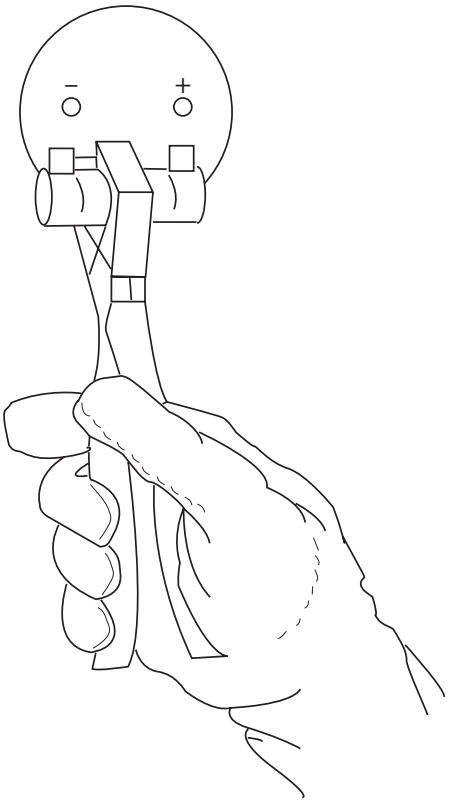
Even if LEDs #2 are NOT ON, continue with this test procedure to verify that the filter capacitors are fully discharged and no voltage is present.

4. Be careful not to make contact with the capacitor terminals that are located in the lower portion of the left and right side switch boards. See Figure F.6.
5. Carefully check for a DC voltage at the capacitor terminals on both switch boards. There are two filter capacitors on each switch board for a total of four filter capacitors per machine. See Figure F.6.

NOTE: The capacitor polarity is marked on the switch boards.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE (continued)

Figure F.7 – Discharge procedure



6. If any voltage is present, proceed to the next step. If no capacitor voltage is present, the filter capacitors are fully discharged.

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

7. Using the high wattage resistor (25-1000 ohms @ 25 watts) and the electrically insulated gloves and pliers, carefully connect the resistor across the two capacitor terminals. Hold the resistor in place for ten seconds. See ***Figure F.6***. Repeat this discharge procedure for all of the four filter capacitors (two filter capacitors on each switch board). DO NOT TOUCH THE FILTER CAPACITOR TERMINALS WITH YOUR BARE HANDS. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE. See Figure F.7.

8. Recheck the voltage across all of the filter capacitor terminals. The voltage should be zero. If any voltage remains, repeat the discharge procedure.

CONTROL BOARD TEST 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

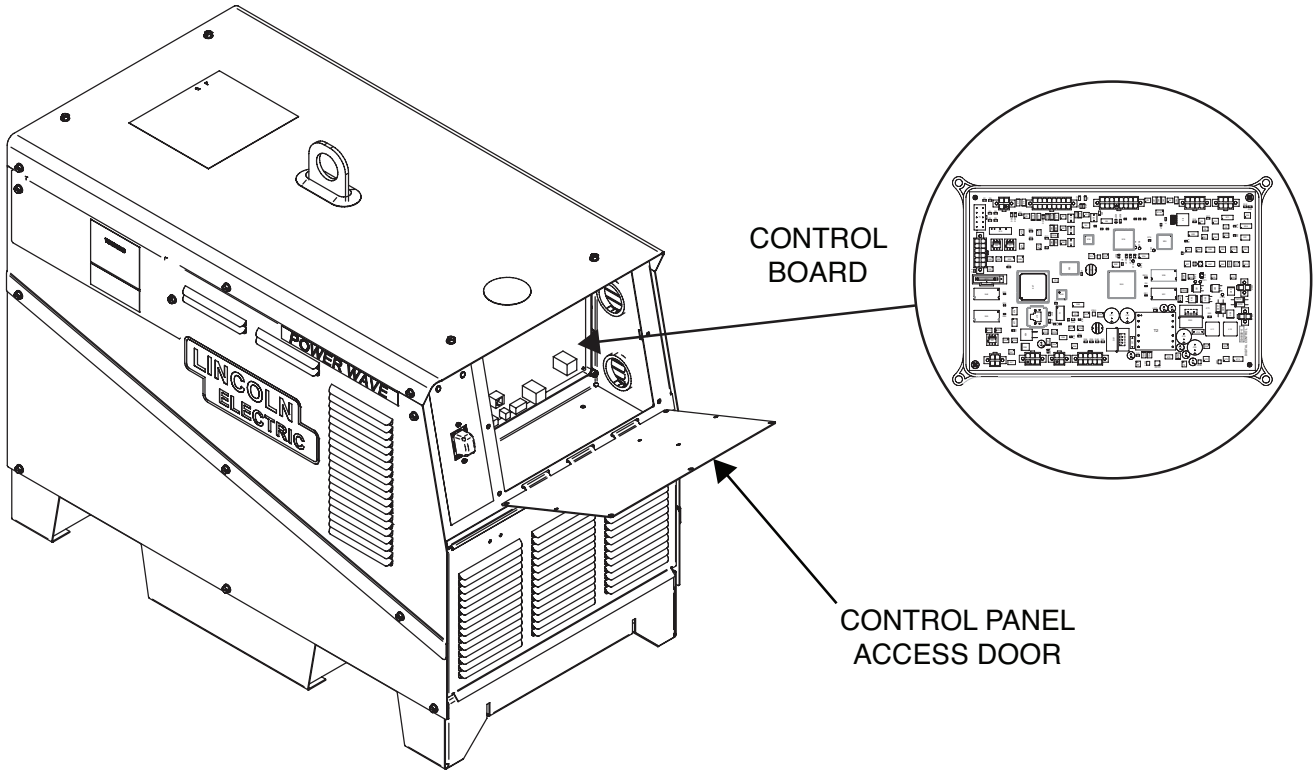
This test will help determine if the Control Board is receiving the correct input voltage and if it is generating the correct output voltages for other circuit components. This test will NOT validate all of the functionalities of the Control Board.

MATERIALS NEEDED

Volt/Ohmmeter
Phillips Screwdriver
Wiring Diagram

CONTROL BOARD TEST PROCEDURE (continued)

Figure F.8 – Control board location



TEST PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Locate the control board. See Figure F.8.
3. Using a phillips screwdriver, remove the seven screws securing the control panel access door to the case front assembly. See Figure F.8.
4. Apply the correct input power to the Power Wave S700 machine.
5. Observe and take note of the ten LEDs on the control board. See ***Figure F.9*** for locations and ***Figure F.10*** for LED functions. If the LEDs do not provide enough information to solve the problem, proceed with the voltage and resistance checks per ***Table F.1***.
6. When testing is complete, replace any wiring plugs that may have been removed and replace the control panel access door.

CONTROL BOARD TEST PROCEDURE (continued)

Figure F.9 – Control board status LEDs functions

G4800 Digital Control PC Board Status LEDs			
LED #	COLOR	STATUS	FUNCTION
1	Green	See Table	Board Status Indicators Solid Green indicates OK (See IM or SVM for error codes)
2	Red	See Table	
3	Green	ON	Output Enable True (threshold determined by weld mode)
		OFF	Output Enable False (threshold determined by weld mode)
4	Green	ON	Single Phase Operation Detected (Faulted Condition)
		OFF	Three Phase Operation Detected
5	Green	ON	Remote Electrode Voltage Sense Active (67 Lead)
		OFF	Electrode Voltage Sensed from Output Stud
6	Green	ON	Remote Work Voltage Sense Active (21 Lead)
		OFF	Work Voltage Sensed from Output Stud
7	Green	ON	Ethernet Physically connected to network or PC
		FLASH	Ethernet Physically connected and communicating
		OFF	No Ethernet Connection
8	Green	ON	Ethernet Speed = 100 Mb (default)
		OFF	Ethernet Speed = 10 Mb
9	Green	ON	On Board Power Supply Active (derived from 40V bus)
		OFF	On Board Power Supply Inactive
10	Green	ON	External DeviceNet Supply Connected
		OFF	External DeviceNet Supply Connected

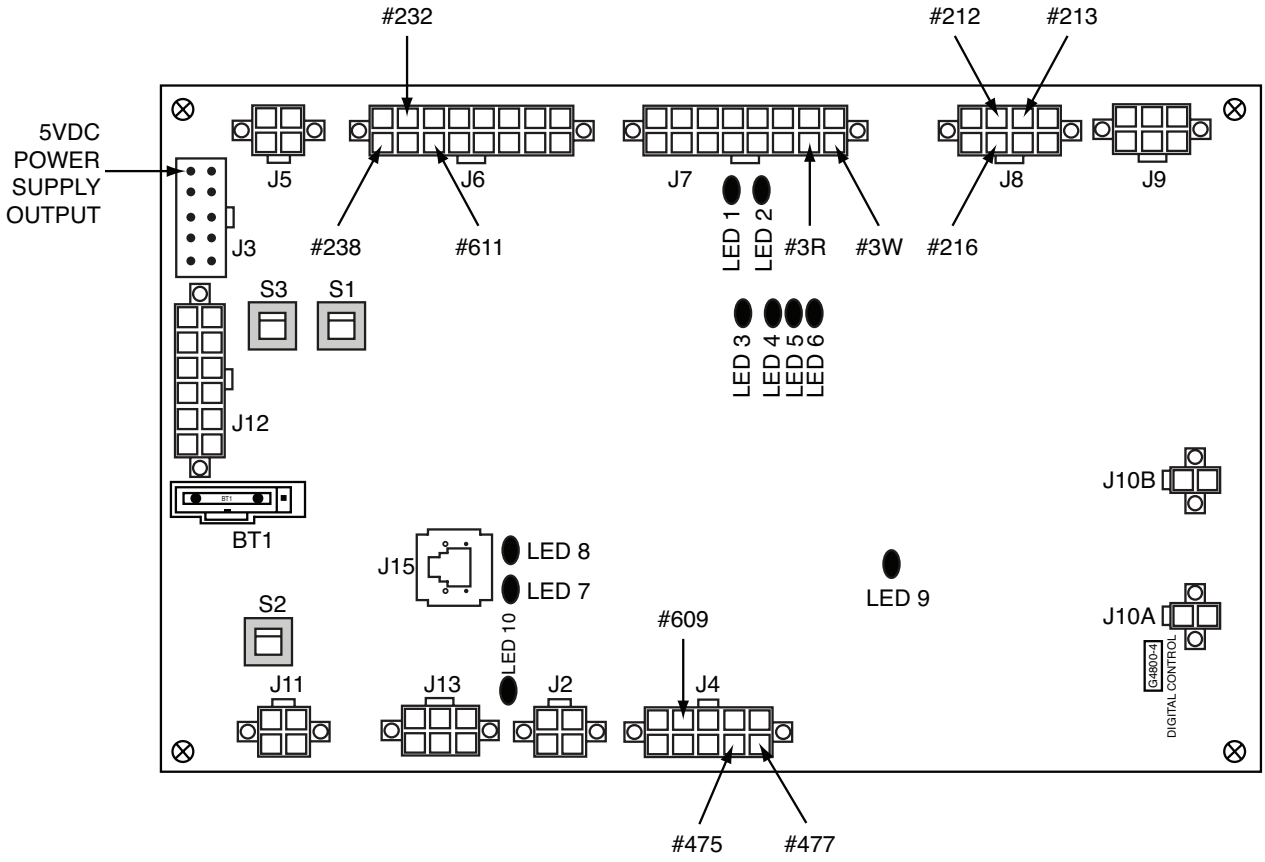
ArcLink Status LEDs		
GREEN	RED	INDICATION
OFF	OFF	Offline: Check power, or configuration
ON	OFF	Online and operational
FLASH	OFF	System Mapping
RAPID FLASH	OFF	Mapping error or Machine identified by PC
*OFF	FLASH	Non-recoverable system fault: • Error code numbers flash red with long pause between digits • Green flash between codes

Table F.1 – Control board voltage and resistance checks

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	CONDITIONS & COMMENTS
INPUT POWER FROM DC BUS BOARD	PLUG J4 PIN 2 (-) LEAD #475	PLUG J4 PIN 1 (+) LEAD #477	40VDC	MACHINE POWERED UP
POWER TO INPUT BOARD - MAIN CONTACTOR CONTROL RELAY	PLUG J6 PIN 2 (-) LEAD #232	PLUG J6 PIN 9 (+) LEAD #238	13VDC	MACHINE POWERED UP
POWER TO THE RIGHT SIDE IGBT SWITCH BOARD	PLUG J6 PIN 11 (-) LEAD #611	PLUG J4 PIN 9 (+) LEAD #609	15VDC	MACHINE POWERED UP
SUPPLY TO CURRENT TRANSDUCER	PLUG J8 PIN 6 (-) LEAD #216	PLUG J8 PIN 2 (+) LEAD #212	15VDC	MACHINE POWERED UP
SUPPLY TO CURRENT TRANSDUCER	PLUG J8 PIN 6 (+) LEAD #216	PLUG J8 PIN 3 (-) LEAD #213	-15VDC	MACHINE POWERED UP
FAN MOTOR CONTROL	PLUG J7 PIN 16 (-) LEAD #3W	PLUG J7 PIN 15 (+) LEAD #3R	10VDC TO 15VDC	MACHINE POWERED UP AND FANS RUNNING

CONTROL BOARD TEST PROCEDURE (continued)

Figure F.10 – Control board status LEDs and test point locations



INPUT BOARD TEST

⚠ WARNING

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

TEST DESCRIPTION

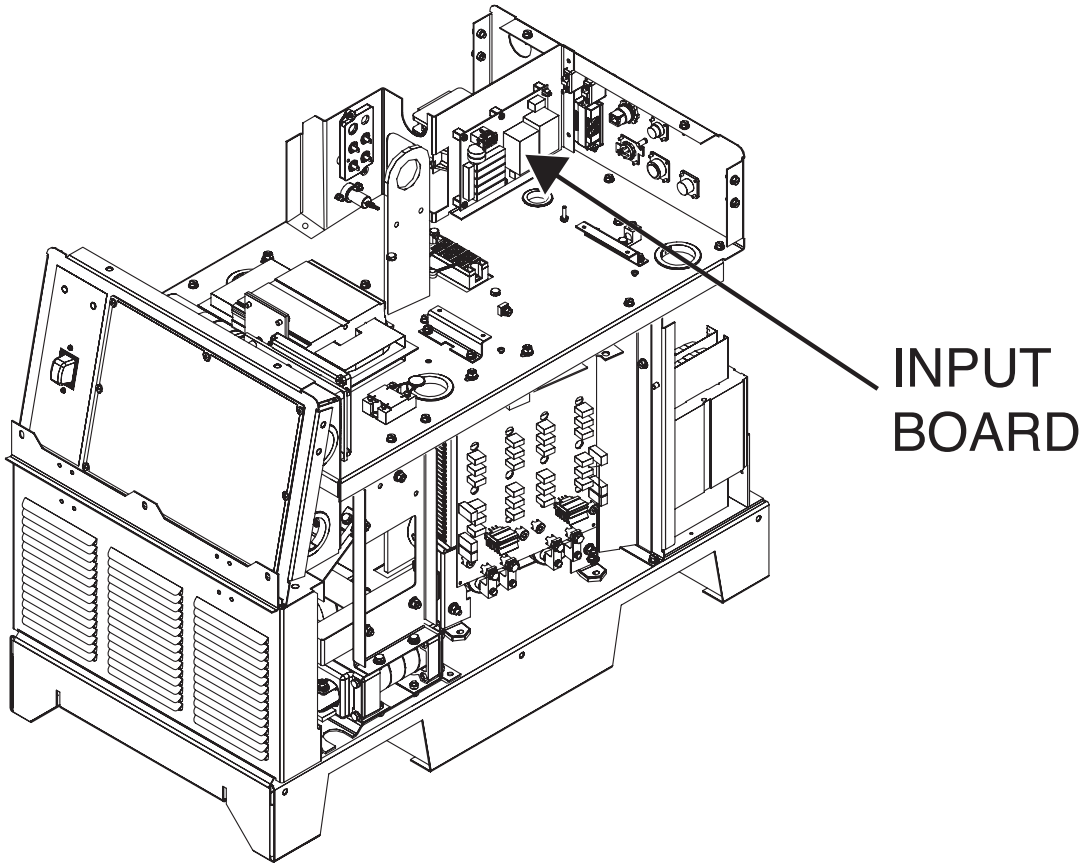
This test will help determine if the Input Board is receiving the proper signals from the Control Board, activating the soft start function and Main Input Contactor.

MATERIALS NEEDED

3/8” Wrench
Volt/Ohmmeter
Wiring Diagram

INPUT BOARD TEST (continued)

Figure F.11 – Input board location



PROCEDURE

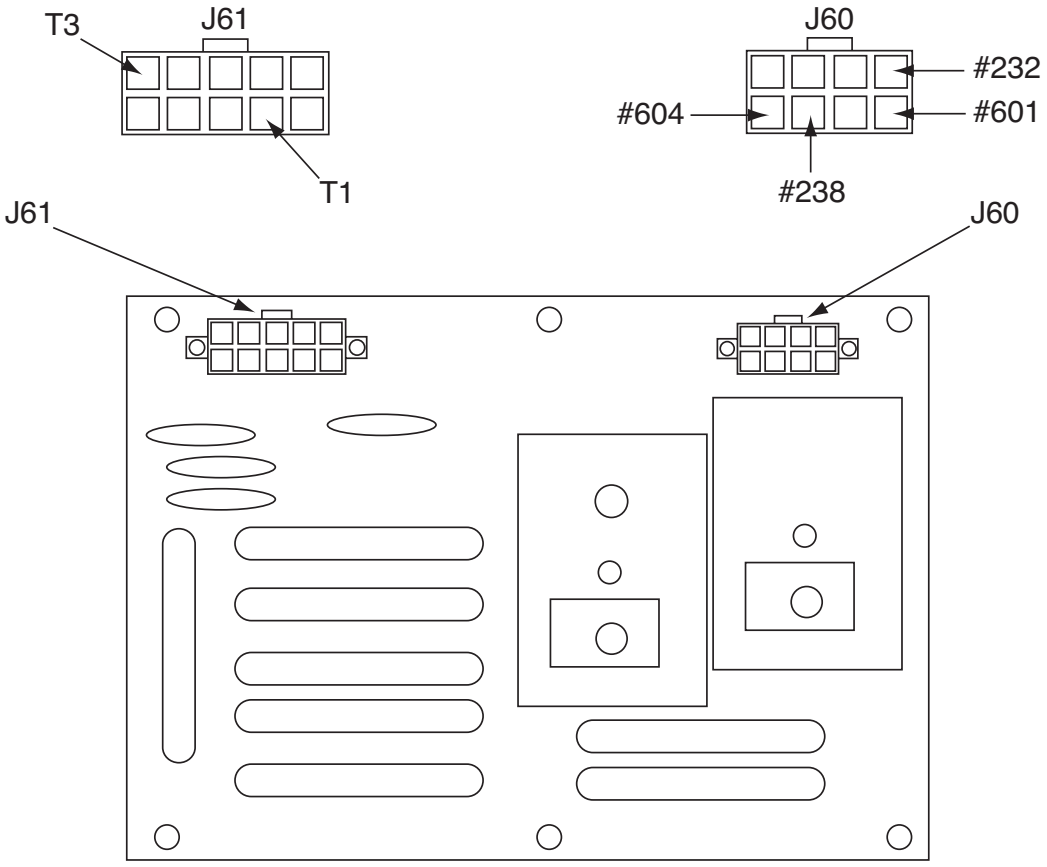
1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the Input Board. See Figure F.11.
4. Apply the correct three phase input power to the Power Wave S700. This test is performed while the three phase input power is being applied to the input board and the immediate area around this board. USE EXTREME CAUTION WHILE PERFORMING THIS TEST.
5. During the first 10-15 seconds after the input power switch (S1) is activated the following voltages should be present. See Table F.2 and ***Figure F.12*** for test point locations. See the Wiring Diagram.

Table F.2 – Input board test points

EXPECTED VOLTAGE	TEST POINT	TEST POINT	COMMENTS
13 - 15 VDC	PLUG J60 PIN 3 (+) LEAD #238	PLUG J60- PIN 4 (–) LEAD #604	THE PRE-CHARGE RELAY SHOULD BE ACTIVATED
INPUT LINE AC VOLTAGE	PLUG J61 PIN 2 LEAD #T1	PLUG J61 PIN 10 LEAD #T3	THE PRE-CHARGE RELAY CONTACTS SHOULD BE CLOSED

INPUT BOARD TEST (continued)

Figure F.12 – Input board test points



6. If the 13 - 15VDC is not present during the first 10-15 seconds after power-up, check the wiring for loose or faulty connections between the input board and the control board.

7. If the wiring is OK and the 13 - 15VDC is not present, perform the ***Control Board Test***.

8. If the 13 - 15VDC is present during the first 10-15 seconds after power-up and the pre-charge relay is not functioning, the input board is faulty. Perform the ***Input Board Removal And Replacement Procedure***.

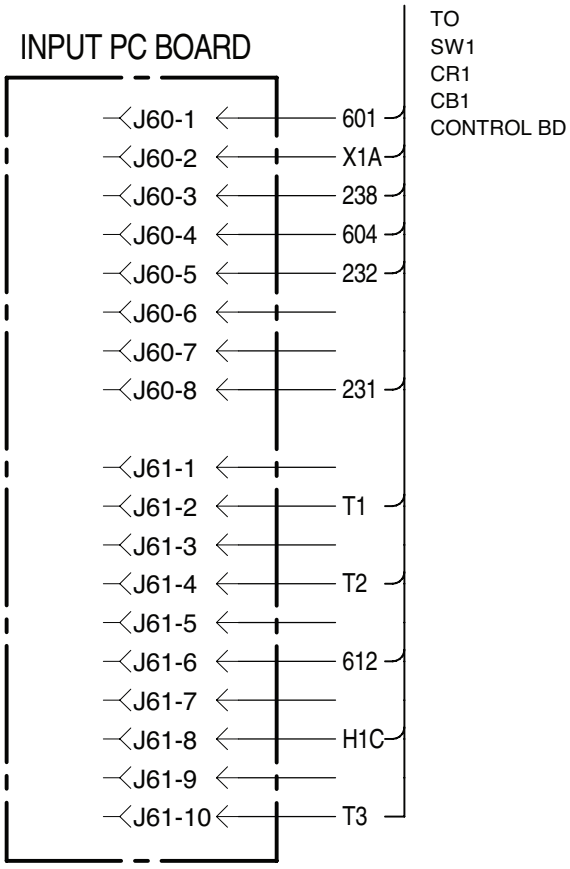
9. After the pre-charge time is complete (15 seconds after power-up), the following voltages should be present. See Table F.3 and Figure F.12 for test point locations. See the Wiring Diagram.

Table F.3 – Input board test points

EXPECTED VOLTAGE	TEST POINT	TEST POINT	COMMENTS
13 - 15 VDC	PLUG J60 PIN 3 (+) LEAD #238	PLUG J60 PIN 5 (–) LEAD #232	THE MAIN CONTACTOR CONTROL RELAY SHOULD BE ACTIVATED
24 VAC	PLUG J60 PIN 1 LEAD #601	LEAD X2 (SEE WIRING DIAGRAM)	THE MAIN CONTACTOR CR1 SHOULD BE CLOSED

INPUT BOARD TEST (continued)

Figure F.13 – Input board drawing



10. If the 13 - 15VDC is not present after the pre-charge time is complete (15 seconds after power up), check the wiring for loose or faulty connections between the input board and the control board. See Figure F.13.

11. If the wiring is OK and the 13 - 15VDC is not present, perform the ***Control Board Test***.

12. If the 13 - 15VDC is present 15 seconds after power-up and the main contactor control relay is not functioning, the input board is faulty. Perform the ***Input Board Removal And Replacement Procedure***.

13. If the 24VAC is present at the main input contactor and the contactor is not activating, perform the ***Input Contactor Test***.

INPUT RECTIFIER TEST

⚠ WARNING

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

TEST DESCRIPTION

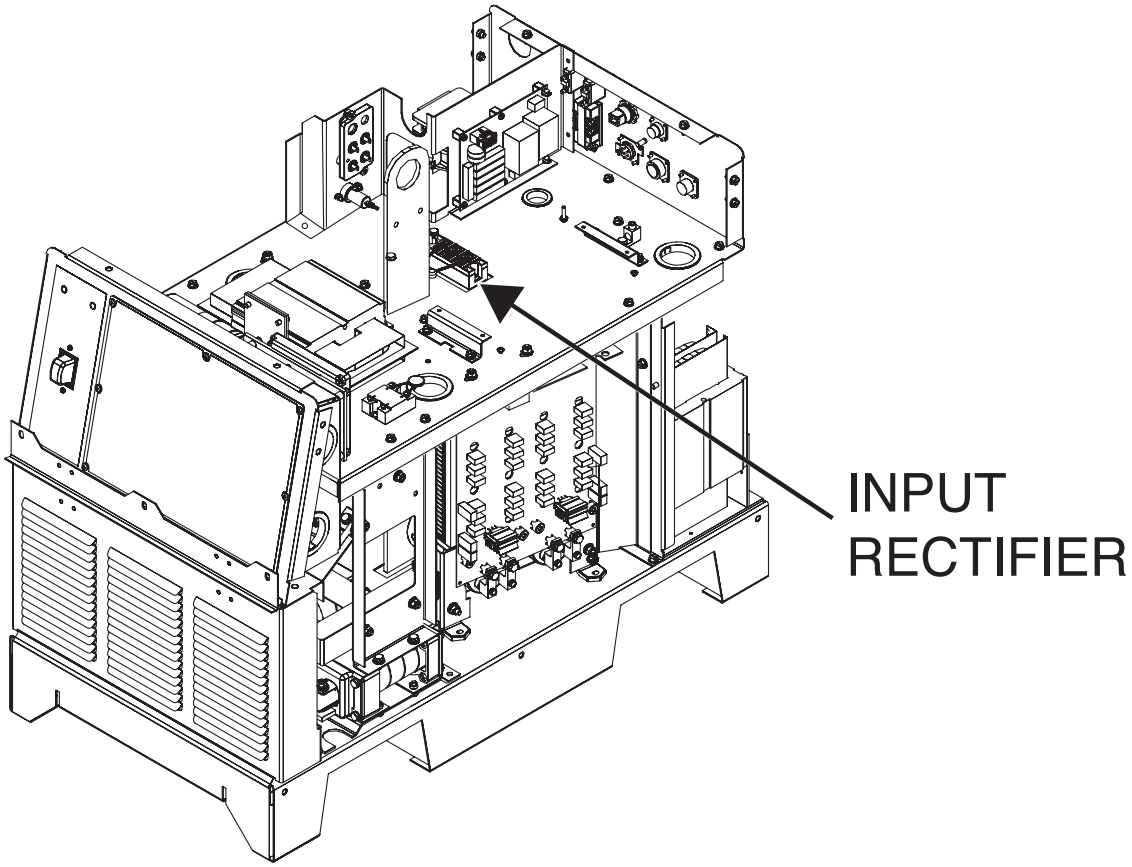
This test will help determine if the Input Rectifier is operational or “open or shorted”.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

INPUT RECTIFIER TEST (continued)

Figure F.14 – Input rectifier test



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the input rectifier. See Figure F.14.
5. Using the volt/ohmmeter (diode test), check the input rectifier per ***Table F.4***. Also see ***Figure F.15***. See the Wiring Diagram.
6. Failure of the input rectifier is typically the result of another problem. If the input rectifier does not pass the tests detailed in ***Table F.4***, perform the ***Switch Board Test***.
7. If the input rectifier is faulty, perform the ***Input Rectifier Removal and Replacement Procedure***.

INPUT RECTIFIER TEST (continued)

Figure F.15 – Input rectifier terminal locations

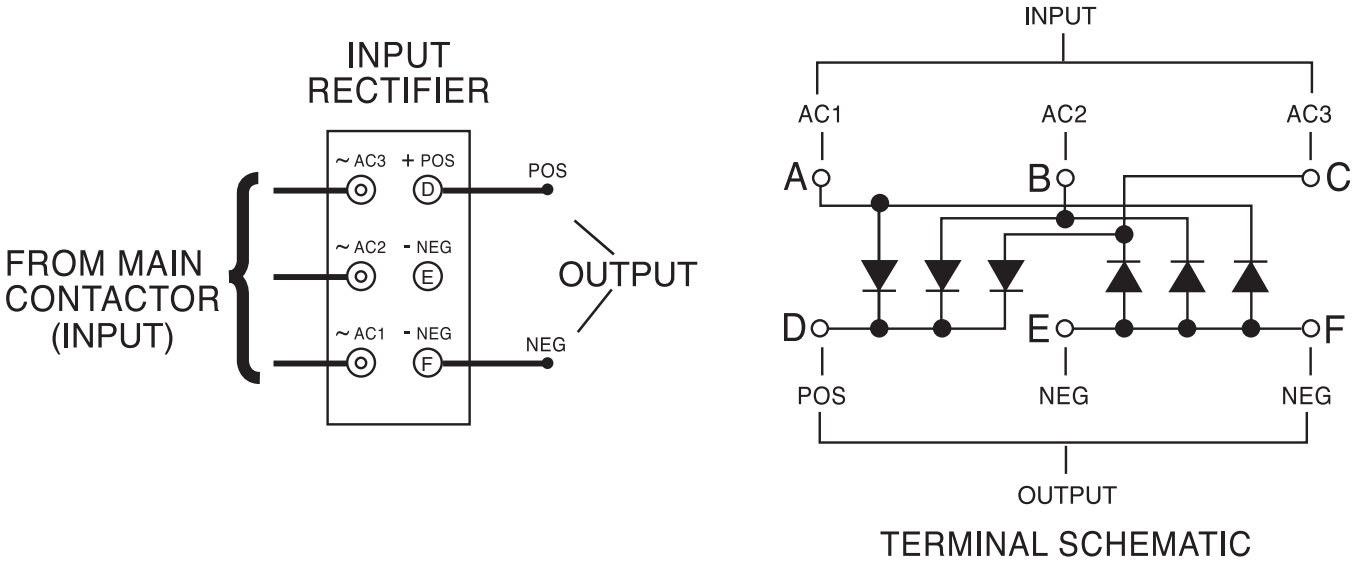


Table F.4 – Input rectifier test points and acceptable readings

+ PROBE (RED)	- PROBE (BLACK)	RESULT
A (CONTACTOR T1)	**D** (LEFT SWITCHBOARD "+" CAP TERMINAL)	0.3 - 0.7V
B (CONTACTOR T1)	**D** (LEFT SWITCHBOARD "+" CAP TERMINAL)	0.3 - 0.7V
C (CONTACTOR T1)	**D** (LEFT SWITCHBOARD "+" CAP TERMINAL)	0.3 - 0.7V
D (LEFT SWITCHBOARD "+" CAP TERMINAL)	**A** (CONTACTOR T1)	OPEN
D (LEFT SWITCHBOARD "+" CAP TERMINAL)	**B** (CONTACTOR T1)	OPEN
D (LEFT SWITCHBOARD "+" CAP TERMINAL)	**C** (CONTACTOR T1)	OPEN
F (RIGHT SWITCHBOARD "-" CAP TERMINAL)	**A** (CONTACTOR T1)	0.3 - 0.7V
F (RIGHT SWITCHBOARD "-" CAP TERMINAL)	**B** (CONTACTOR T1)	0.3 - 0.7V
F (RIGHT SWITCHBOARD "-" CAP TERMINAL)	**C** (CONTACTOR T1)	0.3 - 0.7V
A (CONTACTOR T1)	**F** (RIGHT SWITCHBOARD "-" CAP TERMINAL)	OPEN
B (CONTACTOR T1)	**F** (RIGHT SWITCHBOARD "-" CAP TERMINAL)	OPEN
C (CONTACTOR T1)	**F** (RIGHT SWITCHBOARD "-" CAP TERMINAL)	OPEN

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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

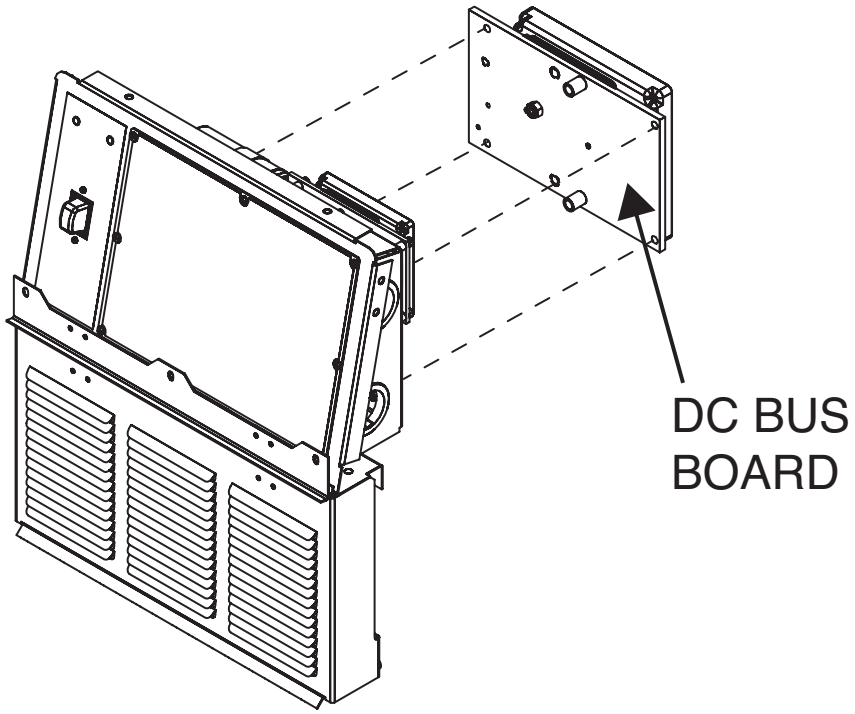
This test will help determine if the DC Bus Board is receiving the correct input voltage and if the board is functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

DC BUS BOARD TEST (continued)

Figure F.16 – DC bus board location



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the DC bus board. See Figure F.16.
4. Carefully apply the correct input power to the Power Wave S700.
5. Locate the red LED on the DC bus board. See ***Figure F.17***.
6. If the red LED is lit, the DC bus board is receiving input voltage from the DC bus rectifier circuit.
7. If the red LED is blinking, carefully remove plug J47 from the DC bus board. See ***Figure F.17***. 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 CB1. Reset if tripped. See Wiring Diagram.
9. Perform the voltage tests per ***Table F.5***. See ***Figure F.17***.
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 ***DC Bus Board Removal and Replacement Procedure***.

DC BUS BOARD TEST (continued)

Figure F.17 – DC bus board test points

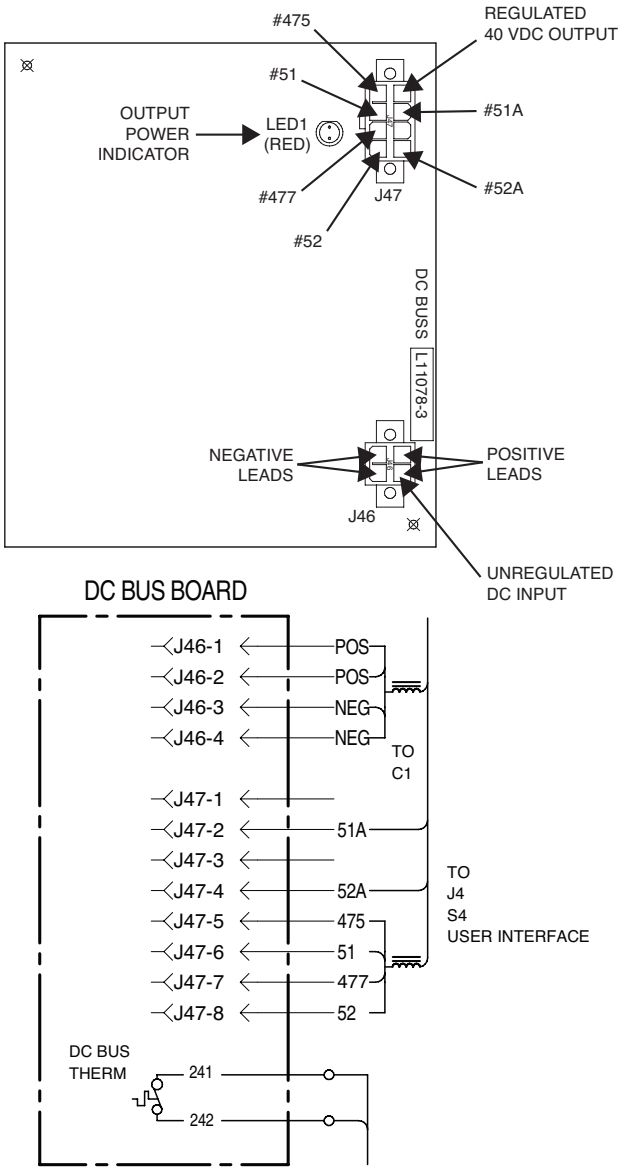


Table F.5 – DC bus board test points and acceptable readings

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READINGS
INPUT FROM DC RECTIFIER CIRCUIT	PLUG J46 PIN 1 (+)	PLUG J46 PIN 3 (–)	65VDC
40VDC OUTPUT TO ARCLINK RECEPTACLE	PLUG J47 PIN 8 (+) LEAD #52	PLUG J47 PIN 6 (–) LEAD #51	40VDC
40VDC OUTPUT TO CONTROL BOARD	PLUG J47 PIN 7 (+) LEAD #477	PLUG J47 PIN 5 (–) LEAD #475	40VDC
40VDC OUTPUT TO OPTIONAL USER INTERFACE	PLUG J47 PIN 4 (+) LEAD #52A	PLUG J47 PIN 2 (–) LEAD #51A	40VDC

INPUT CONTACTOR 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

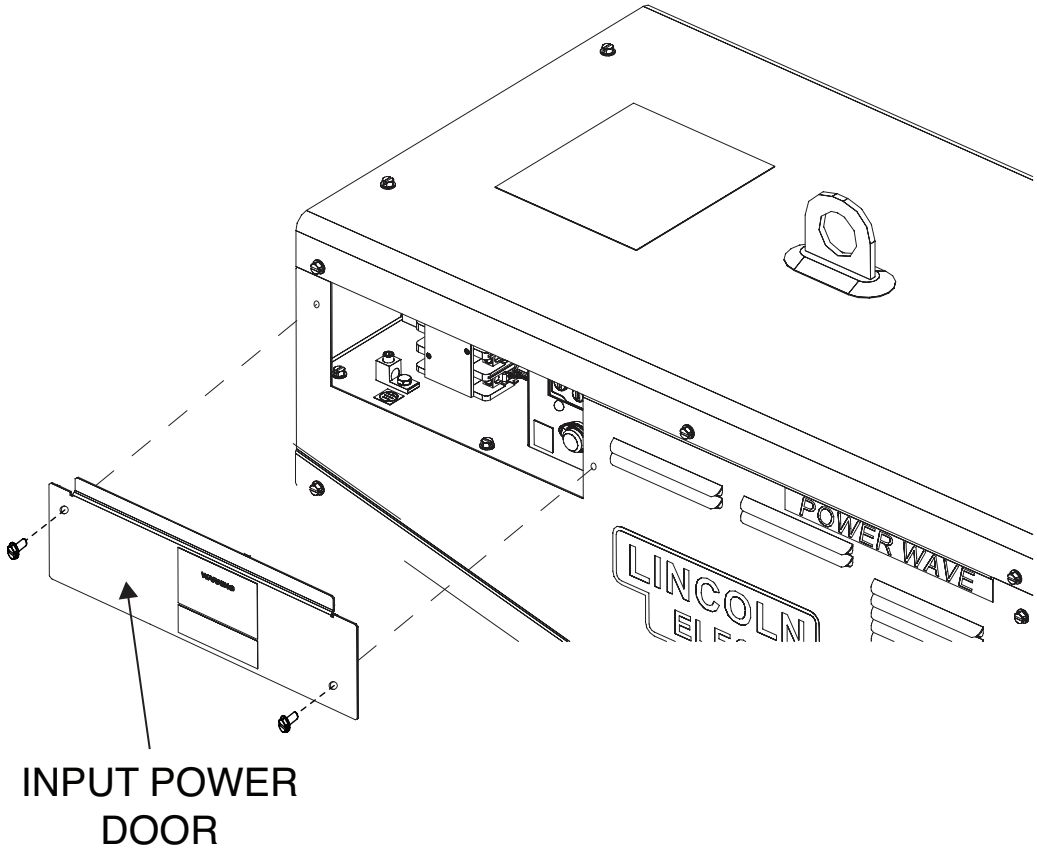
This test will help determine if the Input Contactor (CR1) is operational when the correct input voltage is applied to the contactor's coil.

MATERIALS NEEDED

External 24VAC Supply
Volt/Ohmmeter
3/8" Wrench
Wiring Diagram

INPUT CONTACTOR TEST (continued)

Figure F.18 – Input power door removal



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Using the 3/8” wrench, remove the input power door and the case top. See Figure F.18.
3. Locate the input contactor. See Figure F.19.
4. Label and remove leads #601 and X2 from the input contactor coil terminals. See ***Figure F.20***. See the Wiring Diagram.
5. Using an external 24VAC supply, apply 24VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Perform the ***Input Contactor Removal and Replacement Procedure***.
6. If the input contactor does activate, check the continuity across the three sets of contacts. See ***Figure F.21***. When the input contactor is activated, the resistance should be zero ohms or very low. If the resistance across any set of contacts is high, the input contactor is faulty.
7. When the input contactor is NOT activated, the resistance across the three sets of contacts should be infinite or very high. If the resistance across any set of contacts is low, the contacts may be “stuck” together.

NOTE: Make sure the power switch (SW1) is in the OFF position.

8. If the results of the resistance tests are questionable, remove the contactor cover to inspect the moving contacts and stationary contacts. If necessary, perform the ***Input Contactor Removal and Replacement Procedure***. No replacement parts are available.
9. When the testing is completed, attach the two previously removed leads #601 and X2.
10. Install the previously removed case top and input power door.

INPUT CONTACTOR TEST (continued)

Figure F.19 – Input contactor location

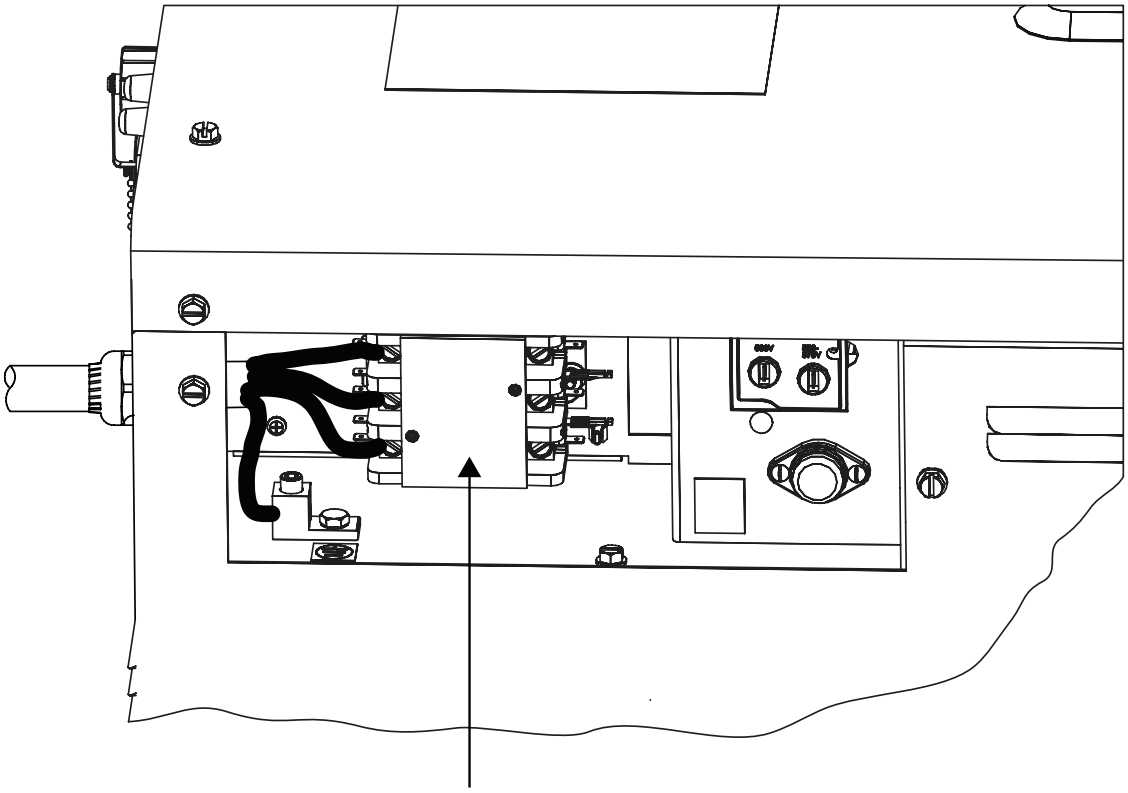
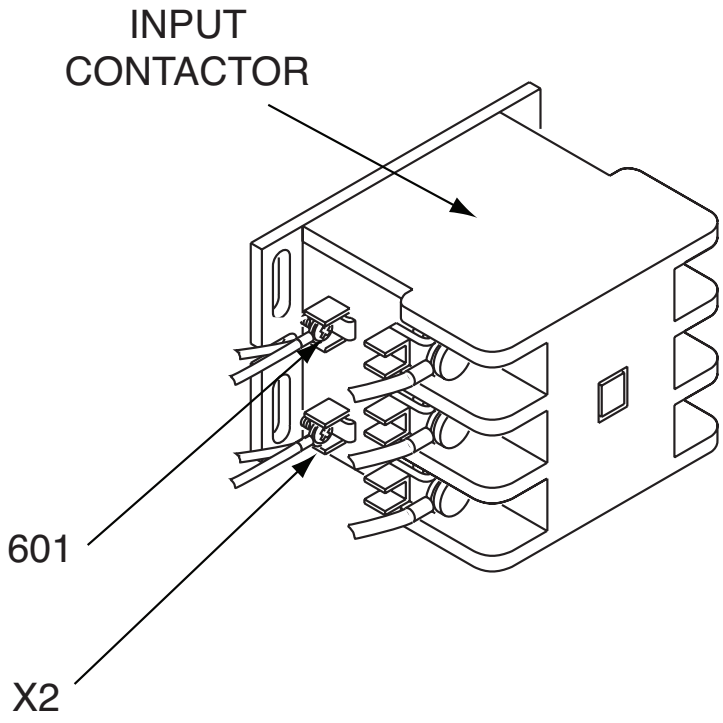
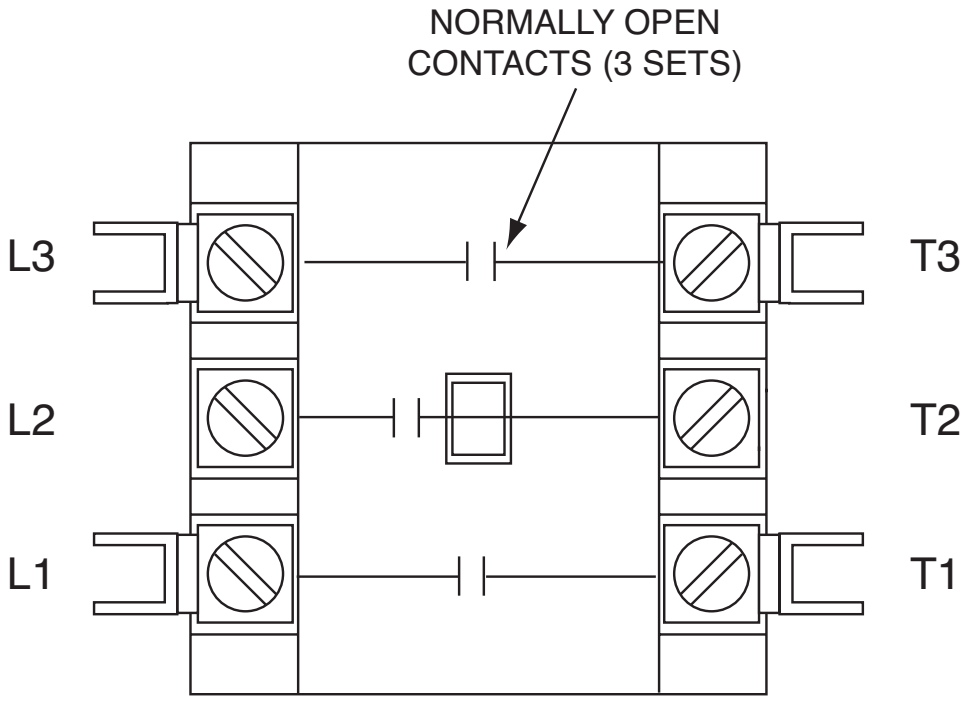


Figure F.20 – Input contactor and leads #601 and X2



INPUT CONTACTOR TEST (continued)

Figure F.21 – Input contactor terminals and contacts



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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

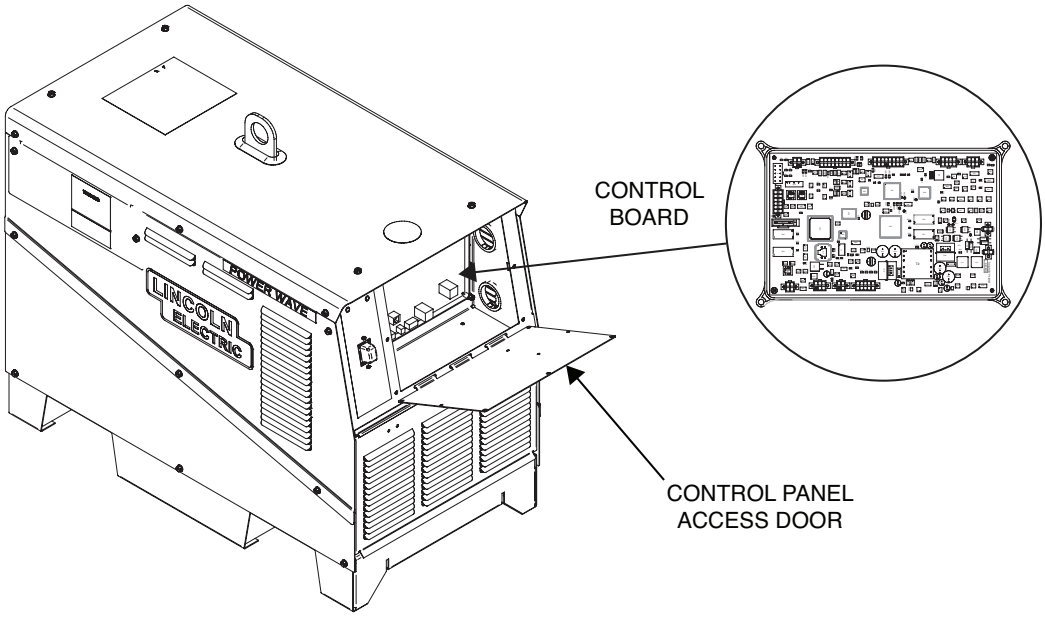
This test will help determine if the Current Transducer is receiving the correct DC supply voltages and if the Current Transducer is generating the correct feedback signals when the Power Wave S700 is producing output current.

MATERIALS NEEDED

Volt/Ohmmeter
3/8” Wrench
Wiring Diagram
Phillips Screwdriver

CURRENT TRANSDUCER TEST (continued)

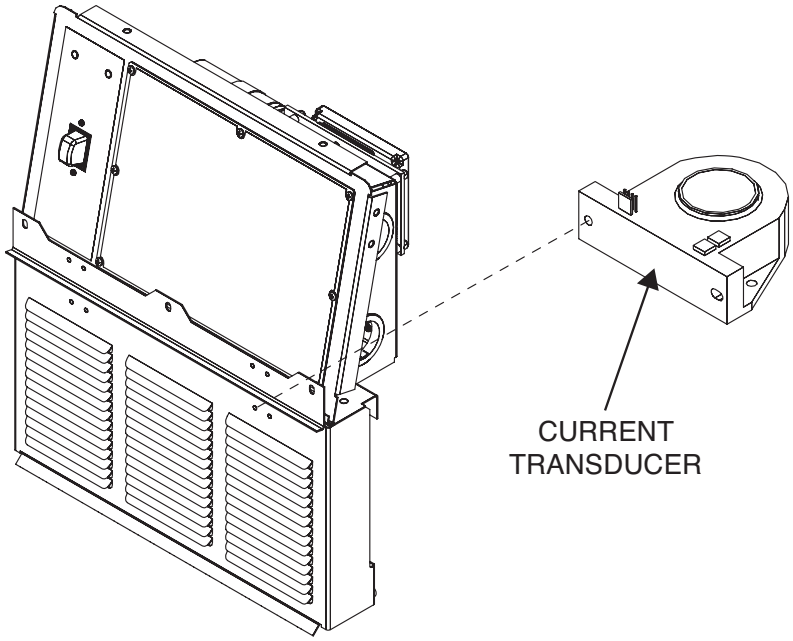
Figure F.22 – Control board location



PROCEDURE

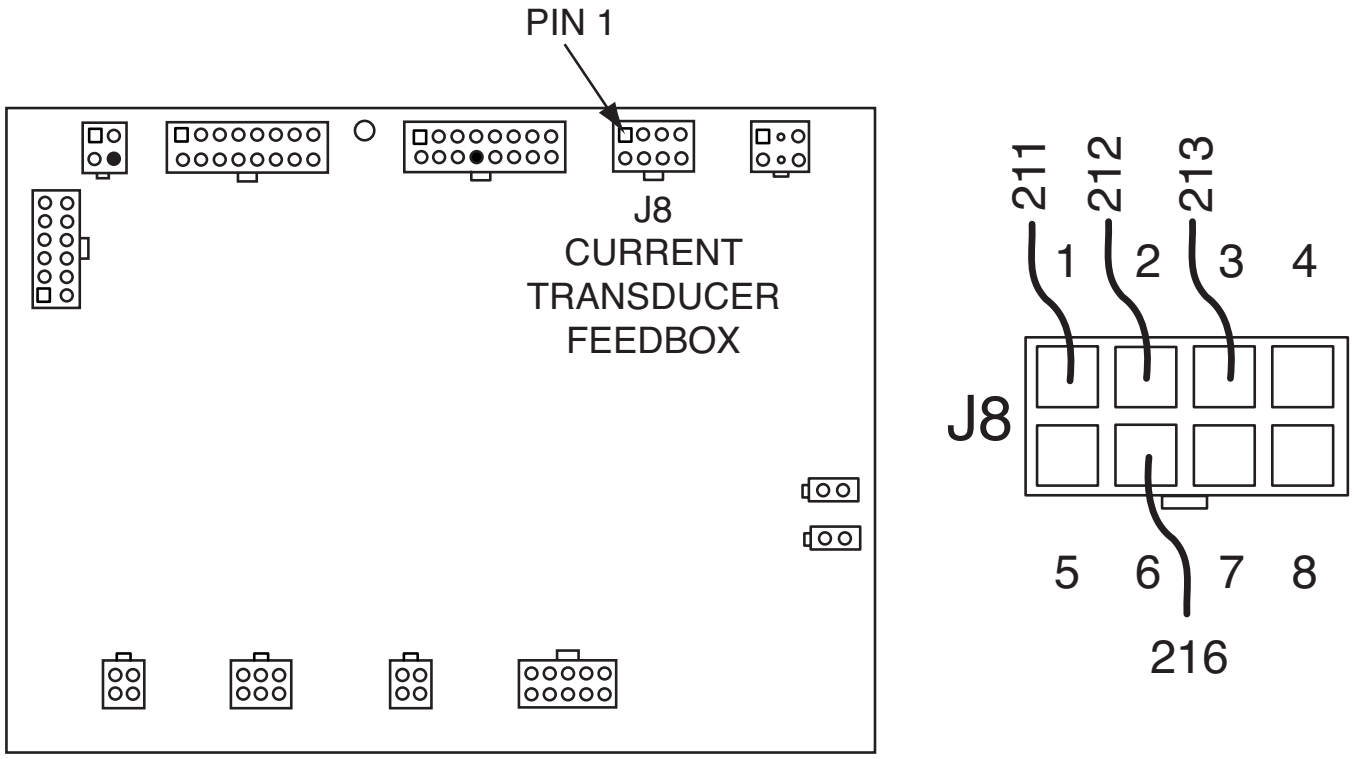
1. Remove the input power to the Power Wave S700.
2. Using the 3/8” wrench and phillips screwdriver, remove the right case side and the control panel access door.
3. Locate the control board. See Figure F.22.
4. Locate the current transducer. See ***Figure F.23***.

Figure F.23 – Current transducer location (behind right case side)



CURRENT TRANSDUCER TEST (continued)

Figure F.24 – Plug J8 and leads on control board



5. Locate the current transducer leads at Plug J8 on the control board. See Figure F.24.
6. Carefully apply the correct input power to the Power Wave S700.
7. Carefully check for DC supply voltages to the current transducer per Table F.6.

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

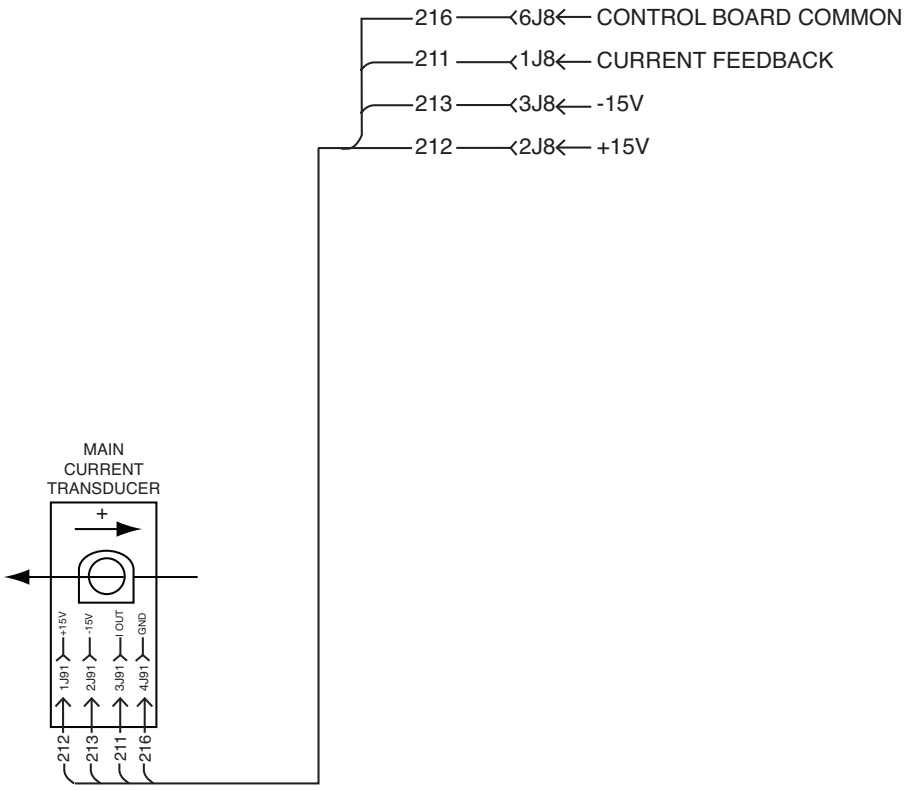
8. If the correct voltages are not present per Table F.6, perform the ***Control Board Test***.

Table F.6 – Current transducer DC supply voltages at plug J8 on control board

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READINGS
POSITIVE 15VDC SUPPLY	PLUG J8 PIN 2 (+) (LEAD 212)	PLUG J8 PIN 6 (–) (LEAD 216)	+15VDC
NEGATIVE 15VDC SUPPLY	PLUG J8 PIN 3 (+) (LEAD 213)	PLUG J8 PIN 6 (+) (LEAD 216)	-15VDC
30VDC SUPPLY	PLUG J8 PIN 2 (–) (LEAD 212)	PLUG J8 PIN 3 (–) (LEAD 213)	+30VDC

CURRENT TRANSDUCER TEST (continued)

Figure F.25 – Wiring between control board and current transducer



9. If the correct supply voltages are present at Plug J8, check the leads for loose or faulty connections between the current transducer and the control board. See the ***Wiring Diagram***. See Figure F.25.

10. To check the operation and feedback capabilities of the current transducer, put the machine into the constant current output (Mode 200).

NOTE: This can be done via Power Wave Manager or a Power Wave Wire Feeder. See ***Calibration Procedure***.

11. See ***Table F.7*** for verification of current transducer feedback verses actual output current. Also see Figure F.25.

12. If the DC supply voltages are correct to the current transducer but the feedback voltages are incorrect, the current transducer may be faulty.

13. If faulty, perform the ***Current Transducer Removal and Replacement Procedure***.

14. When testing is completed, replace the right case side and the control panel access door.

CURRENT TRANSDUCER TEST (continued)

Table F.7 – Current transducer feedback versus actual output current

ACTUAL OUTPUT CURRENT	TEST POINT	TEST POINT	EXPECTED TRANSDUCER FEEDBACK VOLTAGE
500A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	2.0VDC
450A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	1.8VDC
400A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	1.6VDC
350A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	1.4VDC
300A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	1.2VDC
250A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	1.0VDC
200A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	0.8VDC
150A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	0.6VDC
100A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	0.4VDC
50A	PLUG J8 PIN 1 (+) (LEAD 211)	PLUG J8 PIN 6 (–) (LEAD 216)	0.2VDC

SWITCH 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

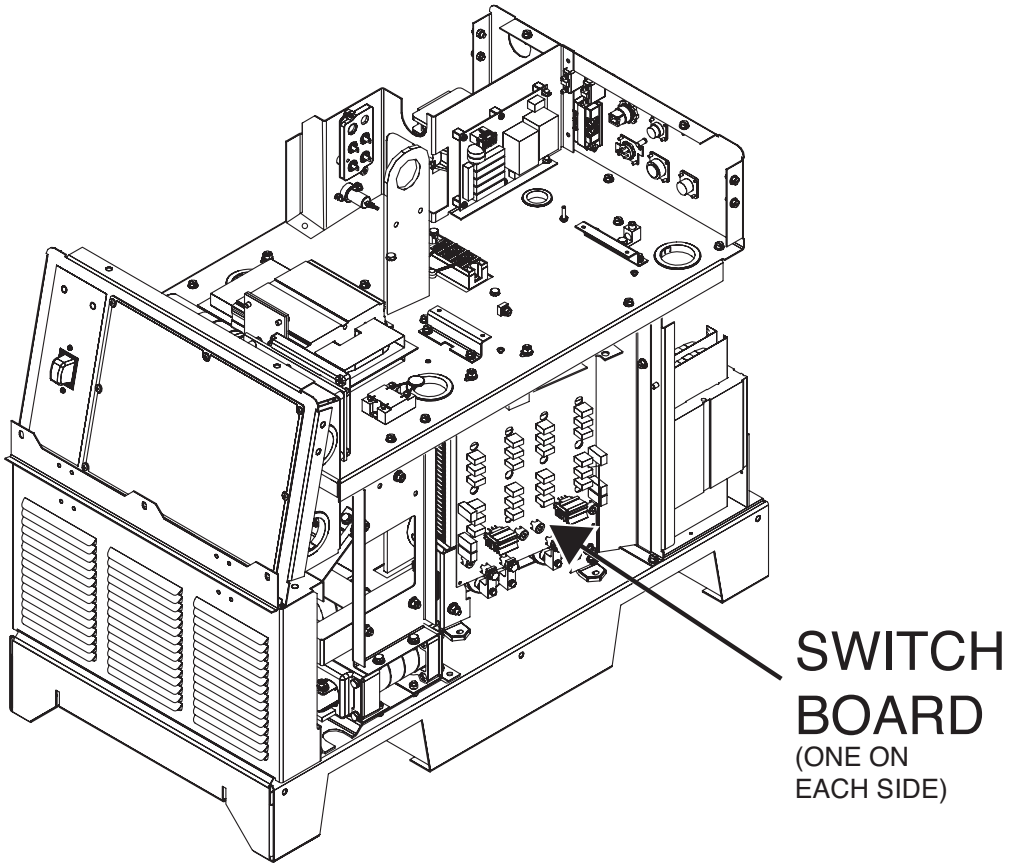
This test will help determine if the Switch Board is shorted and if the voltage to frequency converter is functioning correctly.

MATERIALS NEEDED

Volt/Ohmmeter (Diode Tester)
Wiring Diagram

SWITCH BOARD TEST (continued)

Figure F.26 – Switch board locations



RESISTANCE TEST

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the switch boards; one on each side of the machine. See Figure F.26.
5. Using the volt/ohmmeter (diode test) check the switch boards for a shorted IGBT component. See ***Table F.8***. See ***Figure F.27***. See the Wiring Diagram.
6. If the test results from the previous step are not acceptable, label and disconnect the following leads from the switch board in question. Using a diode tester, perform the checks detailed in ***Table F.9***. See ***Figure F.27***. See the Wiring Diagram.
    a. Two “C” leads
    b. Two Pos. or two Neg. leads
    c. #11 or #16
    d. #13 or #18
    e. #12 or #15
    f. #14 or #17

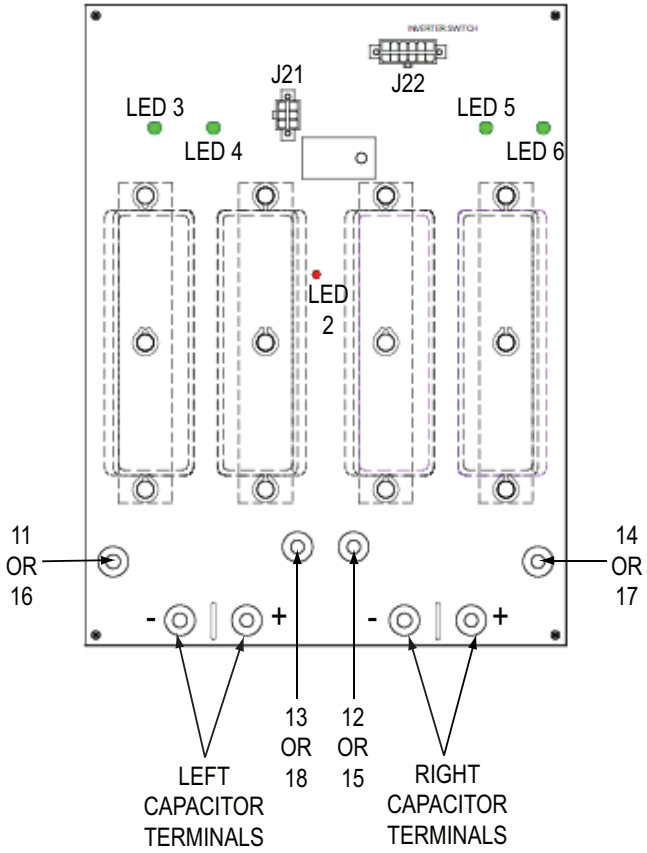
SWITCH BOARD TEST (continued)

Table F.8 – Switch board resistance test points and acceptable readings

TEST POINT	TEST POINT	EXPECTED READINGS	COMMENTS
LEFT CAPACITOR NEGATIVE TERMINAL	#11 OR #16 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
LEFT CAPACITOR NEGATIVE TERMINAL	#13 OR #18 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
LEFT CAPACITOR POSITIVE TERMINAL	#11 OR #16 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
LEFT CAPACITOR POSITIVE TERMINAL	#13 OR #18 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
RIGHT CAPACITOR NEGATIVE TERMINAL	#12 OR #15 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
RIGHT CAPACITOR NEGATIVE TERMINAL	#14 OR #17 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
RIGHT CAPACITOR POSITIVE TERMINAL	#12 OR #15 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT
RIGHT CAPACITOR POSITIVE TERMINAL	#14 OR #17 TERMINAL	GREATER THAN 1000 OHMS	LESS THAN 100 OHMS INDICATES A SHORTED COMPONENT

SWITCH BOARD TEST (continued)

Figure F.27 – Switch board test points and lead locations



7. If the board fails the diode test, it may be faulty.
8. When the testing is complete, replace all leads previously disconnected.
9. If a switch board is faulty, perform the ***Switch Board Removal and Replacement Procedure***.

Table F.9 – Switch board diode test points and acceptable readings

POSITIVE METER LEAD TEST POINT	NEGATIVE METER LEAD TEST POINT	EXPECTED READING
NEGATIVE CAPACITOR TERMINALS	#11 OR #16 AND #12 OR #15	0.33V
NEGATIVE CAPACITOR TERMINALS	#14 OR #17 AND #13 OR #18	0.46V
#14 OR #17 AND #13 OR #18	POSITIVE CAPACITOR TERMINALS	0.33V
#11 OR #16 AND #12 OR #15	POSITIVE CAPACITOR TERMINALS	0.46V

SWITCH BOARD TEST (continued)

Table F.10 – Switch board voltages and frequencies

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	COMMENTS
DC SUPPLY FROM CONTROL BOARD	PLUG J22 PIN 3 (–) RIGHT SIDE IGBT SWITCH BOARD	PLUG J22 PIN 9 (+) RIGHT SIDE IGBT SWITCH BOARD	+15VDC	IF NOT PRESENT PERFORM THE ***CONTROL BOARD TEST***
DC SUPPLY TO LEFT SIDE IGBT SWITCH BOARD	PLUG J22 PIN 4 (–) LEFT SIDE IGBT SWITCH BOARD	PLUG J22 PIN 10 (+) LEFT SIDE IGBT SWITCH BOARD	+15VDC	IF NOT PRESENT SEE THE WIRING DIAGRAM FOR POSSIBLE WIRING PROBLEM
CAPACITOR VOLTAGE TO FREQUENCY FEEDBACK	PLUG J21 PIN 4 (–) LEFT AND RIGHT IGBT SWITCH BOARD	PLUG J21 PIN 1 (+) LEFT AND RIGHT IGBT SWITCH BOARD	2600 Hz. @ 325VDC CAPACITOR VOLTAGE	EACH CAPACITOR VOLT EQUALS 8 Hz. OF FREQUENCY FEEDBACK

Supply voltages, Voltage to Frequency Converter and LEDs

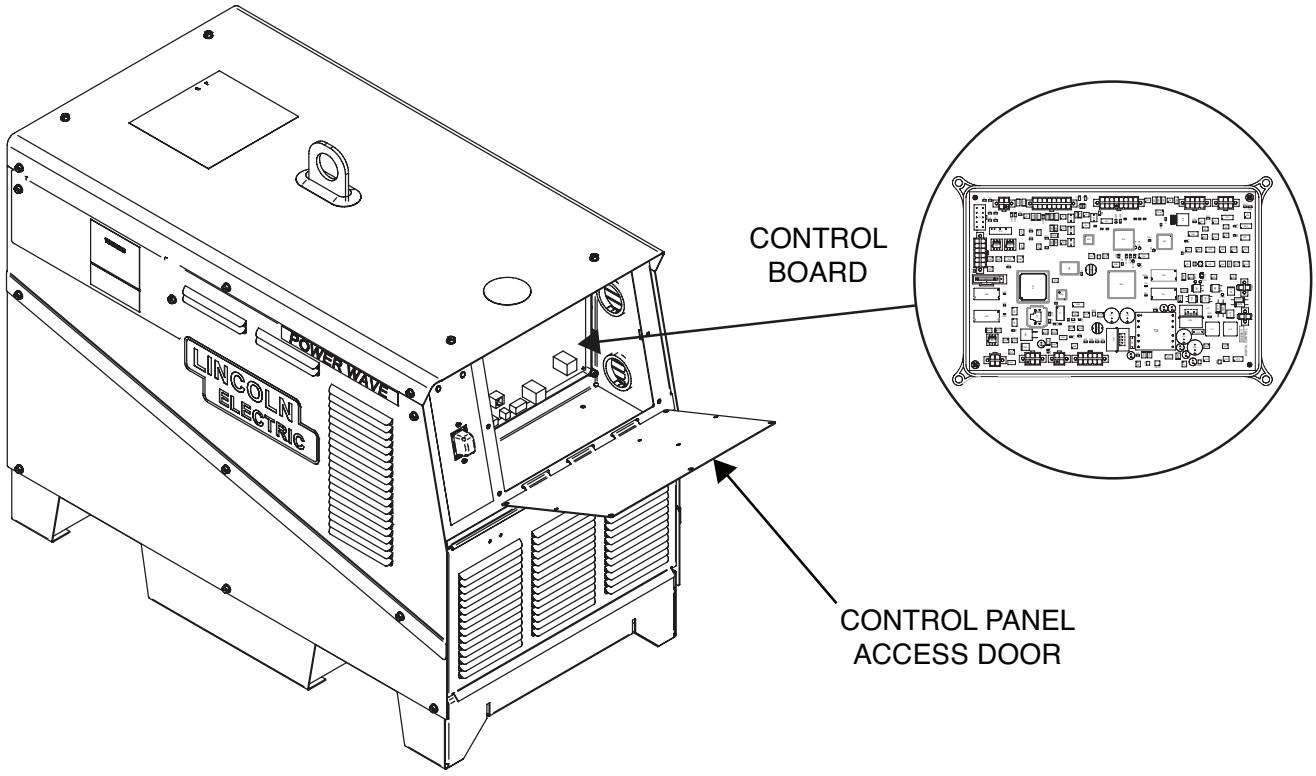
1. Locate the five LEDs on the switch board. See ***Figure F.27***.
2. Carefully apply the correct three phase input power to the Power Wave S700.
3. LEDs 2 through 6 indicate the following conditions:
    a. LED 2 indicates there is greater than 40VDC on the input filter capacitors. Most likely 325VDC.

NOTE: LEDs 3 through 5 will be lit only when the machine is developing welding output.

    b. LED 3 indicates module A 1 gate drives are functioning.
    c. LED 4 indicates module A 2 gate drives are functioning.
    d. LED 5 indicates module A 3 gate drives are functioning.
    e. LED 6 indicates module A 4 gate drives are functioning.
4. Locate plugs J21 and J22 on the Switch board. See ***Figure F.27***.
5. Carefully check for the expected voltages and frequencies per Table F.10. See the Wiring Diagram.

SWITCH BOARD TEST (continued)

Figure F.28 – Control board location



PRIMARY CURRENT TRANSFORMER(S) TEST

Current Transformers (CT) Test Description

The two primary current transformers (CT1 and CT2) monitor the primary currents in the primary windings of the main transformer. See the Wiring Diagram. The output of the CTs is sent to the control board for processing. If the primary current feedback signals (output of the CTs) are not balanced the control board will adjust the pulse width modulation (PWM) signal sent to the switch boards to keep the IGBTs balanced. Also, if either switch board is supplying too much current to the main transformer the control board will remove the PWM signal and the inverter will be shut off to protect the switch board(s).

The best way to test a current transformer is by measuring the inductance. The measurement should always be made inside the machine by disconnecting the CT leads from the control board. Special care should be taken to not disturb the CT location or wiring harness as failures are often the result of stress applied to the device. Polarity is also very important. Always check the wiring diagram to make certain the CT leads are connected properly.

MATERIALS NEEDED

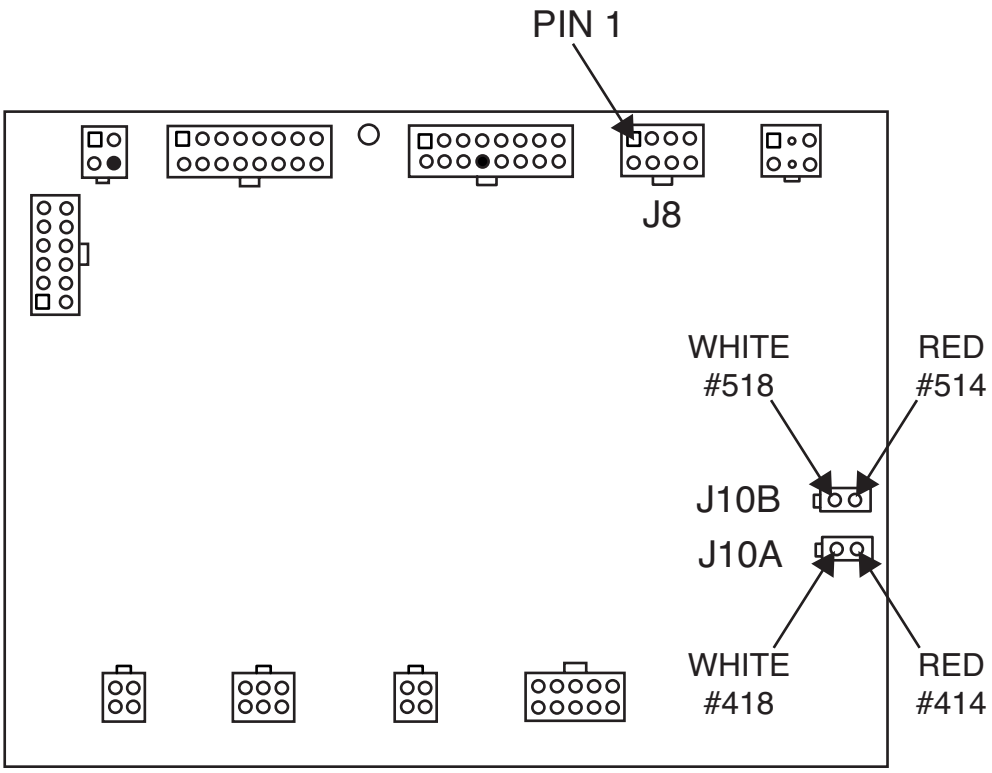
Volt/Ohmmeter With Inductance Measuring Capabilities (Amprobe Model 37XR-A)

Wiring Diagram

Phillips Screwdriver

SWITCH BOARD TEST (continued)

Figure F.29 – Plug J10A, J10B and leads on control board



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Using a phillips screwdriver, remove the control panel access door and locate the control board. ***See Figure F.28***.
3. Label and remove plugs J10A and J10B from the control board. See Figure F.29.
4. Using the volt/ohmmeter with inductance measuring capabilities, check the right side switch board CT inductance by checking from the white lead (#518) to the red lead (#514) at plug J10B. Normal inductance is approximately 370mH +/- 20%.
5. Using the volt/ohmmeter with inductance measuring capabilities, check the left side switch board CT inductance by checking from the white lead (#418) to the red lead (#414) at plug J10A. Normal inductance is approximately 370mH +/- 20%.
6. If the inductance reading is not correct replace the faulty CT.
7. When testing is complete replace plugs J10A and J10B into the correct receptacles. See Figure F.29.
8. Replace the control box cover.

AUXILIARY TRANSFORMER TESTS

⚠ 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

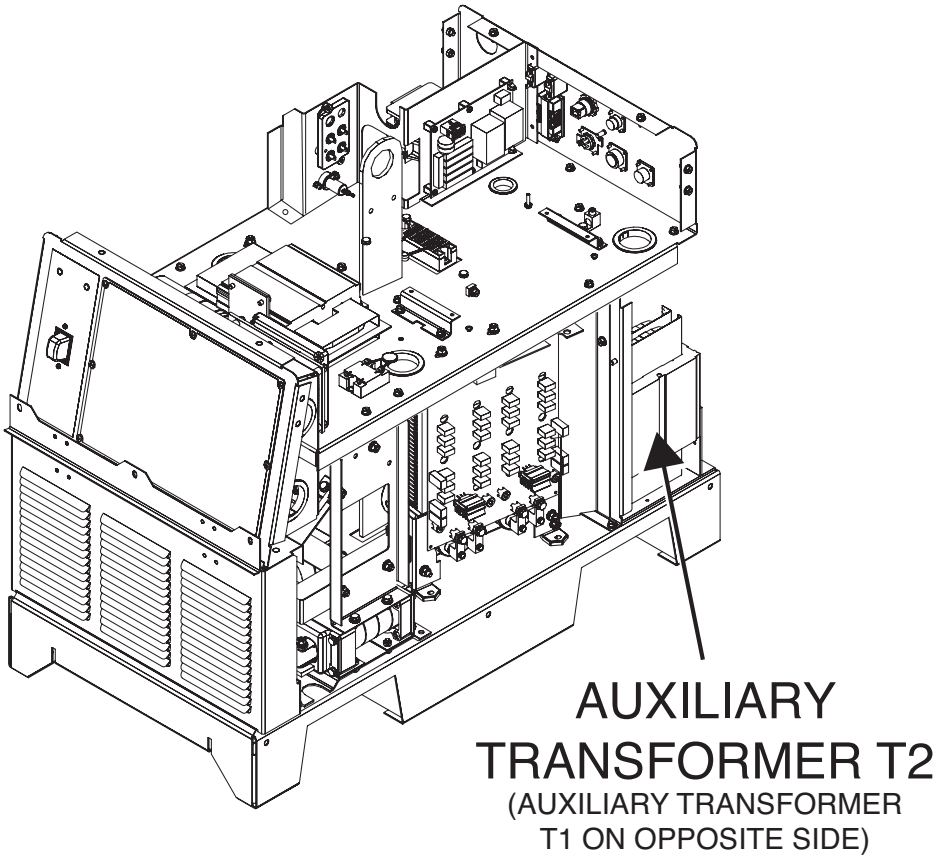
These tests will help determine if the Auxiliary Transformers are receiving the correct input voltages and if they are generating the correct secondary output voltages for other circuit components.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

AUXILIARY TRANSFORMER TESTS (continued)

Figure F.30 – Auxiliary transformer locations

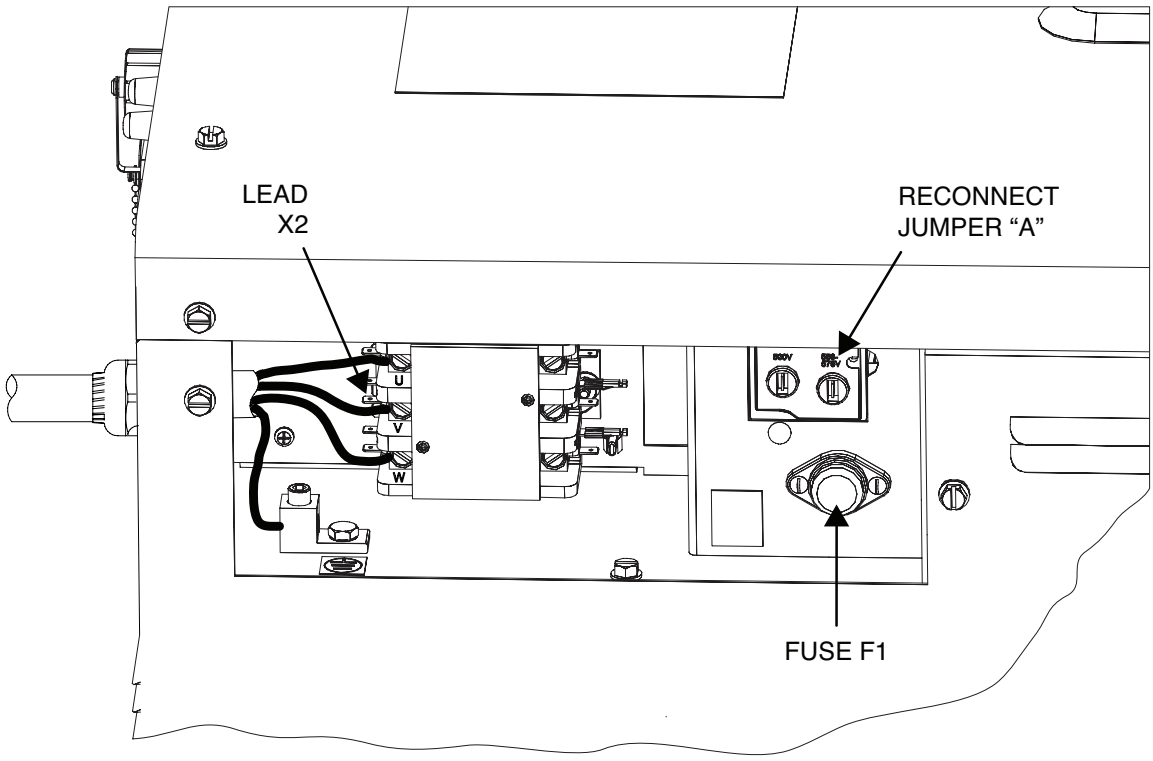


PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. The Power Wave S700 has two auxiliary transformers. The following test procedures are divided so that each transformer can be tested independently. See Figure F.30 for auxiliary transformer locations.

AUXILIARY TRANSFORMER TESTS (continued)

Figure F.31 – Reconnect jumper "A" and lead X2 locations



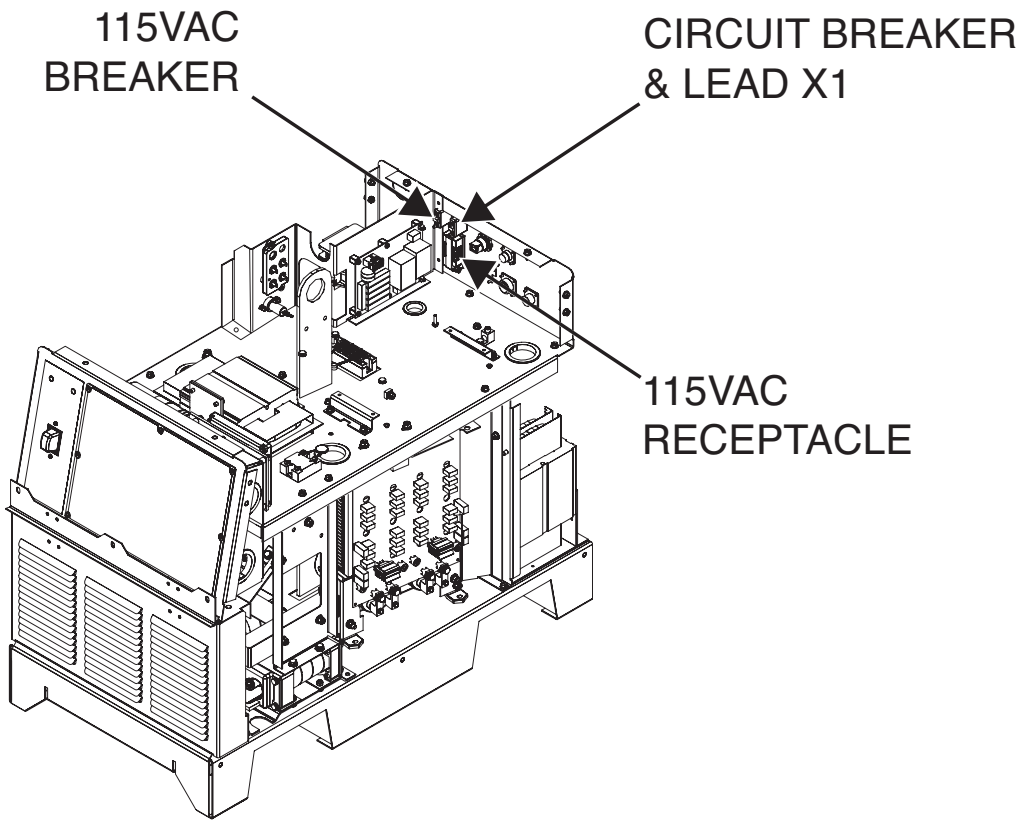
Auxiliary Transformer Test (T1)

1. Auxiliary Transformer T1 supplies 24VAC power to the input contactor (via the input board) and 52VAC to the bus rectifier. See the Wiring Diagram.
2. Check to make sure the auxiliary reconnect jumper "A" is in the correct position to match the three phase input voltage that is being applied to the machine. See the Wiring Diagram. See Figure F.31.
3. Carefully connect the correct input power to the Power Wave S700.
4. Carefully check for the presence of 24VAC at leads X1 to X2. X1 is located at the 10 amp circuit breaker on the machine's case back. X2 is located at the input contactor. See Figure F.31 and ***Figure F.32***. See the Wiring Diagram.

NOTE: The secondary voltages will vary in proportion to the input line voltage.

AUXILIARY TRANSFORMER TESTS (continued)

Figure F.32 – 115VAC breaker, circuit breaker, lead X1 and 115VAC receptacle location



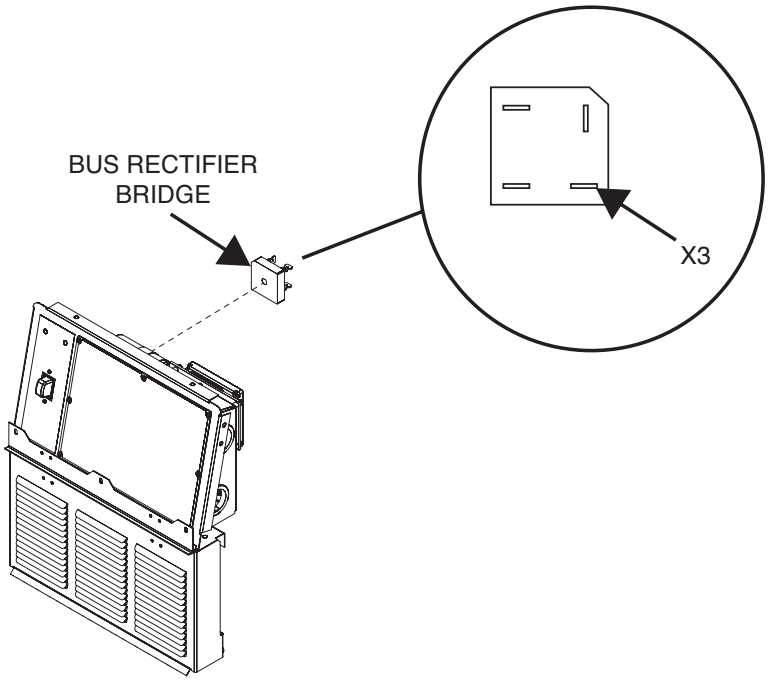
5. Carefully check for the presence of 52VAC at leads X1 to X3. X1 is located at the 10 amp circuit breaker (CB1) on the machine's case back. See Figure F.32. X3 is located at the bus rectifier bridge. See ***Figure F.33***.

NOTE: The secondary voltages will vary in proportion to the input line voltage.

6. If the correct secondary voltages are present, the T1 auxiliary transformer is OK.
7. If the secondary voltages are missing or not correct, check for the presence of the correct primary voltages. Check from lead H1 to the other primary leads. (H2 – H5). See the Wiring Diagram. H1 is located at fuse F1 located on the reconnect panel assembly. See ***Figure F.31***.
8. If the correct input primary voltage is being applied to the primary of T1 and the secondary voltages are not correct, the T1 transformer may be faulty.

AUXILIARY TRANSFORMER TESTS (continued)

Figure F.33 – Bus rectifier bridge location



Auxiliary Transformer Test (T2)

1. Auxiliary transformer T2 has two secondary windings. One 115VAC winding supplies 115VAC to the 115VAC auxiliary receptacle. The other 115VAC winding supplies power (through a solid state relay) to the fan motor.

2. The primary of transformer T2 receives primary voltage (550-575VAC) from leads H1A and H5A (the "tail winding" of transformer T1). See the Wiring Diagram.

3. Check to make sure the auxiliary reconnect jumper "A" is in the correct position to match the three phase input voltage that is being applied to the machine. See the Wiring Diagram. See ***Figure F.31***.

4. Carefully connect the correct input power to the Power Wave S700.

5. Carefully check for the presence of 115VAC at the 115VAC receptacle lead 32B and the 115VAC circuit breaker (CB2) lead 33B. See the Wiring Diagram. See ***Figure F.32***. If the correct voltage is not present check the wiring and connections between the transformer T2 and the receptacle.

NOTE: The secondary voltages will vary in proportion to the input line voltage.

6. Carefully check for 115VAC at leads 33A and 352A. These leads can be accessed at the molex type connector plug located at the top of the T2 transformer. See ***Figure F.30***. See the Wiring Diagram.

NOTE: The secondary voltages will vary in proportion to the input line voltage.

7. If the correct secondary voltages are present the transformer T2 is OK.

8. If the correct secondary voltages are missing or not correct, carefully check for the correct primary voltage (550-575) at leads H1A to H5A. These leads can be accessed at the molex type connector plug located at the top of the T2 transformer. See ***Figure F.30***.

9. If the correct primary voltage is being applied to the primary of T2 and the secondary voltages are not correct the T2 transformer may be faulty.

THERMOSTAT CIRCUIT 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

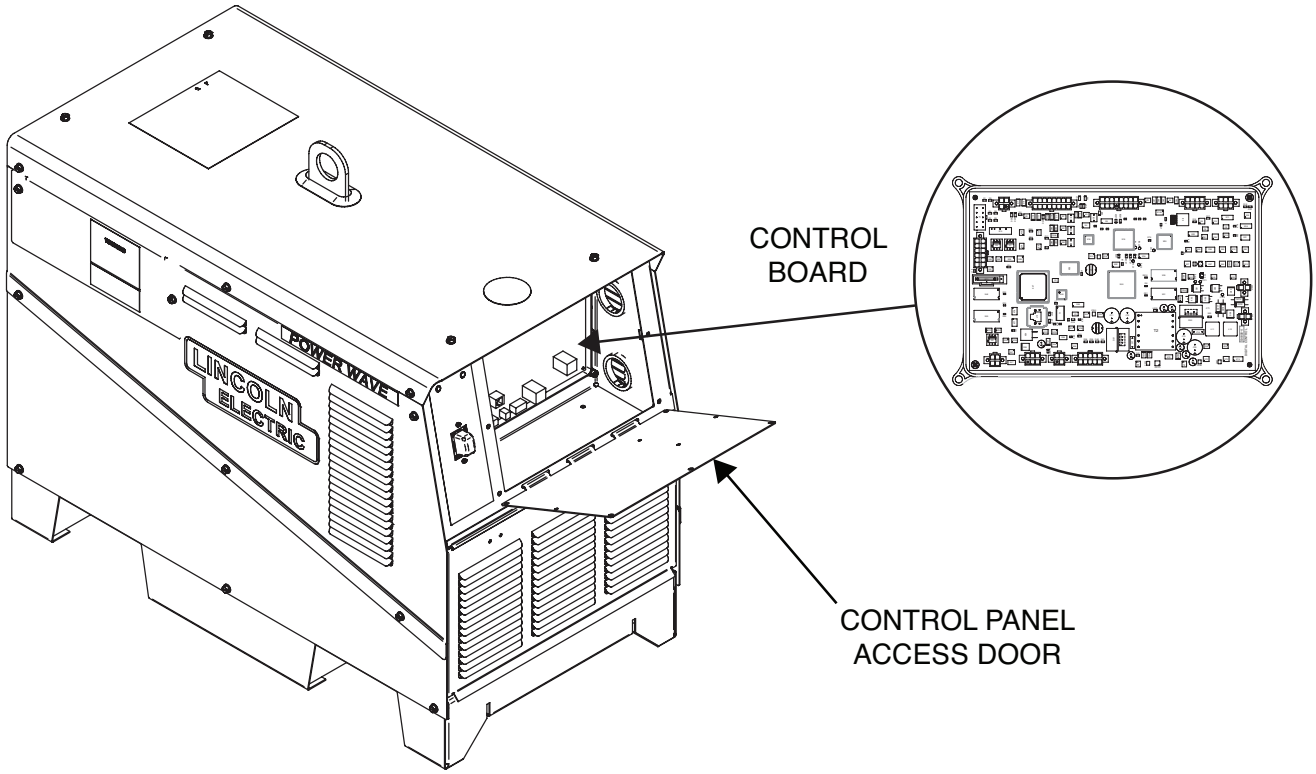
This test will help determine if the Thermostat Circuits are operational.

MATERIALS NEEDED

Volt/Ohmmeter
Phillips Screwdriver
Wiring Diagram

THERMOSTAT CIRCUIT TEST (continued)

Figure F.34 – Control panel access door and control board location



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Using the phillips screwdriver, remove the seven screws securing the control panel access door to the case front assembly. See Figure F.34.
3. Locate and remove plug J4 and J5 from the control board. See ***Figure F.35***.
4. Perform the resistance checks per ***Table F.11***.
5. When testing is completed reconnect the two plugs (J4 and J5) at the control board.
6. Replace the control panel access cover.

THERMOSTAT CIRCUIT TEST (continued)

Figure F.35 – Control board plug J5

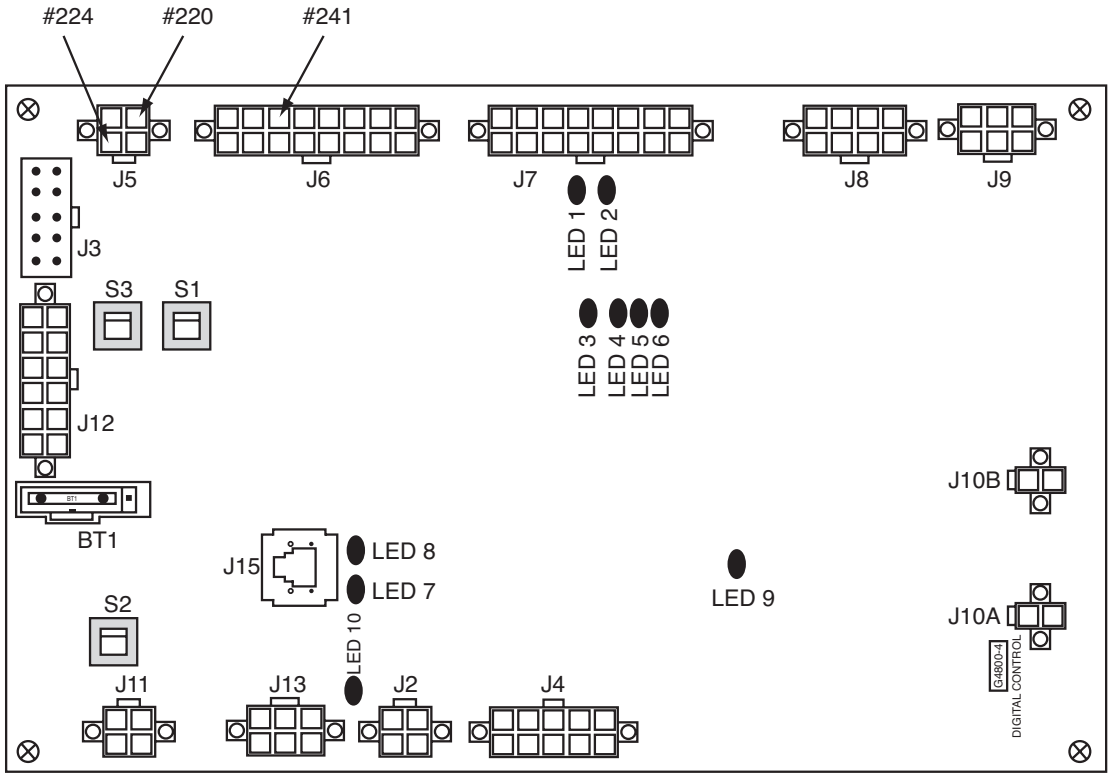


Table F.11 – Thermostat circuit resistance checks

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	COMMENTS
CHECK THE DC BUS BOARD THERMOSTAT AND ASSOCIATED WIRING	LEAD #224 AT PLUG J5 PIN 3	LEAD #241 AT PLUG J6 PIN 3	LESS THAN 1 OHM	IF GREATER THAN 1 OHM CHECK FOR FAULTY THERMOSTAT OR FAULTY WIRING. SEE WIRING DIAGRAM
CHECK THE OUTPUT RECTIFIER THERMOSTAT AND ASSOCIATED WIRING	LEAD #220 AT PLUG J5 PIN 2	LEAD #224 AT PLUG J5 PIN 3	LESS THAN 1 OHM	IF GREATER THAN 1 OHM CHECK FOR FAULTY THERMOSTAT OR FAULTY WIRING. SEE WIRING DIAGRAM

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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

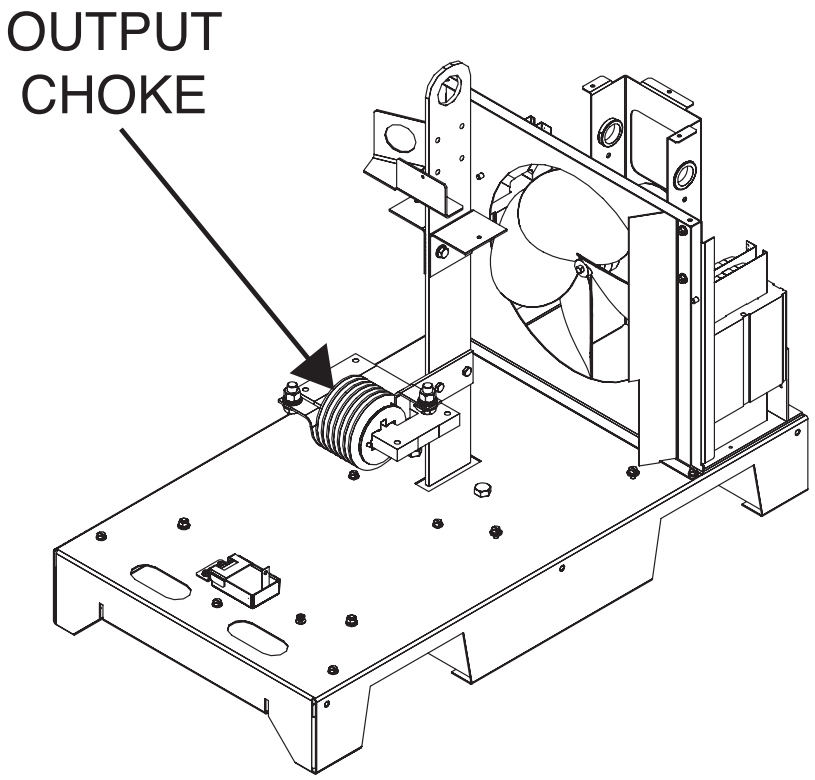
This test will help determine if the Output Choke has a “grounded” or “open” winding.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram
3/4” Wrench
1/2” Wrench

OUTPUT CHOKE TEST (continued)

Figure F.36 – Output choke test



PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the output choke. See Figure F.36.
5. Inspect the windings and connections for signs of burning or overheating.
6. Using the 3/4” wrench, label and disconnect the positive output lead from the output choke. See the Wiring Diagram.
7. Using the 1/2” wrench, disconnect the positive output rectifier lead from the output choke. See the Wiring Diagram.
8. Using the ohmmeter, check the continuity of the choke windings. Normal resistance should be less than one ohm.
9. Using the ohmmeter, check to make sure the windings are NOT grounded to the lamination. Normal resistance should be greater than one million ohms.
10. When testing is complete, replace the heavy cable leads previously removed.
11. Perform the ***Case Cover Replacement Procedure***.

OUTPUT RECTIFIER 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

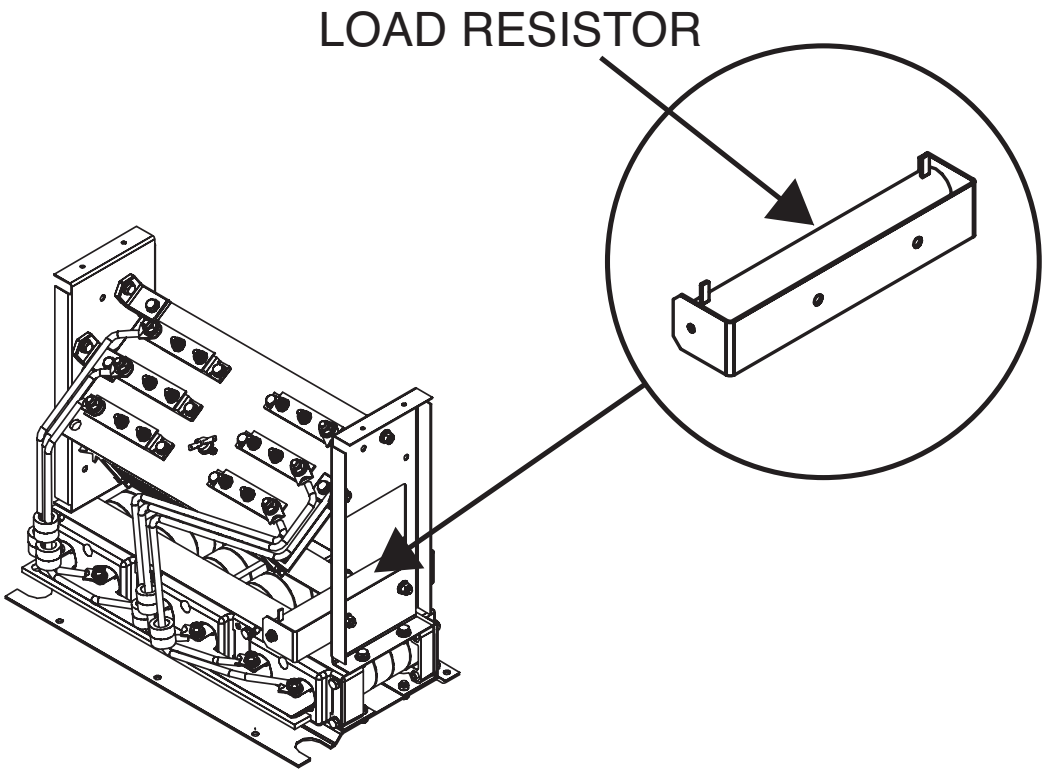
The Output Rectifier assembly consists of six individual diode modules mounted on one heat sink. This test will help determine if the Output Rectifier has a “shorted” or “open” diode module.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram
1/2” Wrench

OUTPUT RECTIFIER TEST (continued)

Figure F.37 – Load resistor location



PROCEDURE

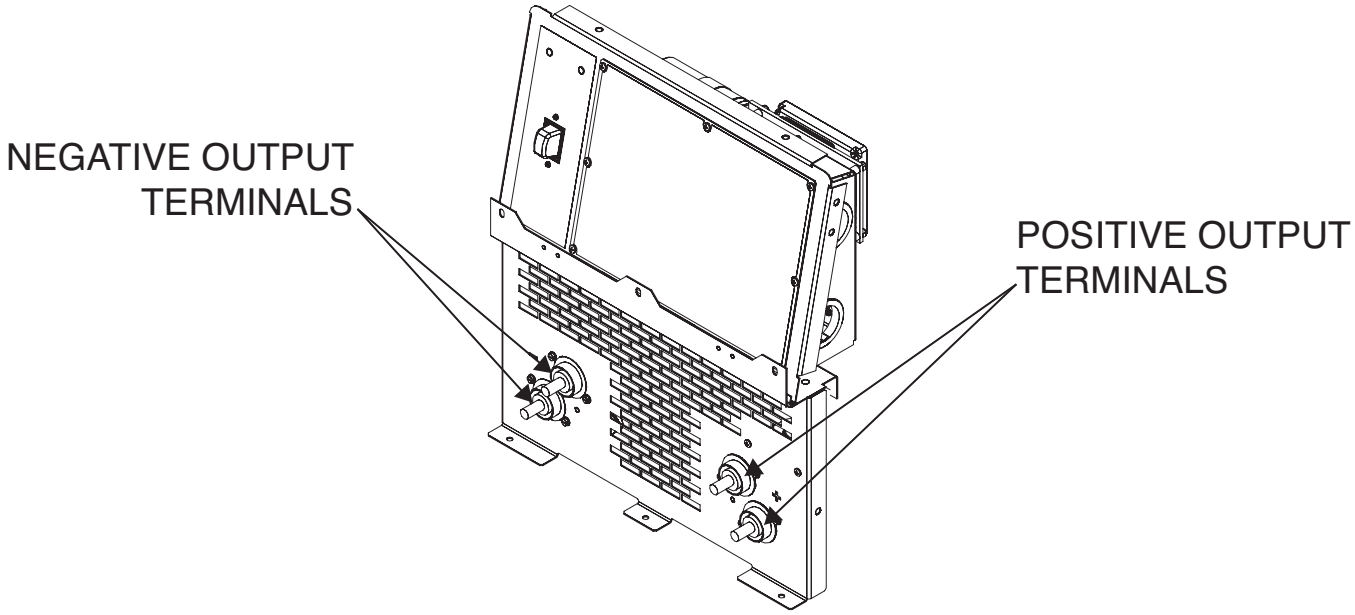
1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate and disconnect the two leads (206B and 202B) from the load resistor located on the right side of the machine. See Figure F.37.
5. Using the volt/ohmmeter, check the diodes per Table F.12. See ***Figure F.38***. If the results are not acceptable or an individual "open" diode is suspect proceed with Step 6.

Table F.12 – Output bridge checks

DESCRIPTION	POSITIVE METER PROBE	NEGATIVE METER PROBE	EXPECTED READING	DVM MODE
CHECK FOR A "SHORTED" DIODE MODULE	NEGATIVE OUTPUT TERMINAL	POSITIVE OUTPUT TERMINAL	APPROXIMATELY .292 VOLTS	DIODE TEST
CHECK FOR A "SHORTED" DIODE MODULE	POSITIVE OUTPUT TERMINAL	NEGATIVE OUTPUT TERMINAL	OPEN	DIODE TEST

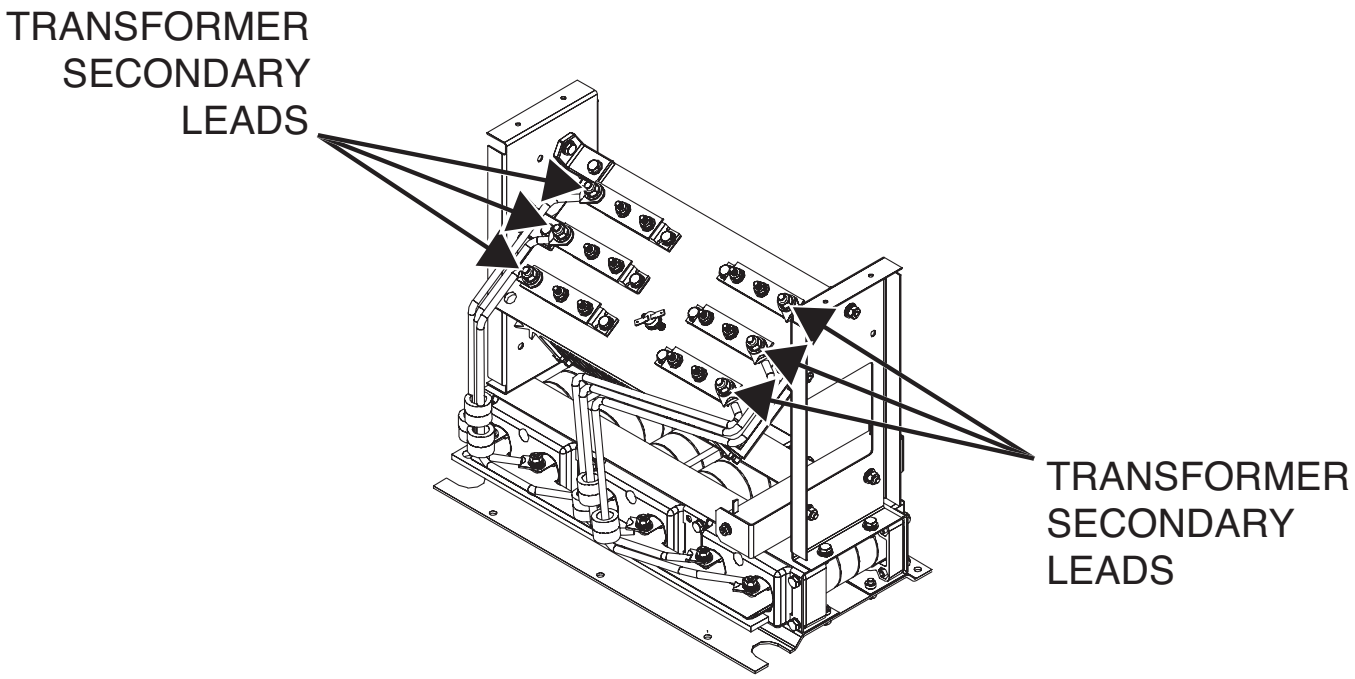
OUTPUT RECTIFIER TEST (continued)

Figure F.38 – Positive and negative output terminals



6. Using the 1/2” wrench, label and disconnect the six transformer secondary leads from the output rectifier modules. **Be sure to electrically isolate the bolts from the heatsink when testing**. See Figure F.39 and the Wiring Diagram.
7. Check the individual diode modules per ***Table F.13***. See Wiring Diagram.
8. If any of the diode modules are faulty, perform the ***Output Diode Module Removal And Replacement Procedure***.
9. When the testing is completed replace the six transformer leads and reconnect the load resistor leads (206B and 202B).

Figure F.39 – Transformer leads and testing points



OUTPUT RECTIFIER TEST (continued)

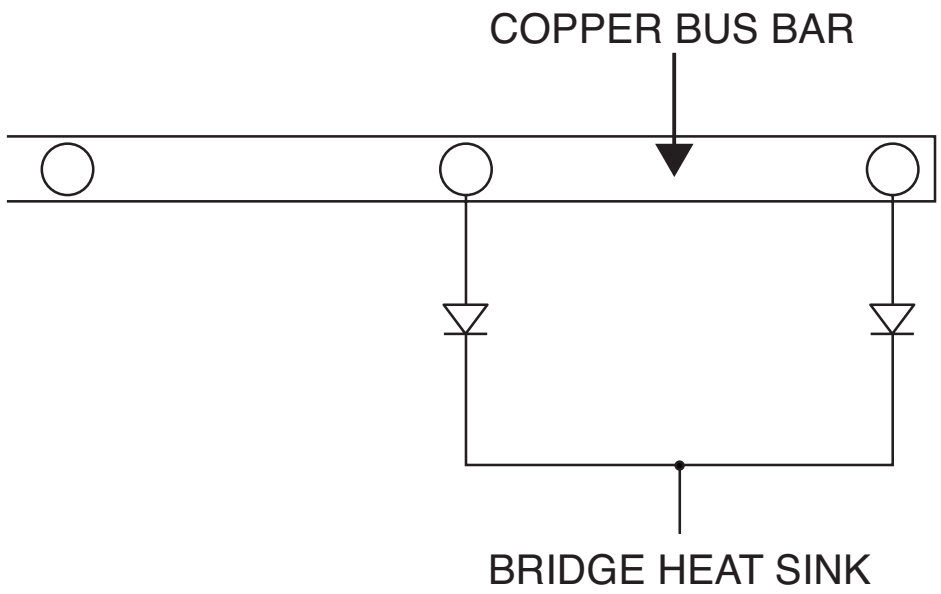
Table F.13 – Individual diode module checks

POSITIVE METER PROBE	NEGATIVE METER PROBE	EXPECTED READING	DVM MODE
DIODE MODULE ANODE (COPPER BUS BAR)	DIODE MODULE CATHODE (BRIDGE HEAT SINK)	.300 VOLTS (+/– 20%)	DIODE TEST
DIODE MODULE CATHODE (BRIDGE HEAT SINK)	DIODE MODULE ANODE (COPPER BUS BAR)	OPEN	DIODE TEST

NOTE: Repeat for all six diode modules.

When testing make sure the copper bus bar and transformer lead mounting bolts are electrically isolated from the bridge heat sink.

Figure F.40 – Copper bus bar



CALIBRATION PROCEDURE USING POWER WAVE UTILITIES SOFTWARE

⚠ 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

Calibration of the Power Wave S700 should be done only after the follow conditions:

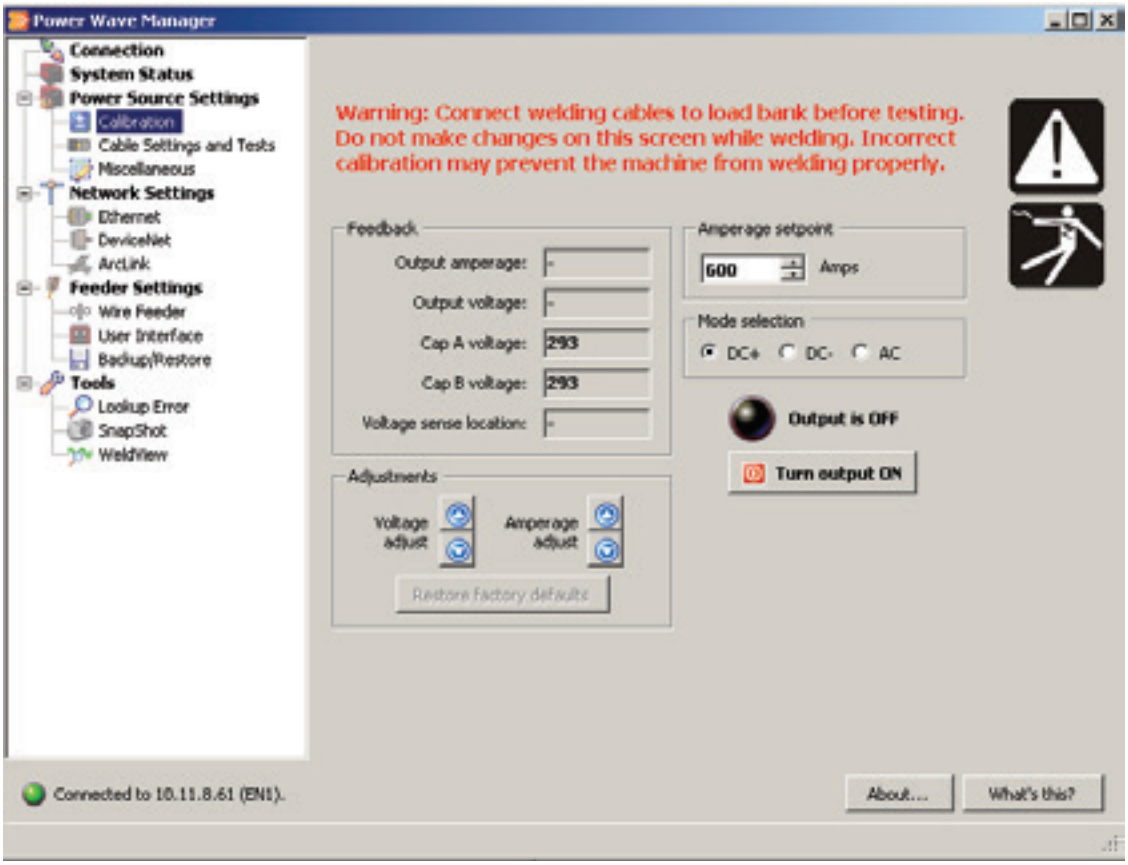
- Calibration check indicates a voltage or current inaccuracy.
- The Control Board or Current Transducer has been replaced.

MATERIALS NEEDED

Power Wave Manager – Available From www.powerwavesoftware.com
Laptop Or Other Suitable Computer
Computer Connection Cables
Resistive Load Bank
2 #4/0 20ft. Cables
Calibrated Test Meters (See Meter Notes)

CALIBRATION PROCEDURE USING POWER WAVE UTILITIES SOFTWARE (continued)

Figure F.41 – Calibration



PROCEDURE

1. Download and install the Power Wave Utilities onto your computer.
2. Connect your computer to the Ethernet port located on the back of the Power Wave S700.
3. Turn on the machine and connect to the machine using Power Wave Manager application. See instructions included in the software.
4. Incorrect calibration can cause welding problems. It is a good practice to save a diagnostic snapshot prior to making any adjustments.
5. Using the 20ft. cables, connect the grid load bank to the machine and set the grid load bank for 600 amps. Some adjustments to load may be necessary when the actual output is applied to bring the output voltage to 32VDC.
6. Connect the external test meters.
7. Set the amperage setpoint for 600 amps. Set the mode selection for DC+. See Figure F.41.
8. Energize the machine's output using the software utility.
9. Use the Amperage Adjust control to make the external test meter match the output amperage shown in the Power Wave Manager utility. (600 amps +/- 2A.) See Figure F.41.
10. Use the Voltage Adjust control to make the output voltage, shown in the Power Wave Manager utility, match the external test meter. (+/- 0.5VDC). See Figure F.41.
11. When calibration is complete, turn off the machine and disconnect the computer, grid bank and test meters.

CALIBRATION CHECK AND 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the Power Wave S700 is calibrated and if necessary how to calibrate.

MATERIALS NEEDED

Resistance Grid Bank
Calibrated Voltmeter
Calibrated Ammeter
2 #4/0 20ft. Cables
Wiring Diagram

Meter Notes: Fluke 170 Series
Voltage-slight dither-overall good performance
Current-steady readout across a 750A @ 50mV shunt

Fluke 355 Series is also recommended

All meters should be calibrated and traceable to a National Standard.

CALIBRATION CHECK AND PROCEDURE (continued)

TEST PROCEDURE NOTES:

- Calibration accuracy is directly related to the quality of the external metering equipment.
- There are several "Test Modes" accessible from the PF10M or PF25M. They are specifically designed for calibration and may not be used for welding. Calibration checks should not be attempted in the weld modes.
- Using DC+ output is recommended for field calibration of the Power Wave S700. Set the PF10M or PF25M to test Mode 200 for DC+ output constant current. Set the PF10M or PF25M to test Mode 200.
- **Calibration testing should be done at 600 Amps @ 32 Volts DC**. Loads with voltages over 40 volts can result in metering errors.
- Calibration inaccuracies due to external metering issues will affect welding performance. Lincoln strongly recommends that calibration be performed in the DC+ mode only.
- Cycling the input power to the Power Wave S700 will clear all test modes from the PF10M or PF25M display.

TEST PROCEDURE

1. Using the two 20ft. #4/0 cables, connect a resistive load to the output terminals of the Power Wave S700 machine. To minimize the inductance, the cables should not be coiled.
2. Set the resistive load bank for approximately 600 amps load.
3. Connect the external test meters to the machine's output. The voltmeter must be connected to the machine's output terminals.
4. Apply the correct input power to the Power Wave S700 and PF10M or PF25M or other compatible ArcLink feeders.
5. Using the PF10M or PF25M, enable the test modes by entering the user preference menu (P.99) select test mode 200. (DC+ constant current).
6. Activate the output using the user preference menu (P.99) and voltage knob on the PF10M or PF25M. Using the Amps control on the PF10M or PF25M along with the load bank adjustment, set the output for a reading of 600 amps at 32 volts.
7. Compare the readings on the PF10M or PF25M display to the readings on the two external calibrated test meters. If there is a significant difference see the ***Calibration Procedure*** to recalibrate the system.

CALIBRATION FUNDAMENTALS

If a calibration adjustment of your Power Wave welding machine is required, the calibrations procedure needs to be run from the Power Wave Manager Software.

Some factors, other than a defective machine, that can affect the measured AC output are:

- Inadequate metering
- Excessive output lead lengths
- Coiled output leads
- Output leads that are not routed side by side

Power Wave test modes always sense output voltage at the machine's output terminals. Make certain the external voltmeter is connected to the machine's output terminals.

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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

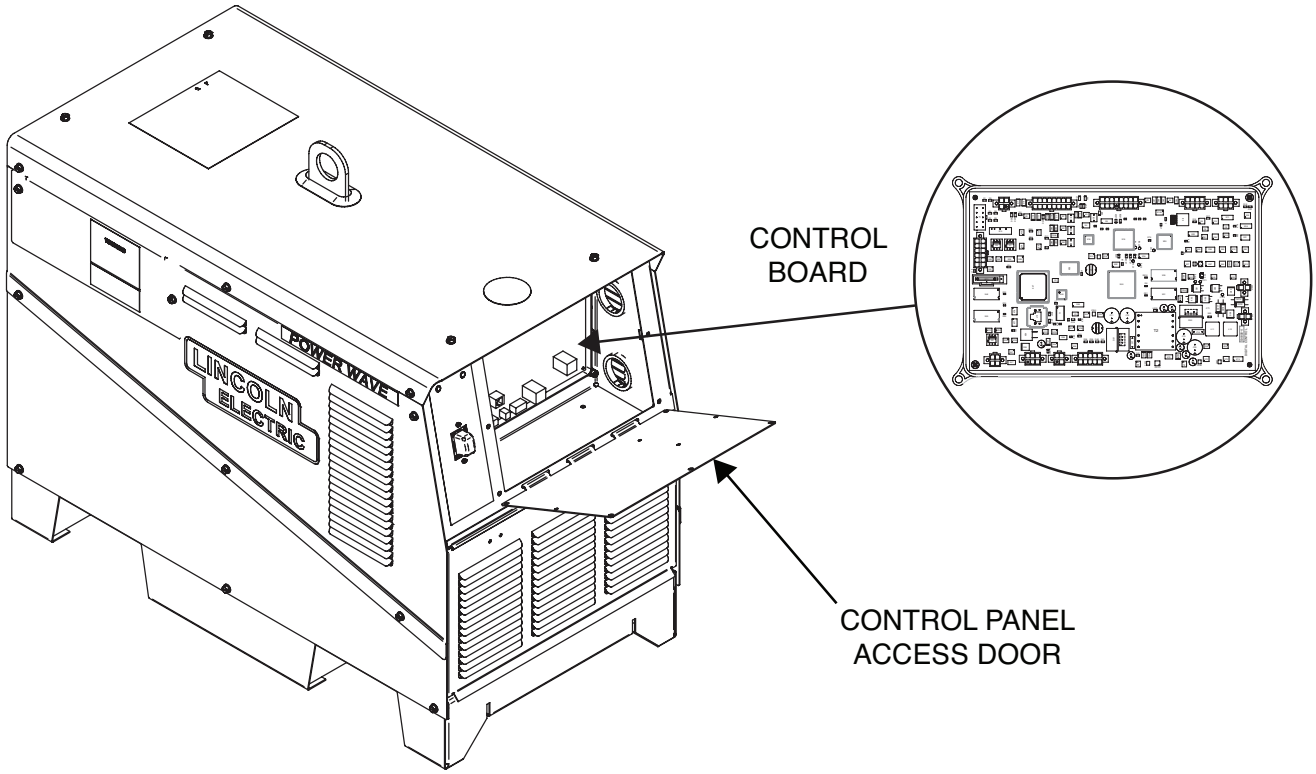
This procedure will aid the technician in the removal and replacement of the Control Board.

MATERIALS NEEDED

Phillips Screwdriver
3/8” Nutdriver
Wiring Diagram

CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.42 – Control panel access door and control board location

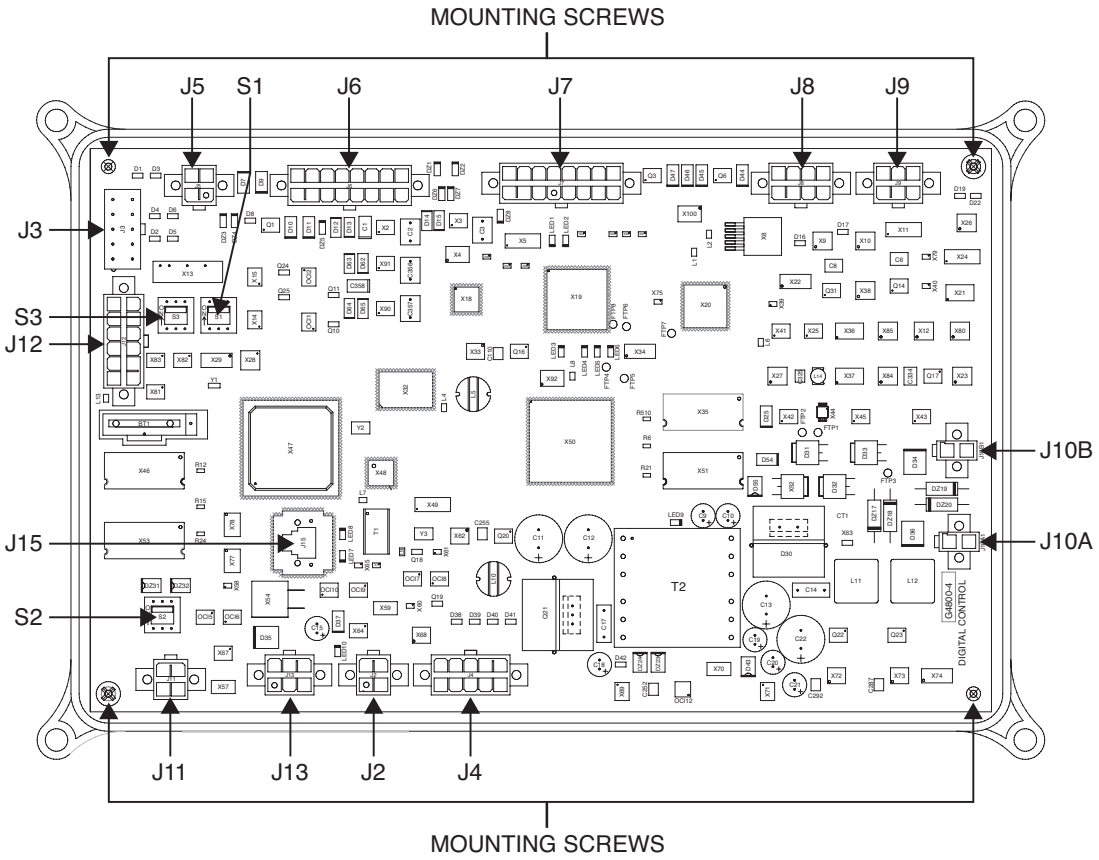


REMOVAL PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Using a phillips screwdriver, remove the seven screws securing the control panel access door to the machine. See Figure F.42.
5. Locate the control board. See Figure F.42.
6. Label and disconnect plugs J3, J5, J6, J7, J8, J9, J10B, J10A, J4, J2, J11, J12, J13 and J15. See ***Figure F.43***. See Wiring Diagram.
7. Using a 3/8” nutdriver, remove the four nuts securing the control board to the machine. Note position of dip switches on S1, S2 and S3 upon removal. See ***Figure F.43***. See Wiring Diagram.
8. Carefully remove the control board from the mounting studs.

CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.43 – Control board plug and mounting screw locations



REPLACEMENT PROCEDURE

1. Carefully position the new control board into the machine.
2. Using a 3/8” nutdriver, attach the four nuts securing the control board to the machine.
3. Connect the previously removed plugs J3, J5, J6, J7, J8, J9, J10B, J10A, J4, J2, J11, J12, J13 and J15 to the control board. See Wiring Diagram.
4. Using a phillips screwdriver, attach the seven screws securing the control panel access door to the machine.
5. Perform the ***Case Cover Replacement Procedure***.

INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

TEST DESCRIPTION

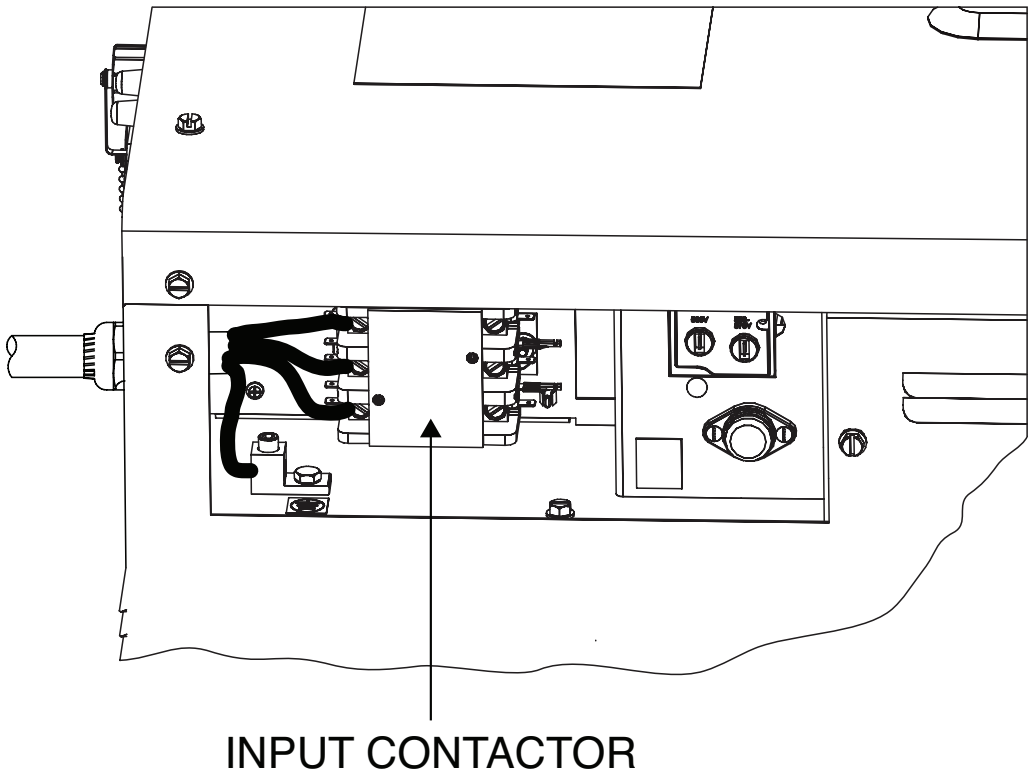
This procedure will aid the technician in the removal and replacement of the Input Contactor.

MATERIALS NEEDED

3/8” Open End Wrench
Large Slotted Screwdriver
Wiring Diagram

INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.44 – Input contactor location



REMOVAL PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the input contactor. See Figure F.44.
5. Disconnect leads L1, L2 and L3 from the input contactor. See ***Figure F.45***.
6. Using a large slotted screwdriver, label and remove heavy black leads C, B and A from terminals T1, T2 and T3. See ***Figure F.45***. See Wiring Diagram.
7. Label and disconnect leads T1, T2, T3, 601, X2, L1A and L3A. See Wiring Diagram.
8. Using a 3/8” open end wrench, remove the four nuts and associated washers securing the contactor to the input power panel. See ***Figure F.46***.
9. Remove the input contactor.

INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.45 – Input contactor terminals

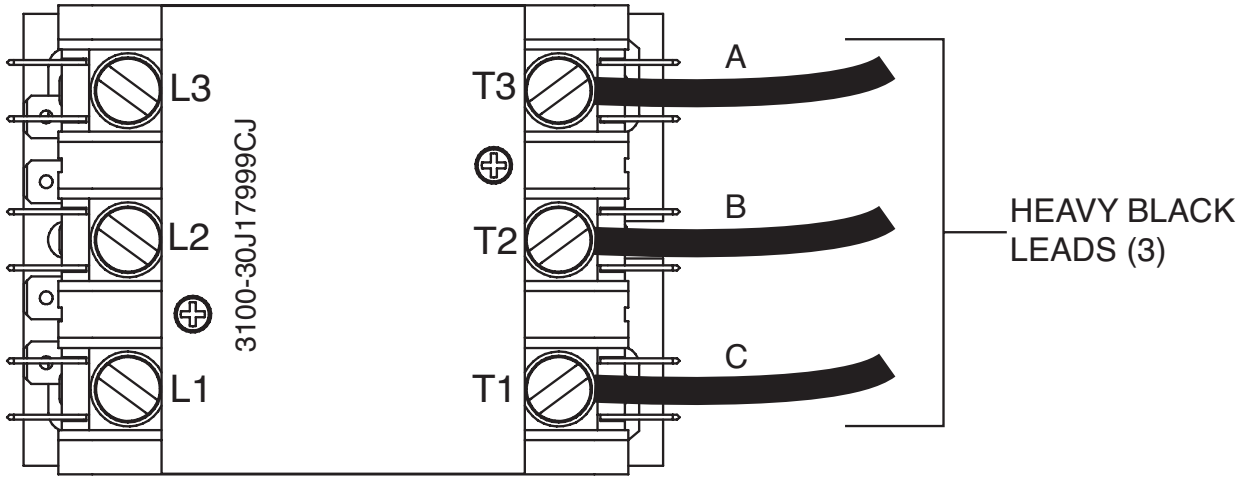
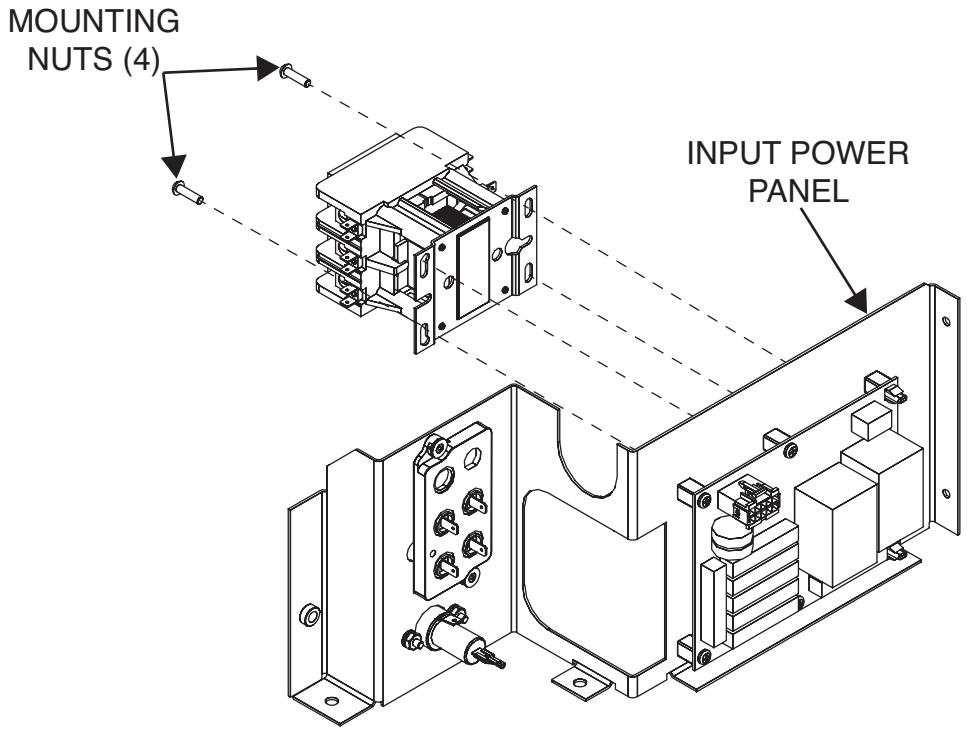


Figure F.46 – Input contactor mounting nuts



INPUT CONTACTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully position the new input contactor into the machine.
2. Using a 3/8” open end wrench, attach the four nuts and associated washers securing the contactor to the input power panel.
3. Connect the previously removed leads to the input contactor. See Wiring Diagram.
4. Using a large slotted screwdriver, attach the heavy black leads C, B and A to terminals T1, T2 and T3. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.

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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

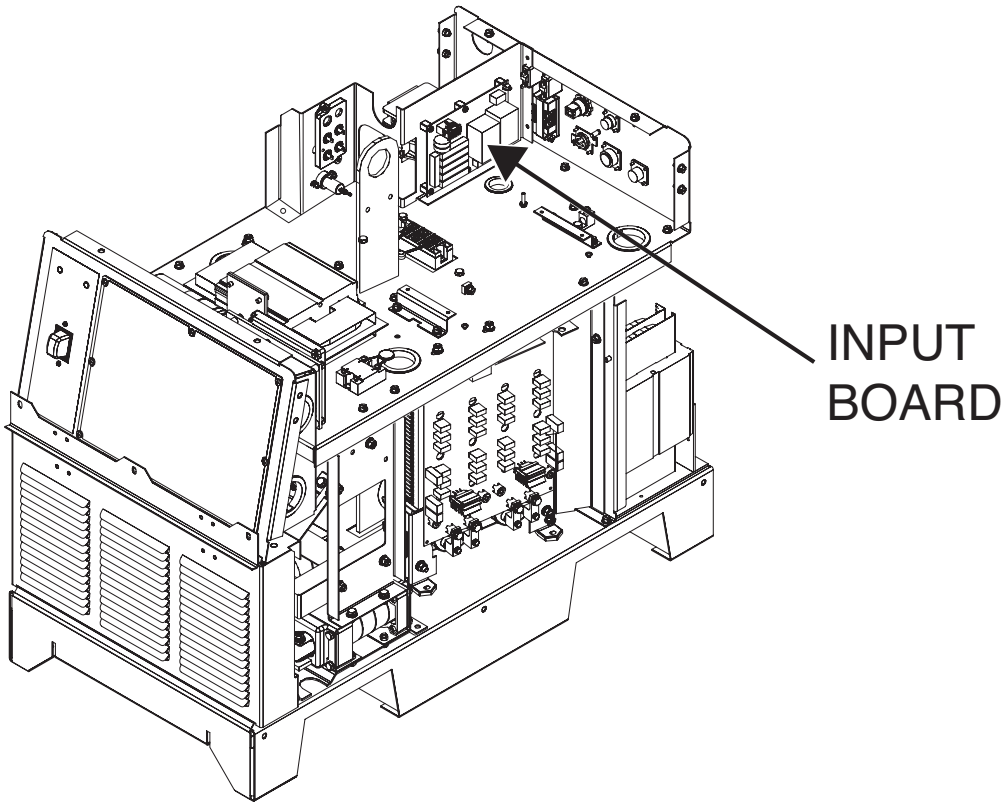
This procedure will aid the technician in the removal and replacement of the Input Board.

MATERIALS NEEDED

Phillips Screwdriver
Wiring Diagram

INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.47 – Input board location



REMOVAL PROCEDURE

1. Remove the input power to the Power Wave S700.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the input board. See Figure F.47.
5. Label and remove plugs J60 and J61 from the input board. See ***Figure F.48***. See Wiring Diagram.
6. Using a phillips screwdriver, remove the four screws securing the input board to the machine. See ***Figure F.48***.
7. Using a phillips screwdriver, remove the two screws and two plastic standoffs securing the board to the input power panel. See ***Figure F.49***.
8. Remove the input board.

INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.48 – Input board lead and mounting screw locations

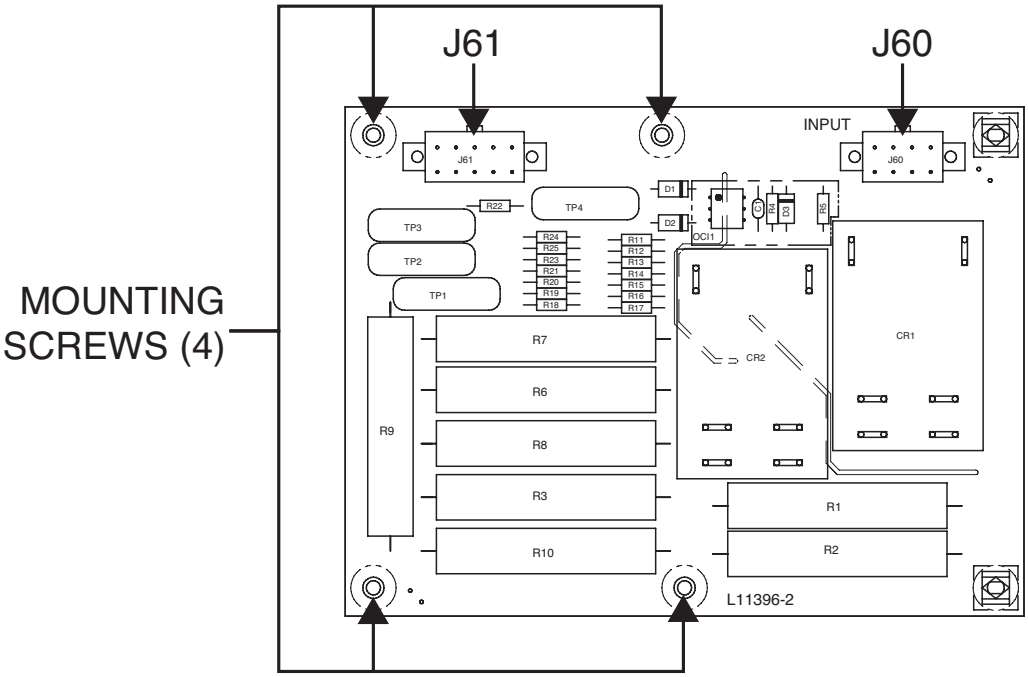
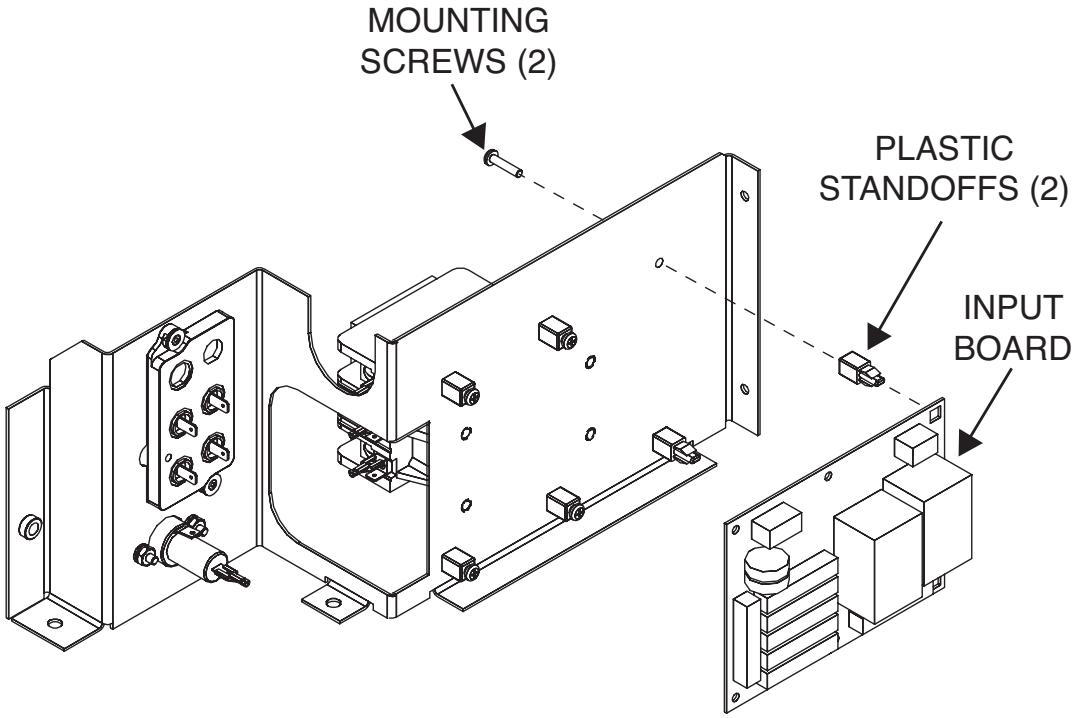


Figure F.49 – Input board mounting screw locations



INPUT BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully position the new input board onto the machine.
2. Using a phillips screwdriver, attach the two screws and two plastic standoffs securing the board to the input power panel.
3. Using a phillips screwdriver, attach the four screws securing the input board to the machine.
4. Connect plugs J60 and J61 to the input board. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.

INPUT RECTIFIER 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

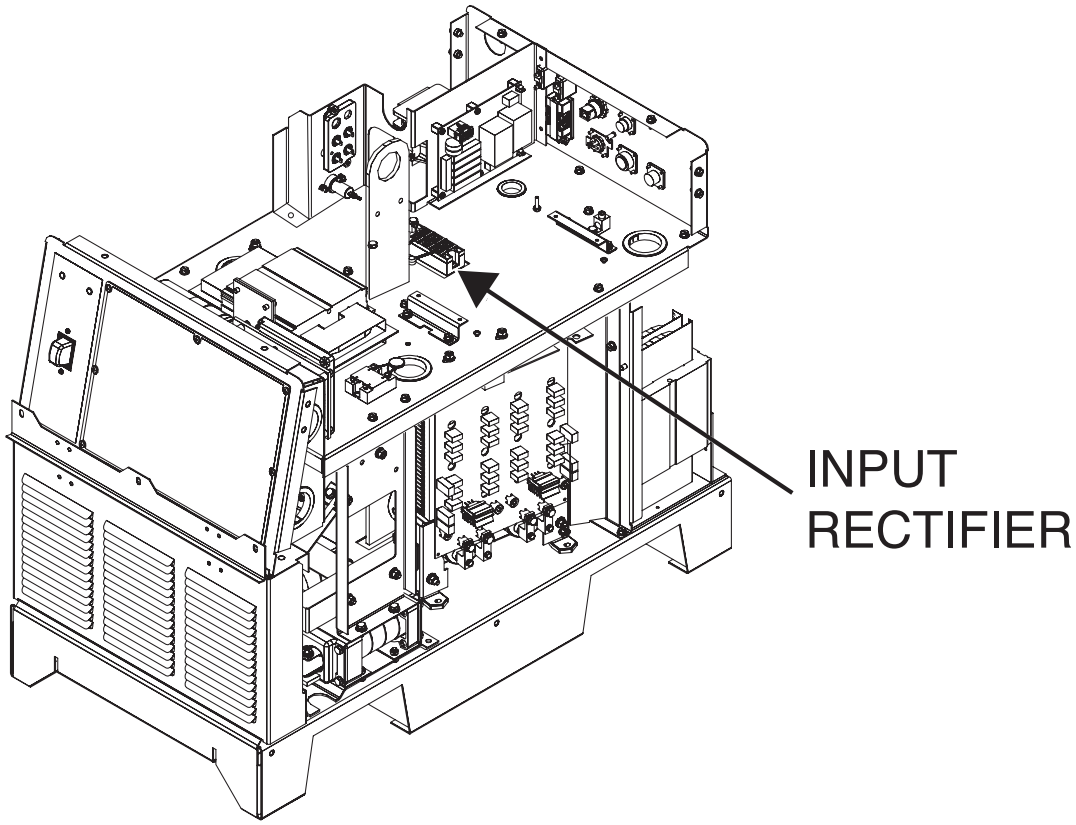
This procedure will aid the technician in the removal and replacement of the Input Rectifier.

MATERIALS NEEDED

Phillips Screwdriver
#25 Torx Wrench
Wiring Diagram
RTV Sealant
Penetrox A-13 LE Co. #T12837-1

INPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.50 – Input rectifier location

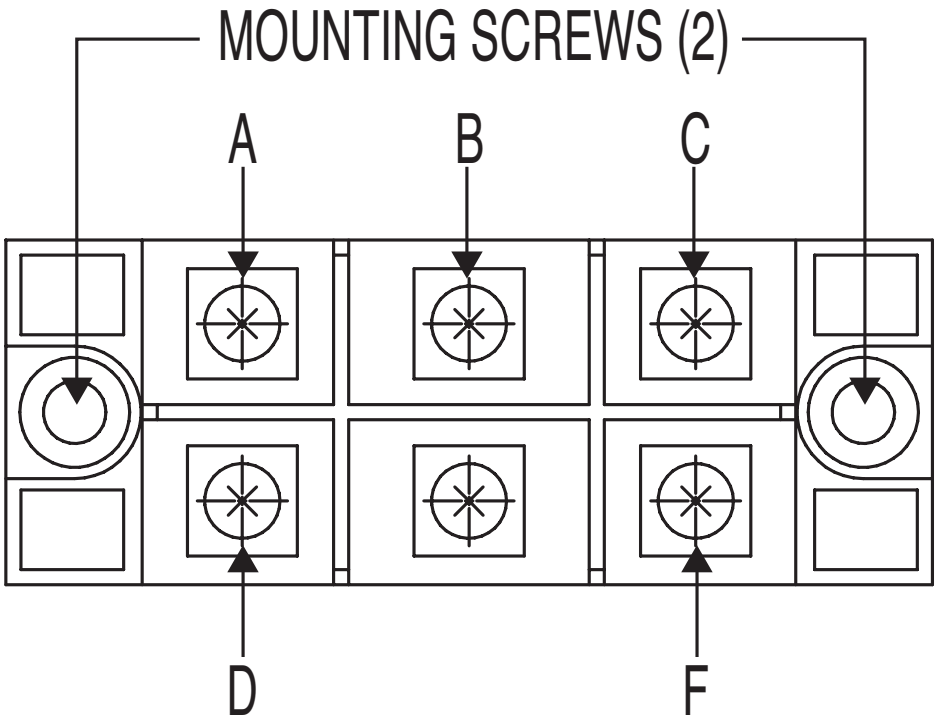


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the input rectifier. See Figure F.50.
5. Remove the RTV sealant from the input rectifier connection terminals.
6. Using a phillips screwdriver, label and remove the five leads from the input rectifier terminals. Note placement of leads, washers and MOVs for reassembly. See ***Figure F.51***. See Wiring Diagram.
7. Using a #25 torx screwdriver, remove the two mounting screws and washers from the input rectifier. See ***Figure F.51***.
8. Carefully remove the input rectifier from the heat sink.

INPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.51 – Input rectifier terminal and mounting screw locations



REPLACEMENT PROCEDURE

1. Carefully clean heat sink surface.
2. Apply an even coating (0.002 in / 0.005 inches thick) of joint compound (Penetrox A-13 LE Co. #T12837-1) to both the heat sink and the input rectifier mounting surfaces.
3. Carefully position the new input rectifier onto the heat sink.
4. Using a #25 torx screwdriver, attach the two mounting screws and washers to the input rectifier. Torque to 44 inch pounds.
5. Using a phillips screwdriver, connect the five leads and MOVs to the input rectifier terminals. See Wiring Diagram. Torque to 26 inch pounds.
6. Apply RTV sealant to the input rectifier connection terminals.
7. Perform the ***Case Cover Replacement Procedure***.

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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

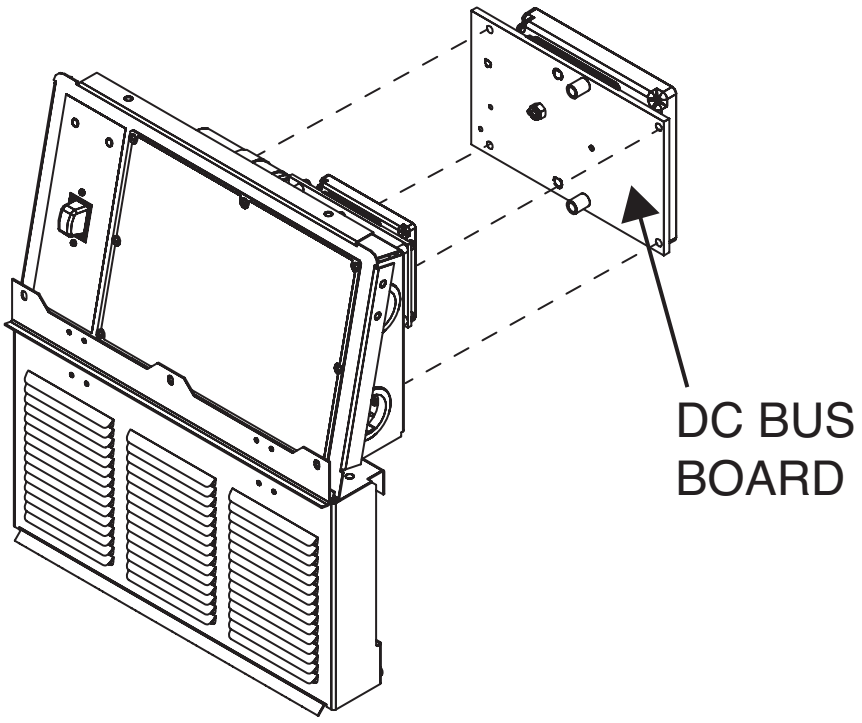
This procedure will aid the technician in the removal and replacement of the DC Bus Board.

MATERIALS NEEDED

3/8” Wrench
3/8” Open End Wrench
Wiring Diagram

DC BUS BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.52 – DC bus board location



REMOVAL PROCEDURE

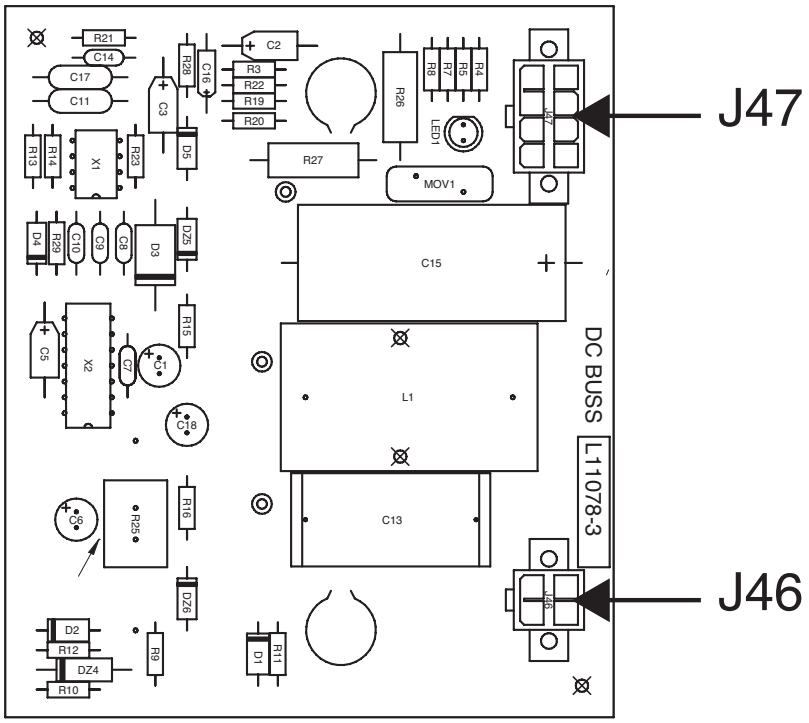
1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate DC bus board. See Figure F.52.
5. Label and remove plugs J46 and J47. See ***Figure F.53***. See Wiring Diagram.
6. Label and remove leads 241 and 242 from the thermostat located on the DC bus board assembly. See Wiring Diagram.
7. Label and remove leads X1A and X3 from the AC side of the diode bridge. See Wiring Diagram.
8. Label and remove the DC+ and DC- leads from the diode bridge. See Wiring Diagram.
9. Using a 3/8” wrench, remove the four DC bus board mounting nuts. Note placement of fiber standoffs for reassembly.

NOTE: A 3/8” open end wrench may be necessary to remove nuts located where nutdriver will not fit.

10. Carefully remove the DC bus board assembly from the mounting studs.
11. If necessary, remove the diode bridge and the thermostat from the aluminum heat sink.

DC BUS BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.53 – DC bus board lead locations



REPLACEMENT PROCEDURE

1. Attach diode bridge and thermostat if previously removed.
2. Carefully position the new DC bus board onto the mounting studs.
3. Using a 3/8” wrench, attach the four DC bus board mounting nuts and fiber standoffs.

NOTE: A 3/8” open end wrench may be necessary to attach nuts located where nutdriver will not fit.

4. Connect the previously removed DC+ and DC– leads to the diode bridge. See Wiring Diagram.
5. Connect the previously removed X1A and X3 leads to the AC side of the diode bridge. See Wiring Diagram.
6. Connect the previously removed leads 241 and 242 to the thermostat located on the DC bus board assembly. See Wiring Diagram.
7. Connect the previously removed plugs J46 and J47 to the DC bus board. See Figure F.53. See Wiring Diagram.
8. Perform the ***Case Cover Replacement Procedure***.

SWITCH 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

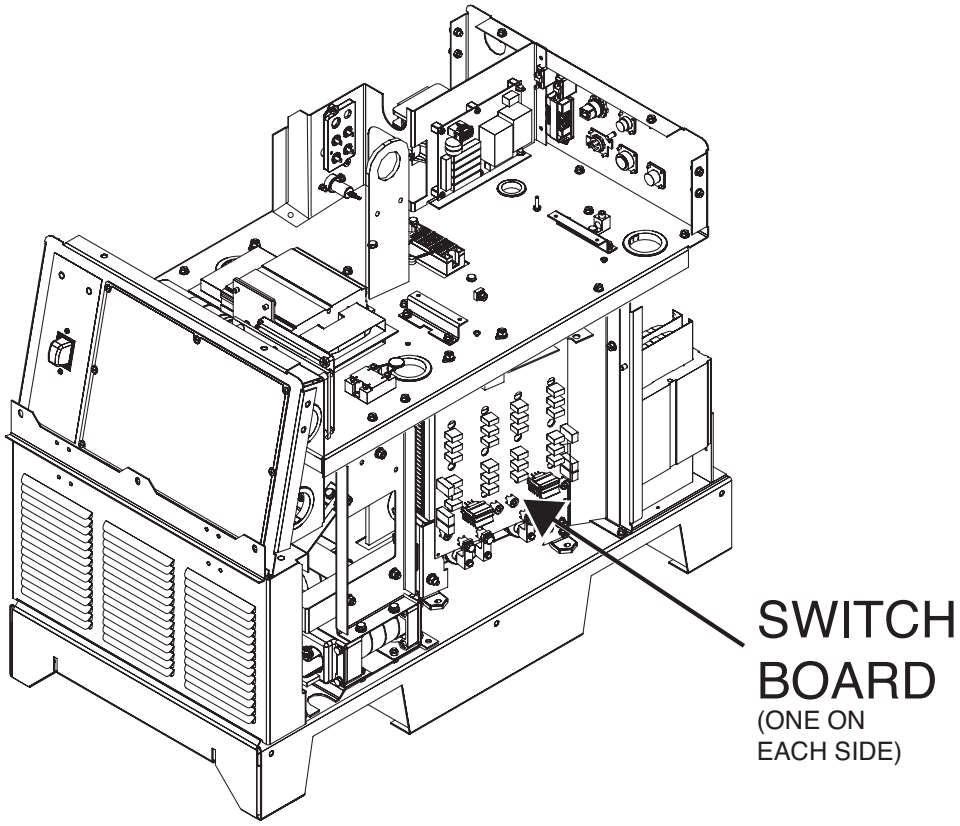
This procedure will aid the technician in the removal and replacement of the Switch Board.

MATERIALS NEEDED

7/16” Wrench
5/16” Wrench
#25 Torx Wrench
Wiring Diagram
Mineral Spirits
Isopropyl Alcohol
Dow Corning 340 (Lincoln Part #T12837)

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.54 – Switch board location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the switch board to be replaced. See Figure F.54.
5. Disconnect plugs J21 and J22 from the switch board. See ***Figure F.55***. See Wiring Diagram.
6. Using a 7/16” wrench, label and disconnect leads 11 or 16 and 14 or 17. Label and disconnect both negative and positive capacitor leads. Label and disconnect 13 or 18 and 12 or 15. Note washer position for replacement. See ***Figure F.55***. See Wiring Diagram.
7. Using a 5/16” wrench, loosen the capacitor links just enough so they can be rotated to one side to maneuver the switch board out of the machine. See ***Figure F.56.***
8. Using a #25 torx wrench, remove the twelve mounting screws and associated washers securing the switch board to the heat sink assembly. See ***Figure F.56.***
9. Remove the switch board.

SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.55 – Switch board connections

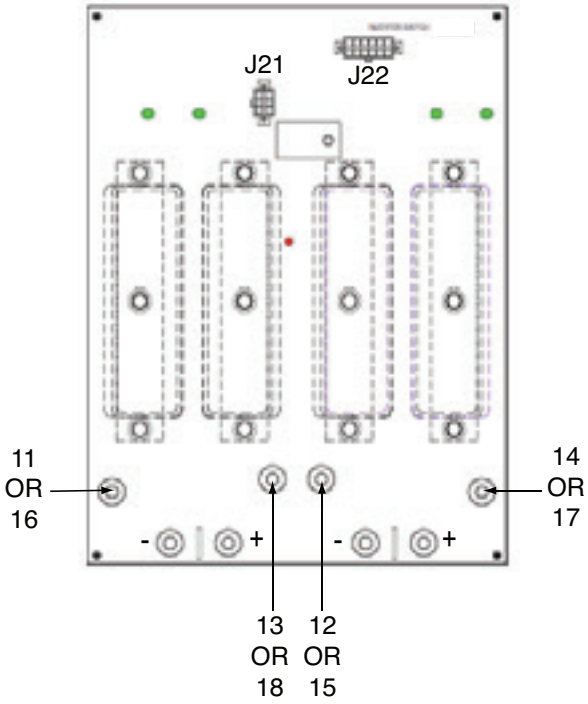
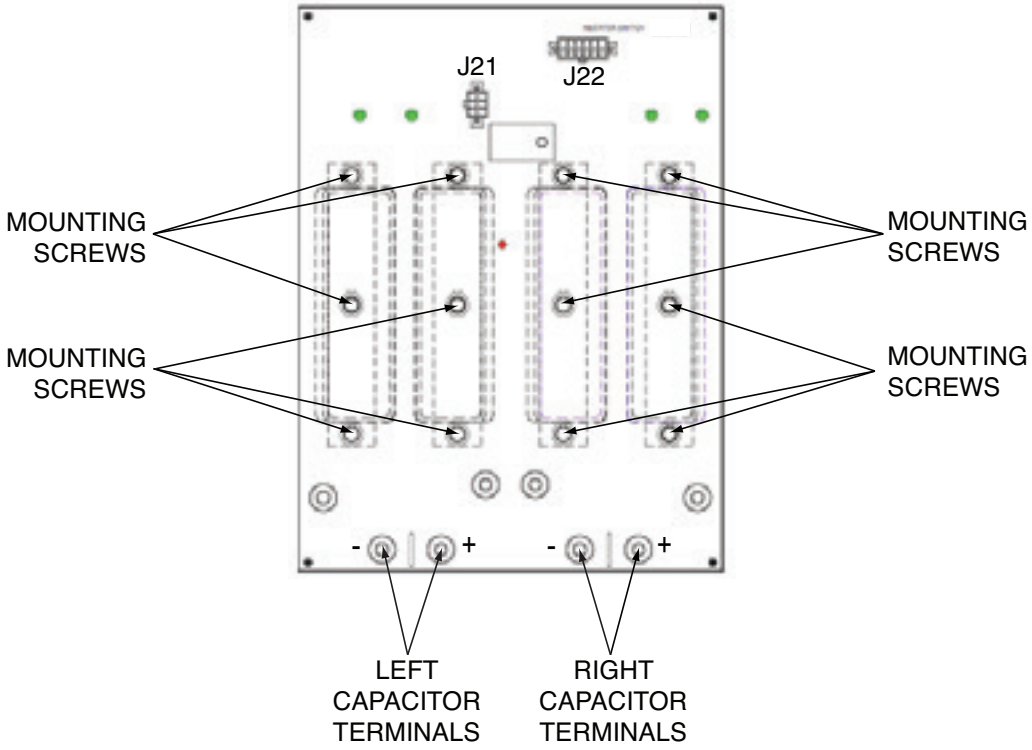
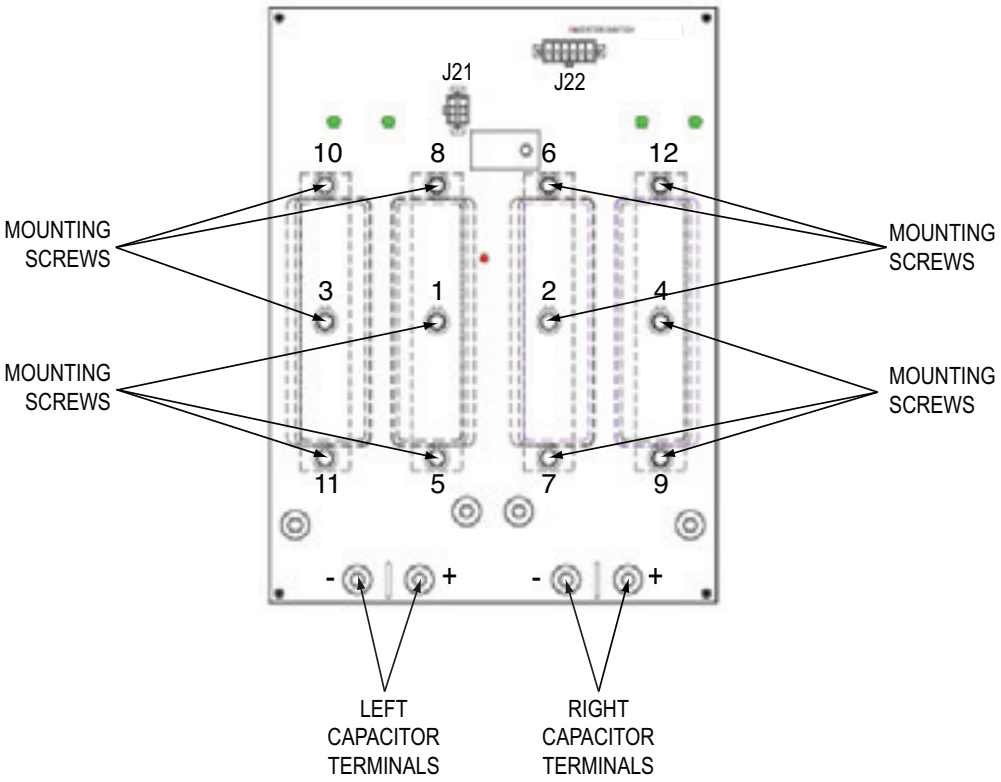


Figure F.56 – Switch board mounting screws



SWITCH BOARD REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.57 – Switch board mounting screw and torque sequence



REPLACEMENT PROCEDURE

NOTE: Before installing the new switch board, the original Dow Corning 340 must be completely removed from the heat sink. Clean the heat sink mating surface and the device's surface using mineral spirits, then with isopropyl alcohol. Be sure not to scratch or mar the heat sink surface when removing the old material. Apply a coating of Dow Corning 340 (Lincoln Part#T12837) to the mating surface of the electronic modules and heat sink.

1. Carefully position new switch board into the machine.

2. Using a #25 torx wrench, attach the twelve mounting screws and associated washers securing the switch board to the heat sink assembly. Torque to 40 - 48 inch pounds following the torque tightening sequence shown in Figure F.57. Tighten one half the recommended torque on the first pass and the full torque on the second pass.

3. Using a 5/16" wrench, tighten the capacitor links to the switch board.

4. Using a 7/16" wrench, connect leads 11 or 16 and 14 or 17 to the appropriate switch board. Connect both negative and positive capacitor leads to the appropriate switch board. Connect 13 or 18 and 12 or 15 to the appropriate switch board. See Wiring Diagram. Torque capacitor terminals to 50 - 60 inch pounds.

5. Connect plugs J21 and J22 to the switch board. See Wiring Diagram.

6. Perform the ***Case Cover Replacement Procedure***.

CURRENT TRANSDUCER 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

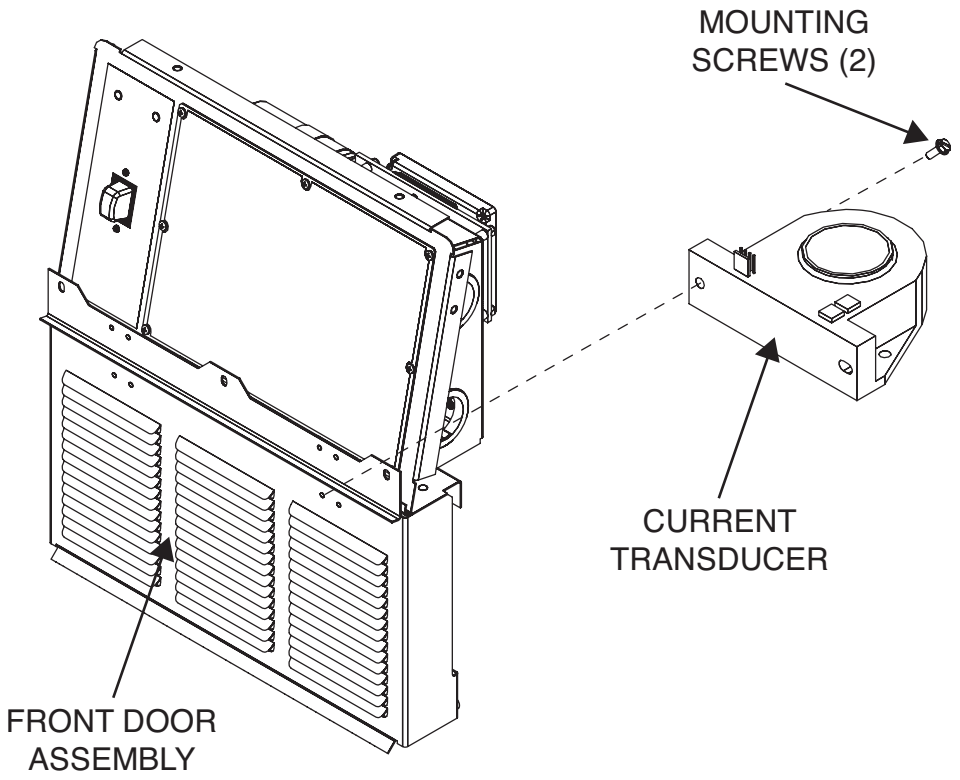
This procedure will aid the technician in the removal and replacement of the Current Transducer.

MATERIALS NEEDED

Phillips Screwdriver
Two 3/4” Open End Wrenches
Wiring Diagram

CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.58 – Current transducer and mounting screw location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Locate the current transducer. See Figure F.58.
5. Open front door assembly. See Figure F.58.
6. Label and disconnect plug P91 attached to the top of the current transducer. See Wiring Diagram.
7. Using two 3/4” open end wrenches, remove the bolt securing the heavy lead, routed through the current transducer, to the output terminals. Note washer and lead locations for reassembly.

NOTE: Take note of position of two smaller leads also connected to the output terminal.

8. Using a phillips screwdriver, remove the two screws securing the current transducer to the front door assembly. See Figure F.58.
9. Remove the current transducer.

CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Carefully position the new current transducer into the machine.
2. Using a phillips screwdriver, attach the two screws securing the current transducer to the front door assembly.
3. Using two 3/4” open end wrenches, attach the bolt securing the large lead to the output terminals.
4. Connect plug P91 to the top of the current transducer. See Wiring Diagram.
5. Close front door assembly.
6. Perform the ***Case Cover Replacement Procedure***.

OUTPUT DIODE MODULE 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 trouble-shooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

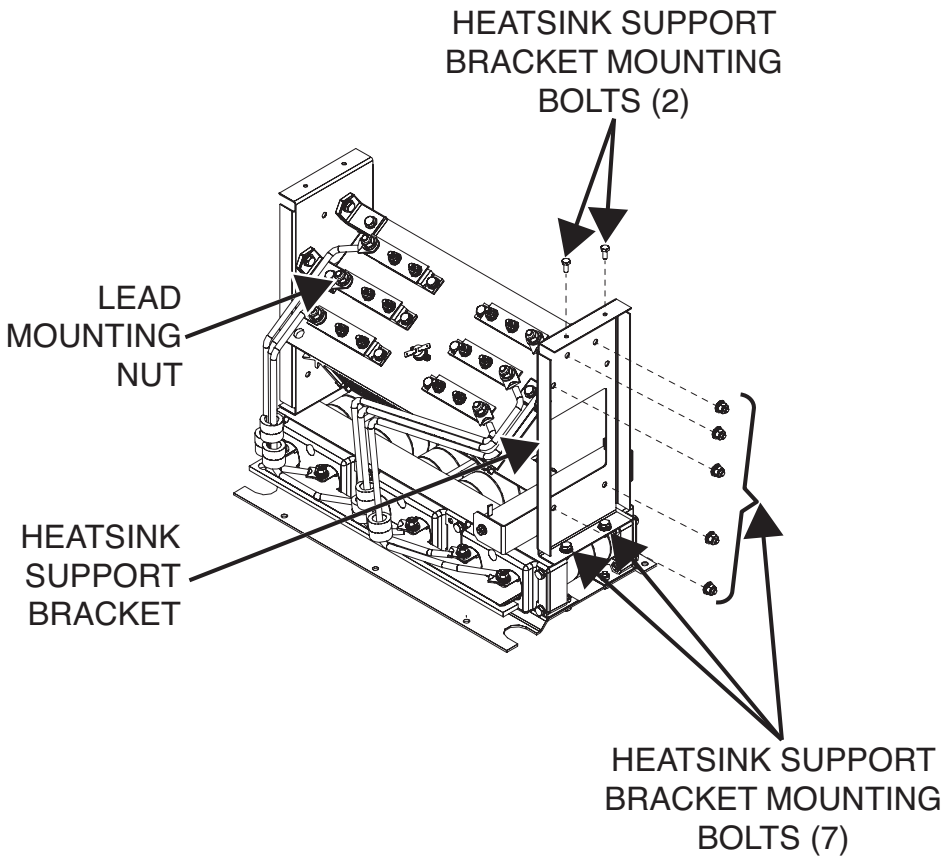
This procedure will aid the technician in the removal and replacement of an Output Diode Module(s).

MATERIALS NEEDED

7/16” Nutdriver
7/16” open end ratchet wrench
3/8” Nutdriver
1/2” Wrench
9/64” Allen Key
Penetrox A13 Joint Compound
7/16” Torque Wrench
9/64” Allen Key Torque Wrench
7/16” Open End Wrench
1/2” Open End Wrench

OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.59 – Heatsink support bracket removal

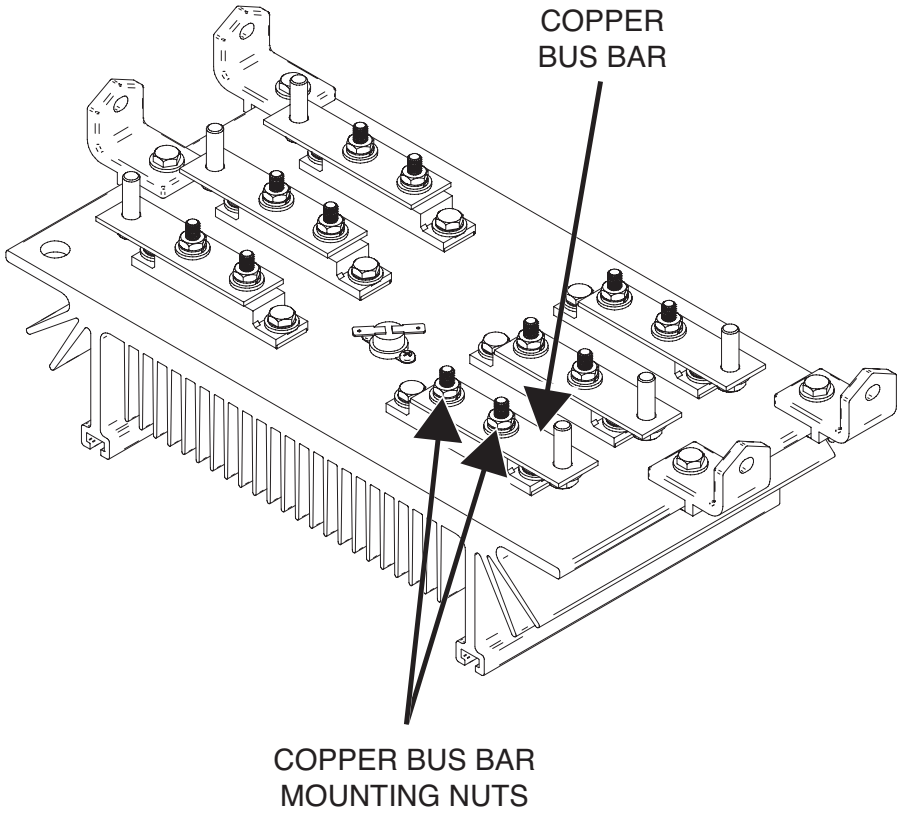


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Input Filter Capacitor Discharge Procedure***.
4. Using a 7/16” nutdriver and 7/16” open end wrench, remove the seven bolts, nuts and associated washers securing the heatsink support bracket. See Figure F.59.
5. Using a 3/8” nutdriver, remove the two screws securing the heatsink support bracket to the top back shelf assembly. See Figure F.59.
6. The heatsink support bracket can now be removed.
7. Using a 1/2” wrench and 1/2” open end wrench, remove nut and associated washers securing lead. Note washer placement for reassembly. See Wiring Diagram. See Figure F.59.
8. Using a 7/16” open end ratchet wrench, remove the two nuts and associated washers securing the copper bus bar. See ***Figure F.60***.
9. The copper bus bar can now be removed.
10. Using a 7/16” open end ratchet wrench, remove the two outer screws and associated washers securing the diode module to the heatsink assembly. See ***Figure F.61***.

OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.60 – Copper bus bar removal



11. Using a 9/64” allen key, remove the center screw from the diode. See ***Figure F.61***.

12. The diode module can now be removed and replaced.

OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.61 – Outer mounting bolt locations

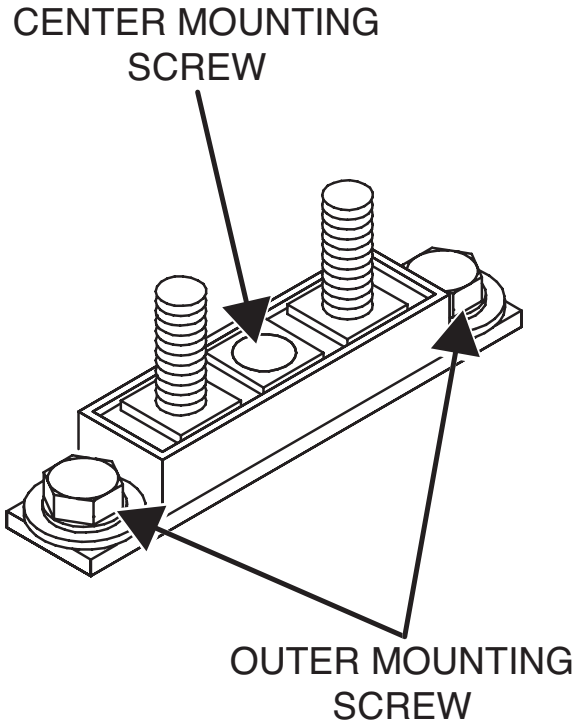
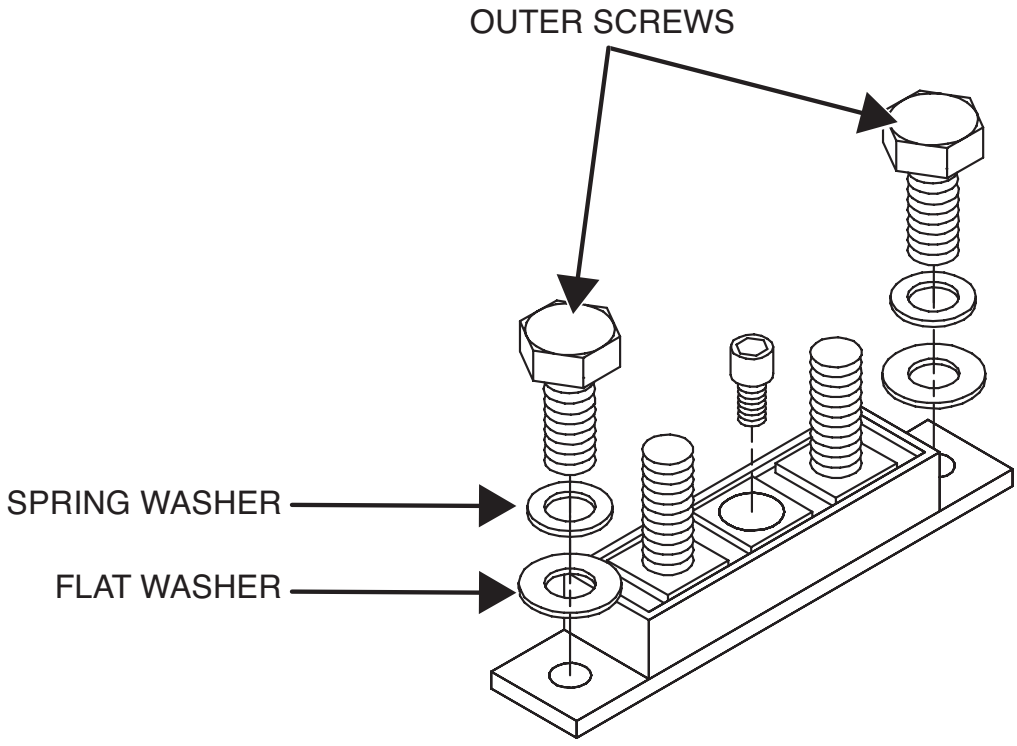


Figure F.62 – Initial placement



OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.63 – Center screw finger tight

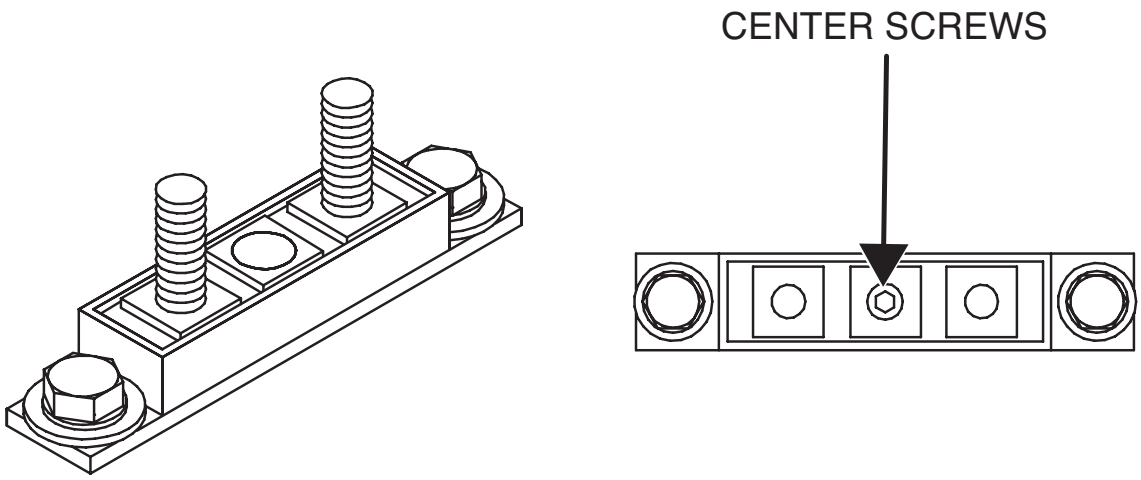
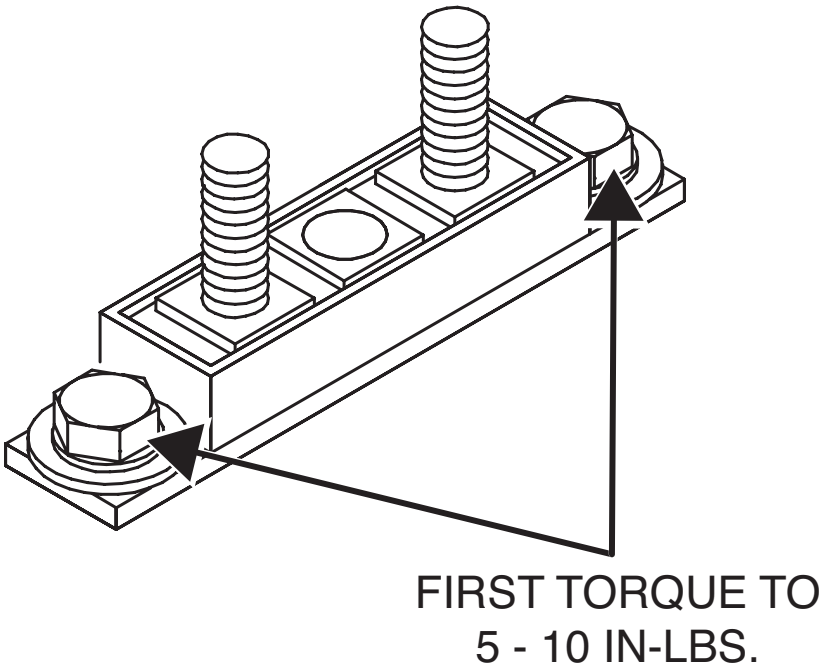


Figure F.64 – Outer screws first torque



OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

Figure F.65 – Center screw torque

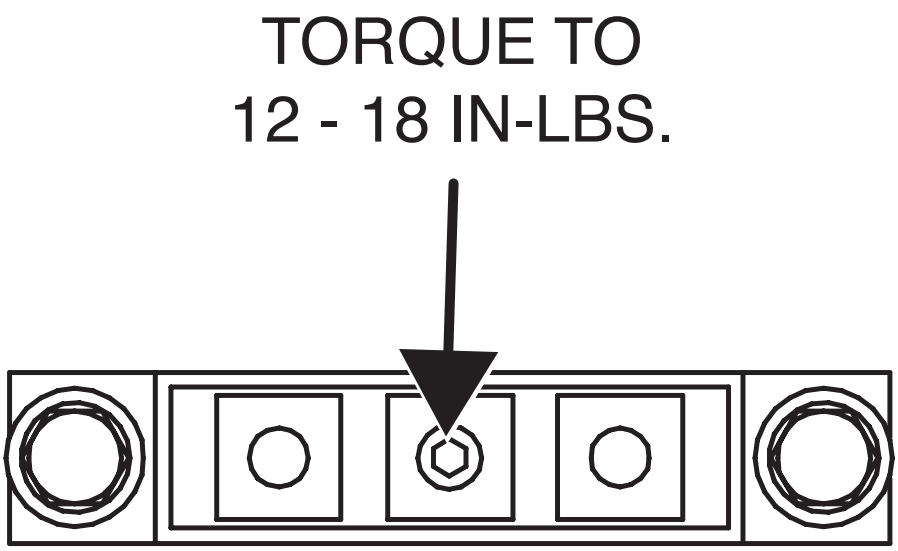
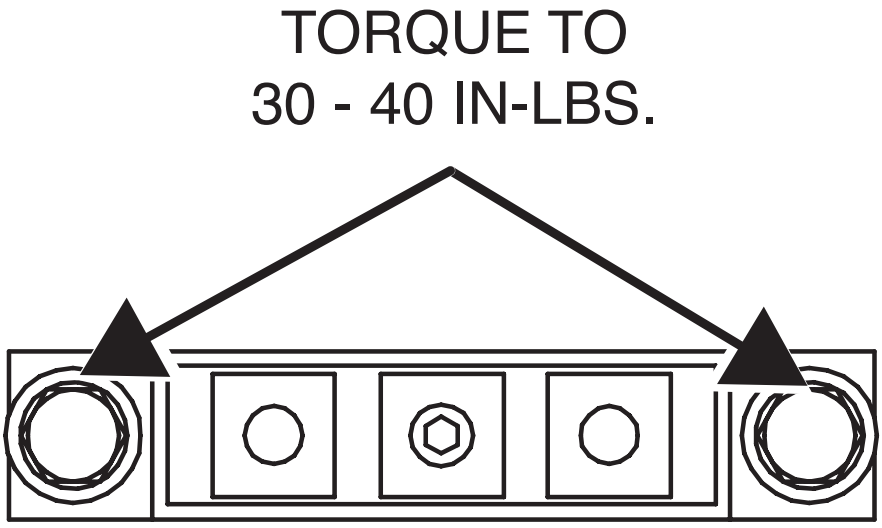


Figure F.66 – Outer screw second torque



OUTPUT DIODE MODULE REMOVAL AND REPLACEMENT PROCEDURE (continued)

REPLACEMENT PROCEDURE

1. Apply a thin, even layer of Penetrox A-13 joint compound (.004 to .010 in.) thick, to the bottom surface of the base plate. Only apply Penetrox in the area under the plastic body of the module. Keep the Penetrox away from the area of the mounting holes.
2. Press the module firmly against the heat sink while aligning the mounting holes. Insert each outer screw through a spring washer, flat washer and then into the holes. Start threading screws into the heat sink (two to three turns, by hand). See ***Figure F.62***.
3. Tighten the center screw by hand, two to three turns. The screw threads may catch on the threads of the heat sink, so be sure to get the face of the screw into contact with the surface of the module. See ***Figure F.63***.
4. Using a 7/16" torque wrench, tighten each of the outer screws to between 5 and 10 in-lbs. See ***Figure F.64***.
5. Using 9/64" allen key torque wrench, tighten the center screw to between 12 and 18 in-lbs. See ***Figure F.65***.
6. Using a 7/16" torque wrench, tighten each of the outer screws to between 30 and 40 in-lbs. See ***Figure F.66***.

NOTE: The mating may be checked by removing the module and observing the compound appearance on both module and heat sink surfaces. The appearance should be textured to verify intimate contact of the mating parts separated. 80% minimum mating is expected in the area opposite the component containing body of the module. Otherwise apply more compound and repeat procedure.

7. Position copper bus bar on to the diode module.
8. Using a 7/16" open end ratchet wrench, attach the two nuts and associated washers securing the copper bus bar.
9. Using a 1/2" open end ratchet wrench and 1/2" open end wrench, attach nut and associated washers securing the lead.
10. Position the heatsink support bracket on the machine.
11. Using a 3/8" nutdriver, attach the two screws securing the heatsink support bracket to the top back shelf assembly.
12. Using a 7/16" nutdriver and 7/16" open end wrench, attach the seven bolts, nuts and associated washers securing the heatsink support bracket.
13. Replace any cable ties previously removed.

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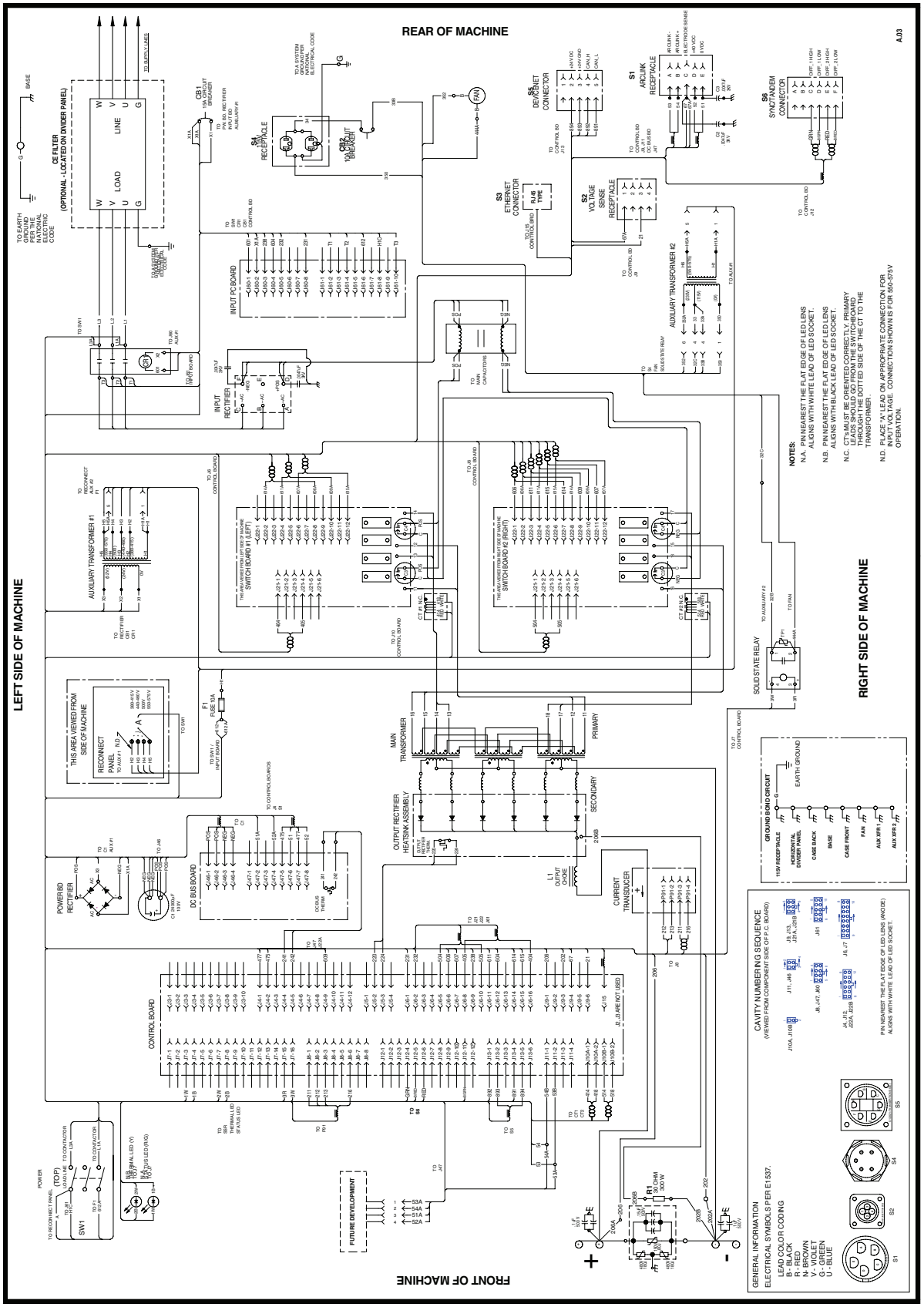
- DIAGRAMS SECTION -

POWER WAVE™ S700 (380-415/ 440-460/ 500/ 550- 575) POWER SOURCE WIRING DIAGRAM



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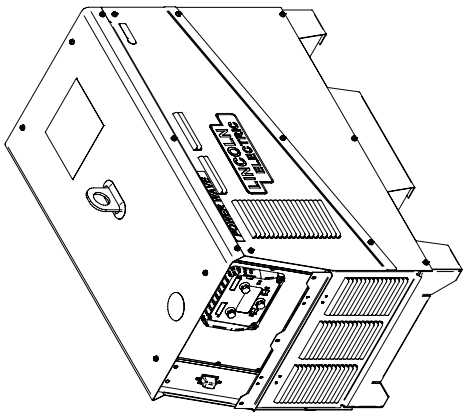

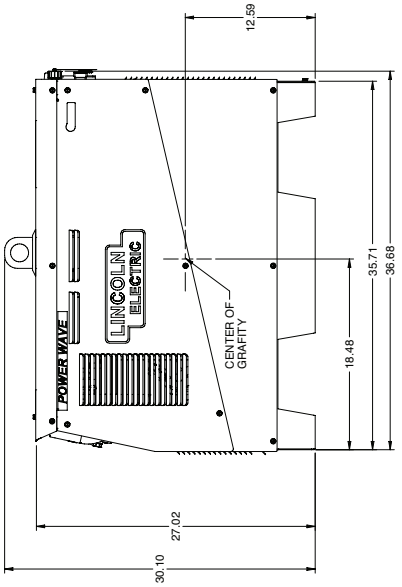
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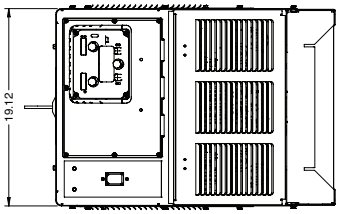
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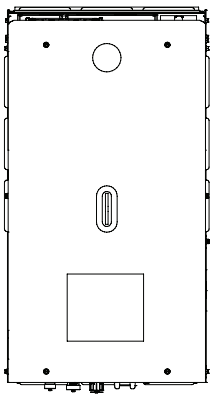

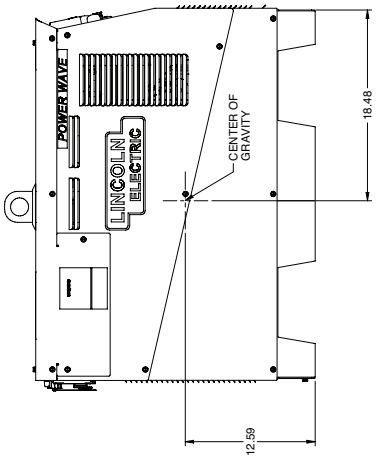
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