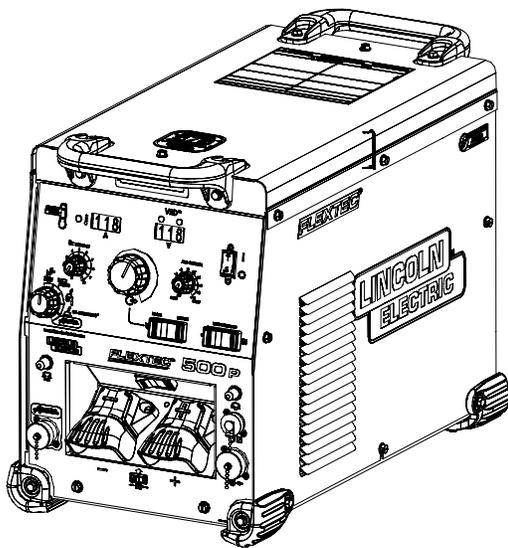


## ***FLEXTEC<sup>®</sup> 500P***

For use with machines having Code Numbers:

**12246**

# ***SERVICE MANUAL***



**SAFETY DEPENDS ON YOU**

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

**⚠ 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.**





# SECTION A: 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. 1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



## FUMES AND GASES CAN BE DANGEROUS.



- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**
- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.



## WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B “Standard for Fire Prevention During Welding, Cutting and Other Hot Work”, available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, Ma 022690-9101.
- 6.j. Do not use a welding power source for pipe thawing.



## CYLINDER MAY EXPLODE IF DAMAGED.



- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY POWERED EQUIPMENT.



- 8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- 8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.
- 8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

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



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

Welding Safety  
Interactive Web Guide  
for mobile devices

# ELECTROMAGNETIC COMPATABILITY (EMC)

## CONFORMANCE

Products displaying the CE mark are in conformity with European Community Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC). It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

## INTRODUCTION

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

## INSTALLATION AND USE

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

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

## ASSESSMENT OF AREA

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

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

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

## METHODS OF REDUCING EMISSIONS

### Mains Supply

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

### Maintenance of the Welding Equipment

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

### Welding Cables

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

### Equipotential Bonding

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

### Earthing of the Workpiece

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

### Screening and Shielding

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

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

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](http://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 coned 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 coned 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 <sup>3</sup>	PEL mg/m <sup>3</sup>
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/m<sup>3</sup>.

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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**Figure E.1 - Block logic diagram**

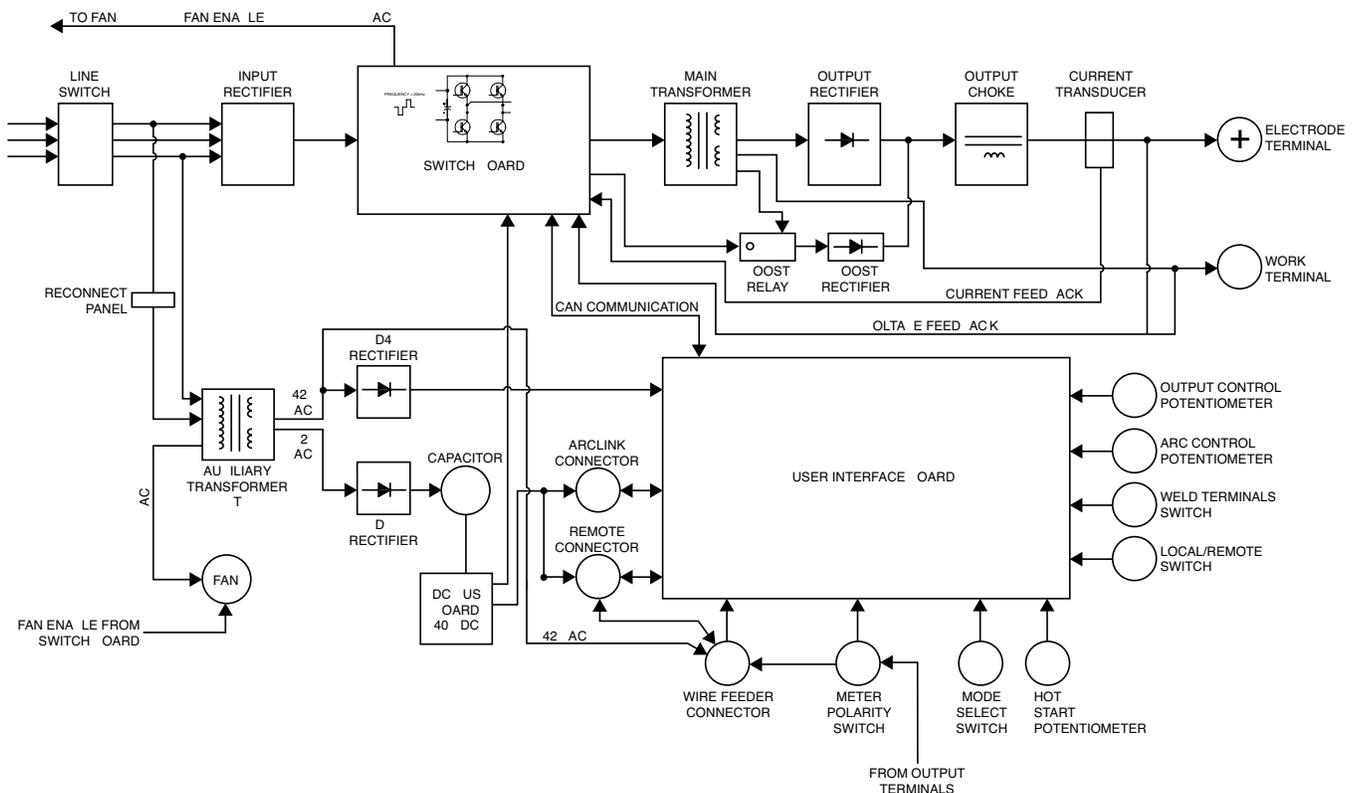
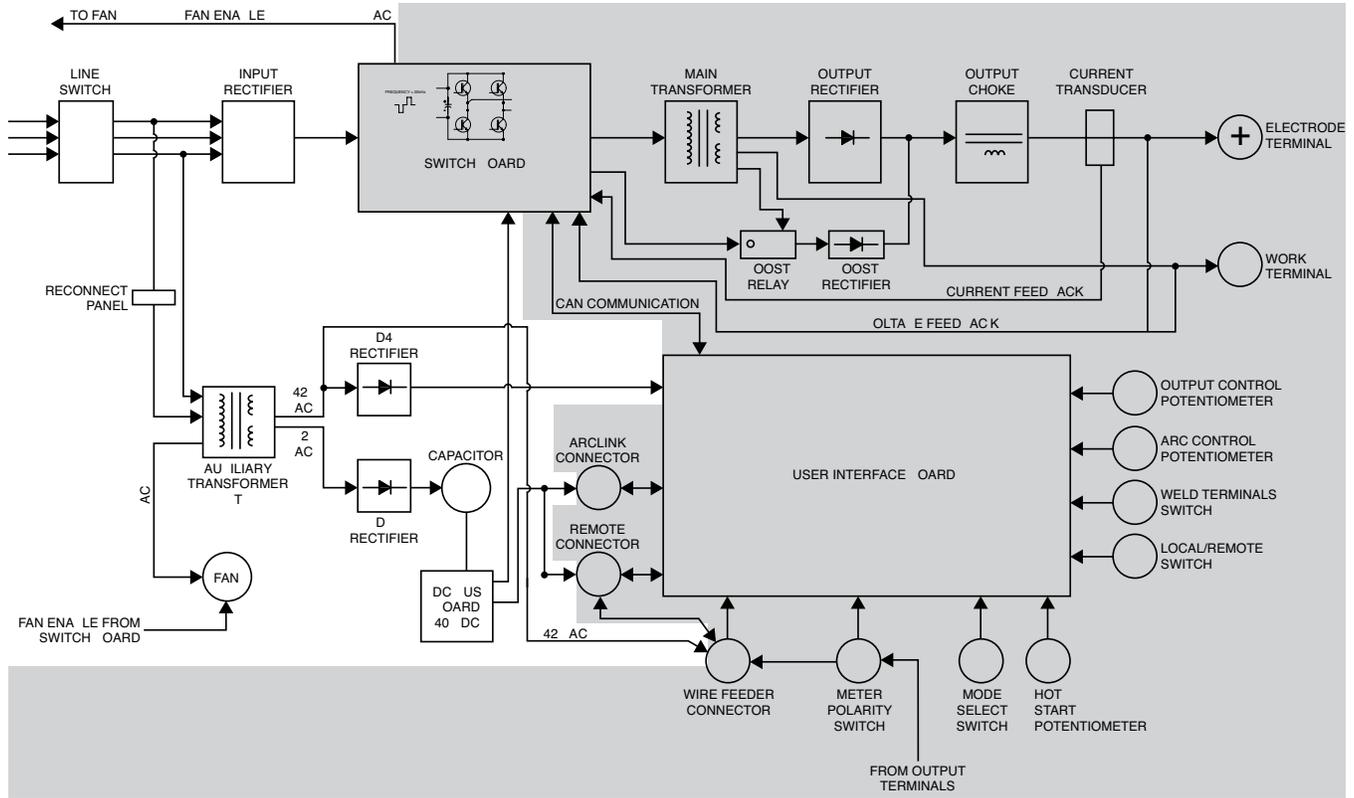


Figure E.2 - Input section



**INPUT SECTION**

When the correct three-phase input voltage is applied the Flextec 500P, via the input line switch, this AC voltage is applied to the input rectifier and the auxiliary transformer.

The voltages generated from the auxiliary transformer are the following:

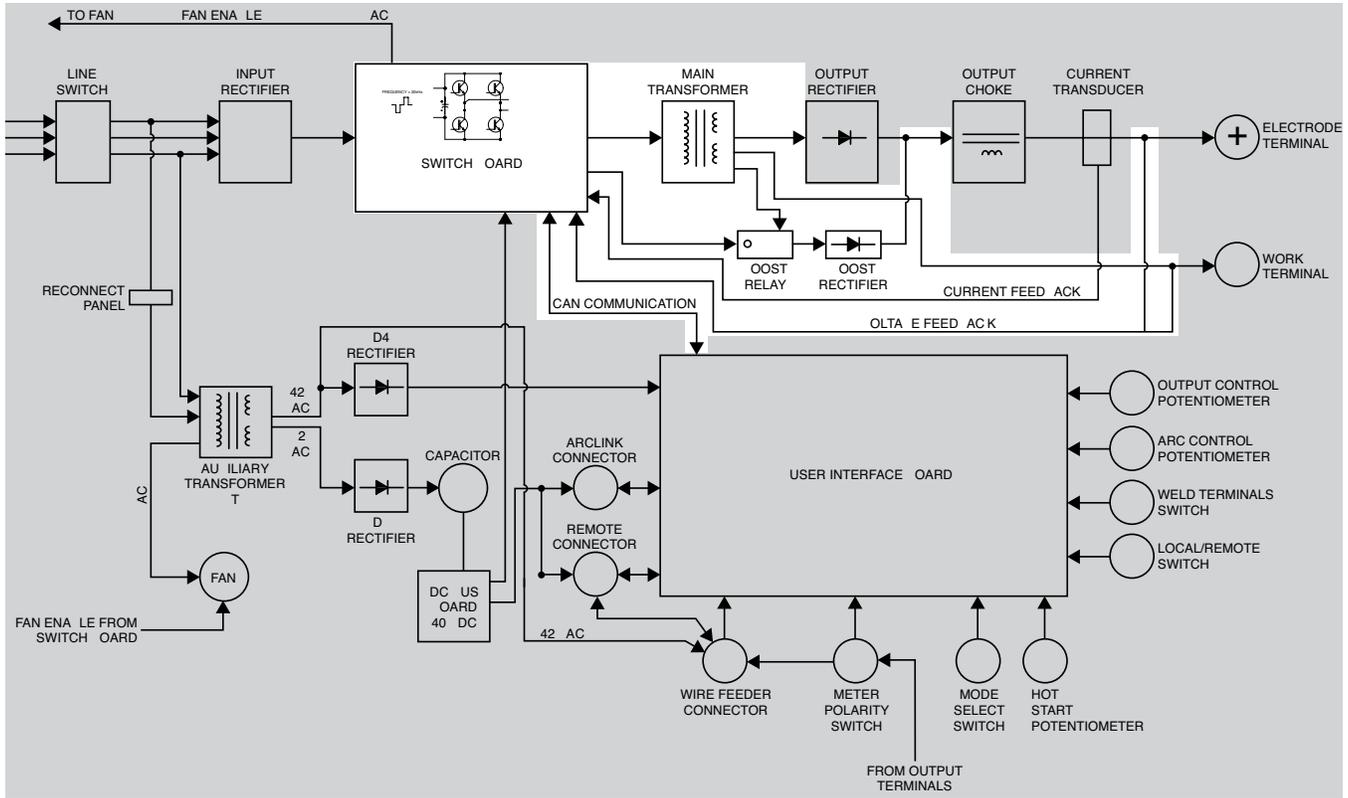
- 42 VAC - Power supply for the user interface board and the 14 pin wire feeder connector.
- 52 VAC - Connected to the DC bus board. The DC bus board maintains a regulated 40 VDC supply that is applied to the switch board and the Arclink connector for use with Arclink wire feeders.
- 115 VAC - Fan power supply.

The input voltage is also applied to the three phase input rectifier and the rectified DC voltage is then passed to the switch board.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure E.3 - Switch board and main transformer



### SWITCH BOARD AND MAIN TRANSFORMER

The main function of the switch board is to receive and process the rectified primary power received from the input rectifier. The circuitry is designed to function from a three-phase input voltage range from 380 VAC to 575 VAC. The switch board provides pulse width modulated power to the primary windings of the main welding transformer. The operating frequency is 20kHz.

The switch board also creates power supplies for the CAN communications (Controller Area Network) and the electronic circuitry located on the switch board.

The switch board has five LEDs that indicate the current status of the switch board. LEDs 1 and 3 indicate status and error codes. LED 2 indicates the CAN power supply is OK. LED 4 indicates the 15 VDC power supply is OK. LED 5 indicates the 5 VDC primary power supply is OK.

In addition the switch board monitors the voltage and current feedback and compares these to the CAN digital signals received from the user interface board. The switch board then sends the appropriate pulse width modulated power to the main transformer.

The main transformer's primary windings receive the pulse width modulated power from the switch board. The 20kHz AC output that is created on the secondary weld windings is applied to the output rectifier.

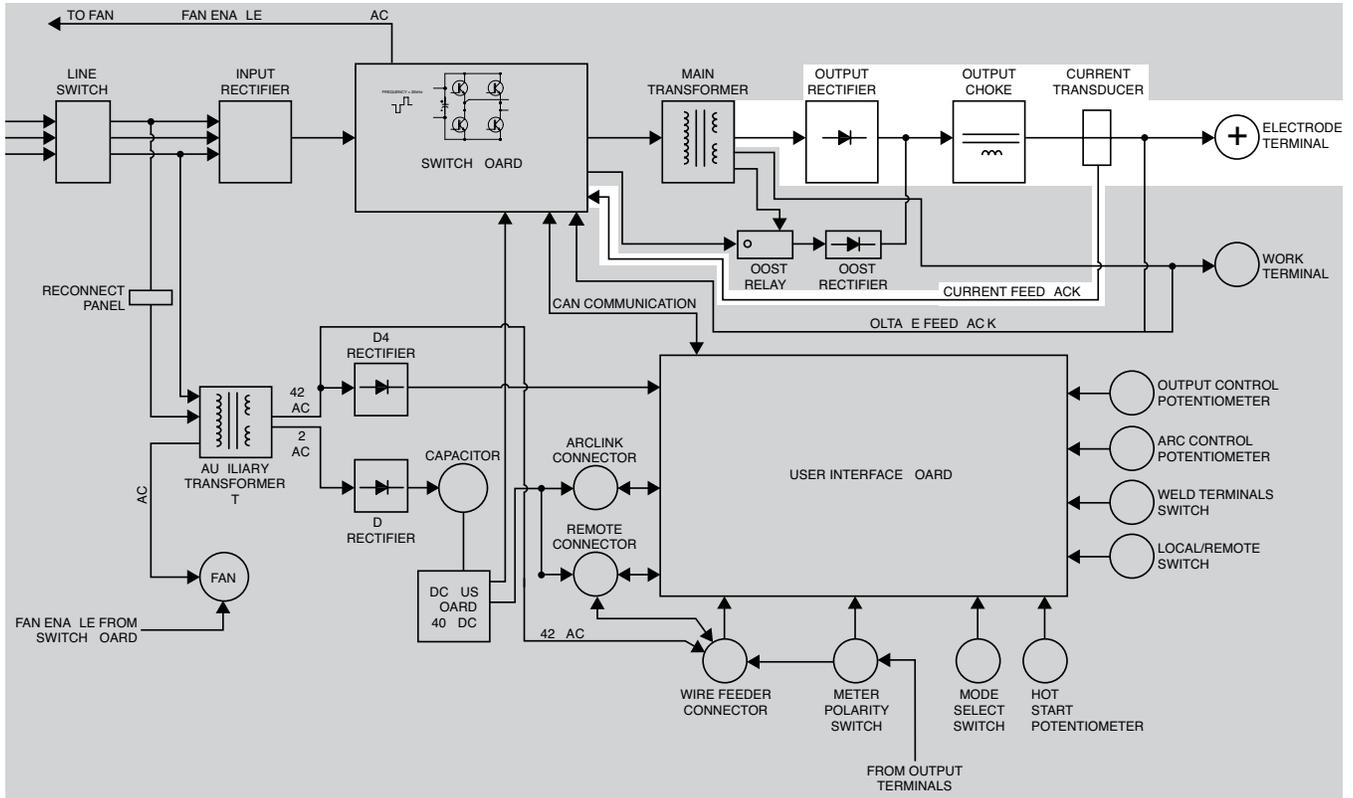
The boost winding of the main transformer provides a higher voltage to the boost rectifier via the boost relay. The boost relay receives a 15 VDC control signal from the switch board when welding current is being drawn. The boost circuit is only active in SMAW mode. This DC boost voltage is applied thru the output choke to the positive output terminal.

The switch board also monitors the thermostat circuits.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure E.4 - Output section



## OUTPUT SECTION

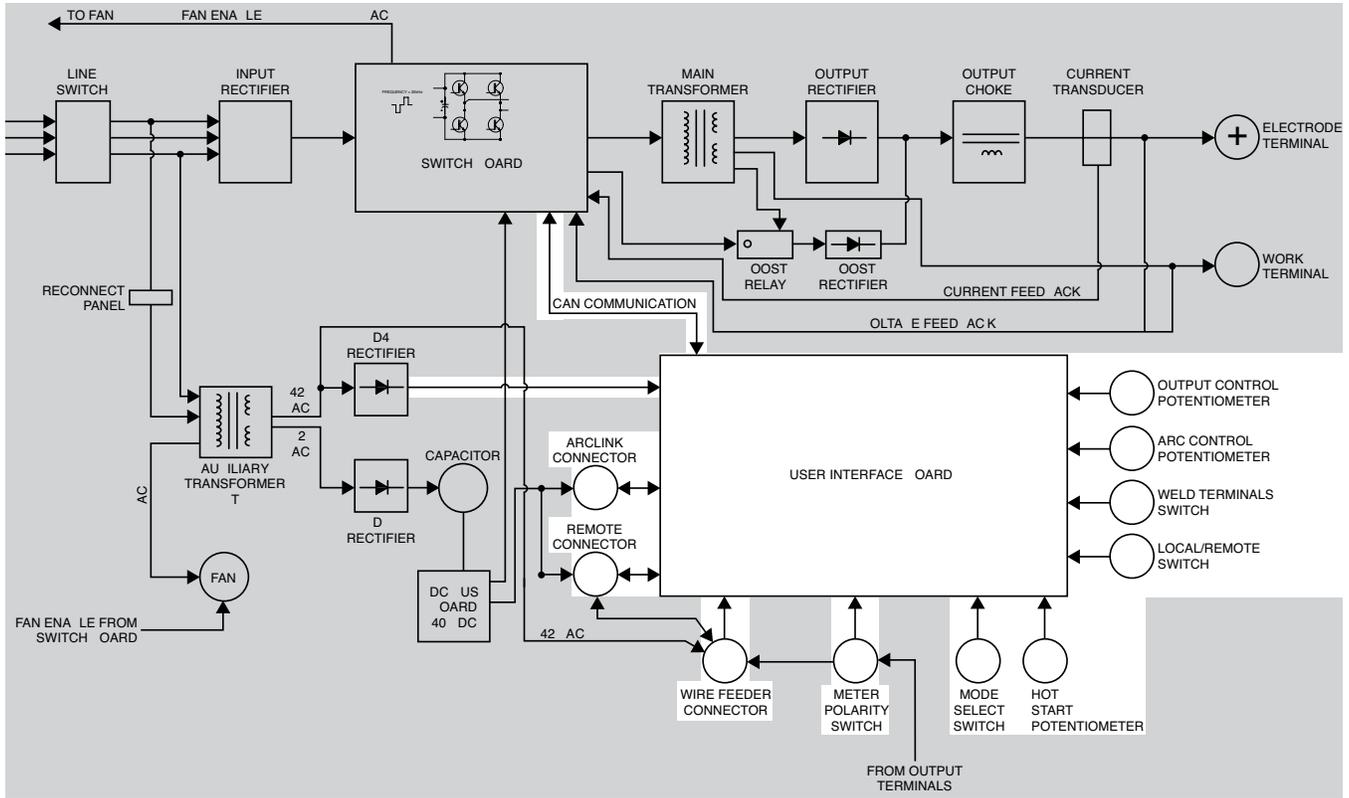
The 20kHz AC output from the main welding transformer is applied to the output rectifier bridge. The resultant DC+ power is coupled, through an output choke to the positive output terminal. The edge wound output choke is an inductor that provides filtering to enhance the arc performance and accurate waveform response.

The current transducer supplies output current information to the switch board.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure E.5 - User interface board and user controls



## USER INTERFACE BOARD AND USER CONTROLS

The user interface board receives rectified DC input power from the D4 rectifier. LED 4 on the user interface board indicates the board is receiving the correct input power.

The user interface board displays to the user the preset settings (voltage or current). During welding it displays the actual voltage and output current.

There are two VRD™ indicator lights on the front of the machine. When shipped the VRD™ function is disabled. VRD™ is enabled by setting dip switches on the user interface board. See Operation section of the Operators manual.

The user controls, switches and connectors allow the operator to communicate to the user interface board the desired processes and welding requirements. The user interface board then sends the desired parameters to the switch board via digital (CAN) communications.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

## THERMAL PROTECTION

Three normally closed (NC) thermostats protect the FLEXTEC 500P from over temperature. Two thermostats provide secondary thermal protection, are wired in series and are connected to the switch board. One of these thermostats is located on the output rectifier heatsink and the other is embedded in the main inverter transformer. These protect the machine against reduced airflow or overload. If excessive operating temperatures should occur, the thermostats will prevent output from the machine. The fan will remain ON, a thermal fault will be logged and the thermal LED will be lit.

One additional thermostat provides auxiliary thermal protection. It is located on the auxiliary transformer and is connected to the switch board. It protects the machine against auxiliary transformer overload and overheating. If the thermostat opens, the fan and the output will remain ON. There is no thermal fault logged.

The thermostats are self-resetting once the machine cools sufficiently or any overload is cleared. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left ON and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louvers are obstructed, then the power must be removed from the machine and the fan problem or air obstruction corrected.

## PROTECTIVE CIRCUITS

Protective circuits are designed into the FLEXTEC 500P to sense trouble and shut down the machine before damage occurs to the machine's internal components.

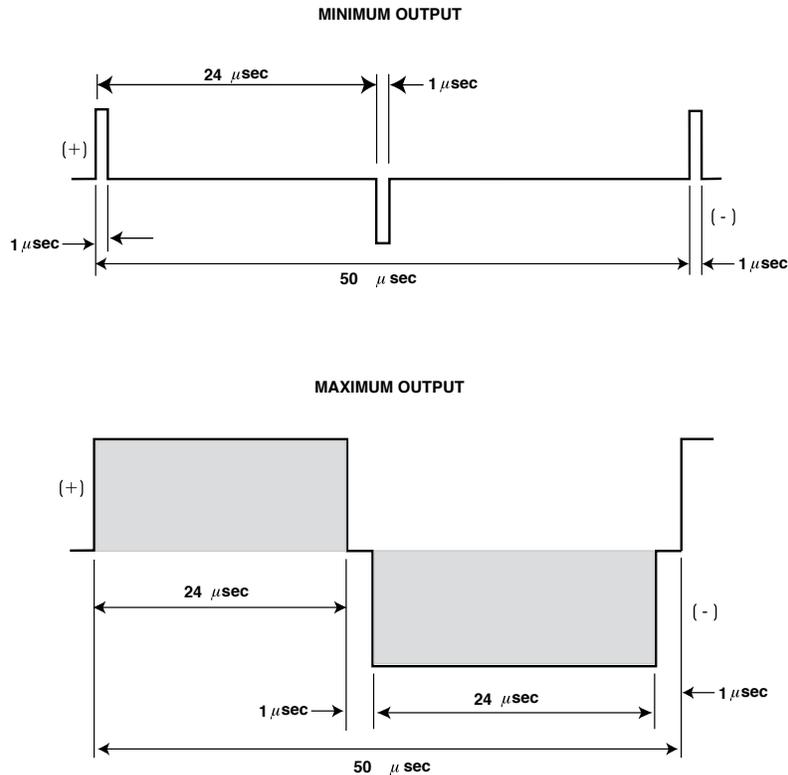
## UNDER/OVER VOLTAGE PROTECTION

The machine is protected from both over and undervoltage conditions. If the DC voltage being applied to the switch board is lower than 180 VDC or higher than 1050 VDC the machine's output will be disabled. If the condition persists for more than one second error code 714 will be displayed when supply voltage is too low. 713 will be displayed when supply voltage is too high.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure E.6 - Typical IGBT outputs



**PULSE WIDTH MODULATION**

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

**MINIMUM OUTPUT**

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during the cycle. The top drawing in Figure E.6 shows the minimum output signal possible over a 50-microsecond time period.

The positive portion of the signal represents one IGBT group<sup>1</sup> conducting for one microsecond. The negative portion is the other IGBT group<sup>1</sup>. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only two microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

**MAXIMUM OUTPUT**

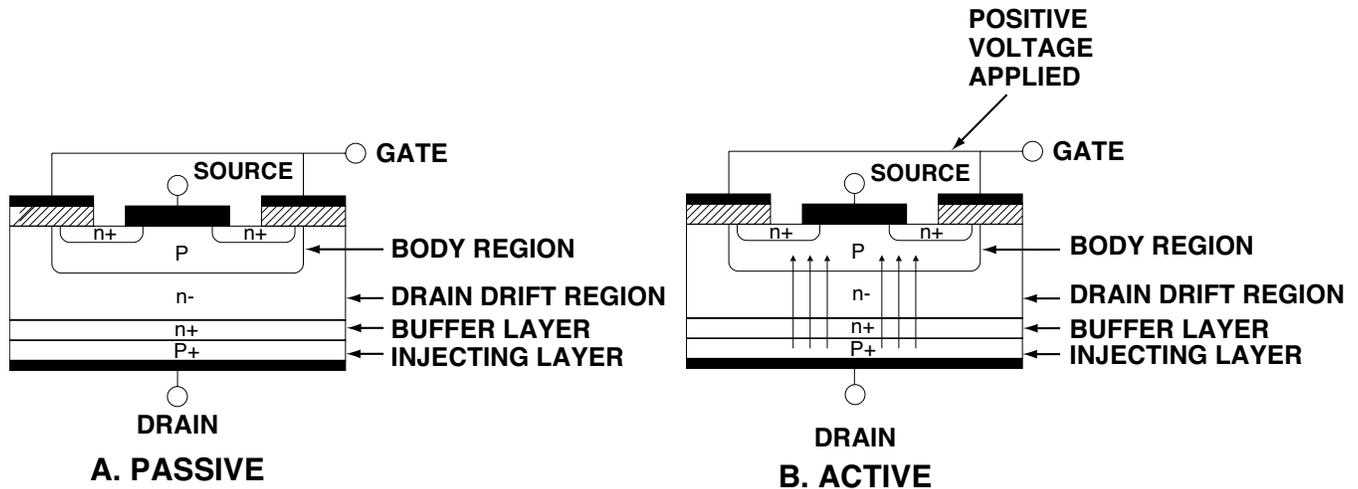
By holding the gate signal on for 24 microseconds each and allowing only two microseconds of dwell time (off time) during the 50-microsecond cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the bottom curve. The more dark area that is under the curve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

<sup>1</sup> An IGBT group consists of two IGBT modules feeding one transformer primary winding.

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure E.7 - 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.

Example A in Figure E.7 shows an IGBT in passive mode. There is no gate signal, zero volts relative to the source and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned OFF like a light switch.

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

**NOTE:**

Unshaded areas of Block Logic Diagram are the subject of discussion.

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## HOW TO USE TROUBLESHOOTING GUIDE

### WARNING

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

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

**Step 1. LOCATE PROBLEM (SYMPTOM).** Look under the column labeled “PROBLEM” (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into two main categories: Function Problems and Welding Problems.

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

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

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

### CAUTION

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

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## PC BOARD TROUBLESHOOTING PROCEDURES

### WARNING

**ELECTRIC SHOCK can kill.**

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



### CAUTION

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

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

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

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.



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

**Reusable Container Do Not Destroy**

- 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
<b>FUNCTION PROBLEMS</b>		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	1. Contact the Lincoln Electric Service Department at 1-888-935-3877.
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make sure the input fuses or circuit breakers are properly sized.	1. Perform the <b><i>Input Rectifier Test</i></b> . 2. Perform the <b><i>Switch Board Test</i></b> . 3. Perform the <b><i>Main Transformer Test</i></b> .
The machine is “dead”. No lights, no output, the machine appears to have no input power.	1. Make sure the input power switch is in the ON position. 2. Check the main input fuses or breakers to make sure all three phases of the correct input power is present at the machine. 3. Check the lead “A” located at the reconnect block. Make certain it is connected to the proper input voltage position.	1. Check the input switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See Wiring Diagram. 2. Perform the <b><i>Auxiliary Transformer (T1) Test</i></b> . 3. Perform the <b><i>User Interface Board Test</i></b> . 4. Perform the <b><i>DC Bus Board Test</i></b> . 5. Perform the <b><i>D3 and D4 Rectifier Test</i></b> .
There is no welding output from the FLEXTEC 500P machine. <b>NOTE:</b> This problem may be accompanied by an error code.	1. Make sure the S3 weld terminals switch is in the “ON” position. 2. Make certain the correct three-phase input power is being applied to the machine. The input may be too high or too low. If this is the case error 711 will be displayed. 3. There may be a thermal shutdown. Check the thermal LED.	1. Perform the <b><i>Auxiliary Transformer (T1) Test</i></b> . 2. Perform the <b><i>Input Rectifier Test</i></b> . 3. Perform the <b><i>Switch Board Test</i></b> . 4. Perform the <b><i>User Interface Board Test</i></b> . 5. Perform the <b><i>Output Rectifier (D2) Assembly Test</i></b> . 6. Perform the <b><i>Main Transformer Test</i></b> .



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

Observe Safety Guidelines detailed in the beginning of this manual.

**TROUBLESHOOTING GUIDE**

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>FUNCTION PROBLEMS</b>		
<p>The thermal LED is "ON". The machine regularly overheats.</p>	<ol style="list-style-type: none"> <li>1. The welding application may be exceeding the recommended duty cycle and/or limits of the machine.</li> <li>2. Dirt or dust may have clogged the cooling channels inside the machine. See the Maintenance section in the operators manual.</li> <li>3. Air intake and exhaust louvers may be blocked due to inadequate clearance around the machine.</li> <li>4. Make sure the fan is functioning correctly. The FLEXTEC 500P is equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output current is established and will continue running for approximately five minutes after the output current is disabled.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>T1 Transformer Thermostat Test</b>.</li> <li>2. Perform the <b>Weld Output Thermostat Circuit Test</b>.</li> <li>3. Perform the <b>Switch Board Test</b>.</li> <li>4. Perform the <b>Fan and F.A.N. Circuit Test</b>.</li> </ol>
<p>The machine turns on but the display is not visible, flickers or has missing digits.</p>	<ol style="list-style-type: none"> <li>1. Turn the machine off and back on to re-boot.</li> <li>2. Check for loose or faulty connections at the user interface board. See Wiring Diagram.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>User Interface Board Test</b>.</li> <li>2. Perform the <b>Auxiliary Transformer (T1) Test</b>.</li> </ol>
<p>The fan is running at all times.</p>	<ol style="list-style-type: none"> <li>1. Make sure there is no load on the output terminals.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>Weld Output Thermostat Circuit Test</b>.</li> <li>2. Perform the <b>Fan And F.A.N. Circuit Test</b>.</li> <li>3. Perform the <b>Switch board Test</b>.</li> </ol>



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

Observe Safety Guidelines detailed in the beginning of this manual.

**TROUBLESHOOTING GUIDE**

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>WELDING PROBLEMS</b>		
There is a general degradation of the welding performance.	<ol style="list-style-type: none"> <li>1. Make sure the correct three phase input is being applied to the machine.</li> <li>2. Make sure the machine's controls are set correctly for the welding process being used.</li> <li>3. Check for poor connections or "loops" in the welding cables.</li> <li>4. If using a wirefeeder check for the correct and consistent wire feed speed at the wirefeeder.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>Choke Test</b>.</li> <li>2. Perform the <b>Current Transducer (LEM) Test</b>.</li> <li>3. Perform the <b>Output Rectifier (D2) Assembly Test</b>.</li> </ol>
The machine loses output during a weld.	<ol style="list-style-type: none"> <li>1. A secondary over-current may have occurred. The welding application may have exceeded the current limitations of the machine.</li> <li>2. Make sure the correct three-phase input power is being applied to the machine.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>Output Rectifier (D2) Assembly Test</b>.</li> <li>2. If in SMAW mode, perform the <b>Boost Relay Test</b>.</li> </ol>

**VRD™ OPERATION**

<b>VRD™ INDICATOR LIGHTS</b>			
<b>MODE</b>		<b>VRD™ "ON"</b>	<b>VRD™ "OFF"</b>
CC-SMAW CC-GTAW	OCV	GREEN (OCV REDUCED)	NO LIGHTS ARE ACTIVE
	WHILE WELDING	GREEN OR RED (DEPENDS ON WELD VOLTAGE)*	
CV-GAS CV-INNERSHIELD	OCV	WELD TERMINALS LOCALLY CONTROLLED WELD TERMINALS "ON" GREEN OR RED (DEPENDS ON OPEN CIRCUIT VOLTAGE)**	NO LIGHTS ARE ACTIVE
		WELD TERMINALS REMOTELY CONTROLLED GUN TRIGGER CLOSED GREEN OR RED (DEPENDS ON OPEN CIRCUIT VOLTAGE)**	
	WHILE WELDING	WELD TERMINALS REMOTELY CONTROLLED GUN TRIGGER OPEN GREEN (OCV REDUCED) GREEN OR RED (DEPENDS ON WELDING VOLTAGE)*	
ARCLINK	OCV	GUN TRIGGER CLOSED GREEN OR RED (DEPENDS ON OPEN CIRCUIT VOLTAGE)**	NO LIGHTS ARE ACTIVE
		GUN TRIGGER OPEN GREEN (OCV REDUCED)	
	WHILE WELDING	GREEN OR RED (DEPENDS ON OPEN CIRCUIT VOLTAGE)**	

\* It is normal for the lights to alternate between colors while welding.

\*\* It is normal for the lights to alternate during OCV preset adjustment, depending on preset voltage test.



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

Observe Safety Guidelines detailed in the beginning of this manual.

## TRUBLESHOOTING GUIDE

### ERROR CODES

Errors are displayed on the user interface board. In addition, there are status lights on the user interface board and the switch board that contain error sequences.

Included in this section is information about the status lights and some basic troubleshooting charts for both machine and weld performance.

The status lights on the user interface board and the switch board are dual-color LED's. Normal operation for each is steady green.

Error conditions are indicated in the following chart.

Error Code	Description	Corrective Action	
6	No CAN messages from Power Source	Communication from the Power Source failed before mapping was complete.	Check the physical wiring connection of the CAN wires. Verify that the switch board has input power from the auxiliary transformer.
18	ArcLink Auto-Mapping Failed	The machine could not properly configure the devices that are attached to it. This configuration problem could be caused by the type of devices that are connected to the machine or a required device that is not connected.	Refer to the operators manual for proper configuration. Verify all devices in the system are properly powered.
21	Device that controls sequence of the welding operation halted due to an error	A component of the system encountered an error during the welding sequence and caused the system to stop. The component with the error could be a wire drive, a user interface or some other part of the system.	Read the status LED of the switch board for a detailed fault code. Check the event logs of the various system components to determine the cause of the fault.
31	Primary Overcurrent	Peak current through the transformer primary has exceeded its threshold.	Check the input power (voltage and frequency). Verify that the PC boards an input rectifier are in working condition and proper input power and welding output cable connections. Verify proper connections of main internal power components. Power must be cycled to the machine to reset the error.
36	Thermal Fault	Machine shutoff output due to elevated internal temperature.	Check for material blocking intake or exhaust louvers. Blow air in the rear louvers to clear dirt from the fan. Note: (The Fan As Needed circuitry automatically shuts off the fan 5 minutes after welding has stopped). Welding output ratings may have been exceeded. Allow the machine to cool down and reset. Measure the thermostats at the Switchboard and replace if defective.
45	Output Voltage Limit Exceeded	During OCV, the voltage at the studs exceeded the allowable levels.	If VRD is enabled, the stud voltage exceeded 35 volts peak. In standard operation, the stud voltage exceeded 113 volts peak. Verify the voltage feedback leads are properly connected inside the machine. Verify the input voltage is within +/- 10% of the nominal value.
213	Communication Fault	CAN communication between the User Interface PC board and the Switch PC board has been interrupted.	Power must be cycled to the machine to reset the error. Visually inspect the CAN harness to ensure connections and condition. Verify power supply to the User Interface and Switch PC boards. Replace defective assemblies as required.
711	DC Link Capacitor Over/Under Voltage	The voltage on the main DC link capacitors housed on the switchboard has either gone too high or too low.	Verify all three phases of the AC input line are connected properly to the machine and that no fuses or breakers are damaged. Verify all power connections to the main switch PC board.
713	Misconnect Protection - UI detected Aux. Trans. Voltage too high	Occurs upon power up when the supply voltage to the User Interface PC board exceeds an acceptable level.	Verify the primary reconnect is properly configured for the input voltage Power must be cycled to the machine to reset the error.
714	Misconnect Protection - UI detected Aux. Trans. Voltage too low	Occurs upon power up when the supply voltage to the User Interface PC board is below an acceptable level.	Verify the primary reconnect is properly configured for the input voltage Power must be cycled to the machine to reset the error.
719	Switch PC Board Error	The Switch PC board experienced an internal error.	Power must be cycled to the machine to reset the error. Replace the switchboard if the error persists.

**If any of these conditions persist contact an authorized Lincoln Field Service Shop.**



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

## 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

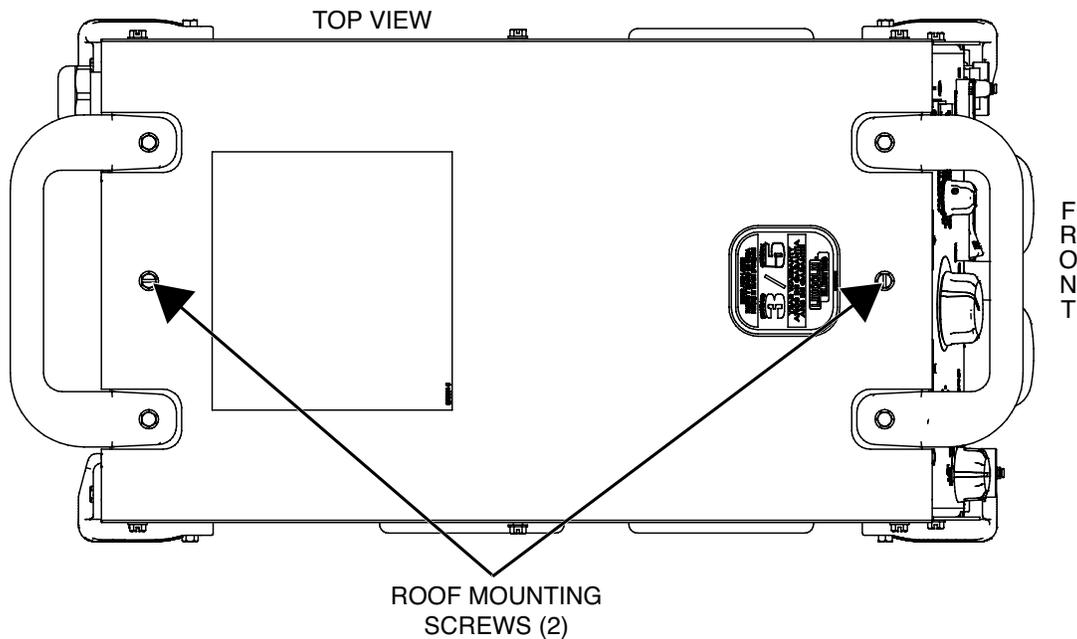
This procedure will aid the technician in the removal and replacement of the Case Covers.

### **MATERIALS NEEDED**

3/8" Nutdriver  
Wiring Diagram

## CASE COVER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.1 – Roof mounting screw locations



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Using a 3/8" nutdriver, remove the eight screws (two on top and three on each side) securing the roof to the machine. See Figure F.1 and **Figures F.2** and **F.3**.
3. Using a 3/8" nutdriver, remove the four side screws and washers securing the corner caps to the left and right case sides. See **Figures F.2** and **F.3**.

**NOTE:** It is not necessary to remove the corner caps completely at this time.

4. Using a 3/8" nutdriver, remove the three screws securing the left case side to the machine. See **Figure F.2**.
5. Using a 3/8" nutdriver, remove the three screws securing the right case side to the machine. See **Figure F.3**.
6. The case covers can now be removed.

# CASE COVER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.2 – Left side mounting screw locations

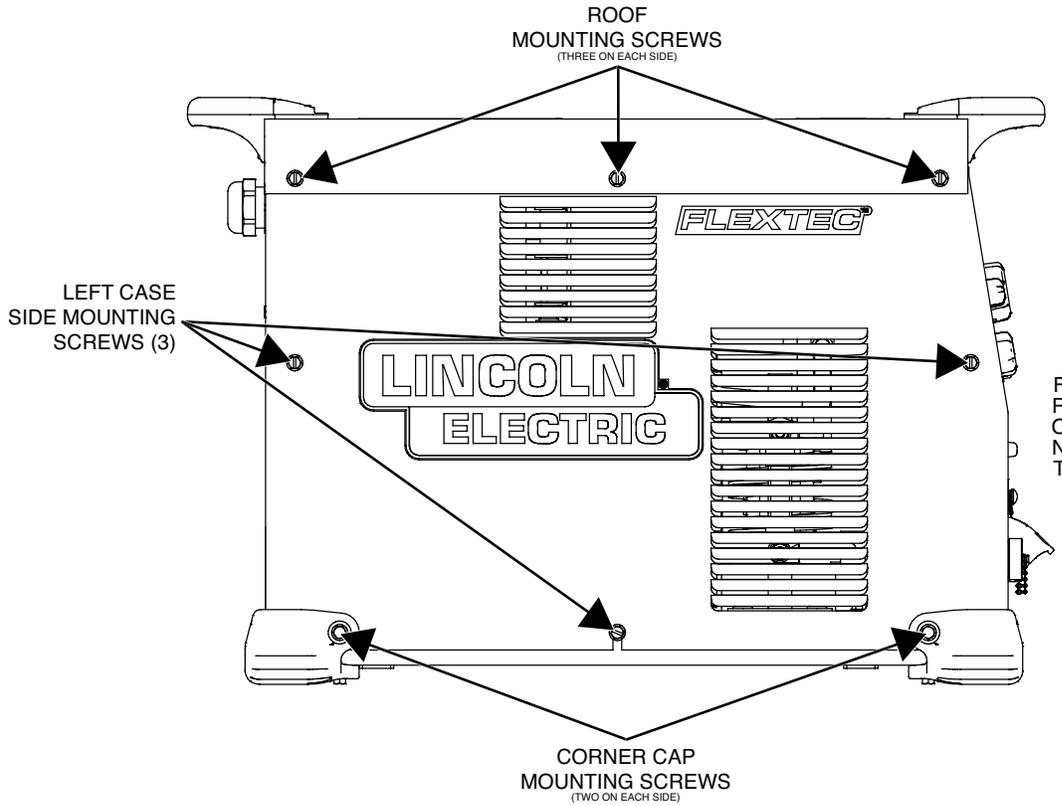
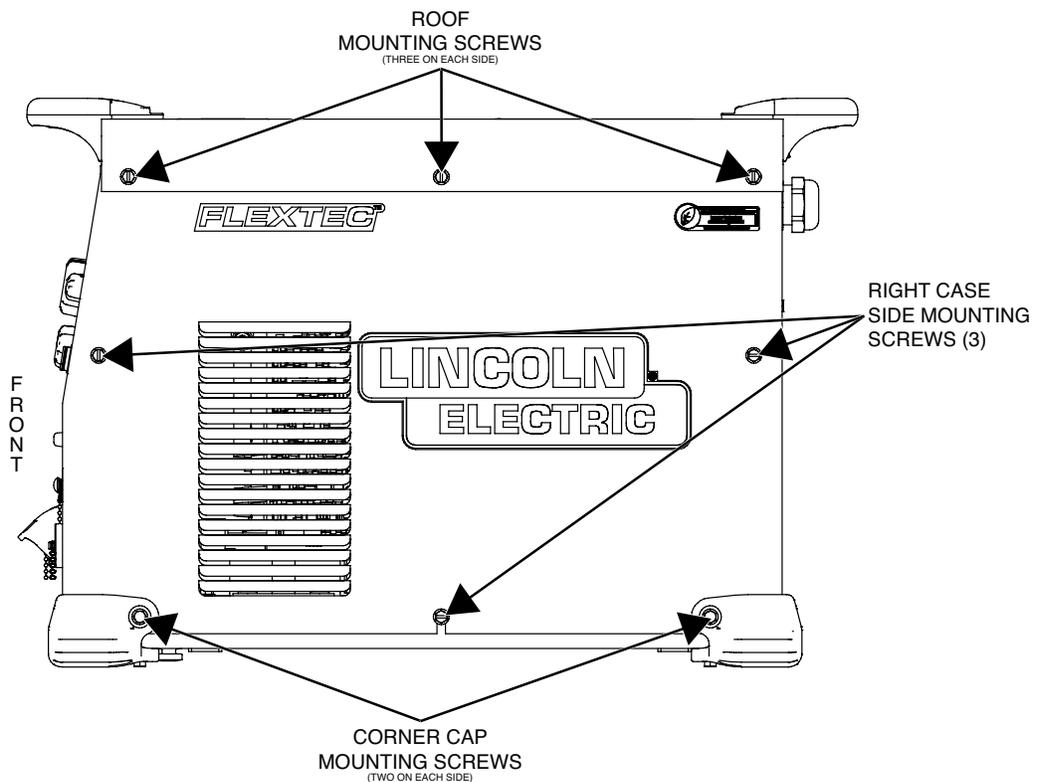


Figure F.3 – Right side mounting screw locations



## CASE COVER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Carefully position the left case side onto the machine.
2. Using a 3/8" nutdriver, attach the three screws securing the left case side to the machine.
3. Carefully position the right case side onto the machine.
4. Using a 3/8" nutdriver, attach the three screws securing the right case side to the machine.
5. Using a 3/8" nutdriver, attach the four side screws and washers securing the corner caps to the left and right case sides.
6. Carefully position the roof onto the machine.
7. Using a 3/8" nutdriver, attach the eight screws (two on top and three on each side) securing the roof to the machine.

## CAPACITOR DISCHARGE PROCEDURE

### **WARNING**

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

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

---

### **TEST DESCRIPTION**

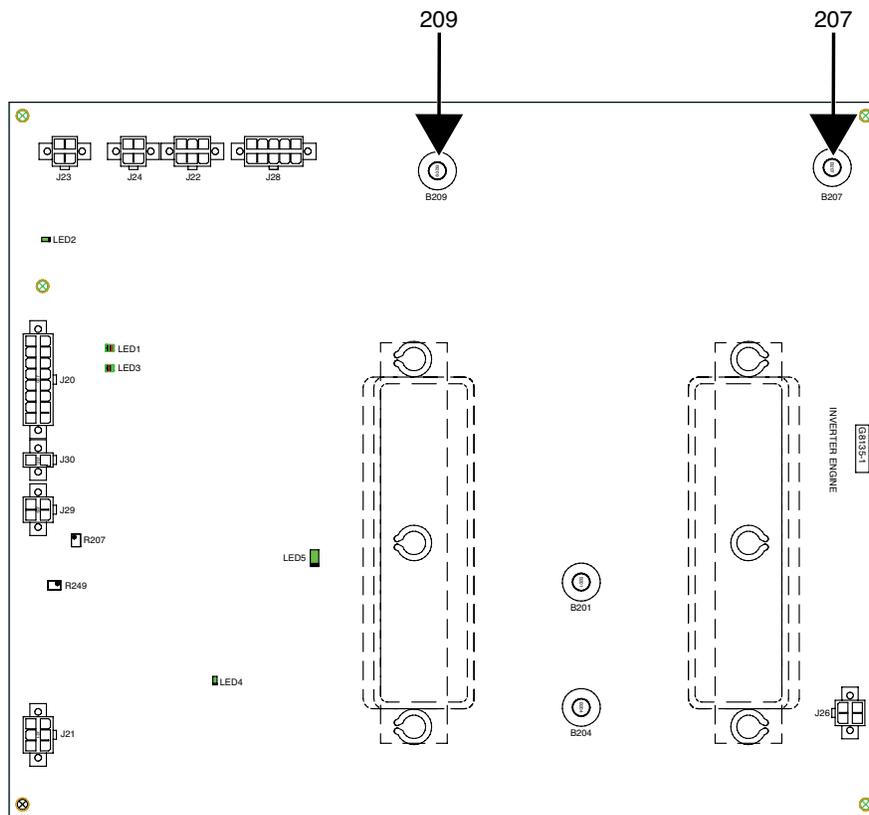
This procedure will help determine if the capacitors are discharged.

### **MATERIALS NEEDED**

- 25-1000 Ohm 25 Watt Resistor
- Electrical Insulating Gloves
- Analog Voltmeter or Digital Multimeter
- Wiring Diagram

## CAPACITOR DISCHARGE PROCEDURE *(continued)*

Figure F.4 – Switch board connections 207 and 209



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Locate the two large bolted connections labeled “207” and “209” on the switch board. See Figure F.4. See Wiring Diagram.
4. Using a 25 watt or more (25 to 1000 ohm) resistor connected to two test leads, carefully discharge the capacitors.
5. Using a digital volt/ohmmeter, ensure the capacitors are discharged by connecting the positive meter probe to “209” and the negative meter probe to “207” on the switch board. The voltage should be zero, if not repeat the discharge procedure. See Wiring Diagram.

## INPUT 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.

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### **TEST DESCRIPTION**

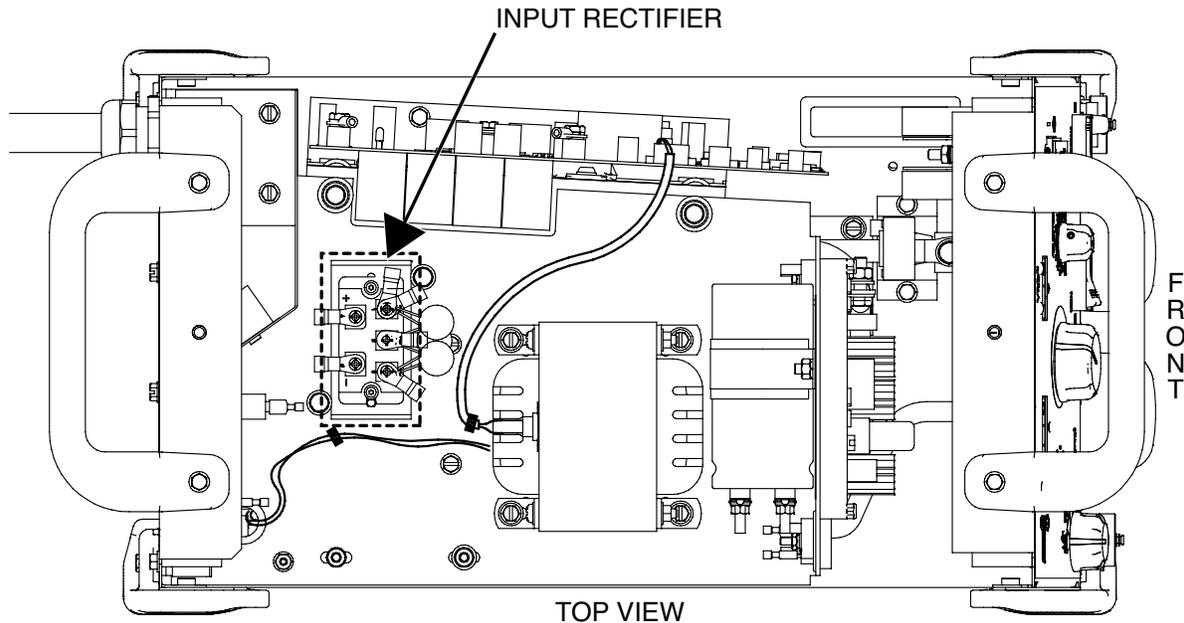
This test will help determine if the Input Rectifier is functioning properly.

### **MATERIALS NEEDED**

- Digital Volt/Ohmmeter
- Phillips Screwdriver
- Wiring Diagram

## INPUT RECTIFIER TEST *(continued)*

Figure F.5 – Input rectifier location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the input rectifier. See Figure F.5.
5. Using a digital volt/ohmmeter, perform the forward voltage drop tests in **Table F.1**. See **Figure F.6**. See Wiring Diagram.
6. If the test results are questionable, using a phillips screwdriver, label and disconnect all leads and MOVs from the input rectifier and retest. See Wiring Diagram.
7. If any portion of the tests fail, the input rectifier may be faulty.
8. If faulty, perform the **Input Rectifier Removal And Replacement Procedure**.
9. Connect any previously disconnected leads to the input rectifier.
10. Perform the **Case Cover Replacement Procedure**.

### INPUT RECTIFIER TEST *(continued)*

Figure F.6 – Input rectifier detail

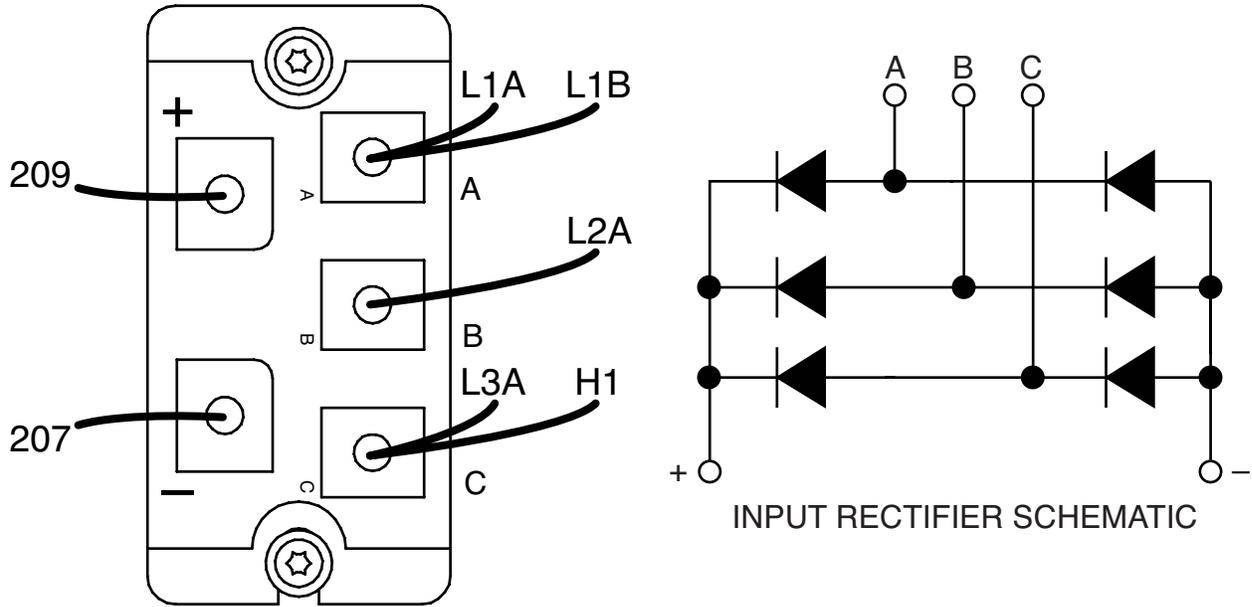


Table F.1 – Forward voltage drop tests

TEST POINT (POSITIVE)	TEST POINT (NEGATIVE)	EXPECTED RESULTS
TERMINAL A	POSITIVE TERMINAL	.03V - 1.0V
TERMINAL B	POSITIVE TERMINAL	.03V - 1.0V
TERMINAL C	POSITIVE TERMINAL	.03V - 1.0V
NEGATIVE TERMINAL	TERMINAL A	.03V - 1.0V
NEGATIVE TERMINAL	TERMINAL B	.03V - 1.0V
NEGATIVE TERMINAL	TERMINAL C	.03V - 1.0V



## T1 TRANSFORMER THERMOSTAT 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.

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### **TEST DESCRIPTION**

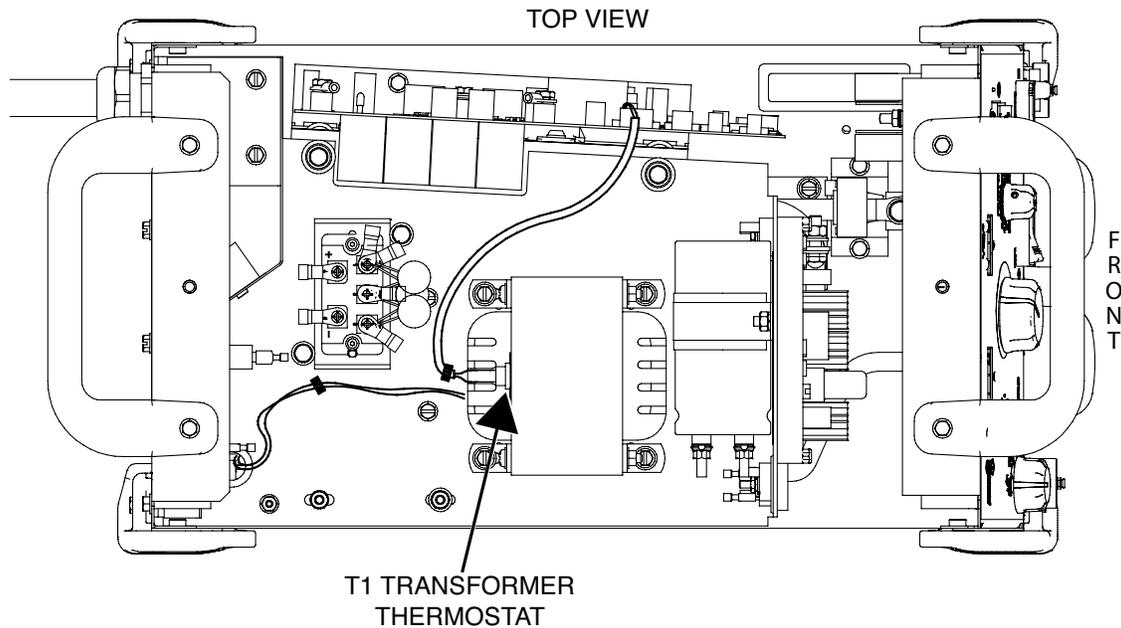
This test will help determine if the T1 Transformer Thermostat is functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## T1 TRANSFORMER THERMOSTAT TEST *(continued)*

Figure F.7 – T1 transformer thermostat location

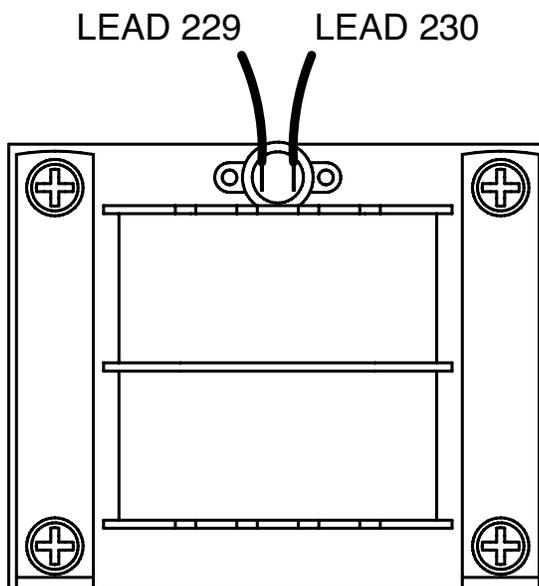


### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate T1 transformer thermostat. See Figure F.7. See Wiring Diagram.
5. Label and disconnect leads #230 and #229 from the T1 transformer thermostat. See **Figure F.8**. See Wiring Diagram.
6. Using a digital volt/ohmmeter, test the resistance from one terminal to the other. The resistance should be very low (less than one ohm).
7. If the resistance is greater than one ohm. The thermostat may be faulty.
8. If the T1 transformer thermostat is faulty, perform the **T1 Transformer Thermostat Removal And Replacement Procedure**.
9. Connect the previously removed leads. See Wiring Diagram.
10. Perform the **Case Cover Replacement Procedure**.

### T1 TRANSFORMER THERMOSTAT TEST *(continued)*

Figure F.8 – T1 transformer thermostat lead locations





## FAN AND F.A.N. 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

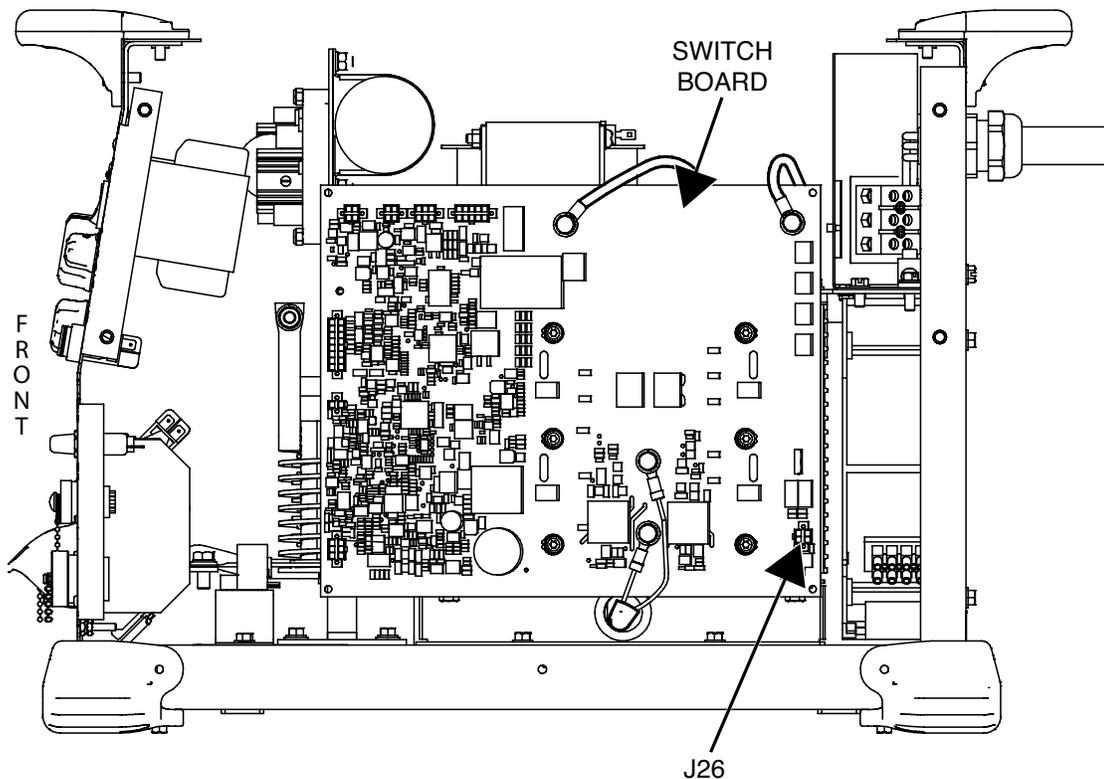
This test will help determine if the Fan and F.A.N. Circuit are functioning properly.

### **MATERIALS NEEDED**

Jumper Wire  
Wiring Diagram

## FAN AND F.A.N. CIRCUIT TEST (continued)

Figure F.9 – Plug J26 on the switch board



### PROCEDURE

**NOTE:** The fan should turn ON briefly when the machine is turned on. The fan turns on during welding and remains on for five minutes after output is disabled. The fan also turns on during a thermal fault.

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate plug J26 on the switch board. See Figure F.9. See Wiring Diagram.
5. Label and disconnect plug J26 from the switch board and insert a jumper wire into the end of the connector to short leads #24 and #22 together. See **Figure F.10**. See Wiring Diagram.
6. Carefully apply the correct input power to the Flextec 500P.
7. When the machine is turned on, the fan should start and run as long as the power is on. If this test results in the fan operating properly, all components of the fan circuit are OK with the possible exception of the switch board.
8. If the test fails to start the fan, check the 115 volt primary of the auxiliary transformer (T1) and the fan itself. Perform the **Auxiliary Transformer (T1) Test**. If the transformer produces the required 115 volts and the plug J26 leads are jumped, the fan and/or fan capacitor are suspect. See Wiring diagram.
9. If the test results in a running fan, remove the jumper wire from between leads #24 and #22. Connect plug J26 to the switch board. Label and disconnect one lead from thermostat #2. See **Figure F.11**. See Wiring Diagram.
10. If removing the lead from thermostat #2 causes the switch board to flash error 36 and the thermo LED (on the user interface) turns on but the fan still does not start, the switch board may be faulty. Perform the **Switch Board Test**.
11. If no error 36 flashes and the thermo LED does not turn on, the user interface may be faulty. Perform the **User Interface Board Test**.
12. If any component tests faulty, replace the suspect component.
13. Connect any previously removed leads and plugs.
14. Perform the **Case Cover Replacement Procedure**.

### FAN AND F.A.N. CIRCUIT TEST *(continued)*

Figure F.10 – Plug J26 lead locations

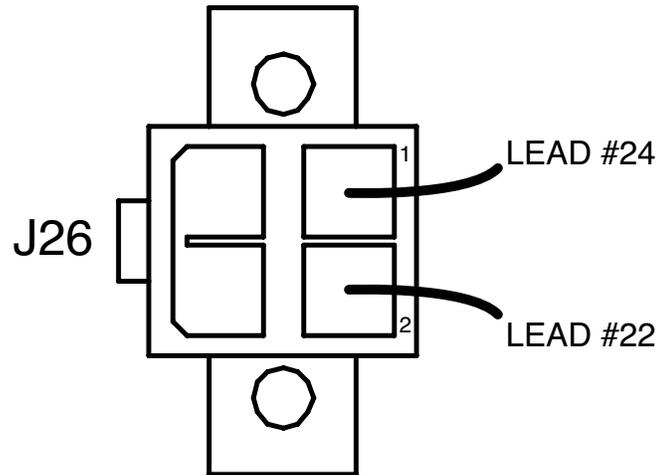
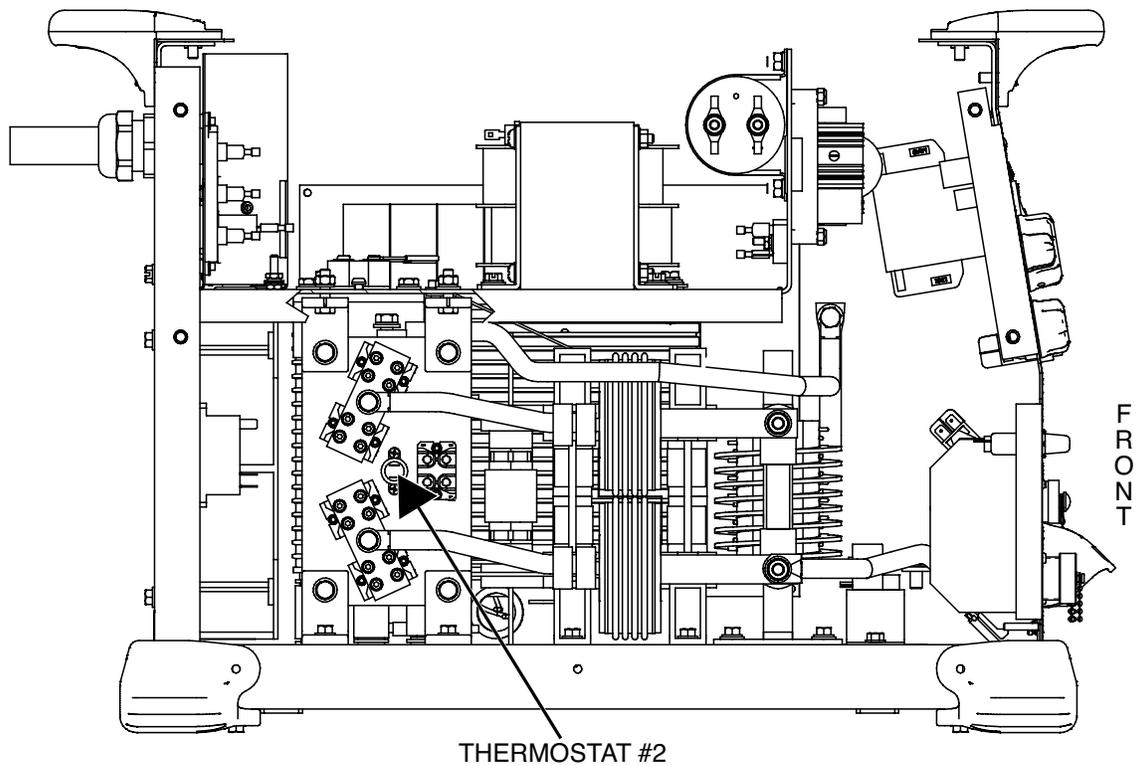


Figure F.11 – Thermostat #2 location





## AUXILIARY TRANSFORMER (T1) TEST

### **WARNING**

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

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

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### **TEST DESCRIPTION**

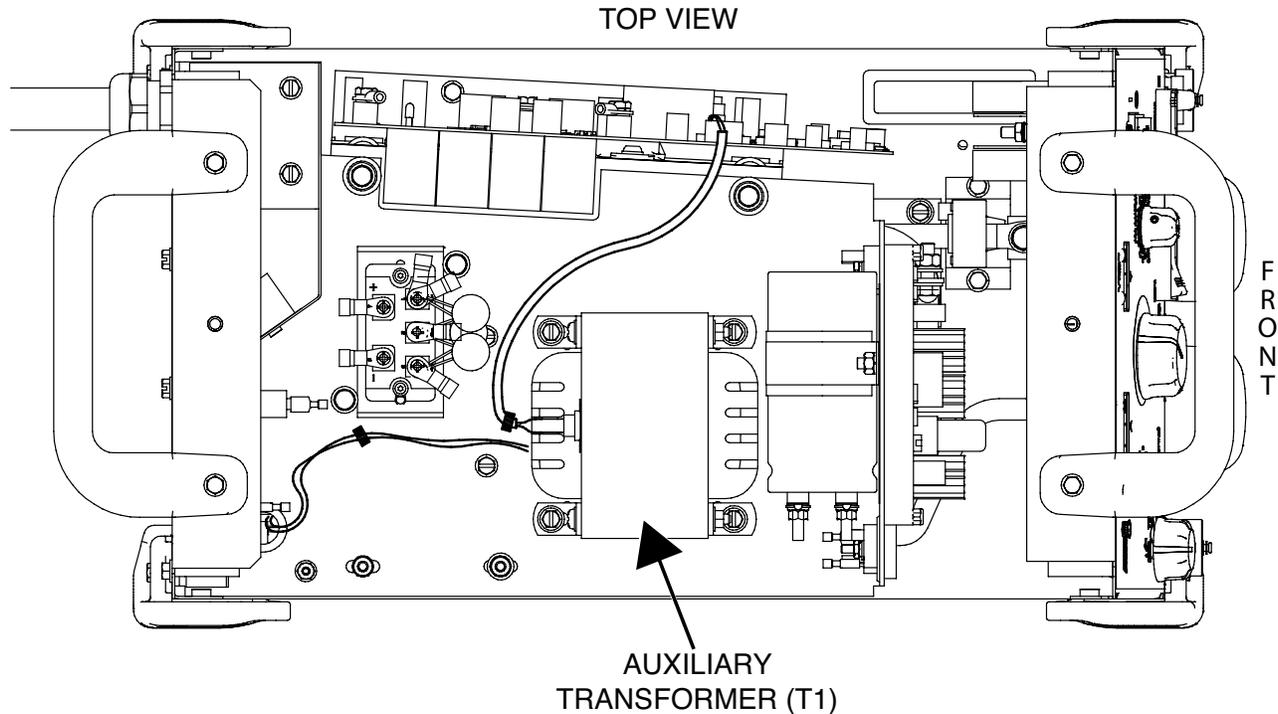
This test will help determine if the Auxiliary Transformer (T1) is functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## AUXILIARY TRANSFORMER (T1) TEST *(continued)*

Figure F.12 – Auxiliary transformer (T1) location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
  2. Perform the **Case Cover Removal Procedure**.
  3. Perform the **Capacitor Discharge Procedure**.
  4. Locate the auxiliary transformer (T1). See Figure F.12.
  5. Carefully apply the correct input power to the Flextec 500P and turn ON the machine.
  6. Using a digital volt/ohmmeter, test for the correct primary voltages at the reconnect terminal block. See **Table F.2**. See **Figure F.13**. See Wiring Diagram.
- NOTE:** The reconnect jumper must be in the correct position for the supply voltage being used.
7. If the correct primary voltages are NOT present, check all input power leads, reconnect jumper, fuse and connections. See Wiring Diagram.
  8. If the correct primary voltages are present continue testing.
  9. Using a digital volt/ohmmeter, test for the correct secondary voltages at the D3 and D4 rectifiers. See **Table F.2**. See **Figure F.14**. See Wiring Diagram.
  10. If the primary voltages are correct and the secondary voltages are low or not present, label and disconnect the AC leads (X13, X14, X15 and X16) from the D3 and D4 rectifiers and retest. If the AC secondary voltages are still low or not present the auxiliary transformer may be faulty.
  11. If faulty, perform the **Auxiliary Transformer (T1) Removal And Replacement Procedure**.
  12. Perform the **Case Cover Replacement Procedure**.

### AUXILIARY TRANSFORMER (T1) TEST *(continued)*

Figure F.13 – Reconnect panel and lead location

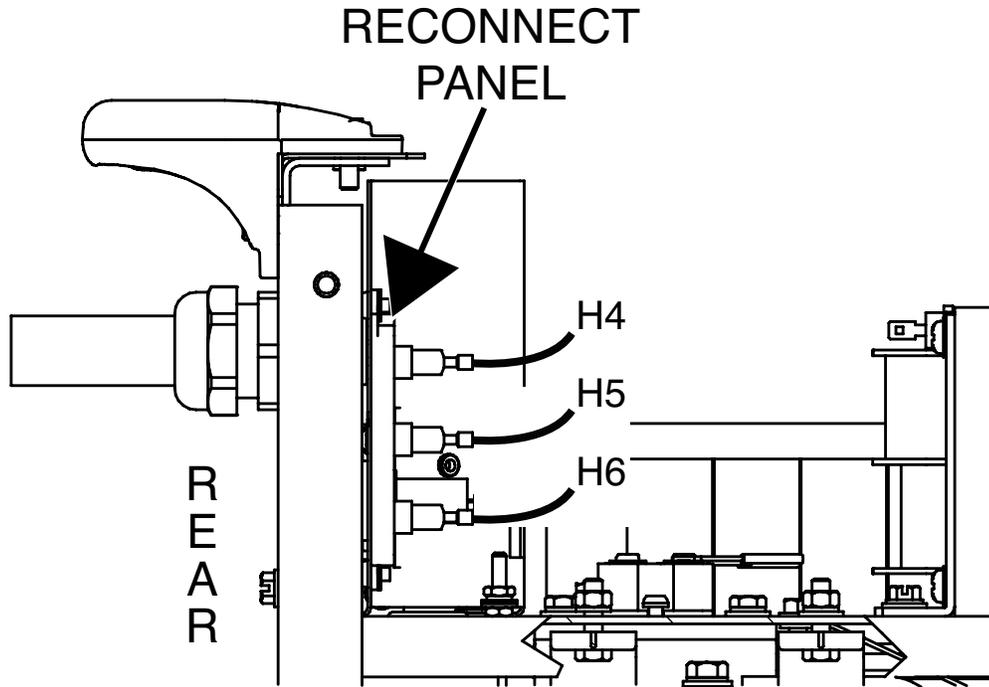
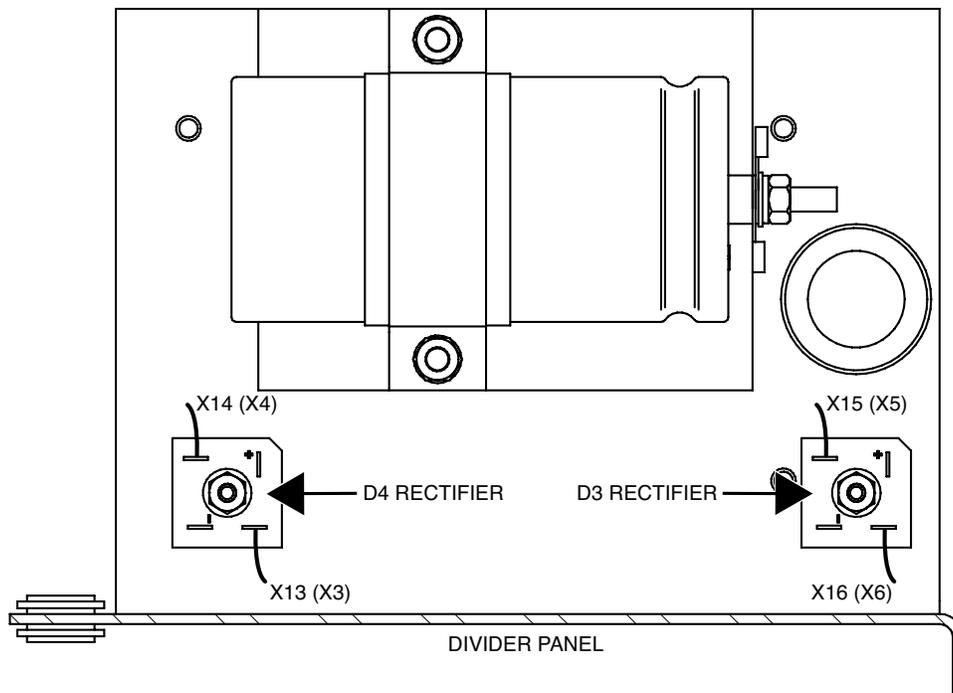


Figure F.14 – D3 and D4 rectifier leads and location



## AUXILIARY TRANSFORMER (T1) TEST *(continued)*

Table F.2 – Primary and secondary voltage tests

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
PRIMARY VOLTAGE	H2	H3	115 VAC
PRIMARY VOLTAGE	H1	H4	380 VAC
PRIMARY VOLTAGE	H1	H5	460 VAC
PRIMARY VOLTAGE	H1	H6	575 VAC
SECONDARY VOLTAGE	X13 (X3)	X14 (X4)	42 VAC
SECONDARY VOLTAGE	X16 (X6)	X15 (X5)	52 VAC

## 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

---

### **TEST DESCRIPTION**

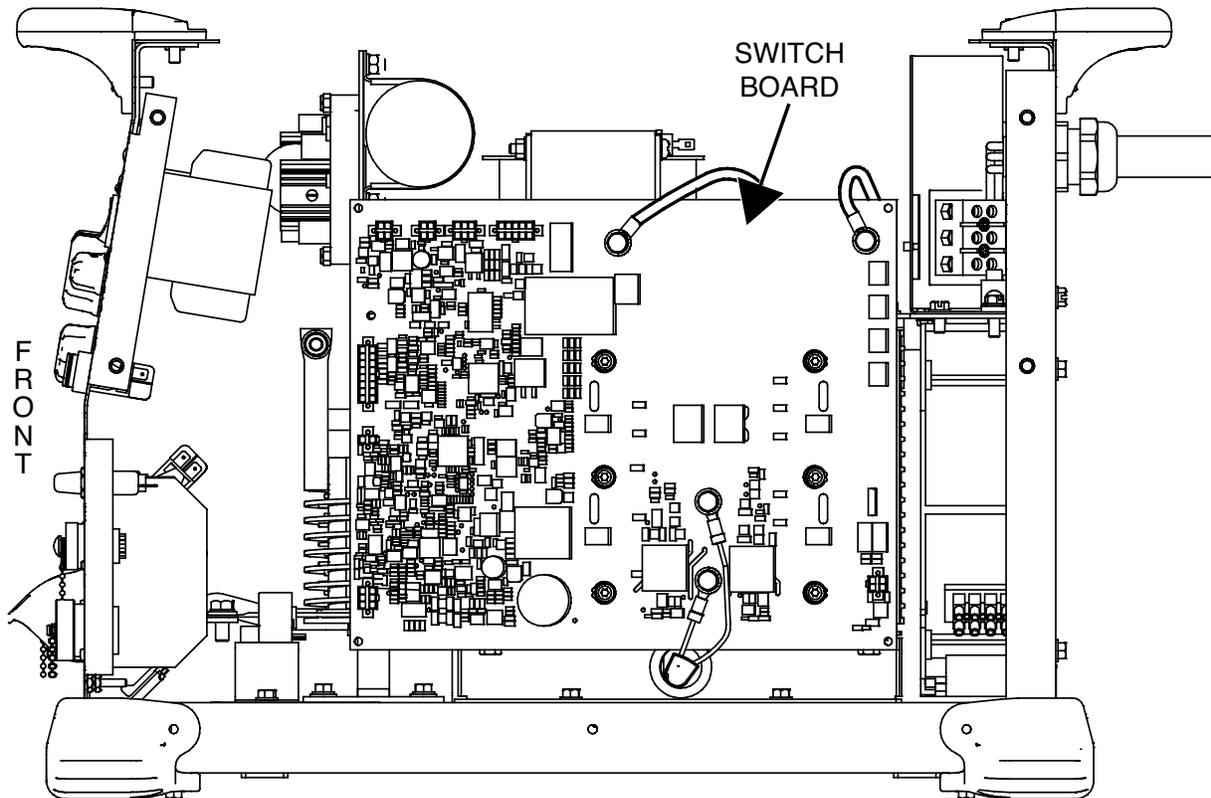
This test will help determine if the Switch Board is functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## SWITCH BOARD TEST *(continued)*

Figure F.15 – Switch board location

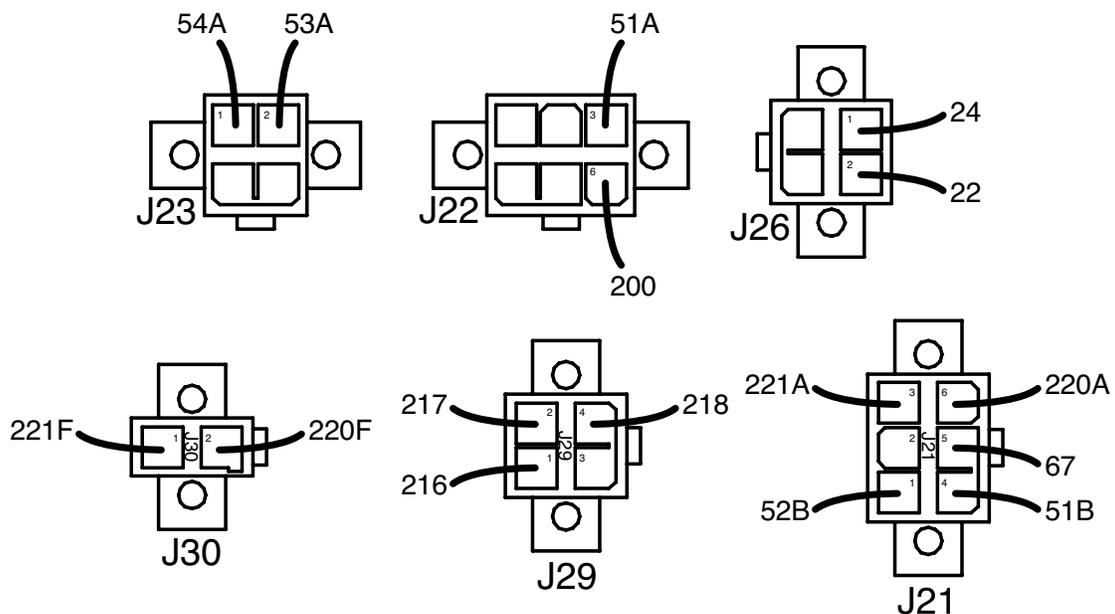
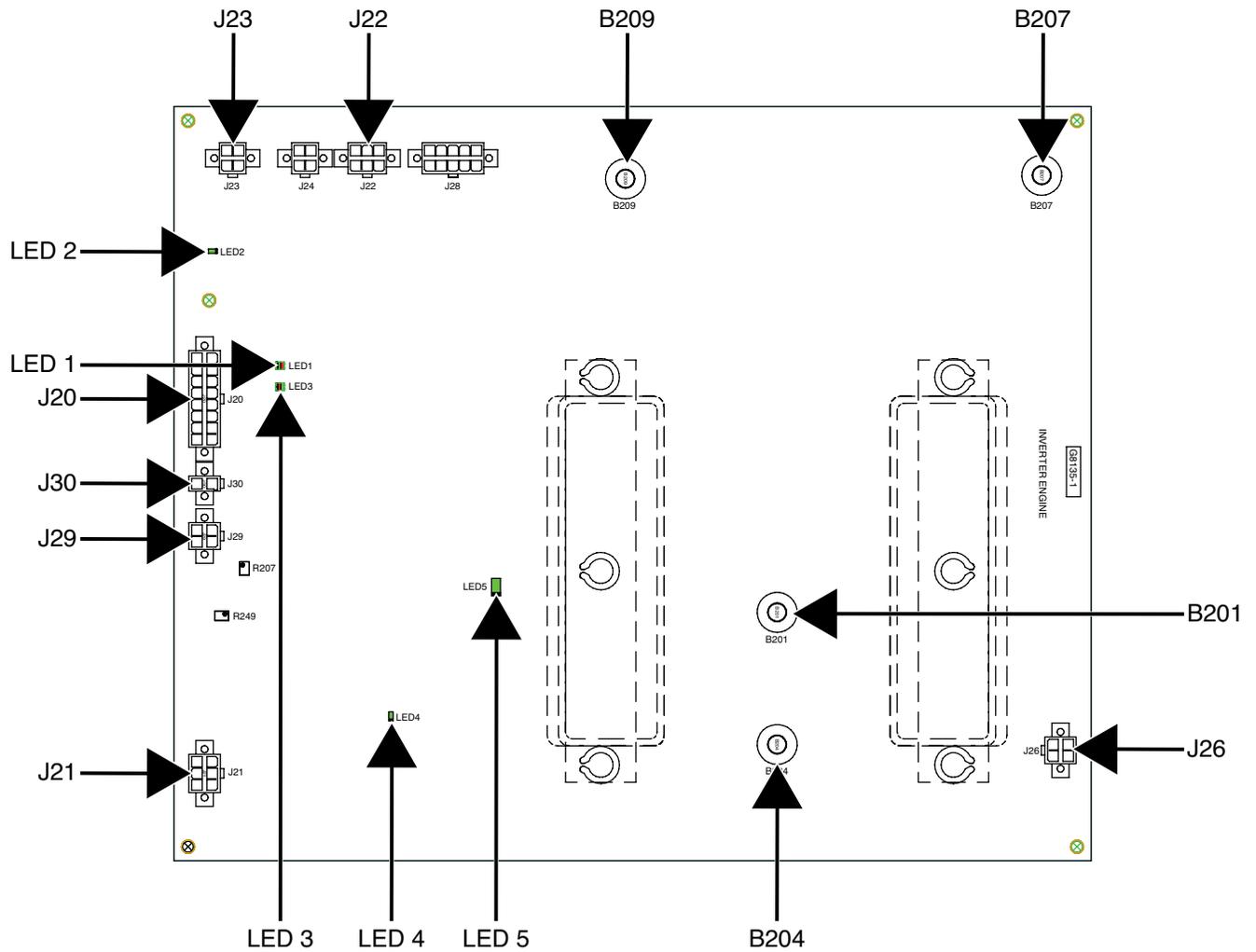


### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the switch board. See Figure F.15.
5. Using a digital volt/ohmmeter, perform the resistance tests outlined in **Table F.3**. See **Figure F.16**. See Wiring Diagram.
6. If any of the resistance tests results (B209, B201, B204 and B207) are not as expected, label and disconnect the leads attached to the terminals and retest.
7. Carefully apply the correct input power to the Flextec 500P and turn ON the machine.
8. Check the LEDs per **Table F.4**. See **Figure F.16** for LED locations.
9. If the LEDs are not indicating a properly functioning switch board, proceed with the following steps.
10. Using a digital volt/ohmmeter, perform the voltage tests outlined in **Table F.5**. See **Figure F.16**. See Wiring Diagram.
11. If the tests fail the switch board may be faulty.
12. If faulty, perform the **Switch Board Removal And Replacement Procedure**.
13. Perform the **Case Cover Replacement Procedure**.

### SWITCH BOARD TEST *(continued)*

Figure F.16 – Switch board LED and plug locations



## SWITCH BOARD TEST *(continued)*

**Table F.3 – Switch board resistance tests**

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING	CONDITION
Checking for short circuit on the “High Side” IGBTs	B209 (+)	B201 (–)	GREATER THAN 100,000 OHMS	MACHINE “OFF” NO INPUT POWER APPLIED
Checking for short circuit on the “Low Side” IGBTs	B204 (+)	B207 (–)	GREATER THAN 100,000 OHMS	MACHINE “OFF” NO INPUT POWER APPLIED
Checking for short circuit on “Primary Side”	B209 (+)	B207 (–)	GREATER THAN 500,000 OHMS	MACHINE “OFF” NO INPUT POWER APPLIED
Main transformer primary connections and winding	B201	B204	VERY LOW RESISTANCE APPROX. 0.5 OHMS	MACHINE “OFF” NO INPUT POWER APPLIED
	PLUG J21 PIN 3 (LEAD #221)	WORK STUD (–)	VERY LOW RESISTANCE (LESS THAN ONE OHM)	MACHINE “OFF” NO INPUT POWER APPLIED
	PLUG J21 PIN 5 (LEAD #67)	ARCLINK CONNECTOR PIN “C” #67	VERY LOW RESISTANCE (LESS THAN ONE OHM)	MACHINE “OFF” NO INPUT POWER APPLIED
	PLUG J21 PIN 6 (LEAD #220A)	ELECTRODE STUD (+)	VERY LOW RESISTANCE (LESS THAN ONE OHM)	MACHINE “OFF” NO INPUT POWER APPLIED
	PLUG J30 PIN 1 (LEAD #221F)	WORK STUD (–)	VERY LOW RESISTANCE (LESS THAN ONE OHM)	MACHINE “OFF” NO INPUT POWER APPLIED
	PLUG J30 PIN 2 (LEAD #220F)	ELECTRODE STUD (+)	VERY LOW RESISTANCE (LESS THAN ONE OHM)	MACHINE “OFF” NO INPUT POWER APPLIED

**Table F.4 – Switch board LEDs**

LED#	COLOR	FUNCTION
1	RED	STATUS “ERROR” (CHECK CODE FOR SPECIFIC ERROR)
1	GREEN	STATUS “OK”
2	GREEN	CAN POWER SUPPLY “OK”
3	GREEN	STATUS “OK”
3	RED	STATUS “ERROR” (CHECK CODE FOR SPECIFIC ERROR)
4	GREEN	+15 VDC POWER SUPPLY “OK”
5	GREEN	+5 VDC PRIMARY POWER SUPPLY “OK”

LIGHT CONDITION	MEANING
STEADY GREEN	SYSTEM “OK”.
BLINKING GREEN	OCCURS DURING STARTUP OR RESET AND INDICATES THAT THE SWITCH BOARD IS WAITING FOR COMMUNICATION FROM THE CONTROL BOARD. NORMAL FOR THE FIRST 1-10 SECONDS AFTER POWER IS TURNED ON.
ALTERNATING GREEN AND RED	A SYSTEM FAULT HAS OCCURRED. IF THE SWITCH BOARD STATUS LED IS FLASHING ANY COMBINATION OF RED AND GREEN, ERRORS ARE PRESENT.  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.  SEE <b>ERROR CODES</b> .

## SWITCH BOARD TEST *(continued)*

Table F.5 – Switch board voltage tests

DESCRIPTION	TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING	CONDITION
FAN SUPPLY VOLTAGE FROM AUXILIARY TRANSFORMER (T1)	PLUG J26 PIN 1 (LEAD #24)	PLUG J26 PIN 2 (LEAD #22)	115 VAC	FAN NOT ACTIVATED. IF 115VAC IS NOT PRESENT, PERFORM THE <b>AUXILIARY TRANSFORMER (T1) TEST</b> .
FAN SUPPLY VOLTAGE FROM AUXILIARY TRANSFORMER (T1)	PLUG J26 PIN 1 (LEAD #24)	PLUG J26 PIN 2 (LEAD #22)	0 VAC	FAN ACTIVATED
RECTIFIED AND FILTERED INPUT VOLTAGE	B209 (+)	B207(-)	535 VDC TO 815 VDC DEPENDING UPON THE INPUT VOLTAGE (380 VAC TO 575 VAC)	CORRECT INPUT POWER APPLIED TO MACHINE AND PRE-CHARGE COMPLETED. IF NOT CORRECT, PERFORM THE <b>INPUT RECTIFIER TEST</b> .
SUPPLY FROM DC BUS BOARD	PLUG J21 PIN 1 (LEAD #52B)	PLUG J21 PIN 4 (LEAD #51B)	+40 VDC	MACHINE ON. IF 40 VDC IS NOT PRESENT, PERFORM THE <b>DC BUS BOARD TEST</b> .
POSITIVE SUPPLY VOLTAGE FOR THE CURRENT TRANSDUCER	PLUG J29 PIN 1 (LEAD #216)	PLUG J29 PIN 4 (LEAD #218)	+15 VDC	MACHINE ON. IF +15 VDC IS NOT PRESENT, THE SWITCH BOARD MAY BE FAULTY.
NEGATIVE SUPPLY VOLTAGE FOR THE CURRENT TRANSDUCER	PLUG J29 PIN 2 (LEAD #217)	PLUG J29 PIN 4 (LEAD #218)	-15 VDC	MACHINE ON. IF -15 VDC IS NOT PRESENT, THE SWITCH BOARD MAY BE FAULTY.
CAN COMMUNICATION	PLUG J23 PIN 2 (LEAD #53A)	PLUG J23 PIN 1 (LEAD #54A)	2 VDC	MACHINE ON.
ALPS SENSE	PLUG J22 PIN 6 (LEAD #200)	PLUG J22 PIN 3 (LEAD #51A)	20 VDC	MACHINE ON. IF 20 VDC IS NOT PRESENT, THE SWITCH BOARD MAY BE FAULTY.



## OUTPUT RECTIFIER (D2) ASSEMBLY TEST

### **WARNING**

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### **TEST DESCRIPTION**

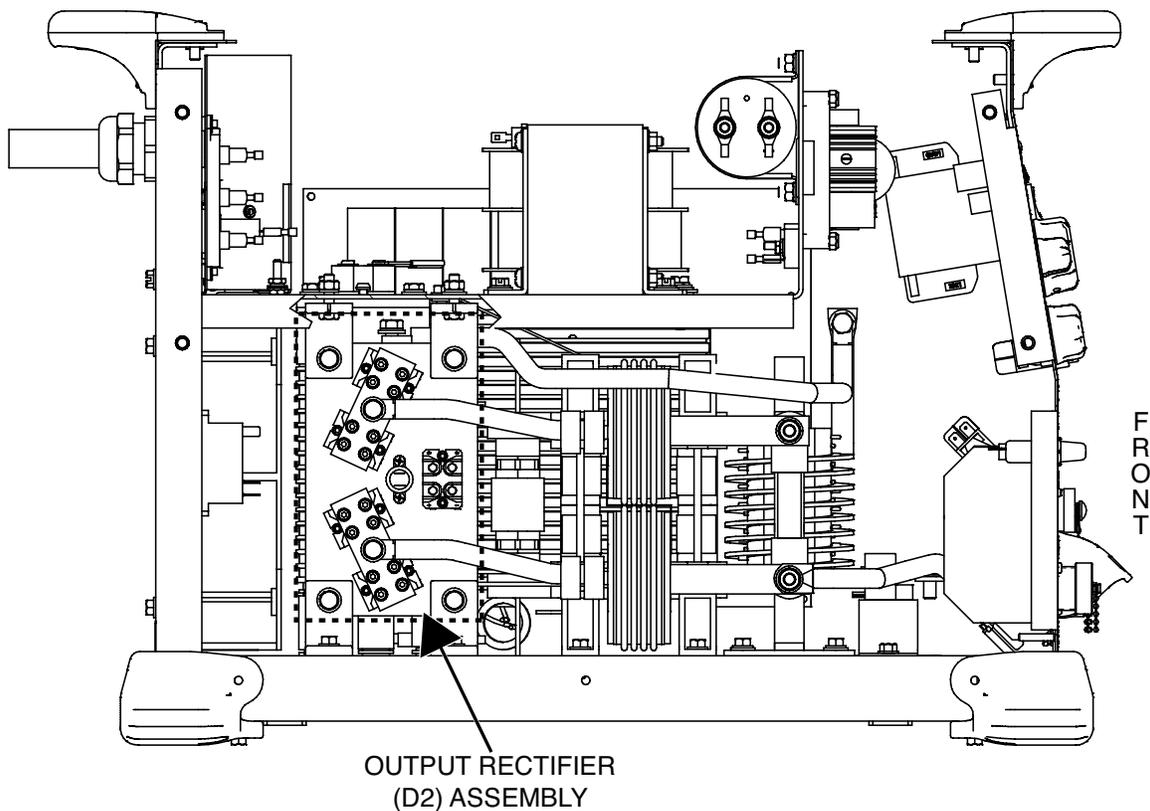
This test will help determine if the Output Rectifier (D2) Assembly is functioning properly.

### **MATERIALS NEEDED**

- 7/16" Nutdriver
- Torx Nutdriver (Size T20)
- Digital Volt/Ohmmeter
- Wiring Diagram

## OUTPUT RECTIFIER (D2) ASSEMBLY TEST *(continued)*

Figure F.17 – Output rectifier assembly location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the output rectifier (D2). See Figure F.17.
5. Using a 7/16" nutdriver, remove the bolt and associated washers securing the transformer leads (X1 and X3) to the output rectifier assembly. Label and disconnect the transformer leads (X1 and X3) from the output rectifier assembly. See **Figure F.18**. See Wiring Diagram.
6. Using a Torx nutdriver (size T20), remove the screw and associated washers securing the NEG lead to the boost rectifier. Label and disconnect NEG lead. See **Figures F.18** and **F.19**. See Wiring Diagram.
7. Using a digital volt/ohmmeter (set for diode testing), perform the forward voltage drop test per **Table F.6**. See **Figures F.18** and **F.19**. See Wiring Diagram.
8. If the tests determine that the diodes are shorted or open, the output rectifier assembly may be faulty.
9. When testing is complete connect any previously disconnected leads. See Wiring Diagram.
10. Perform the **Case Cover Replacement Procedure**.

## OUTPUT RECTIFIER (D2) ASSEMBLY TEST *(continued)*

Figure F.18 – Output rectifier leads and test points

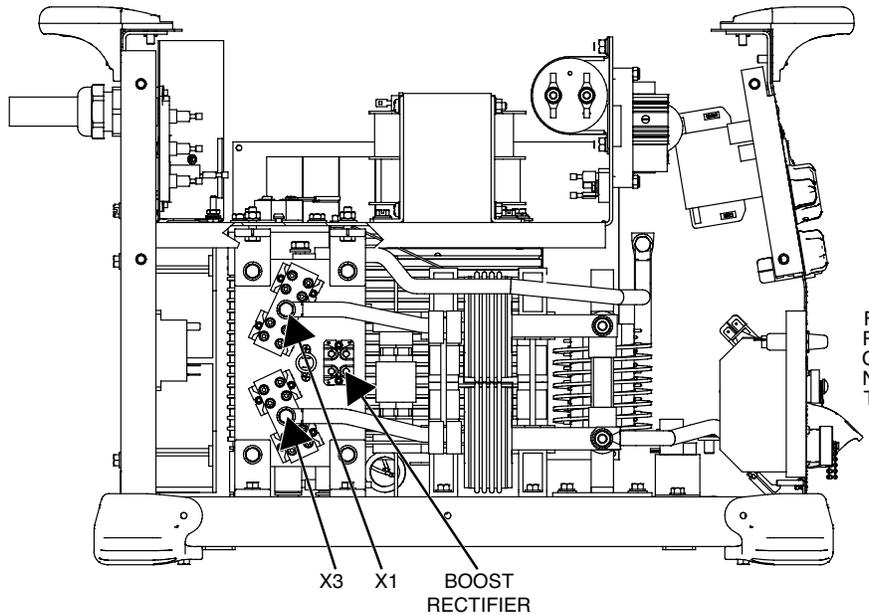
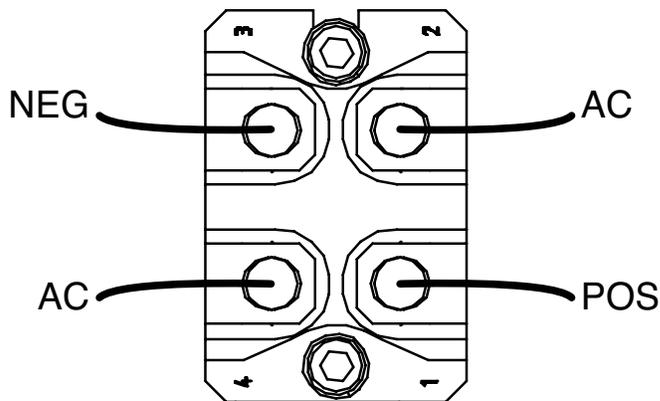
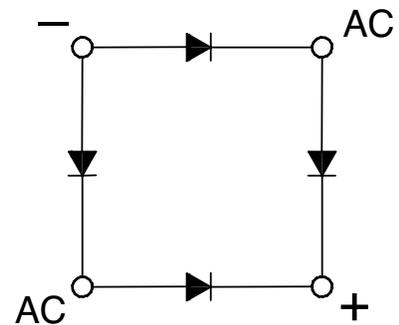


Figure F.19 – Output rectifier leads and test points



BOOST RECTIFIER



BOOST RECTIFIER SCHEMATIC

Table F.6 – Output rectifier forward voltage drop tests

TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
RECTIFIER TERMINAL X1	OUTPUT RECTIFIER HEATSINK	0.2VDC - 0.7VDC
RECTIFIER TERMINAL X3	OUTPUT RECTIFIER HEATSINK	0.2VDC - 0.7VDC
BOOST RECTIFIER NEG TERMINAL	BOOST RECTIFIER TOP AC TERMINAL	0.2VDC - 0.7VDC
BOOST RECTIFIER NEG TERMINAL	BOOST RECTIFIER BOTTOM AC TERMINAL	0.2VDC - 0.7VDC
BOOST RECTIFIER TOP AC TERMINAL	BOOST RECTIFIER POS TERMINAL	0.2VDC - 0.7VDC
BOOST RECTIFIER BOTTOM AC TERMINAL	BOOST RECTIFIER POS TERMINAL	0.2VDC - 0.7VDC



## CHOKE TEST

### **WARNING**

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

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

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### **TEST DESCRIPTION**

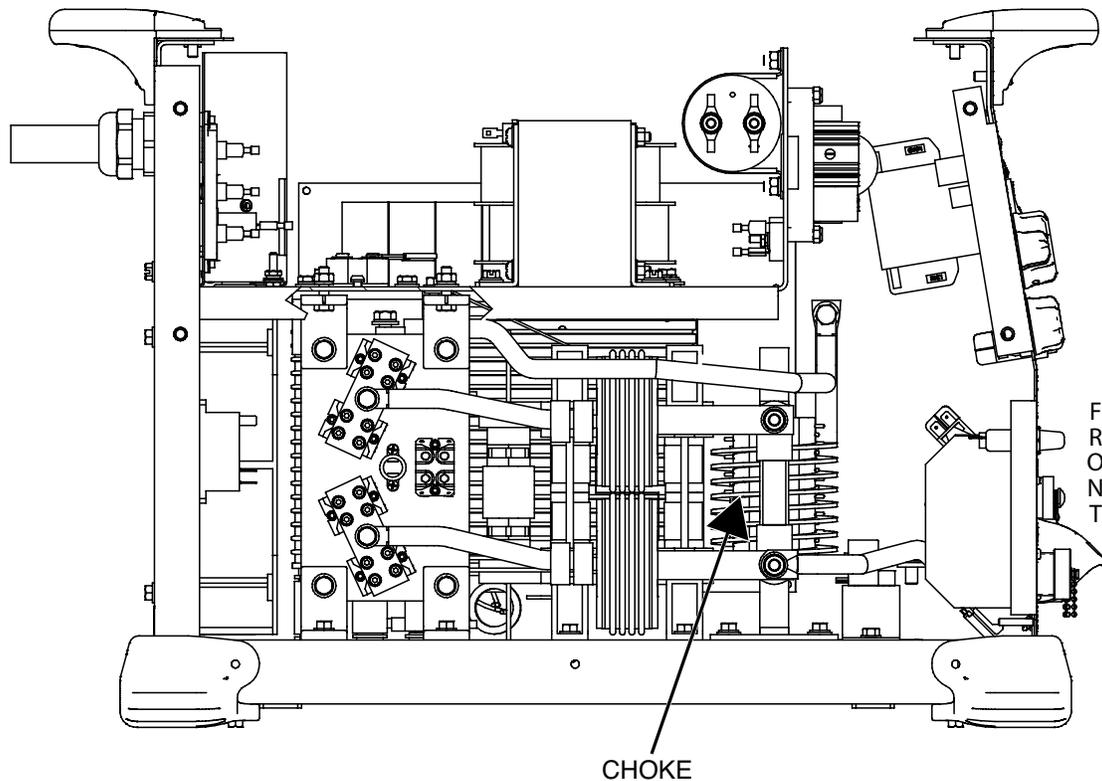
This test will help determine if the Choke is open, shorted (turn to turn) or grounded.

### **MATERIALS NEEDED**

- Digital Volt/Ohmmeter
- 1/2" Nutdriver
- 1/2" Open End Wrench
- Wiring Diagram

## CHOKE TEST *(continued)*

Figure F.20 – Choke location

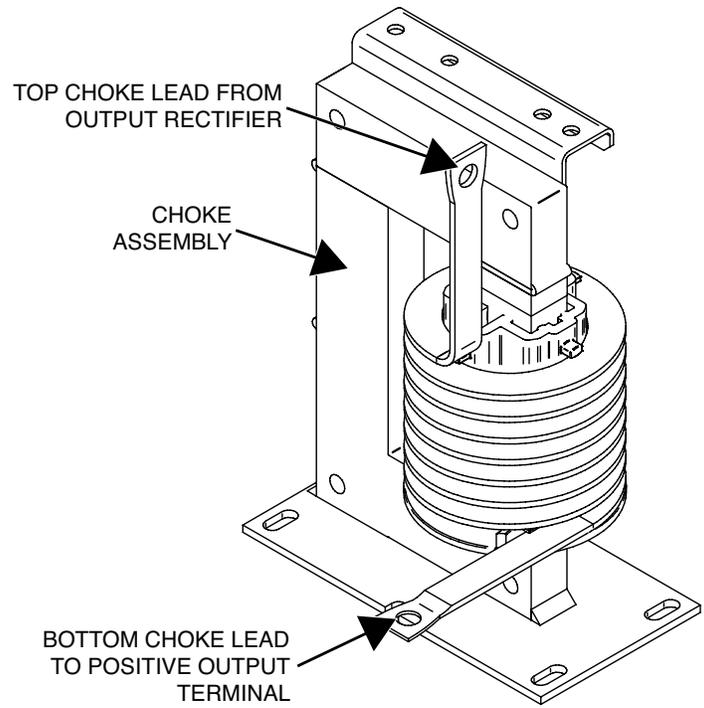


### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the choke assembly. See Figure F.20.
5. **OPEN:** No weld output. Using a digital volt/ohmmeter, test the resistance from the choke lead connected to the heat sink of the output rectifier to the positive output terminal. See **Figure F.21**. See Wiring Diagram. The resistance should be very low (less than one ohm).
6. **Turn To Turn Short:** Reduced inductance, arc instability, excessive heating of the choke. Check for any physical signs of arcing within the choke assembly. See **Figure F.21**.
7. **Choke Coil Grounded:** Reduced inductance, alternate weld current path. Electrically isolate the choke coil by disconnecting both choke leads. To electrically isolate the choke coil, using a 1/2" nutdriver and 1/2" open end wrench, remove the bolt, nut and associated washers securing the top and bottom choke leads. Using a digital volt/ohmmeter, check the resistance from choke coil to chassis ground. Resistance should be at least 500,000 ohms. See **Figure F.21**. See Wiring Diagram.
8. If any of the tests fail, the choke may be faulty.
9. If faulty, perform the **Choke Removal And Replacement Procedure**.
10. Connect any previously removed leads. See Wiring Diagram.
11. Perform the **Case Cover Replacement Procedure**.

### CHOKE TEST *(continued)*

Figure F.21 – Choke detail





## USER INTERFACE BOARD TEST

### **WARNING**

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

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

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### **TEST DESCRIPTION**

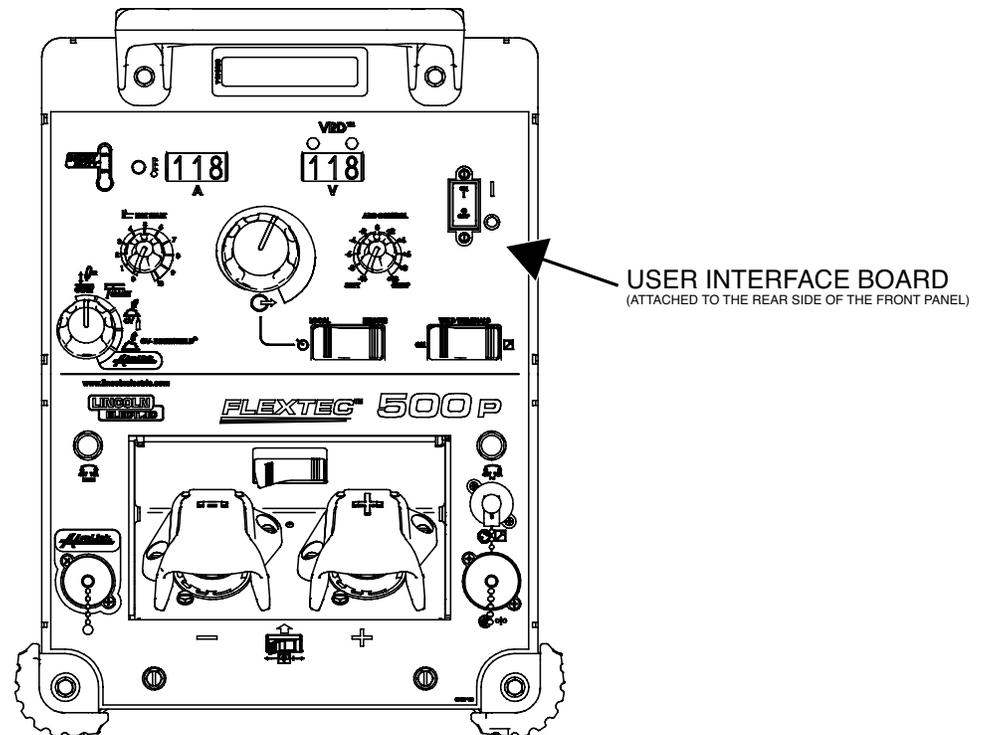
This test will help determine if the User Interface Board is functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## USER INTERFACE BOARD TEST *(continued)*

Figure F.22 – User interface board location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the user interface board. See Figure F.22.
5. Using a digital volt/ohmmeter, perform the resistance tests outlined in **Table F.7** with all plugs in board. See **Figure F.23**. See Wiring Diagram.
6. Carefully apply the correct input power to the Flextec 500P and turn ON the machine.
7. Observe and make sure the status LEDs on the front and rear of the user interface board are indicating a properly functioning user interface board. See **Table F.8**. See **Figure F.23**.
8. Using a digital volt/ohmmeter, perform the voltage tests outlined in **Table F.9**. See **Figures F.23** and **F.24**. See Wiring Diagram.
9. If the tests fail, the user interface may be faulty.
10. If faulty, perform the **User Interface Board Removal And Replacement Procedure**.
11. Perform the **Case Cover Replacement Procedure**.

## USER INTERFACE BOARD TEST *(continued)*

Figure F.23 – User interface board LED and plug locations

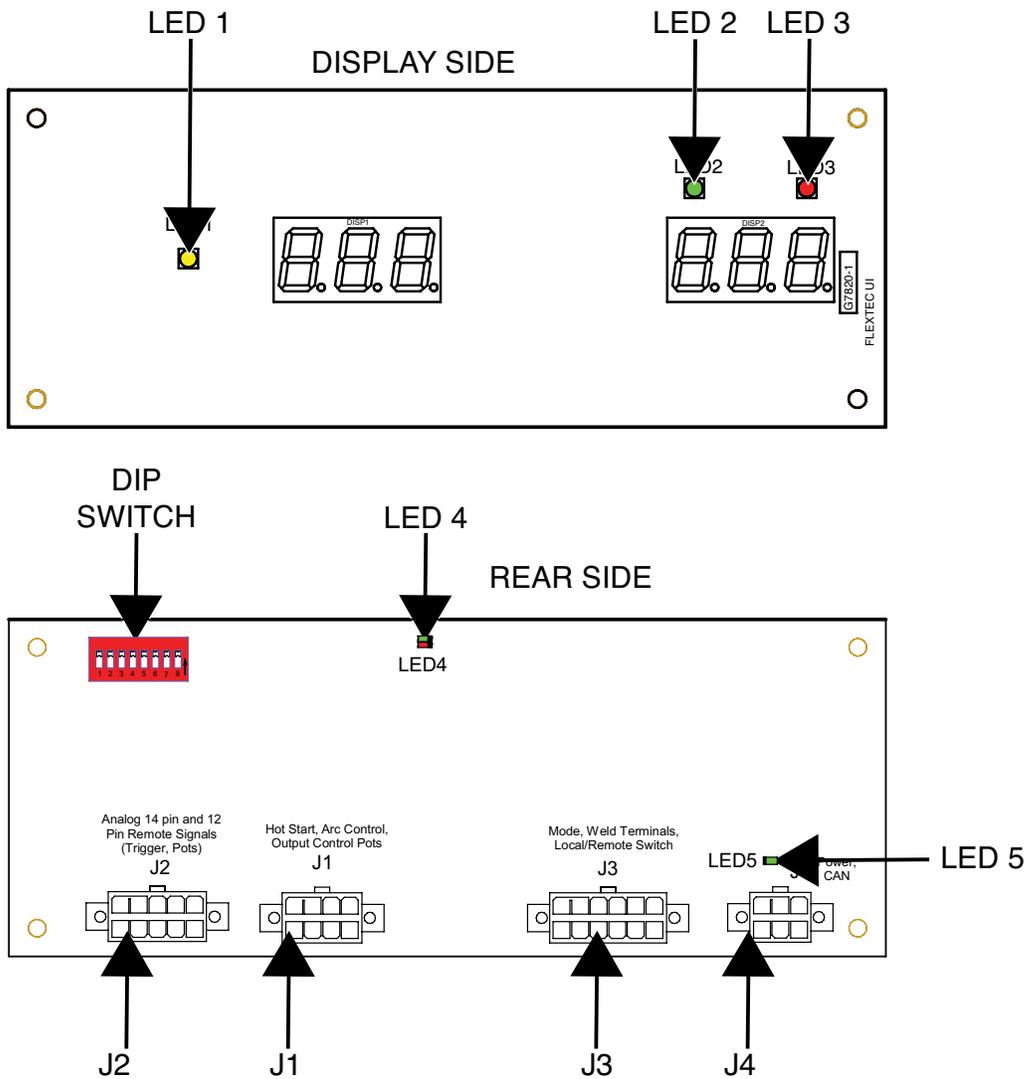
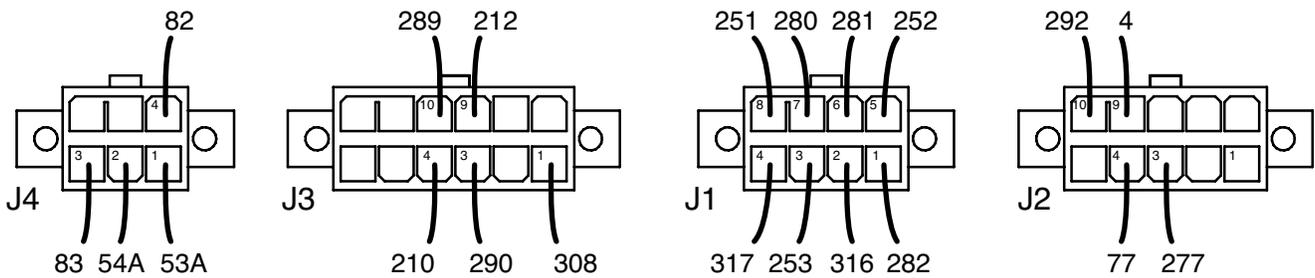


Figure F.24 – User interface board pin and lead locations



## USER INTERFACE BOARD TEST *(continued)*

**Table F.7 – User interface board resistance tests**

TEST POINT	TEST POINT	EXPECTED READING
PLUG J1 PIN 1	PLUG J1 PIN 6	0 - 10 K OHMS DEPENDANT ON ARC CONTROL POT POSITION.
PLUG J1 PIN 3	PLUG J1 PIN 5	0 - 5 K OHMS DEPENDANT ON OUTPUT CONTROL KNOB POSITION.
PLUG J1 PIN 4	PLUG J1 PIN 2	0 - 5 K OHMS DEPENDANT ON HOT START KNOB POSITION.

**Table F.8 – User interface board LEDs**

LED#	COLOR	FUNCTION
1	AMBER	THERMAL LED
2	GREEN	VRD LED VOLTAGE REDUCED
3	RED	VRD LED VOLTAGE NOT REDUCED
4	GREEN	STATUS "OK"
4	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
5	GREEN	+15 VDC POWER SUPPLY "OK"

LIGHT CONDITION	MEANING
STEADY GREEN	SYSTEM "OK".
ALTERNATING GREEN AND RED	<p>A SYSTEM FAULT HAS OCCURRED. IF THE USER INTERFACE BOARD STATUS LED IS FLASHING ANY COMBINATION OF RED AND GREEN, ERRORS ARE PRESENT.</p> <p>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.</p> <p>SEE <b>ERROR CODES</b>.</p>

**USER INTERFACE BOARD TEST** *(continued)***Table F.9 – User interface board voltage tests**

DESCRIPTION	TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING	CONDITION
INPUT FROM D4 RECTIFIER	PLUG J4 PIN 4 (LEAD #82)	PLUG J4 PIN 3 (LEAD #83)	APPROX 40 VDC	MACHINE ON.
CAN COMMUNICATION	PLUG J4 PIN 2 (LEAD #54A)	PLUG J4 PIN 1 (LEAD #53A)	2 VDC	MACHINE ON.
+15	PLUG J3 PIN 3 (LEAD #290)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	MACHINE ON.
+15	PLUG J3 PIN 4 (LEAD #210)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	MACHINE ON.
WELD TERMINALS SWITCH	PLUG J3 PIN 9 (LEAD #212)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	WELD TERMINALS SWITCH ON.
WELD TERMINALS SWITCH	PLUG J3 PIN 9 (LEAD #212)	PLUG J2 PIN 10 (LEAD #292)	0 VDC	WELD TERMINALS SWITCH OFF.
LOCAL/REMOTE SWITCH	PLUG J3 PIN 10 (LEAD #289)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	LOCAL/REMOTE SWITCH IN LOCAL POSITION.
12 PIN REMOTE SUPPLY	PLUG J2 PIN 3 (LEAD #277)	PLUG J3 PIN 1 (LEAD #308)	10 VDC	MACHINE ON.
14 PIN REMOTE SUPPLY	PLUG J2 PIN 4 (LEAD #77)	PLUG J3 PIN 1 (LEAD #308)	10 VDC	MACHINE ON.
REMOTE TRIGGER	PLUG J2 PIN 9 (LEAD #4)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	MACHINE ON.
ARC CONTROL SUPPLY	PLUG J1 PIN 7 (LEAD #280)	PLUG J2 PIN 10 (LEAD #292)	10 VDC	MACHINE ON.
OUTPUT CONTROL SUPPLY	PLUG J1 PIN 8 (LEAD #251)	PLUG J2 PIN 10 (LEAD #292)	10 VDC	MACHINE ON.
MODE SWITCH	PLUG J3 PIN 1 (LEAD #308)	PLUG J2 PIN 10 (LEAD #292)	15 VDC	MODE SWITCH IN GTAW POSITION
MODE SWITCH	PLUG J3 PIN 1 (LEAD #308)	PLUG J2 PIN 10 (LEAD #292)	12.5 VDC	MODE SWITCH IN SMAW POSITION
MODE SWITCH	PLUG J3 PIN 1 (LEAD #308)	PLUG J2 PIN 10 (LEAD #292)	10 VDC	MODE SWITCH IN CV-GAS POSITION
MODE SWITCH	PLUG J3 PIN 1 (LEAD #308)	PLUG J2 PIN 10 (LEAD #292)	7.5 VDC	MODE SWITCH IN CV-INNERSHIELD POSITION
MODE SWITCH	PLUG J3 PIN 1 (LEAD #308)	PLUG J2 PIN 10 (LEAD #292)	5.0 VDC	MODE SWITCH IN ARCLINK POSITION



## WELD OUTPUT 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

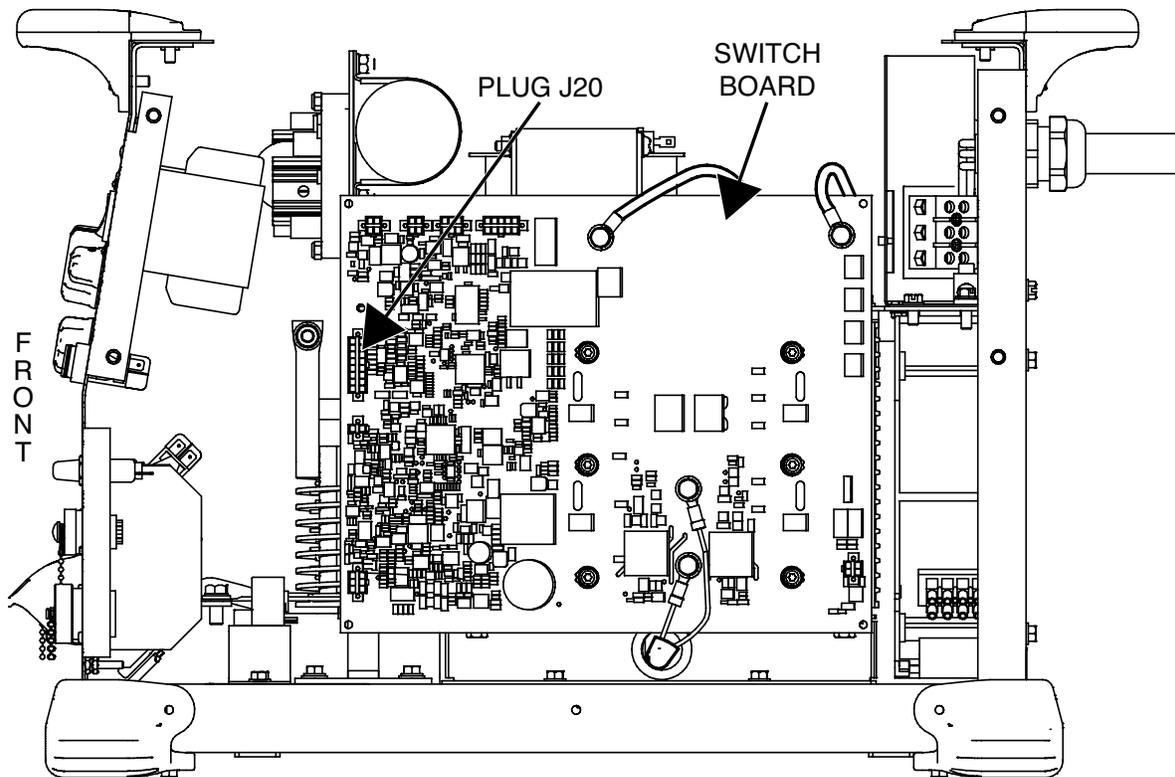
This test will help determine if the Thermal Protection Thermostats are functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## WELD OUTPUT THERMOSTAT CIRCUIT TEST *(continued)*

Figure F.25 – Plug J20 on the switch board



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate plug J20 on the switch board. See Figure F.25.
5. Disconnect plug J20 from the switch board and using a digital volt/ohmmeter, check the resistance between pin 5 (lead #224) and pin 13 (lead #225). See **Figure F.26**. See Wiring Diagram. The resistance should be very low (less than one ohm).
6. If the resistance is greater than one ohm, electrically isolate each thermostat and test individually. See Wiring Diagram.
7. To electrically isolate thermostat #1, label and disconnect the red lead from thermostat #2. Using a digital volt/ohmmeter, test resistance from the disconnected red lead to plug J20 pin 13 (lead #225). The resistance should be very low (less than one ohm). See **Figure F.27**. See Wiring Diagram.
8. To electrically isolate thermostat #2, label and disconnect leads #224 and the red lead from thermostat #2. Using a digital volt/ohmmeter, test resistance from one terminal of thermostat #2 to the other. The resistance should be very low (less than one ohm). See **Figure F.27**. See Wiring Diagram.
9. If thermostat #1 is faulty, perform the **Main Transformer Removal And Replacement Procedure**.
10. If thermostat #2 is faulty, perform the **Thermostat #2 Removal And Replacement Procedure**.
11. Connect any previously removed plugs and leads. See Wiring Diagram.
12. Perform the **Case Cover Replacement Procedure**.

# WELD OUTPUT THERMOSTAT CIRCUIT TEST *(continued)*

Figure F.26 – Plug J20 pin and lead locations

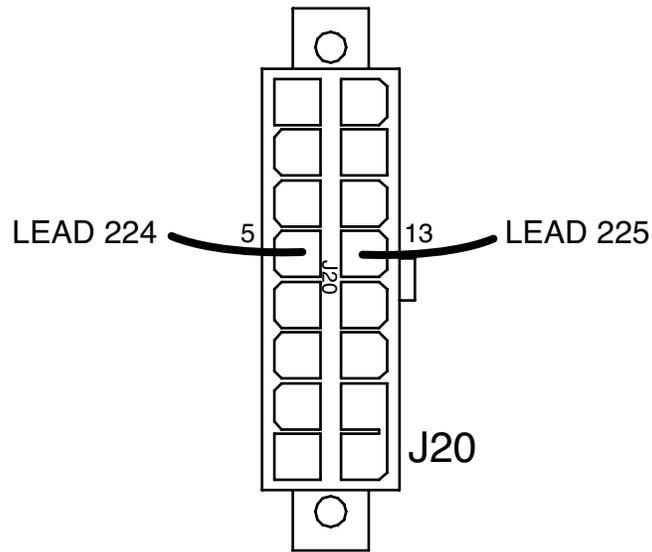
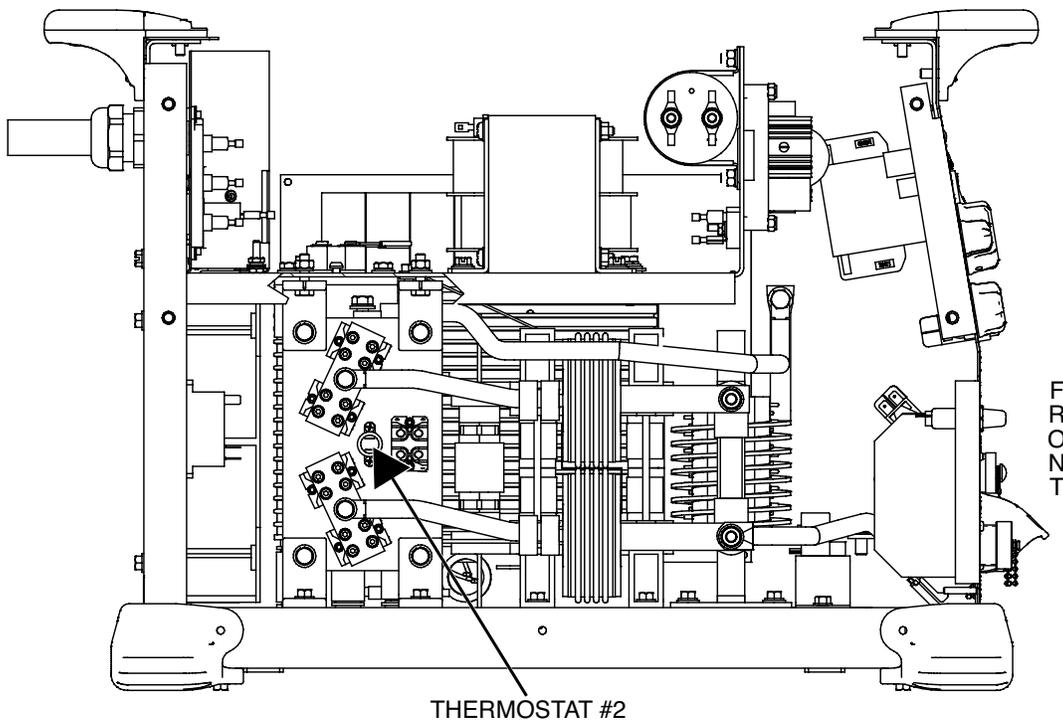


Figure F.27 – Thermostat #2 location





## CURRENT TRANSDUCER (LEM) TEST

### **WARNING**

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

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

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### **TEST DESCRIPTION**

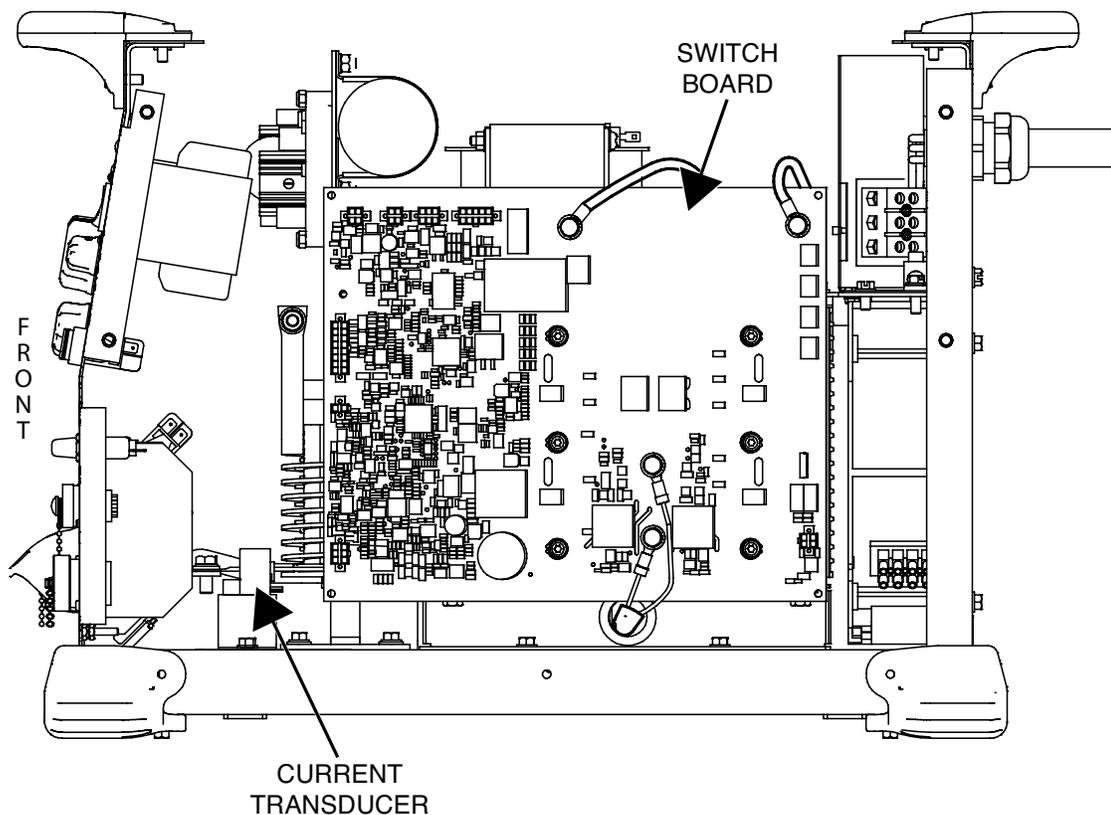
This test will help determine if the Current Transducer is functioning properly.

### **MATERIALS NEEDED**

- Digital Volt/Ohmmeter
- Load Bank
- Wiring Diagram

## CURRENT TRANSDUCER (LEM) TEST *(continued)*

Figure F.28 – Current transducer location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
  2. Perform the **Case Cover Removal Procedure**.
  3. Perform the **Capacitor Discharge Procedure**.
  4. Locate the current transducer. See Figure F.28.
  5. Locate plug J29 on the switch board. See **Figure F.29**. See Wiring Diagram.
  6. Carefully apply the correct input power to the Flextec 500P and turn the machine ON.
  7. Using a digital volt/ohmmeter, carefully check for the DC supply voltages to the current transducer per **Table F.10**. See **Figure F.29**. See Wiring Diagram.
- 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 at the switch board, perform the **Switch Board Test**.
  9. Place the machine into a constant current output mode. Using a load bank, load the machine according to **Table F.11**.
  10. Using a digital volt/ohmmeter, test the current transducer feedback versus actual output current. See **Table F.11**. See **Figure F.29**. See Wiring Diagram.
  11. If the DC supply voltages are correct but the feedback voltages are incorrect the current transducer may be faulty.
  12. If faulty, perform the **Current Transducer Removal And Replacement Procedure**.
  13. Perform the **Case Cover Replacement Procedure**.

## CURRENT TRANSDUCER (LEM) TEST *(continued)*

Figure F.29 – Plug J29 pin and lead locations

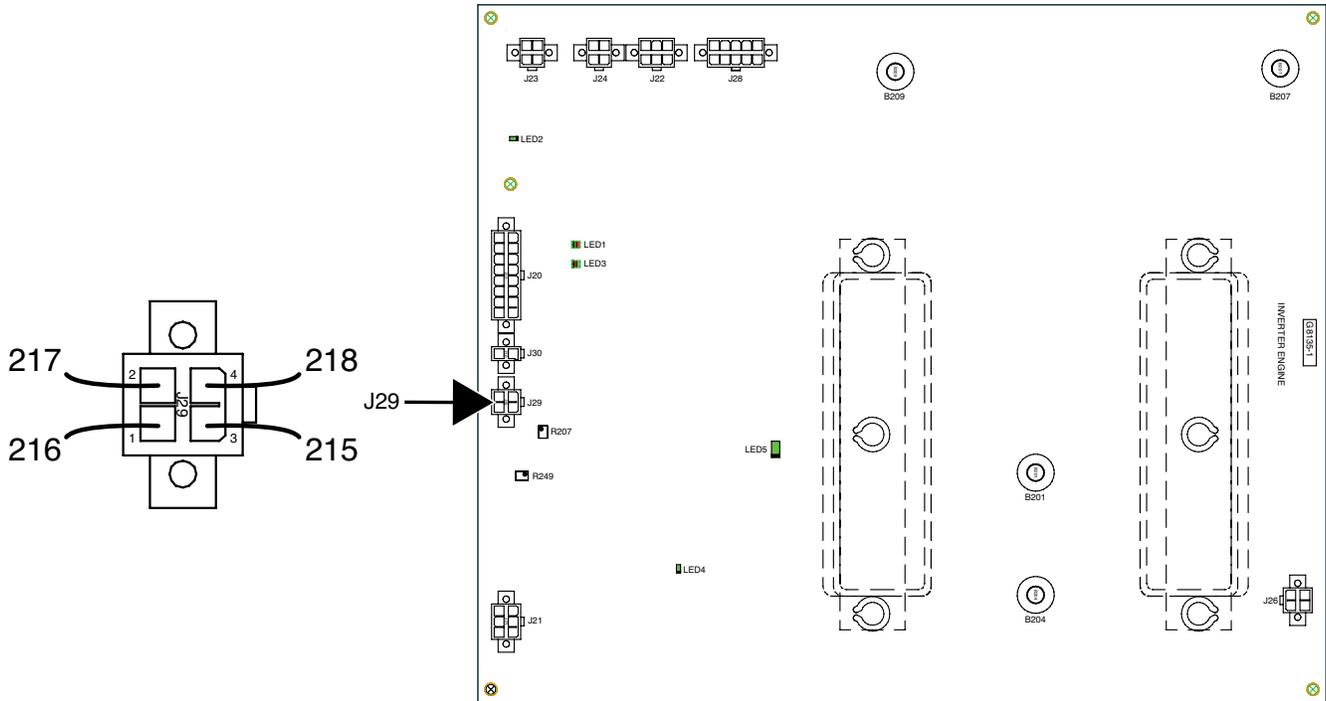


Table F.10 – DC supply voltages from switch board

DESCRIPTION	TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
POSITIVE VOLTAGE SUPPLY	PLUG J29 PIN 1 (LEAD 216)	PLUG J29 PIN 4 (LEAD 218)	+15 VDC
NEGATIVE VOLTAGE SUPPLY	PLUG J29 PIN 2 (LEAD 217)	PLUG J29 PIN 4 (LEAD 218)	-15 VDC

Table F.11 – Current transducer feedback versus actual output current

ACTUAL OUTPUT CURRENT (AMPS)	TEST POINT (POS)	TEST POINT (NEG)	CURRENT TRANSDUCER FEEDBACK VOLTAGE
500	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	4.0 VDC
450	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	3.6 VDC
400	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	3.2 VDC
350	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	2.8 VDC
300	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	2.4 VDC
250	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	2.0 VDC
200	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	1.6 VDC
150	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	1.2 VDC
100	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	0.8 VDC
50	PLUG J29 PIN 3 (LEAD 215)	PLUG J29 PIN 4 (LEAD 218)	0.4 VDC



## DC BUS BOARD TEST

### **WARNING**

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

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

---

### **TEST DESCRIPTION**

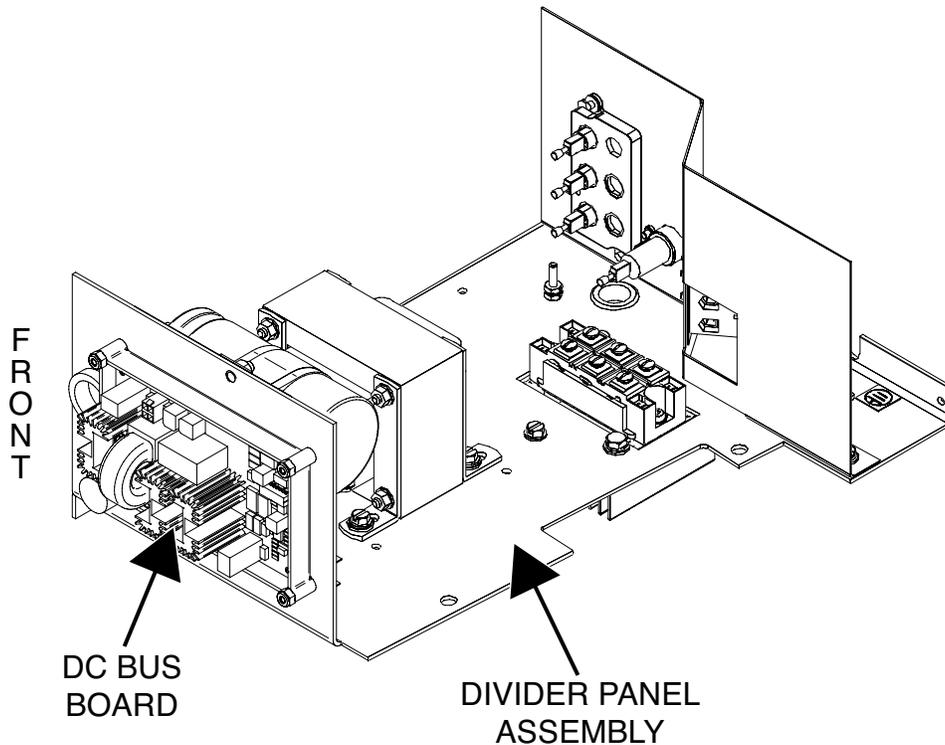
This test will help determine if the DC Bus Board is functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## DC BUS BOARD TEST *(continued)*

Figure F.30 – DC bus board location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the DC bus board. See Figure F.30.
5. Carefully apply the correct input power to the Flextec 500P and turn the machine ON.
6. Locate the red LED on the DC bus board. See **Figure F.31**.
7. If the red LED is illuminated the DC bus board is receiving input voltage from the DC bus rectifier circuit.
8. If the red LED is blinking, carefully remove plug J47 from the DC bus board. See **Figure F.31**. If the blinking stops and the red LED stays illuminated and steady, this is an indication of a heavy load on the 40 VDC output line. See Wiring Diagram.
9. LED is not illuminated check C1 capacitor, perform the **Auxiliary Transformer (T1) Test**. See Wiring Diagram.
10. Using a digital volt/ohmmeter, perform the voltage tests outlined in **Table F.12**. See **Figure F.31**. See Wiring Diagram.
11. 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 may be faulty.
12. If faulty, perform the **DC Bus Board Removal And Replacement Procedure**.
13. Perform the **Case Cover Replacement Procedure**.

### DC BUS BOARD TEST *(continued)*

Figure F.31 – DC bus board LED and plug locations

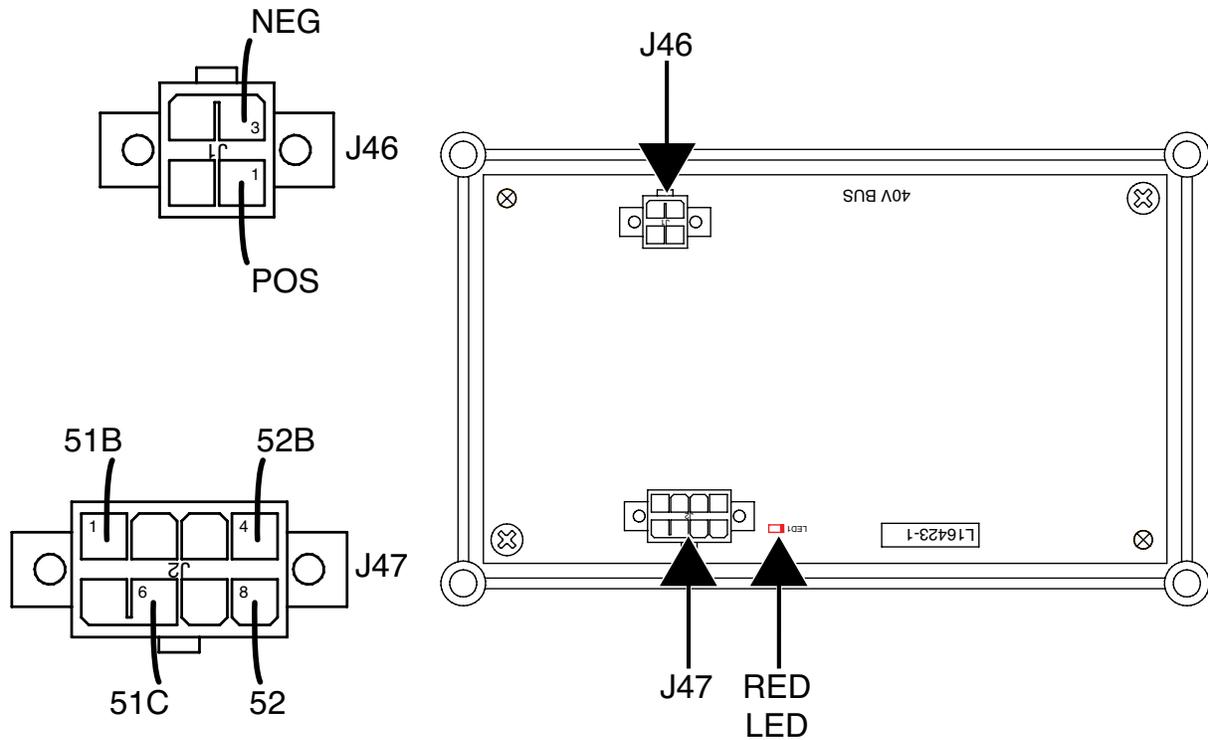


Table F.12 – DC bus board voltage tests

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
INPUT FROM DC RECTIFIER CIRCUIT	PLUG J46 PIN 1 (+)	PLUG J46 PIN 3 (+)	65 VDC
40 VDC OUTPUT TO ARCLINK RECEPTACLE	PLUG J47 PIN 8 (+) (LEAD #52)	PLUG J47 PIN 6 (-) (LEAD #51C)	40 VDC
40 VDC OUTPUT TO SWITCH BOARD	PLUG J47 PIN 4 (LEAD #52B)	PLUG J47 PIN 1 (LEAD #51B)	40 VDC



## D3 AND D4 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

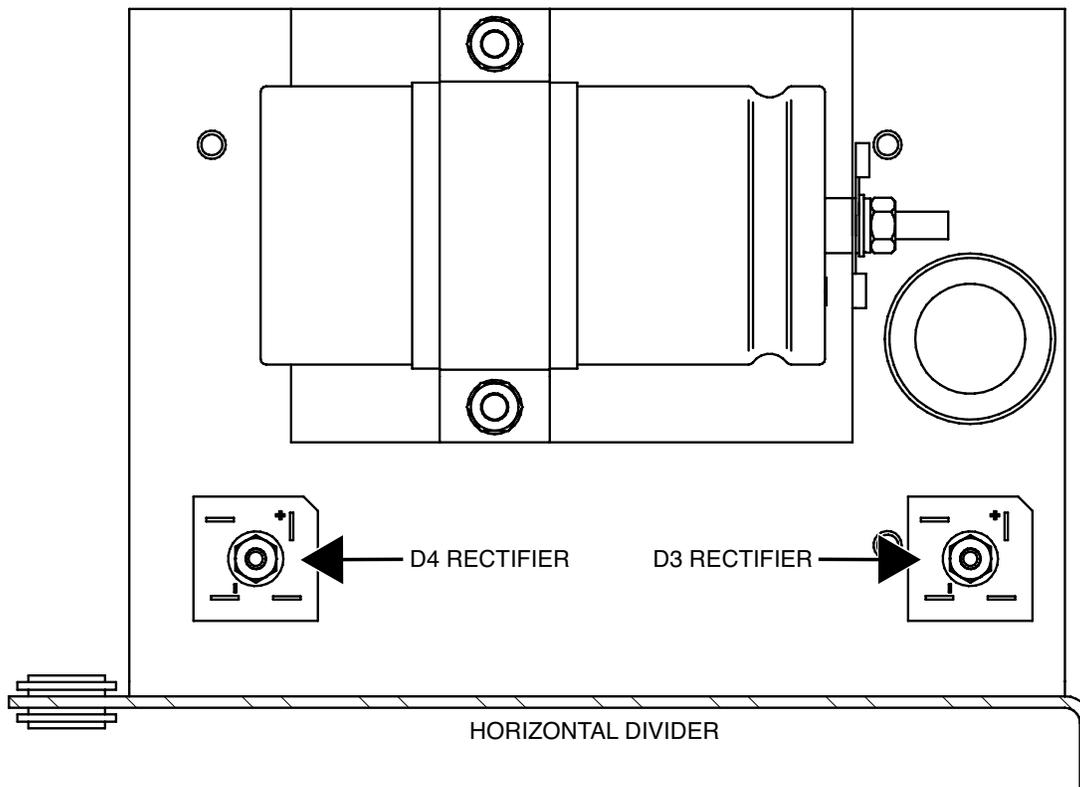
This test will help determine if the D3 and D4 Rectifiers are functioning properly.

### **MATERIALS NEEDED**

Digital Volt/Ohmmeter  
Wiring Diagram

## D3 AND D4 RECTIFIER TEST *(continued)*

Figure F.32 – D3 and D4 rectifier location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the D3 and D4 rectifiers. See Figure F.32. See Wiring Diagram.
5. Label and disconnect the leads from the D3 rectifier.
6. Using a digital volt/ohmmeter, perform the forward voltage drop tests per **Table F.13**. See **Figure F.33**. See Wiring Diagram.
7. If any of the tests fail, the D3 rectifier may be faulty.
8. Connect all previously removed leads.
9. Label and disconnect the leads from the D4 rectifier.
10. Using a digital volt/ohmmeter, perform the forward voltage drop tests per **Table F.13**. See **Figure F.33**. See Wiring Diagram.
11. If any of the tests fail, the D4 rectifier may be faulty.
12. Connect all previously removed leads.
13. If faulty, perform the **D3 And D4 Rectifiers Removal And Replacement Procedure**.
14. Perform the **Case Cover Replacement Procedure**.

### D3 AND D4 RECTIFIER TEST *(continued)*

Figure F.33 – D3 and D4 rectifier lead locations and test points

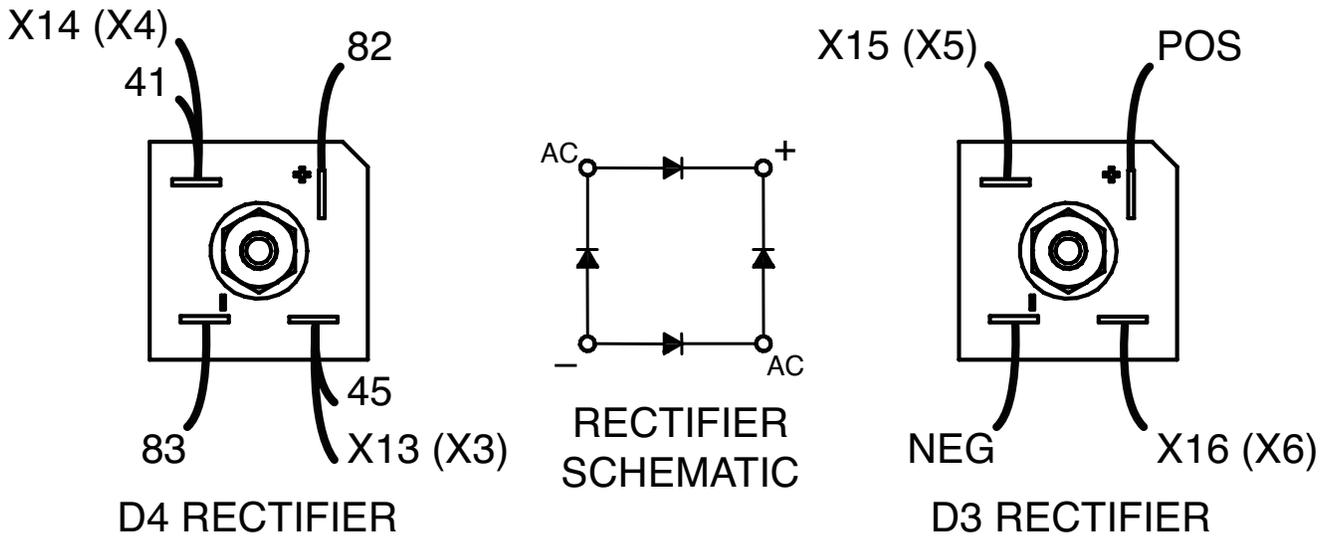


Table F.13 – D3 and D4 rectifier test points

TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
TOP AC TERMINAL	POSITIVE TERMINAL	0.2VDC - 0.7VDC
BOTTOM AC TERMINAL	POSITIVE TERMINAL	0.2VDC - 0.7VDC
NEGATIVE TERMINAL	TOP AC TERMINAL	0.2VDC - 0.7VDC
NEGATIVE TERMINAL	BOTTOM AC TERMINAL	0.2VDC - 0.7VDC



## BOOST RELAY TEST

### **WARNING**

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

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

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### **TEST DESCRIPTION**

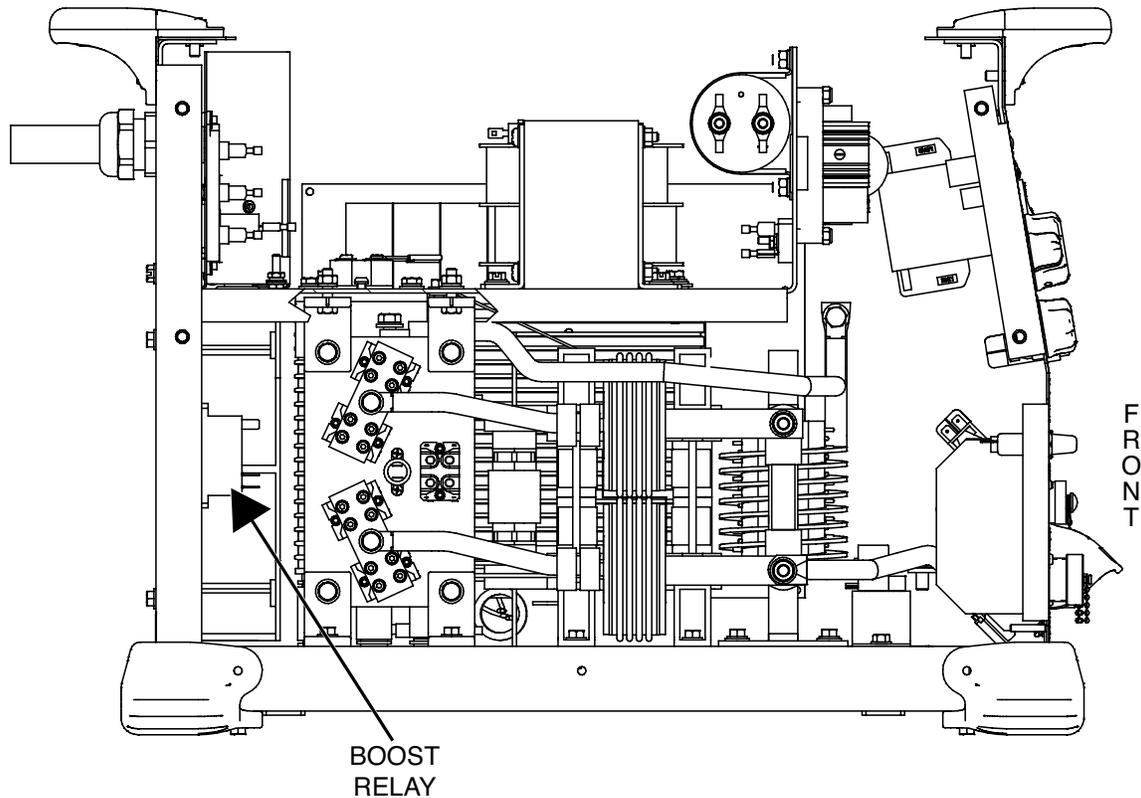
This test will help determine if the Boost Relay is functioning properly.

### **MATERIALS NEEDED**

- Digital Volt/Ohmmeter
- External 15 VDC Power Supply
- Wiring Diagram

## BOOST RELAY TEST *(continued)*

Figure F.34 – Boost relay location



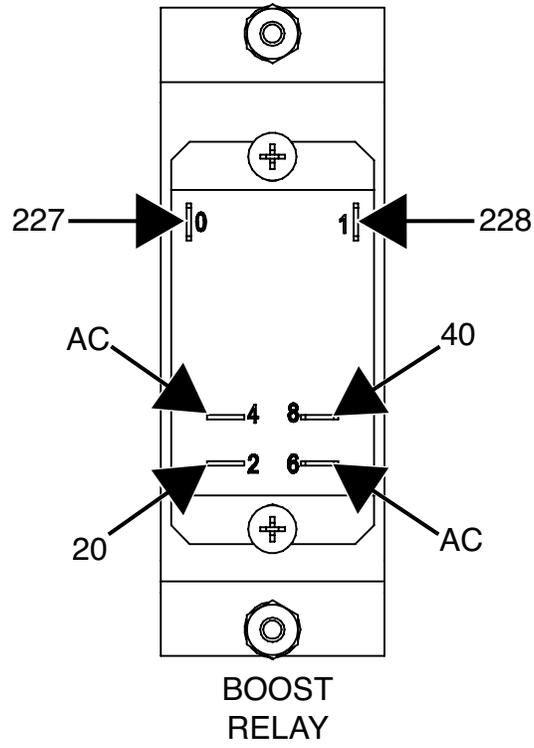
### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the boost relay. See Figure F.34. See Wiring Diagram.
5. Label and disconnect leads #227 and #228 from the boost relay. See **Figure F.35**. See Wiring Diagram.
6. Using a digital volt/ohmmeter, measure the resistance of the boost relay coil. See **Figure F.35**. The resistance should be approximately 83 Ohms.
7. Label and disconnect the remaining leads from the boost relay. See **Figure F.35**. See Wiring Diagram.
8. Using a digital volt/ohmmeter, measure the resistance of the contacts (terminals 2 to 4 and terminals 6 to 8). See **Figure F.35**. See Wiring Diagram. The resistance between the contacts should be infinite.
9. Using an external 15 VDC supply, apply voltage to the coil. An audible click should be heard as the contacts close. See Wiring Diagram.
10. Using a digital volt/ohmmeter, test the contacts again (terminals 2 to 4 and terminals 6 to 8), resistance should be very low (less than one ohm).
11. If these tests fail, the boost relay may be faulty.
12. If faulty, perform the **Boost Relay Removal And Replacement Procedure**.
13. Connect all previously removed leads.
14. Perform the **Case Cover Replacement Procedure**.

**NOTE:** The boost relay is only activated when the machine is in SMAW mode and welding current is being drawn.

### BOOST RELAY TEST *(continued)*

Figure F.35 – Boost relay terminal and lead locations





## MAIN TRANSFORMER 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.

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### **TEST DESCRIPTION**

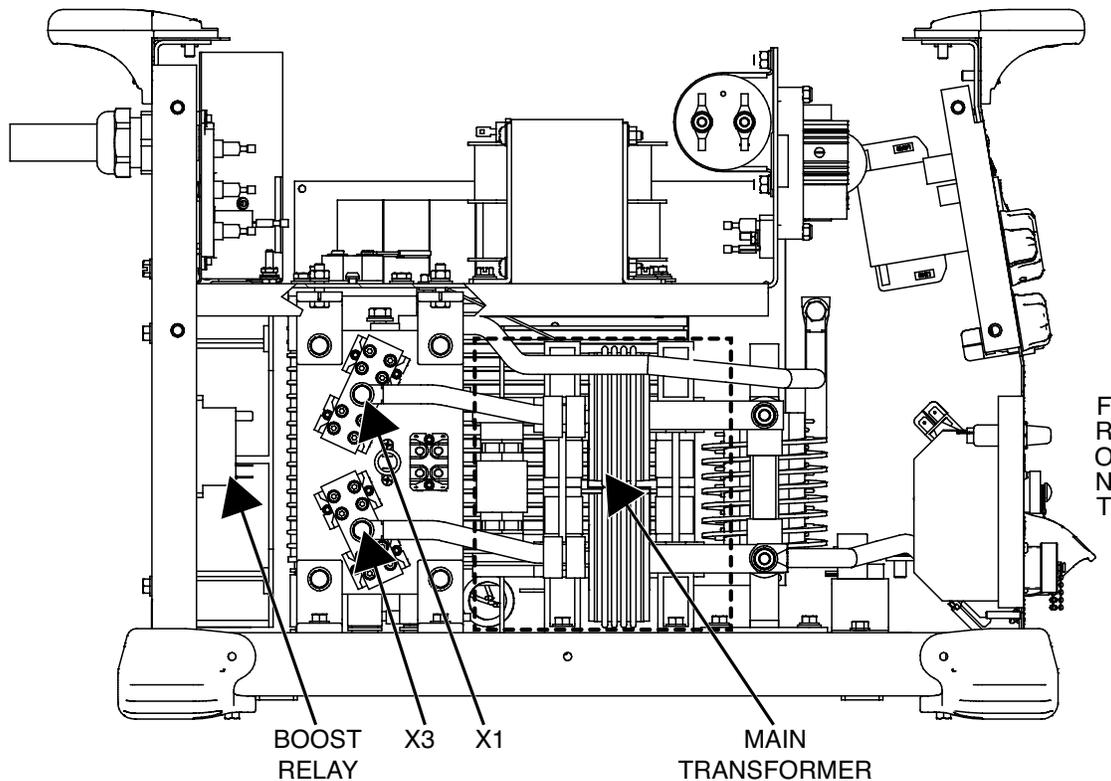
This test will help determine if the Main Transformer is functioning properly.

### **MATERIALS NEEDED**

- 7/16" Nutdriver
- Digital Volt/Ohmmeter
- Wiring Diagram

## MAIN TRANSFORMER TEST *(continued)*

Figure F.36 – Main transformer location



### PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the main transformer. See Figure F.36.
5. Label and disconnect, leads 40 and 20 from the boost relay. See **Figure F.37**. See Wiring Diagram.
6. Using a 7/16" nutdriver, remove the bolt and associated washers securing the main transformer secondary winding leads to terminals X1 and X3 of the output rectifier. See Figure F.36. See Wiring Diagram.
7. Using a 7/16" nutdriver, label and disconnect leads 201 and 204 from terminals B201 and B204 on the switch board. See **Figure F.38**. See Wiring Diagram.
8. Using a digital volt/ohmmeter, perform the resistance test in **Table F.14**. See Wiring Diagram.
9. If any of the tests fail, the main transformer may be faulty.
10. If faulty, perform the **Main Transformer Removal And Replacement Procedure**.
11. Connect any previously removed leads.
12. Perform the **Case Cover Replacement Procedure**.

### MAIN TRANSFORMER TEST *(continued)*

Figure F.37 – Boost relay lead location

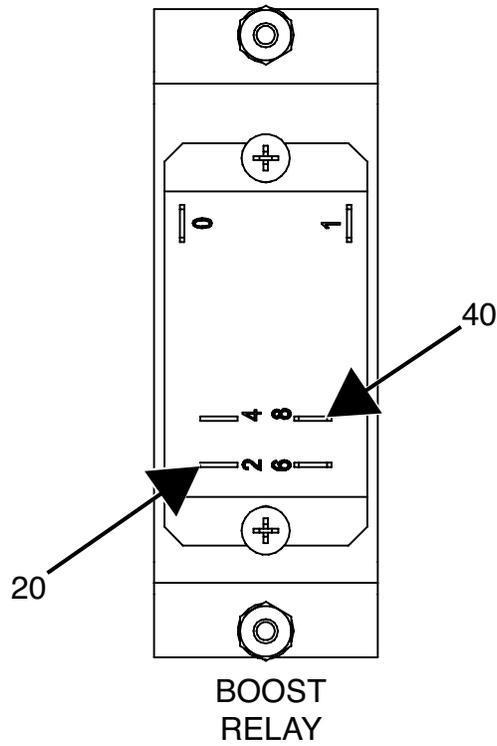
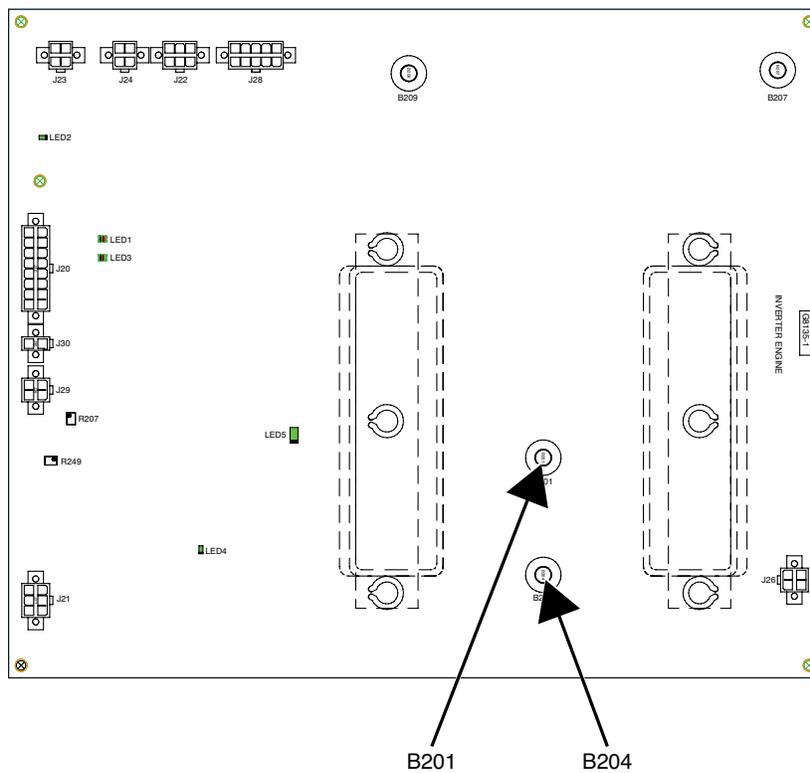


Figure F.38 – Switch board terminal locations



## MAIN TRANSFORMER TEST *(continued)*

**Table F.14 – Main transformer resistance tests**

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
BOOST WINDING AND REACTOR	LEAD #40 (DISCONNECTED FROM THE BOOST RELAY)	LEAD #20 (DISCONNECTED FROM THE BOOST RELAY)	VERY LOW RESISTANCE (LESS THAN ONE OHM)
SECONDARY WINDING	SECONDARY WINDING LEAD (DISCONNECTED FROM OUTPUT RECTIFIER TERMINAL X1)	SECONDARY WINDING LEAD (DISCONNECTED FROM OUTPUT RECTIFIER TERMINAL X3)	VERY LOW RESISTANCE (LESS THAN ONE OHM)
PRIMARY WINDING	LEAD #201 (DISCONNECTED FROM THE SWITCH BOARD)	LEAD #204 (DISCONNECTED FROM THE SWITCH BOARD)	VERY LOW RESISTANCE (LESS THAN ONE OHM)

## SPECIAL TESTING MODES

### **WARNING**

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

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

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#### **TEST DESCRIPTION**

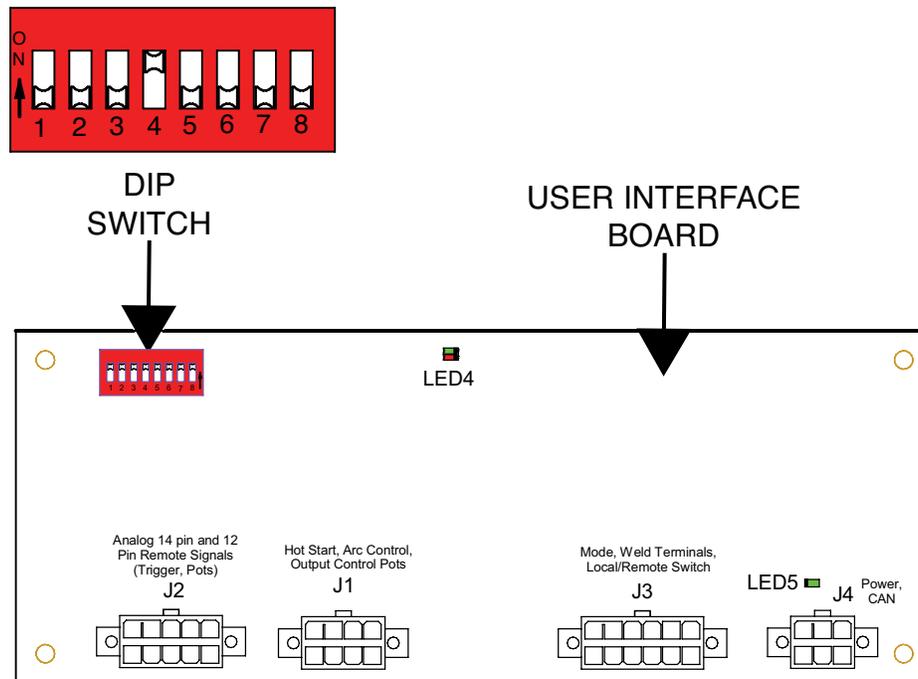
These modes can be used for calibration or to verify correct voltage and current feedback.

#### **MATERIALS NEEDED**

- Grid Load Bank
- Wiring Diagram
- Certified Voltmeter And Ammeter

## SPECIAL TESTING MODES *(continued)*

Figure F.39 – Dip switch location and setting

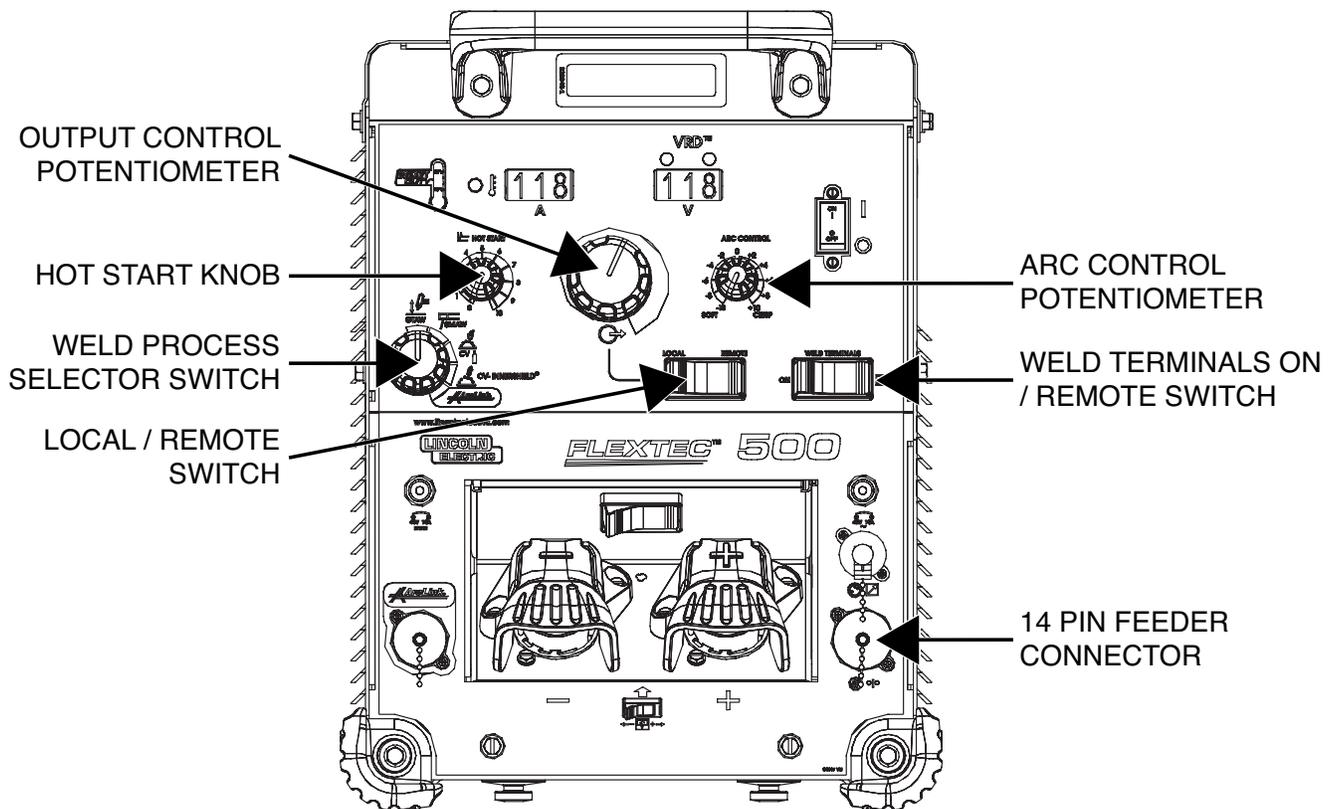


### CONSTANT VOLTAGE GRID LOAD TESTING

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the dip switch on the user interface board. See Figure F.39.
5. Place the #4 dip switch in the ON position. See Figure F.39. All other dip switches should be in the OFF position.
6. Place the weld terminals on/remote switch into the remote position. See **Figure F.40**.
7. Place the weld process selection switch into the GMAW position. See **Figure F.40**.
8. The local / remote switch selects whether the local output control potentiometer or the remote 12 pin connector potentiometer will be used. Place the local / remote switch in the appropriate position for the testing situation. See **Figure F.40**.
9. The output control potentiometer controls voltage set (10.0 to 45.0 volts) when the local / remote switch is in the Local position.
10. Turn the arc control potentiometer fully clockwise (+10). See **Figure F.40**.
11. Turn the hot start knob to the "0" position. See **Figure F.40**.
12. If necessary, disconnect the 14 pin feeder connector. See **Figure F.40**.
13. The 12 pin remote connector controls voltage set (10.0 to 45.0 volts) when Local / Remote switch is in the Remote position.
14. Connect a load bank and the certified meters to the machine.
15. Carefully apply the correct input power to the machine and turn the machine ON. Allow at least thirty seconds after power on before running this test to allow for the ArcLink system to be mapped.
16. The left display will read "U " and the right display will show the preset voltage.
17. Adjust the output control knob or the 12 pin remote potentiometer to set the preset voltage desired for testing.
18. Switch the weld terminal switch to the ON position (with the machine properly loaded by a grid load) and the machine will show the actual voltage and current on the displays.
19. When the output control potentiometer is changed quickly while operating, the output may "drop out" during a transition to a new voltage. This is normal for the special voltage grid load test mode. The meter reading on the machine must match the readings on the certified meters.
20. Switch the weld terminals switch to the Remote position and the output will turn off.
21. Carefully remove the input power from the machine.

## SPECIAL TESTING MODES *(continued)*

Figure F.40 – User control locations



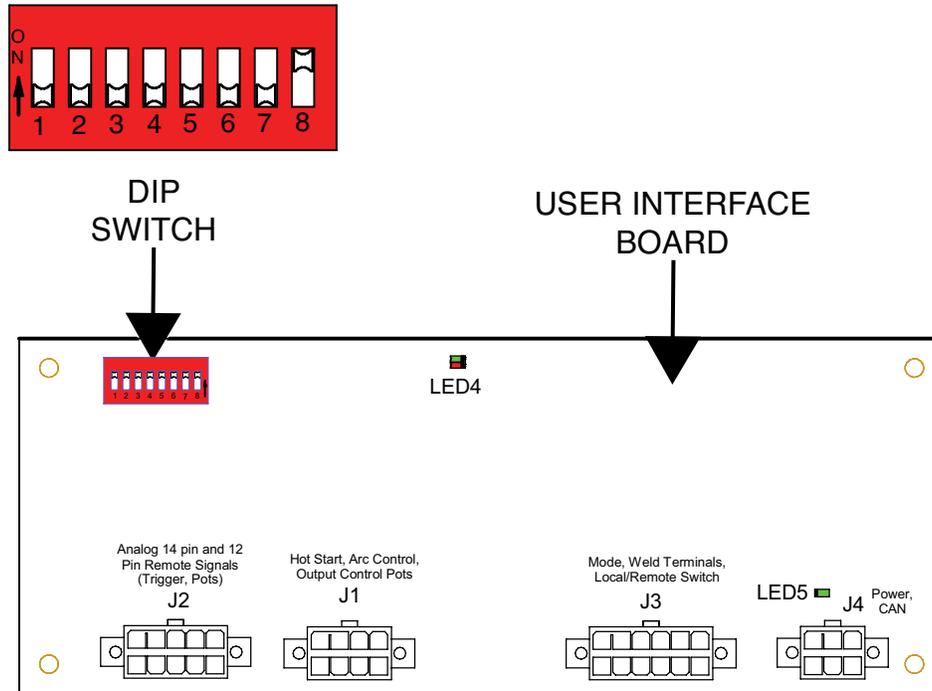
22. Place the #4 dip switch in the OFF position.
23. Perform the **Case Cover Replacement Procedure**.

### CONSTANT CURRENT GRID LOAD TESTING

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the dip switch on the user interface board. See **Figure F.39**.
5. Place the #4 dip switch in the ON position. See **Figure F.39**. All other dip switches should be in the OFF position.
6. Place the weld terminals on/remote switch into the remote position. See Figure F.40.
7. Place the weld process selection switch into the GTAW position. See Figure F.40.
8. The local / remote switch selects whether the local output control potentiometer or the remote 12 pin connector potentiometer will be used. Place the local / remote switch in the appropriate position for the testing situation. See Figure F.40.
9. The output control potentiometer controls current set (10 to 500 amps) when the local / remote switch is in the Local position.
10. Turn the arc control potentiometer fully counter-clockwise (-10). See Figure F.40.
11. Turn the hot start knob to the "0" position. See Figure F.40.
12. If necessary, disconnect the 14 pin feeder connector. See Figure F.40.
13. The 12 pin remote connector controls current set (10 to 500 amps) when Local / Remote switch is in the Remote position.
14. Connect a load bank and the certified meters to the machine.
15. Carefully apply the correct input power to the machine and turn the machine ON. Allow at least thirty seconds after power on before running this test to allow for the ArcLink system to be mapped.
16. The right display will read "Cur" and the left display will show the preset for the current set.
17. Adjust the output control knob to set the preset current desired for testing.
18. Switch the weld terminal switch to the ON position (with the machine properly loaded by a grid load) and the machine will show the actual voltage and current on the displays. The meter reading on the machine must match the readings on the certified meters.
19. Switch the weld terminals switch to the Remote position and the output will turn off.

## SPECIAL TESTING MODES *(continued)*

Figure F.41 – Dip switch location and setting



20. Carefully remove the input power from the machine.
21. Place the #4 dip switch in the OFF position.
22. Perform the **Case Cover Replacement Procedure**.

### ERROR LOG READING PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the dip switch on the user interface board. See **Figure F.39**.
5. Place the #8 dip switch in the ON position. See Figure F.41. All other dip switches should be in the OFF position.
6. Place the weld terminals on/remote switch into the ON position. See **Figure F.40**.
7. Place the process selection switch into the GTAW position. See **Figure F.40**.
8. Place the local / remote switch in the Local position. See **Figure F.40**.
9. Turn the output control potentiometer fully counter-clockwise. See **Figure F.40**.
10. Turn the arc control potentiometer fully counter-clockwise (-10). See **Figure F.40**.
11. Turn the hot start knob to the “0” position. See **Figure F.40**.
12. Carefully apply the correct input power to the machine and turn the machine ON.
13. The displays will show “---” “---”.
14. The weld terminal switch will be used to step through the test steps and the error log.
15. The left display will show the test step number.
16. Cycle the weld terminals switch until the left display shows “17”. The right display will show “---”.
17. Rotate the output control potentiometer clockwise.
18. The left display will show numbers between 1 and 25.
19. The right display will show the 25 most recent Weld Sequencer errors.
20. Return the output control potentiometer to zero.
21. Cycle the weld terminals switch again. The left display will show “18”. The right display will show “---”.
22. Rotate the output control potentiometer clockwise.
23. The left display will show numbers between 1 and 25.
24. The right display will show the 25 most recent Weld Controller errors.

## SPECIAL TESTING MODES *(continued)*

24. The right display will show the 25 most recent Weld Controller errors.
25. Return the output control potentiometer to zero.
26. Cycle the weld terminals switch again. The left display will show "19". The right display will show "---".
27. Rotate the output control potentiometer clockwise.
28. The left display will show numbers between 1 and 25.
29. The right display will show the 25 most recent Weld Controller errors.
30. Return the output control potentiometer to zero.
31. Carefully remove the input power from the machine.
32. Place the #8 dip switch in the OFF position.
33. Perform the **Case Cover Replacement Procedure**.
16. Cycle the weld terminal switch until the left display shows " 12". The right display will show the last three digits of the switch board parameter file version.
17. Cycle the weld terminal switch until the left display shows " 13". The right display will show the last three digits of the switch board weld set.
18. Cycle the weld terminal switch until the left display shows " 14". The right display will show the last three digits of the user interface boot code version.
19. Cycle the weld terminal switch until the left display shows " 15". The right display will show the last three digits of the user interface main code version.
20. Cycle the weld terminal switch until the left display shows " 16". The right display will show the last three digits of the user interface parameter version.

## SOFTWARE VERSION READING PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Locate the dip switch on the user interface board. See **Figure F.39**.
5. Place the #8 dip switch in the ON position. See **Figure F.41**. All other dip switches should be in the OFF position.
6. Place the weld terminals on/remote switch into the ON position. See **Figure F.40**.
7. Place the process selection switch into the GTAW position. See **Figure F.40**.
8. Place the local / remote switch in the Local position. See **Figure F.40**.
9. Turn the output control potentiometer fully counter-clockwise. See **Figure F.40**.
10. Turn the arc control potentiometer fully counter-clockwise (-10). See **Figure F.40**.
11. Turn the hot start knob to the "0" position. See **Figure F.40**.
12. Carefully apply the correct input power to the machine and turn the machine ON.
13. Cycle the weld terminal switch until the left display shows " 9". The right display will show the last three digits of the switch board software number (Example: S30146-07 is software, then the right display shows "607").
14. Cycle the weld terminal switch until the left display shows " 10". The right display will show the last three digits of the switch board boot code version.
15. Cycle the weld terminal switch until the left display shows " 11". The right display will show the last three digits of the switch board main code version.
21. At this point, all software has been verified.
22. Carefully remove the input power from the machine.
23. Place the #8 dip switch in the OFF position.
23. 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

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

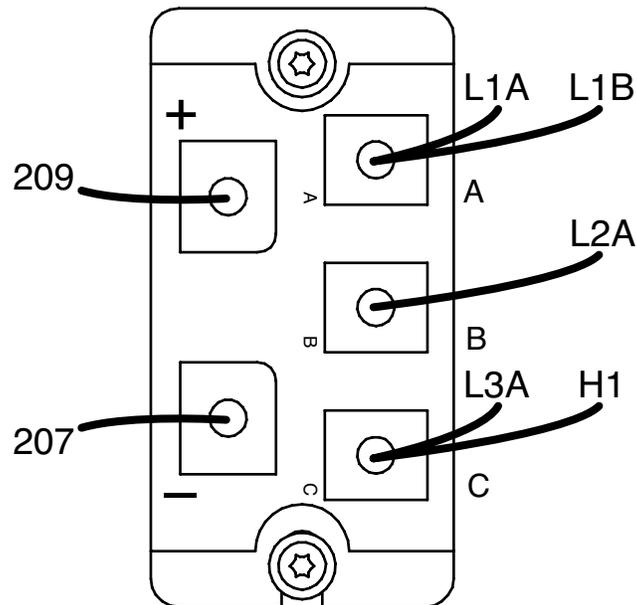
### **MATERIALS NEEDED**

- 5/16" Nutdriver
- Torx Nutdriver (Size T25)
- Dow Corning 340 Heat Sink Compound (Lincoln Part #T12837)
- Wiring Diagram

## INPUT RECTIFIER

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.42 – Input rectifier lead locations

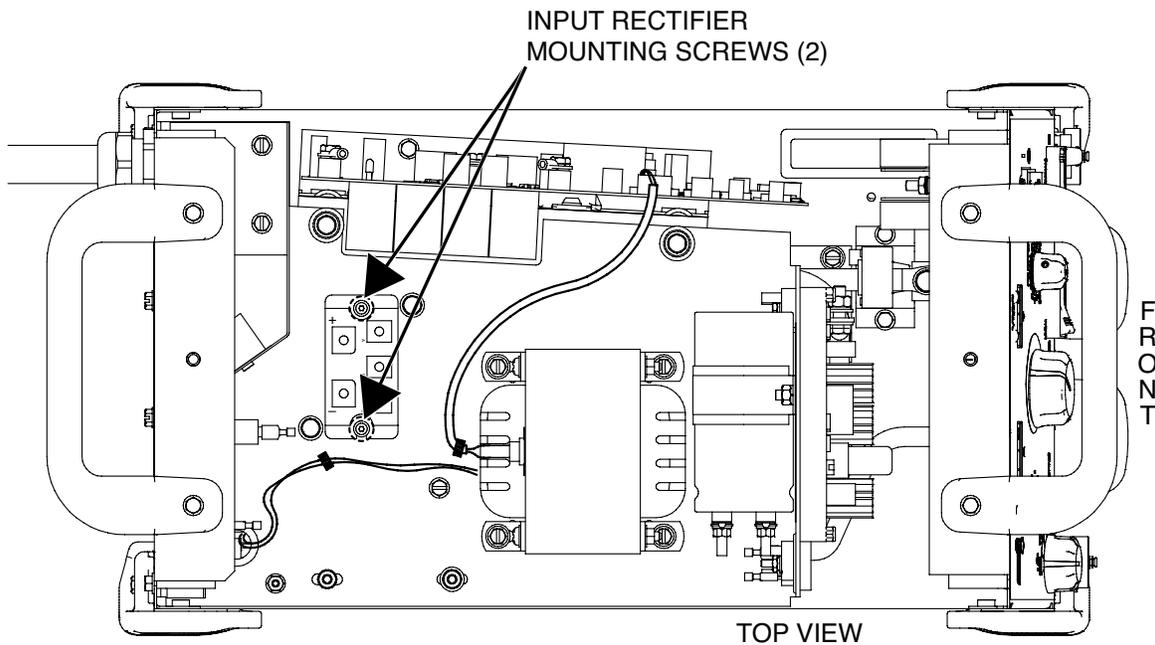


### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Using a 5/16" nutdriver, remove the five screws, lockwashers and washers securing the leads to the input rectifier. See Figure F.42. See Wiring Diagram.
5. Label and disconnect leads 209, 207, L1A, L1B, L2A, L3A, H1 and the MOVs from the input rectifier terminals. See Figure F.42. See Wiring Diagram.
6. Using a Torx nutdriver (size T25), remove the two screws and washers securing the input rectifier to the heat sink. See **Figure F.43**.
7. Carefully separate the input rectifier from the heat sink.
8. The input rectifier can now be replaced.

## INPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

Figure F.43 – Input rectifier mounting screw locations



### REPLACEMENT PROCEDURE

1. Apply a coating of Dow Corning 340 heat sink compound (Lincoln part #T12837) to the rear of the new input rectifier.
2. Carefully position the new rectifier onto the heat sink.
3. Using a Torx nutdriver (size T25), attach the two screws and washers securing the input rectifier to the heat sink.
4. Using a 5/16" nutdriver, attach the five screws, lockwashers and washers securing leads 209, 207, L1A, L1B, L2A, L3A, H1 and the MOVs to the input rectifier. See Wiring Diagram.
5. Perform the **Case Cover Replacement Procedure**.
6. Perform the **Retest After Repair Procedure**.



## AUXILIARY TRANSFORMER (T1) REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the Auxiliary Transformer (T1).

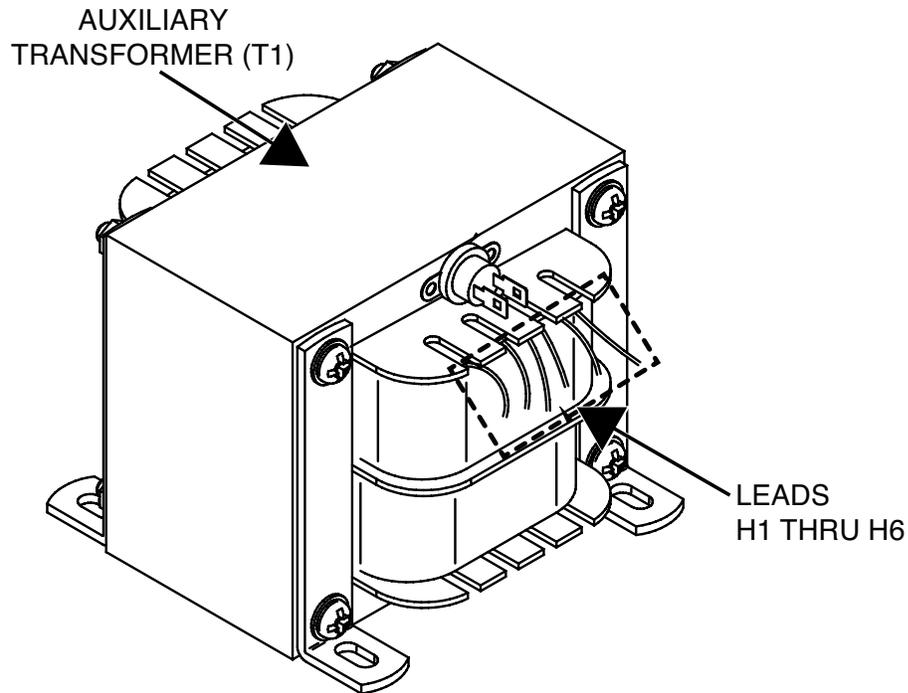
### **MATERIALS NEEDED**

Phillips Screwdriver  
Wiring Diagram

## AUXILIARY TRANSFORMER (T1)

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.44 – Auxiliary transformer (T1) lead locations



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect leads H1, H2, H3, H4, H5 and H6 from their connection points. See Figure F.44. See Wiring Diagram.
5. Label and disconnect leads X13 (X3) and X14 (X4) from the D4 rectifier. See **Figure F.45**. See Wiring Diagram. Cut any cable ties as necessary.
6. Label and disconnect leads X16 (X6) and X15 (X5) from the D3 rectifier. See **Figure F.45**. See Wiring Diagram. Cut any cable ties as necessary.
7. Using a phillips screwdriver, remove the four screws and washers securing the auxiliary transformer (T1) to the machine. See **Figure F.46**.
8. The auxiliary transformer (T1) can now be removed and replaced.

### AUXILIARY TRANSFORMER (T1)

#### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.45 – Auxiliary transformer (T1) secondary lead connection points

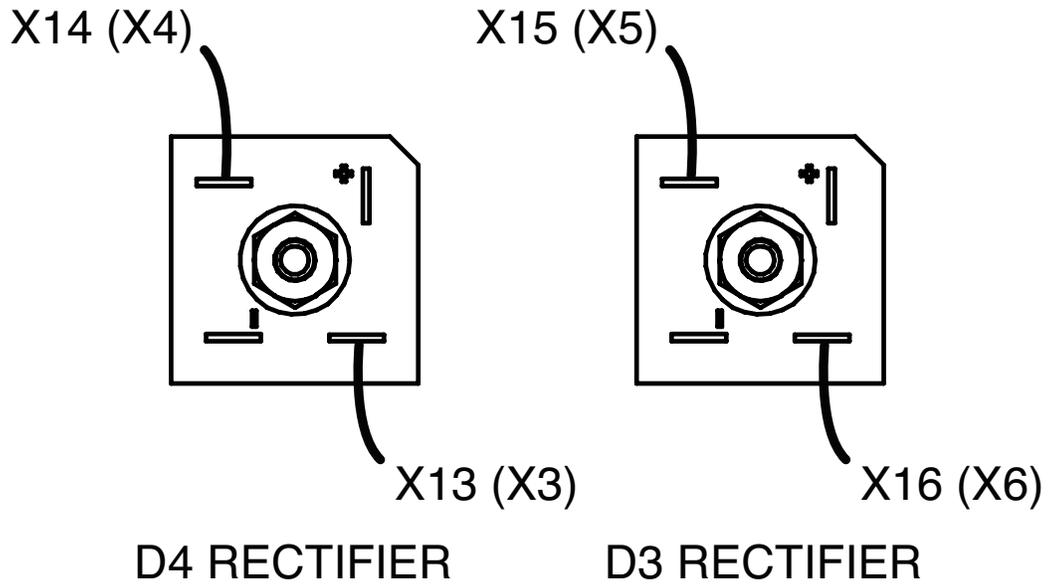
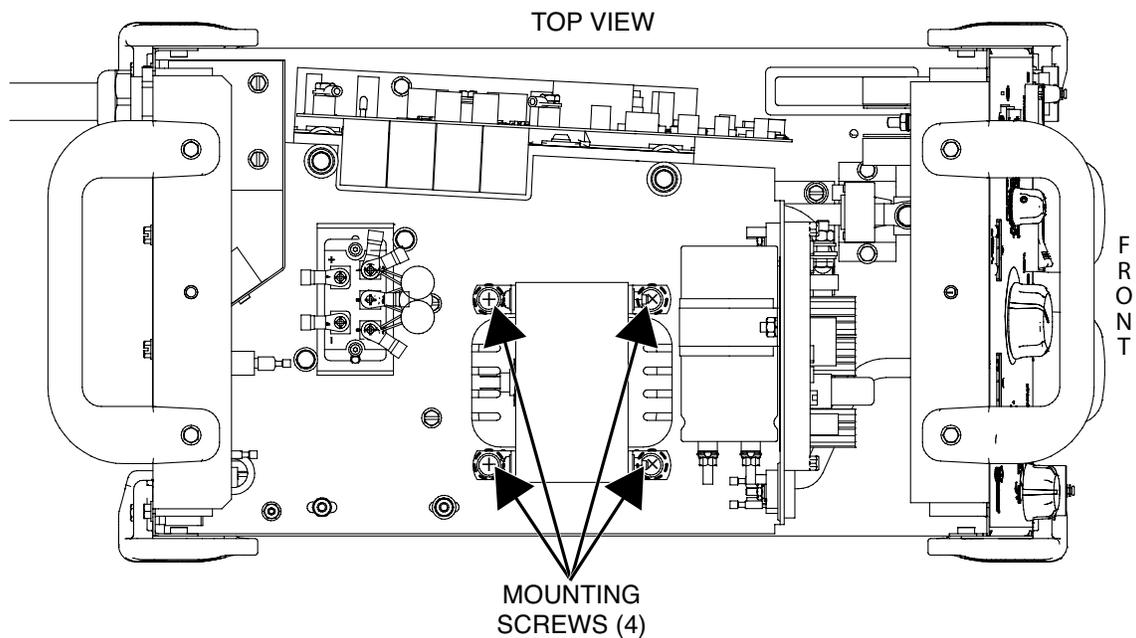


Figure F.46 – Auxiliary transformer (T1) mounting screws



## AUXILIARY TRANSFORMER (T1) REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Carefully position the new auxiliary transformer (T1) into the machine.
2. Using a phillips screwdriver, attach the four screws and washers securing the auxiliary transformer (T1) to the machine.
3. Connect leads X16 (X6) and X15 (X5) to the D3 rectifier. See Wiring Diagram. Replace any cable ties as necessary.
4. Connect leads X13 (X3) and X14 (X4) to the D4 rectifier. See Wiring Diagram. Replace any cable ties as necessary.
5. Connect leads H1, H2, H3, H4, H5 and H6 to their connection points. See Wiring Diagram.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.

## T1 TRANSFORMER THERMOSTAT REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

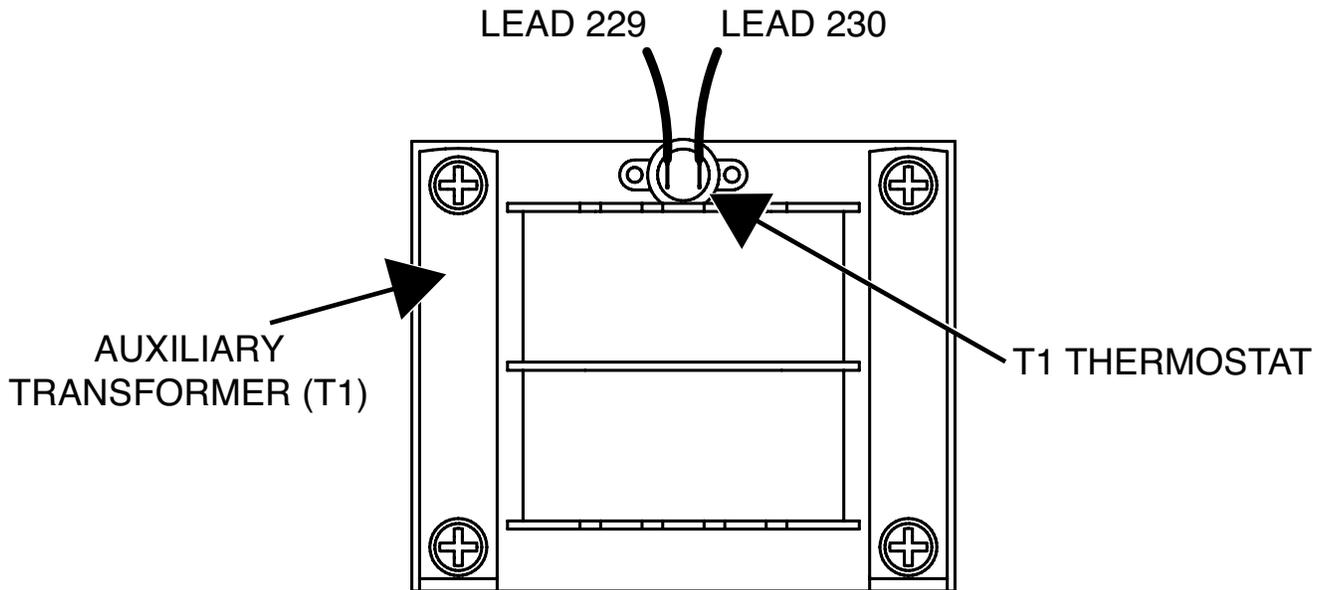
This procedure will aid the technician in the removal and replacement of the T1 Transformer Thermostat.

### **MATERIALS NEEDED**

Small Knife  
E2614 Epoxy Adhesive  
Wiring Diagram

## T1 TRANSFORMER THERMOSTAT REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.47 – T1 transformer thermostat leads and location



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect leads #229 and #230 from the T1 transformer. See Figure F.47. See Wiring Diagram.
5. Using a small knife, carefully scrape away the adhesive securing the thermostat to the auxiliary transformer (T1). See Figure F.47.
6. Using a small knife, gently pry the thermostat away from the auxiliary transformer (T1). See Figure F.47.
7. The T1 transformer thermostat can now be removed and replaced.

## T1 TRANSFORMER THERMOSTAT REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Clean any remaining adhesive from the auxiliary transformer (T1) mating surface before installing new thermostat.
2. Apply a coating of E2614 epoxy adhesive to the mating surfaces of the thermostat and the transformer. Apply adhesive to transformer in sufficient amounts to fill all voids where thermostat face will mount.
3. Carefully position the new thermostat onto the auxiliary transformer.
4. Allow the adhesive to cure at room temperature.
5. Connect leads #229 and #230 to the auxiliary transformer (T1). See Wiring Diagram.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.



## FAN REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

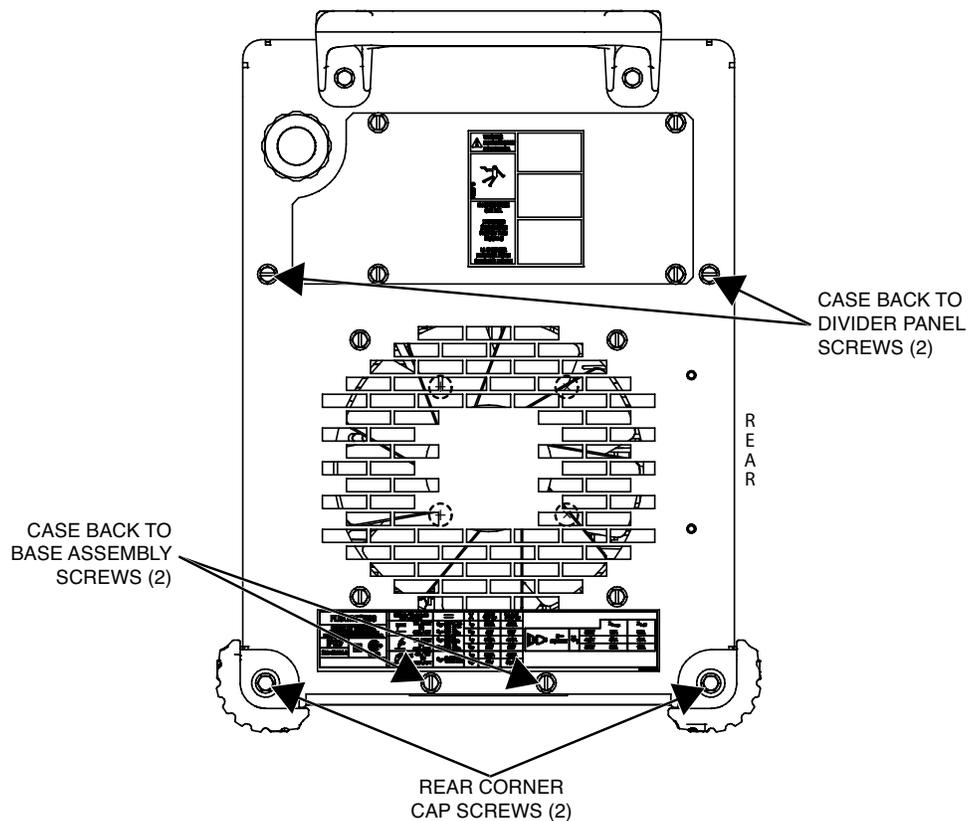
This procedure will aid the technician in the removal and replacement of the Fan.

### **MATERIALS NEEDED**

- 3/8" Nutdriver
- Small Slotted Screwdriver
- Cable Ties
- Wiring Diagram

## FAN REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.48 – Case back mounting screw locations



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Using a 3/8" nutdriver, remove the two screws securing the case back assembly to the base and center assembly. See Figure F.48.
5. Using a 3/8" nutdriver, remove the two screws securing the case back assembly to the divider panel. See Figure F.48.
6. Using a 3/8" nutdriver, remove the screw and washer securing each rear corner cap. See Figure F.48.
7. Carefully lift the case back assembly up and away from the machine to allow for clearance of the fan.
8. Label and disconnect leads 22 and 23 from leads H3 and H2 of the auxiliary transformer. See Wiring Diagram.
9. Using a 3/8" nutdriver, remove the nut and washer securing the ground (green) lead to the divider panel. See Wiring Diagram.
10. Route the fan wiring thru the hole in the divider panel.
11. Label and disconnect plug J26 from the switch board. See **Figure F.49**. See Wiring Diagram.
12. Using a 3/8" nutdriver, remove the four screws securing the fan to the case back. See **Figure F.50**.
13. Using a 3/8" nutdriver, loosen the bolt securing the ground lug to the divider panel. See **Figure F.51**. See Wiring Diagram. Only loosen the bolt enough to allow for the removal of the fan.
14. Carefully maneuver the fan out of the machine.
15. Using a small slotted screwdriver, loosen the screws securing leads 24, 23 and ground to the fan terminals. Label and disconnect the leads. See **Figure F.52**. See Wiring Diagram.
16. Cut cable ties to remove wiring from the fan body. Note routing and cable tie placement for reassembly.

# FAN REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.49 – Switch board plug J26 location

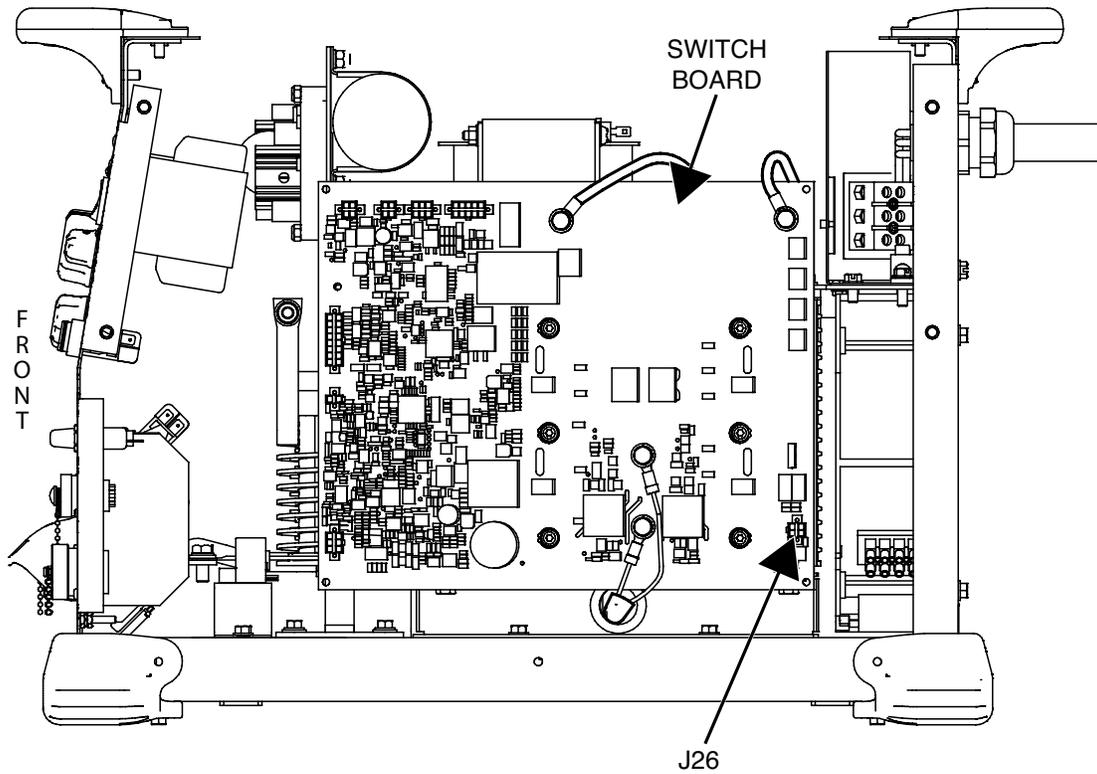
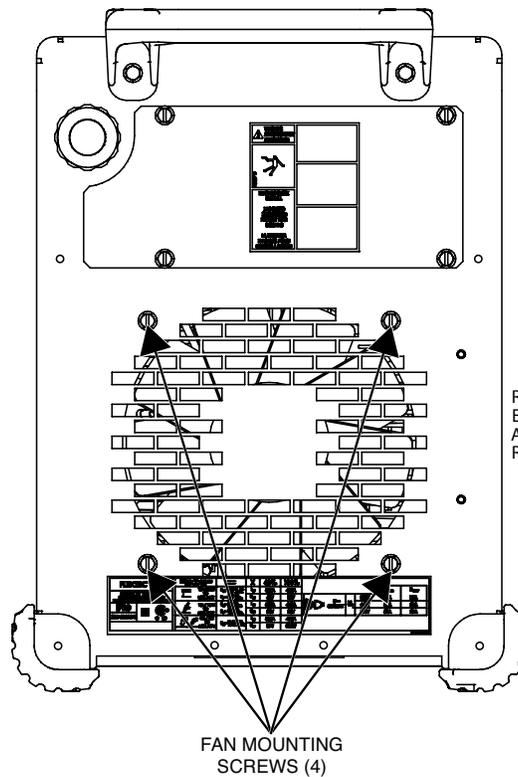


Figure F.50 – Fan mounting screw locations



# FAN REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.51 – Ground lug mounting screw location

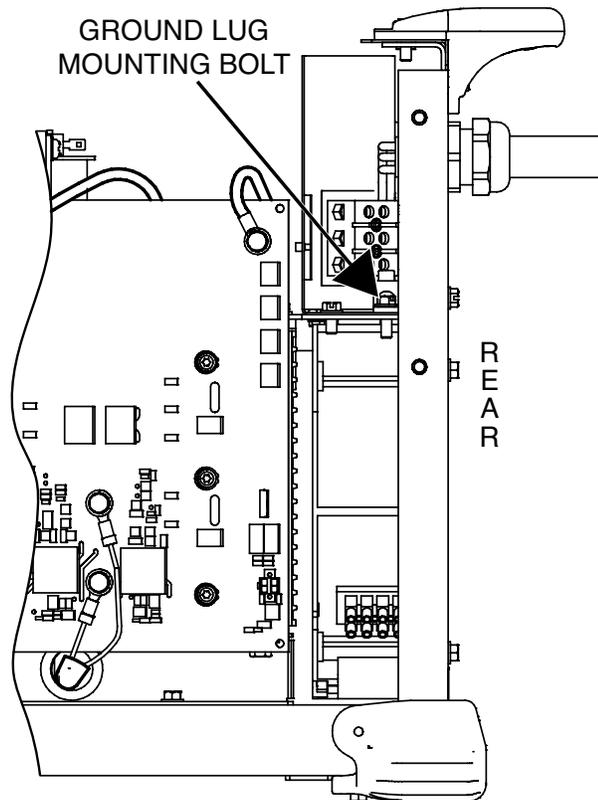
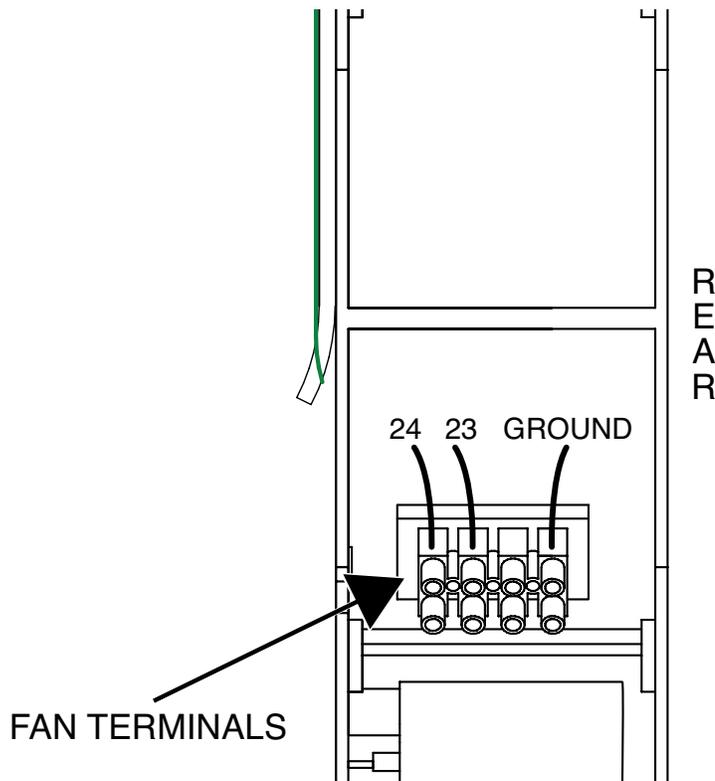
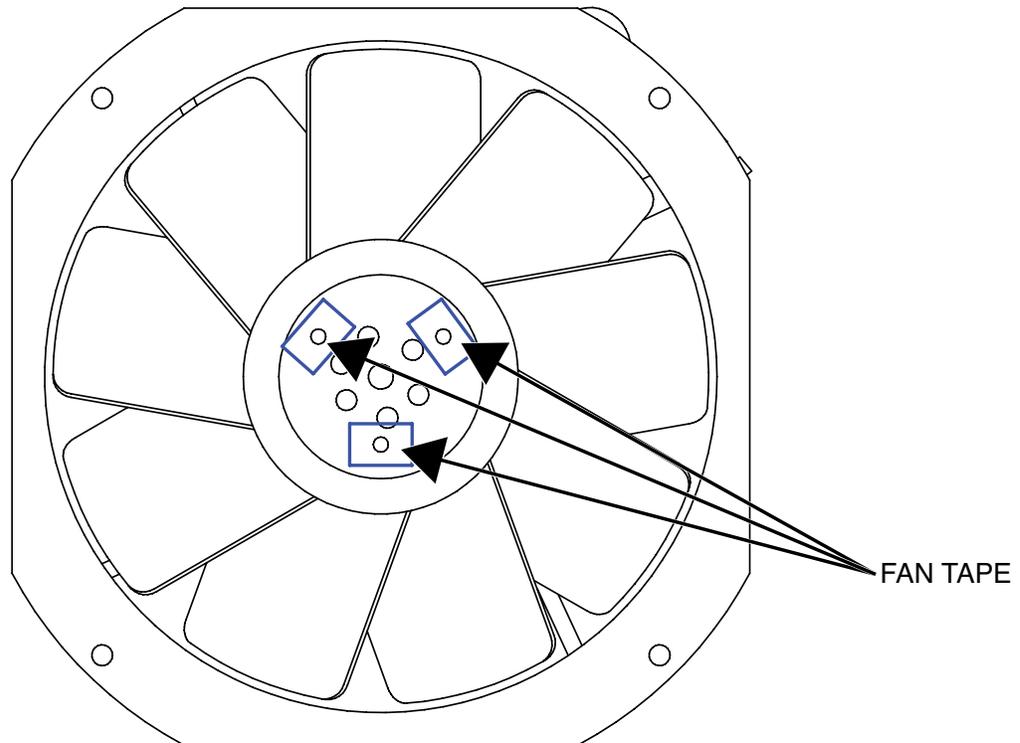


Figure F.52 – Fan terminal and lead locations



## FAN REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.53 – Fan taping detail



### REPLACEMENT PROCEDURE

1. Using the tape (supplied with fan), cover the three holes on the face of the fan. See Figure F.53.
2. Connect leads 24, 23 and ground lead to the fan terminals. See Wiring Diagram.
3. Using a small slotted screwdriver, tighten the screws securing the leads in the fan terminals.
4. Using cable ties, secure the leads to the fan body in the same manner as they were removed.
5. Carefully position the new fan into the machine. Note fan orientation for airflow. Airflow is rear to front.
6. Using a 3/8" nutdriver, tighten the bolt securing the ground lug to the divider panel.
7. Using a 3/8" nutdriver, attach the four screws securing the fan to the case back.
8. Connect plug J26 to the switch board. See Wiring Diagram.
9. Route the fan wiring thru the hole in the divider panel.
10. Using a 3/8" nutdriver, attach the nut and washer securing the ground (green) lead to the divider panel. See Wiring Diagram.
11. Connect leads 22 and 23 to leads H3 and H2 of the auxiliary transformer. See Wiring Diagram.
12. Carefully position the case back assembly onto the machine.
13. Using a 3/8" nutdriver, attach the screw and washer securing each rear corner cap.
14. Using a 3/8" nutdriver, attach the two screws securing the case back assembly to the divider panel.
15. Using a 3/8" nutdriver, attach the two screws securing the case back assembly to the base and center assembly.
16. Perform the **Case Cover Replacement Procedure**.
17. Perform the **Retest After Repair 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

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

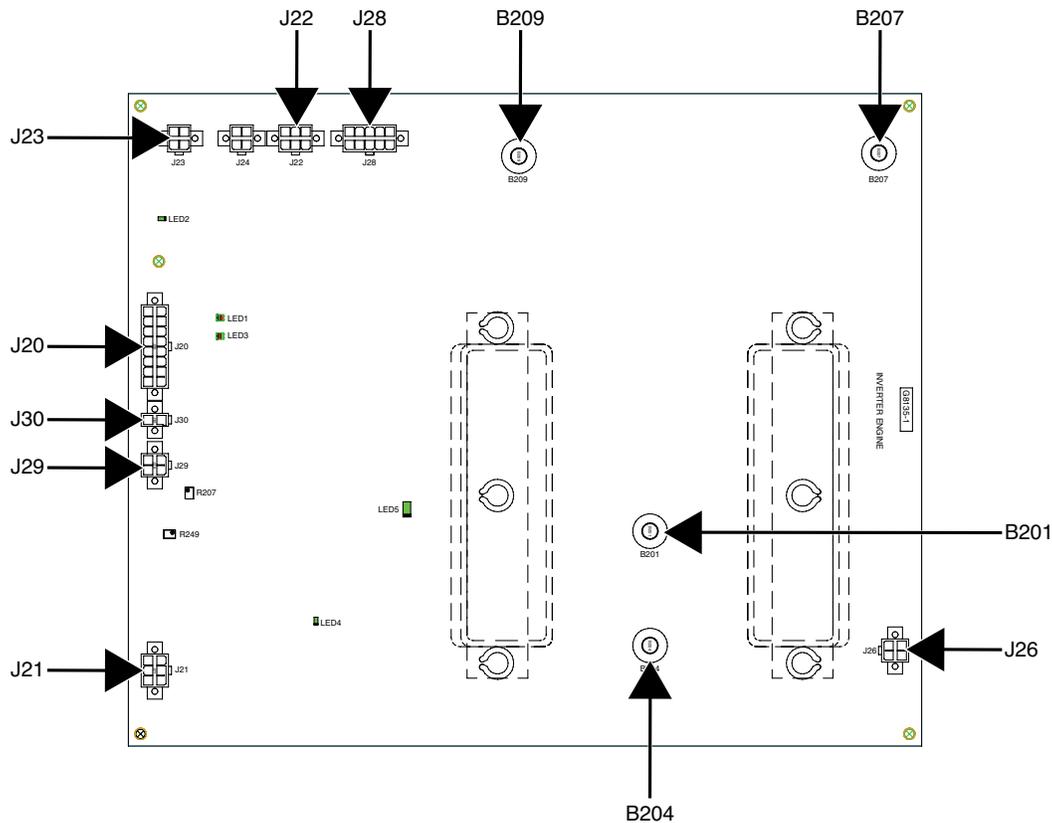
### **MATERIALS NEEDED**

- 7/16" Nutdriver
- 3/8" Nutdriver
- Wiring Diagram

## SWITCH BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.54 – Switch board plug and lead locations



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect plugs J23, J22, J28, J26, J21, J29, J30 and J20 from the switch board. See Figure F.54. See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the bolt and associated washers securing leads 209, 207, 201 and 204 to the switch board. Label and disconnect leads 209, 207, 201 and 204 from the switch board. See Figure F.54. See Wiring Diagram.
6. Using a 7/16" nutdriver, remove the two bolts, lockwashers and washers securing the heat sink to the divider panel. See **Figure F.55**.
7. Using a 3/8" nutdriver, remove the two bolts securing the switch board mounting brace to the base of the machine. See **Figure F.56**.
8. Carefully remove the switch board and heatsink assembly out of the machine.
9. Using a 7/16" nutdriver, remove the two bolts, lockwashers and washers securing the switch board and heat sink assembly to the mounting brace. See **Figure F.57**.
10. The heatsink and switch board can now be removed and replaced.

# SWITCH BOARD

## REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.55 – Switch board mounting screw locations

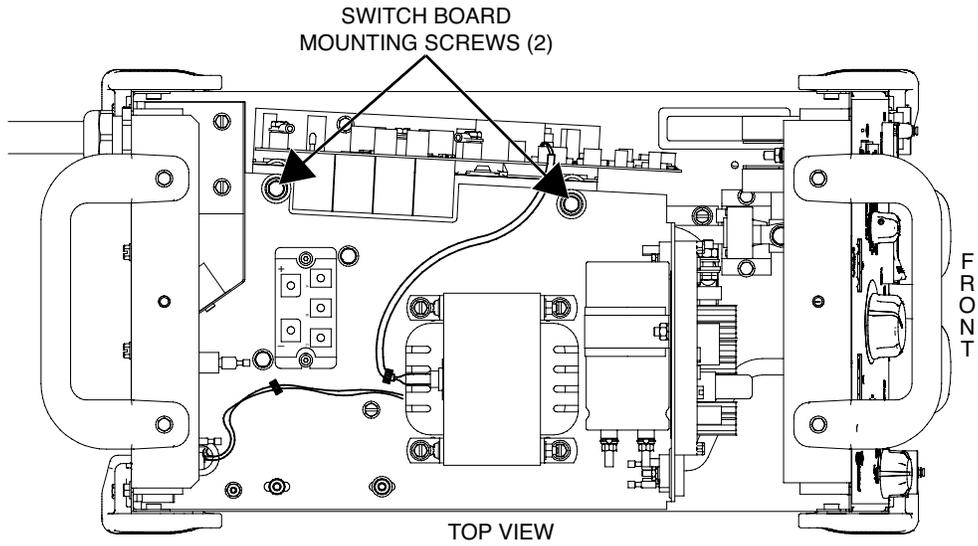
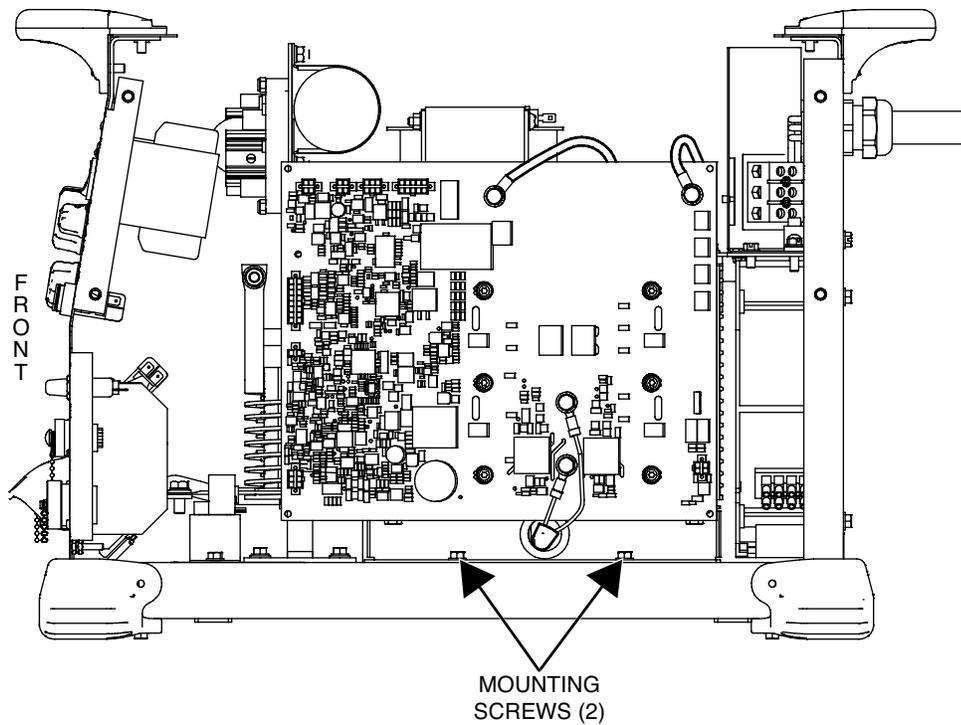


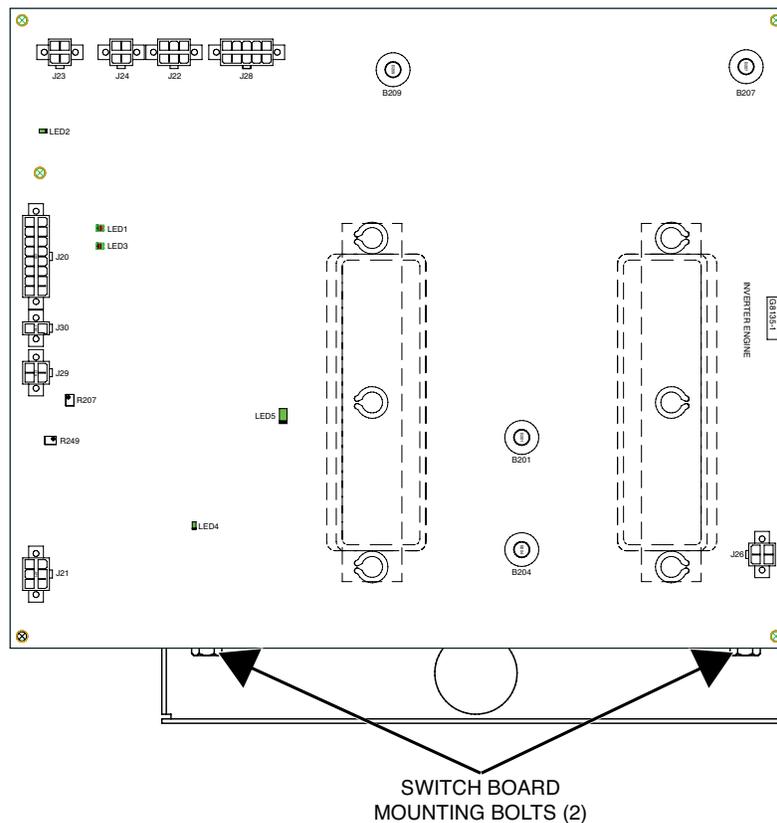
Figure F.56 – Heat sink mounting bracket screw locations



## SWITCH BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.57 – Heat sink mounting screw locations



### REPLACEMENT PROCEDURE

1. Using a 7/16" nutdriver, attach the two bolts, lockwashers and washers securing the switch board and heat sink assembly to the mounting brace.
2. Carefully position the new switch board and heat sink into the machine.
3. Using a 3/8" nutdriver, attach the two bolts securing the switch board mounting brace to the base of the machine.
4. Using a 7/16" nutdriver, attach the two bolts, lockwashers and washers securing the heat sink to the divider panel.
5. Using a 7/16" nutdriver, attach the bolt and associated washers securing leads 209, 207, 201 and 204 to the switch board. See Wiring Diagram. Torque to 50-60 in/lbs.
6. Connect plugs J23, J22, J28, J26, J21, J29, J30 and J20 to the switch board. See Wiring Diagram.
7. Perform the **Case Cover Replacement Procedure**.
8. Perform the **Retest After Repair Procedure**.

## OUTPUT RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

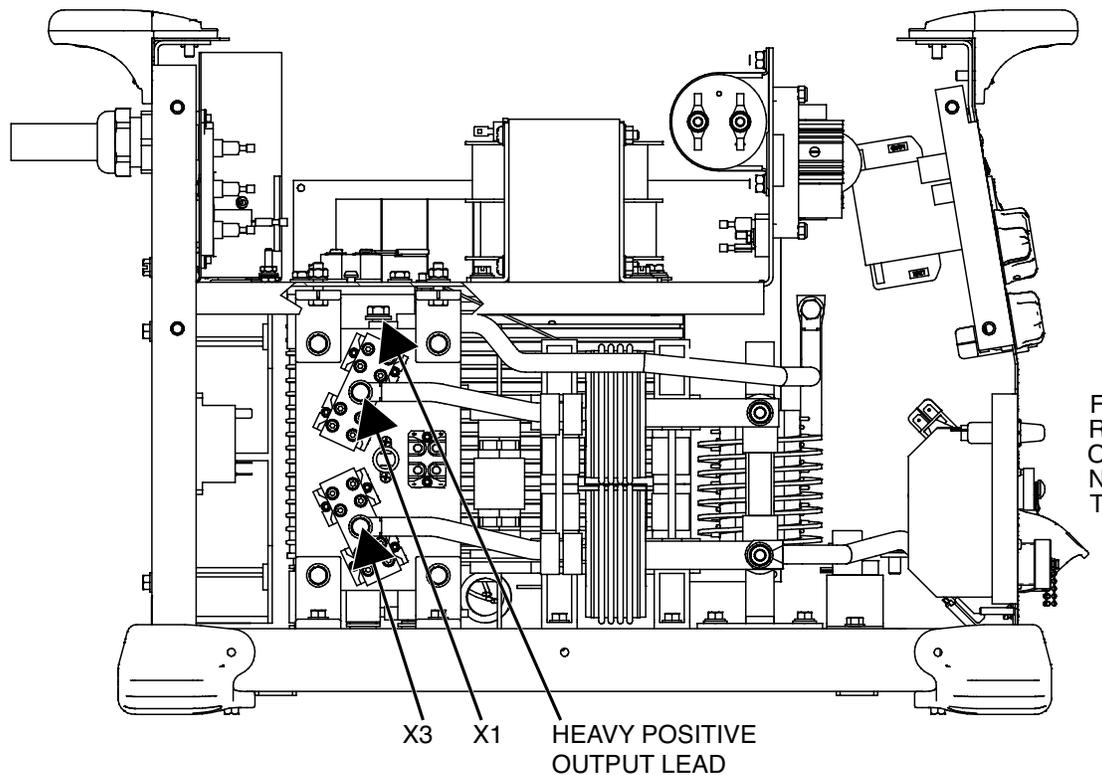
This procedure will aid the technician in the removal and replacement of the Output Rectifier Assembly.

### **MATERIALS NEEDED**

- 7/16" Nutdriver
- Torx Nutdriver (Size T20)
- 3/8" Nutdriver
- Penetrox Heat Sink Compound (Lincoln Part #T12837-1)
- Wiring Diagram

## OUTPUT RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.58 – X1 and X3 lead locations



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Using a 7/16" nutdriver, remove the bolt and associated washers securing the X1 and X3 leads to the output rectifier. See Figure F.58. See Wiring Diagram.
5. Label and disconnect leads #224 and the red lead from thermostat #2. See **Figure F.59**. See Wiring Diagram.
6. Using a Torx nutdriver (size T20), loosen the screws securing leads AC, POS, AC and NEG to the boost rectifier. Label and disconnect the leads from the boost rectifier. See **Figure F.59**. See Wiring Diagram.
7. Using a 3/8" nutdriver, remove the four screws securing the output rectifier assembly to the machine. See **Figure F.60**.
8. Carefully maneuver the output rectifier assembly out of the machine enough to remove the heavy positive output lead attached to the top of the output rectifier. Note the routing of leads from the main transformer thru the mounting brackets of the output rectifier for reassembly.
9. Using a 7/16" nutdriver, remove the bolt and associated washers securing the heavy positive output lead to the top of the output rectifier heatsink. See Figure F.58. See Wiring Diagram.
10. The output rectifier assembly can now be removed and replaced.

# OUTPUT RECTIFIER ASSEMBLY

## REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.59 – Thermostat #2 and boost rectifier lead connection points

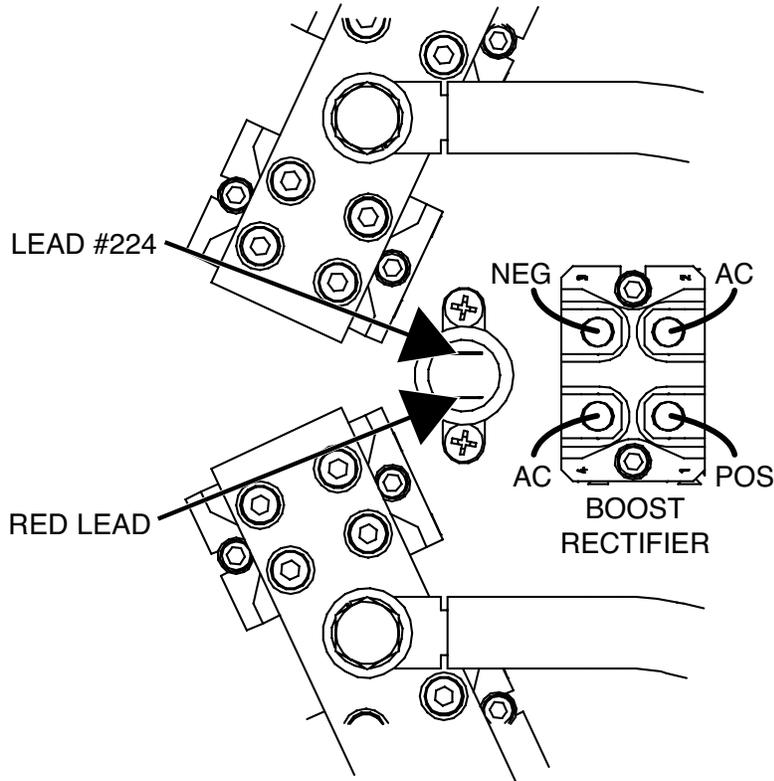
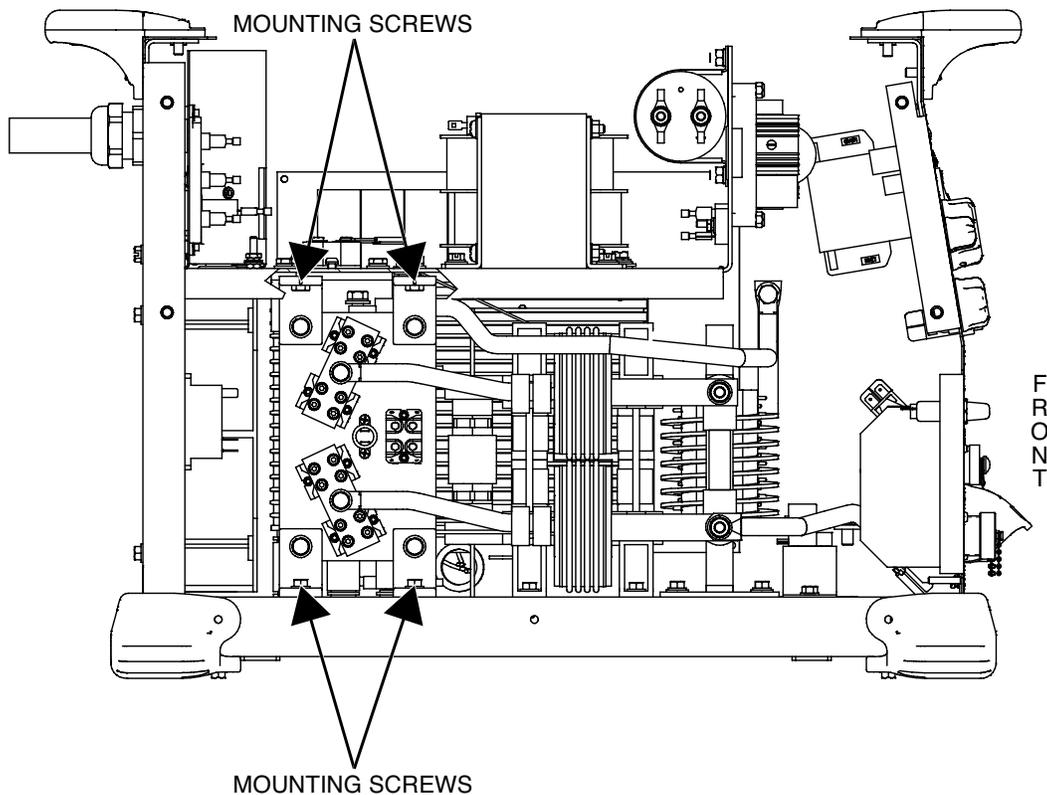


Figure F.60 – Output rectifier mounting screw locations



## OUTPUT RECTIFIER ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Apply a thin coating of Penetrox heat sink compound (Lincoln part #T12837-1) to the mating surfaces of the heavy positive output lead and the output rectifier heatsink.
2. Using a 7/16" nutdriver, attach the bolt and associated washers securing the heavy positive output lead to the top of the output rectifier heatsink. See Wiring Diagram.
3. Carefully position the output rectifier into the machine. Be sure to route the transformer leads thru the mounting brackets on the bottom of the output rectifier.
4. Using a 3/8" nutdriver, attach the four screws securing the output rectifier to the machine.
5. Connect leads AC, POS, AC and NEG to the boost rectifier. See Wiring Diagram.
6. Using a Torx nutdriver (size T20), tighten the screws securing leads AC, POS, AC and NEG to the boost rectifier. See Wiring Diagram.
7. Connect leads #224 and the red lead to thermostat #2. See Wiring Diagram.
8. Using a 7/16" nutdriver, attach the bolt and associated washers securing the X1 and X3 leads to the output rectifier. See Wiring Diagram.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

## CHOKE REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

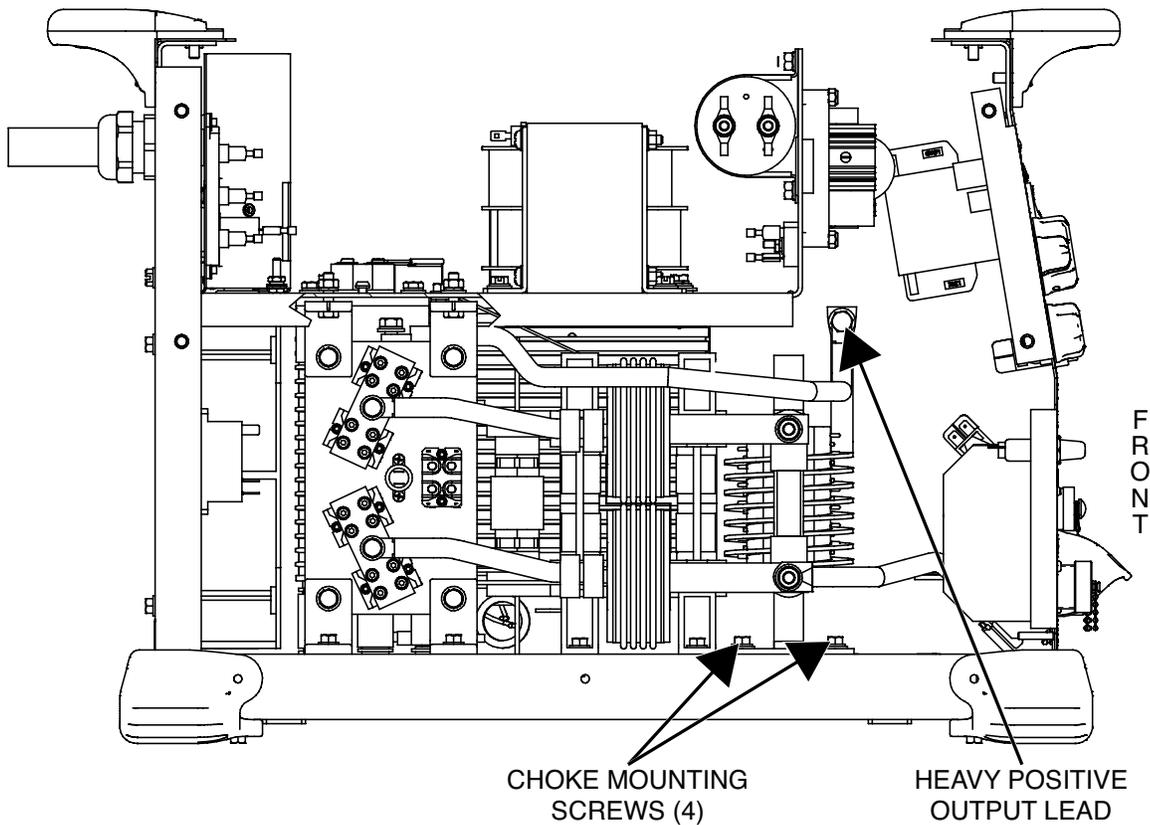
This procedure will aid the technician in the removal and replacement of the Choke.

### **MATERIALS NEEDED**

- 1/2" Nutdriver With An Extension
- 1/2" Open End Wrench
- 3/8" Nutdriver
- Penetrox Heat Sink Compound (Lincoln Part #T12837-1)
- Wiring Diagram

## CHOKE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.61 – Choke mounting bolts and lead #220 location



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Perform the ***Current Transducer Removal Procedure***.
5. Perform the ***Switch Board Removal Procedure***.
6. Using a 1/2" nutdriver with an extension and a 1/2" open end wrench, remove the bolt and associated washers securing the heavy positive output lead to the choke lead. See Figure F.61. See Wiring Diagram.
7. Using a 3/8" nutdriver, remove the four screws and washers securing the choke to the base assembly. See Figure F.61.
8. Carefully maneuver the choke out of the machine.

## CHOKE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Carefully position the new choke into the machine.
2. Using a 3/8" nutdriver, attach the four screws and washers securing the choke to the base assembly.
3. Apply a thin coating of Penetrox heat sink compound (Lincoln part #T12837-1) to the choke connection points.
4. Using a 1/2" nutdriver with an extension and a 1/2" open end wrench, attach the bolt and associated washers securing the heavy positive output lead to the choke lead. See Wiring Diagram.
5. Perform the ***Switch Board Replacement Procedure***.
6. Perform the ***Current Transducer Replacement Procedure***.
7. Perform the ***Case Cover Replacement Procedure***.
8. Perform the ***Retest After Repair Procedure***.



## USER INTERFACE BOARD REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

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

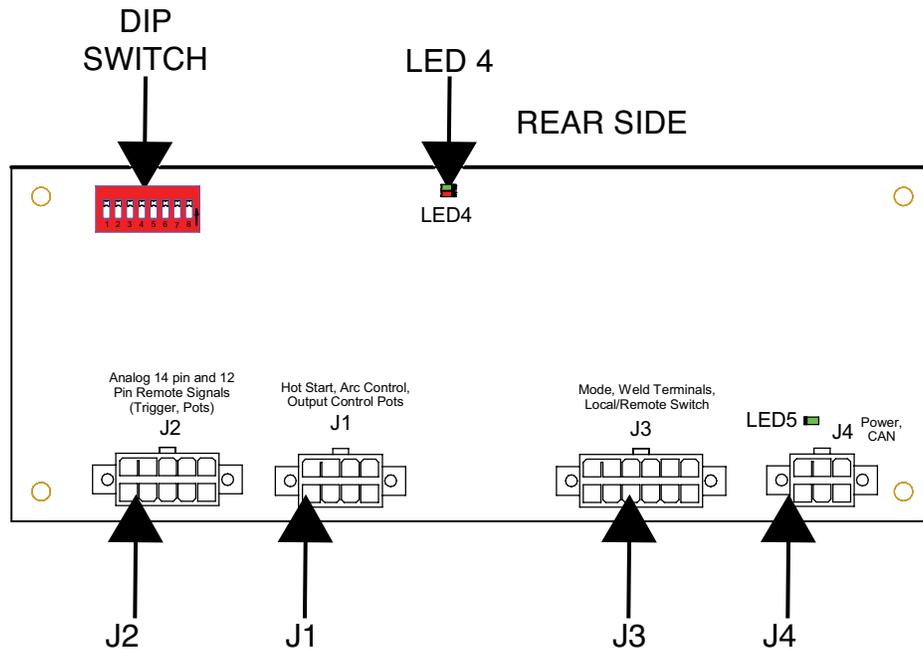
### **MATERIALS NEEDED**

Phillips Screwdriver  
Wiring Diagram

## USER INTERFACE BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.62 – User interface board plugs



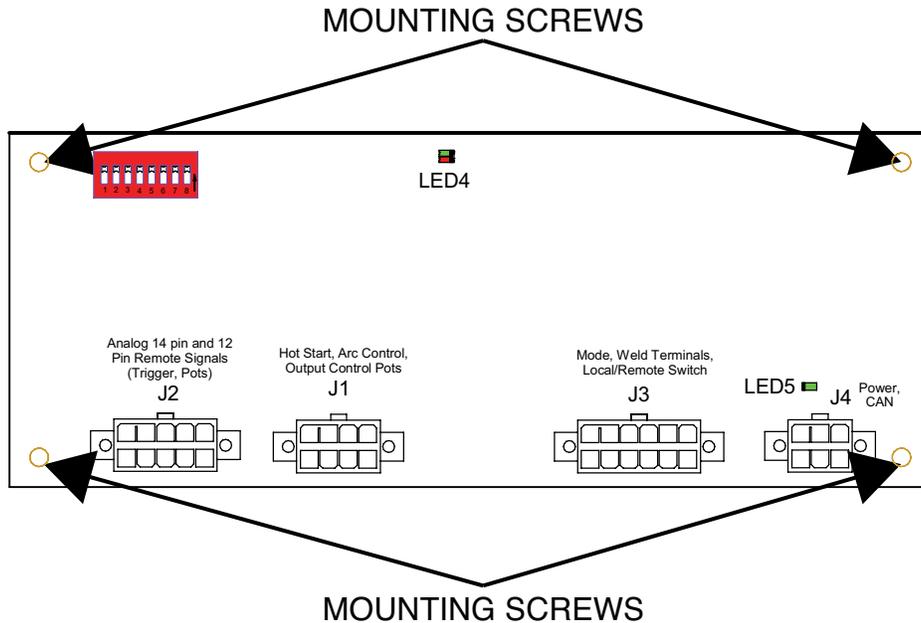
### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect plugs J1, J2, J3 and J4 from the rear of the user interface board. See Figure F.62. See Wiring Diagram.
5. Using a phillips screwdriver, remove the four screws securing the user interface board to the front panel. See **Figure F.63**.
6. The user interface board can now be removed and replaced.

## USER INTERFACE BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.63 – User interface mounting screw locations



### REPLACEMENT PROCEDURE

1. Carefully position the new user interface board into the machine.
2. Using a phillips screwdriver, attach the four screws securing the user interface board to the front panel.
3. Connect plugs J1, J2, J3 and J4 to the rear of the user interface board. See Wiring Diagram.
4. Perform the **Case Cover Replacement Procedure**.
5. Perform the **Retest After Repair Procedure**.



## THERMOSTAT #2 REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

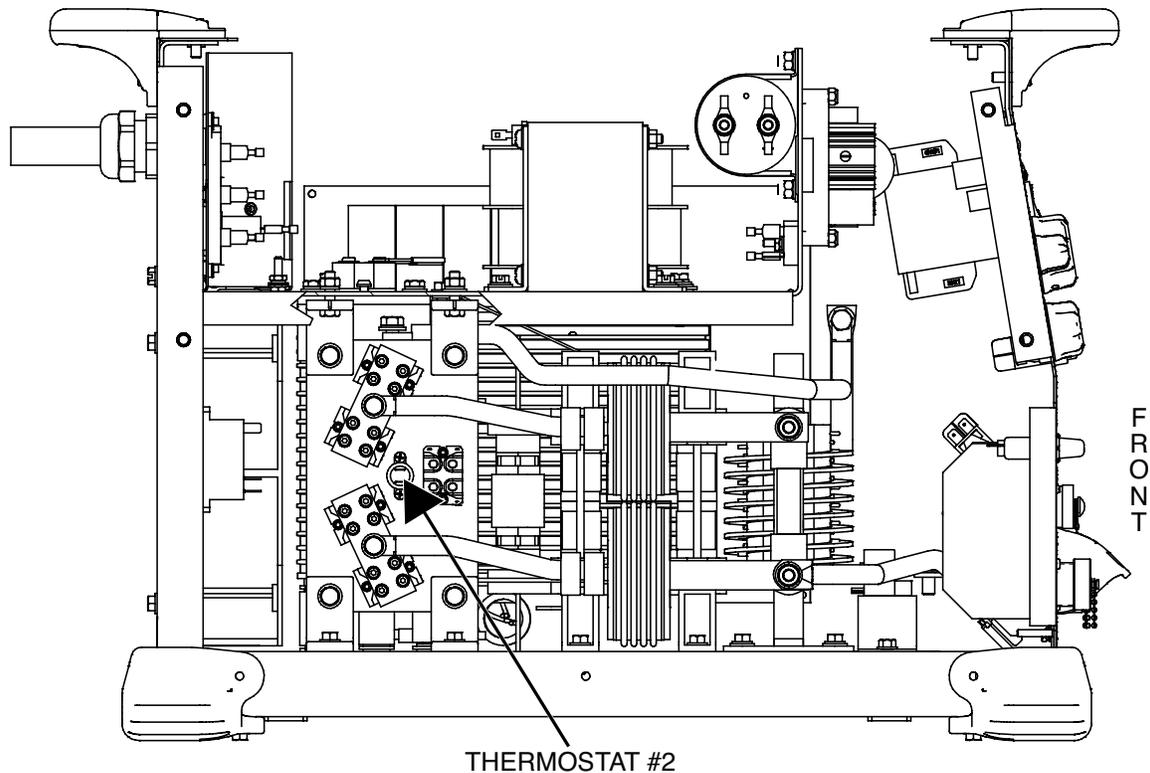
This procedure will aid the technician in the removal and replacement of Thermostat #2.

### **MATERIALS NEEDED**

Small Phillips Screwdriver  
Penetrox Heat Sink Compound (Lincoln Part #T12837-1)  
Wiring Diagram

## THERMOSTAT #2 REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.64 – Thermostat #2 lead locations

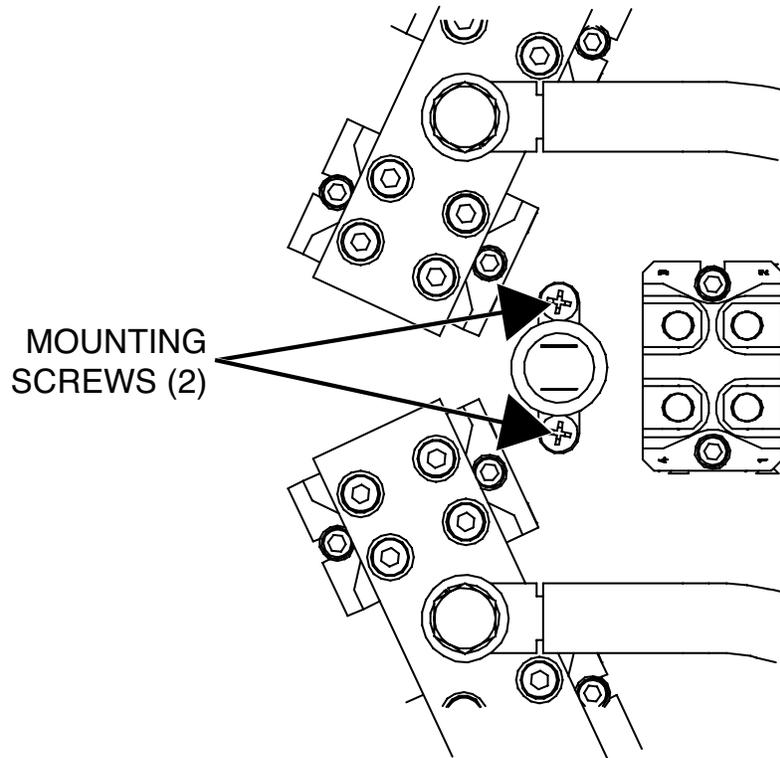


### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect lead #224 and the red lead from thermostat #2. See Figure F.64. See Wiring Diagram.
5. Using a small phillips screwdriver, remove the two screws securing thermostat #2 to the output rectifier assembly. See **Figure F.65**.
6. Thermostat #2 can now be removed and replaced.

## THERMOSTAT #2 REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.65 – Thermostat #2 mounting screw locations



### REPLACEMENT PROCEDURE

1. Clean the mating surface of output rectifier heatsink before replacing thermostat #2.
2. Apply a coating of Penetrox heat sink compound (Lincoln part #T12837-1) to the rear of thermostat #2.
3. Carefully position the new thermostat #2 onto the output rectifier heatsink.
4. Using a small phillips screwdriver, attach the two screws securing thermostat #2 to the output rectifier assembly.
5. Connect lead #224 and the red lead to thermostat #2. See Wiring Diagram.
6. Perform the **Case Cover Replacement Procedure**.
7. Perform the **Retest After Repair 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

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

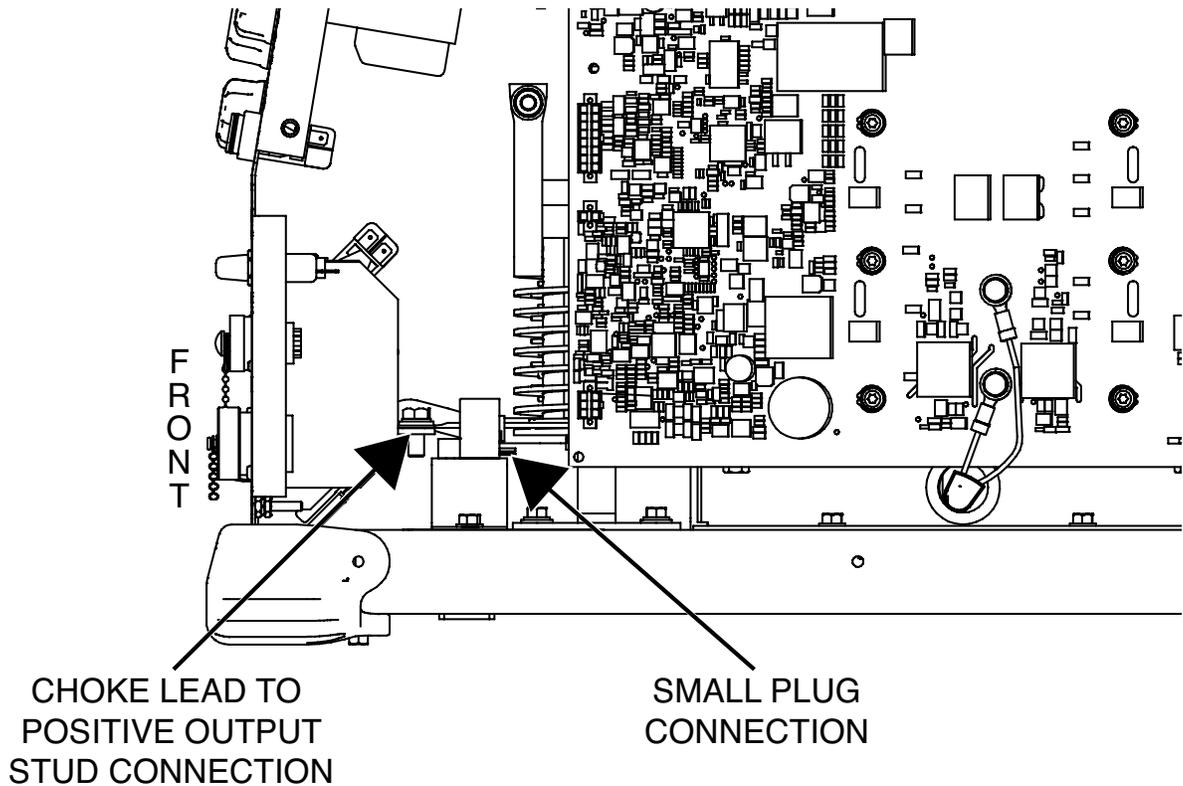
### **MATERIALS NEEDED**

- 1/2" Wrench
- 3/8" Nutdriver
- 1/4" Nutdriver
- Penetrox Heat Sink Compound (Lincoln Part #T12837-1)
- Wiring Diagram

## CURRENT TRANSDUCER

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.66 – Current transducer plug location



### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect the small plug from the rear of the current transducer. See Figure F.66. See Wiring Diagram.
5. Using a 1/2" wrench, remove the bolt, lockwasher and washer securing the choke lead to the positive output stud. See Figure F.66. See Wiring Diagram.
6. Using a 3/8" nutdriver, remove the two screws securing the LEM support to the base assembly. See **Figure F.67**.
7. Using a 3/8" nutdriver, remove the two screws and washers securing the front corner caps to the machine. See **Figure F.68**.
8. Using a 3/8" nutdriver, remove the two screws securing the front panel to the base assembly. See **Figure F.68**.
9. Using a 1/2" wrench, label and disconnect lead #221 (heavy lead) from the main transformer. See **Figure F.69**. See Wiring Diagram. This will allow the front panel to be moved forward.
10. Carefully slide the front panel away from the machine to allow for the removal of the current transducer.
11. Carefully maneuver the current transducer and LEM support out of the machine.
12. Using a 1/4" nutdriver, remove the screw securing the current transducer to the LEM support. See **Figure F.70**.
13. The current transducer can now be removed and replaced.

# CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.67 – LEM support mounting screw locations

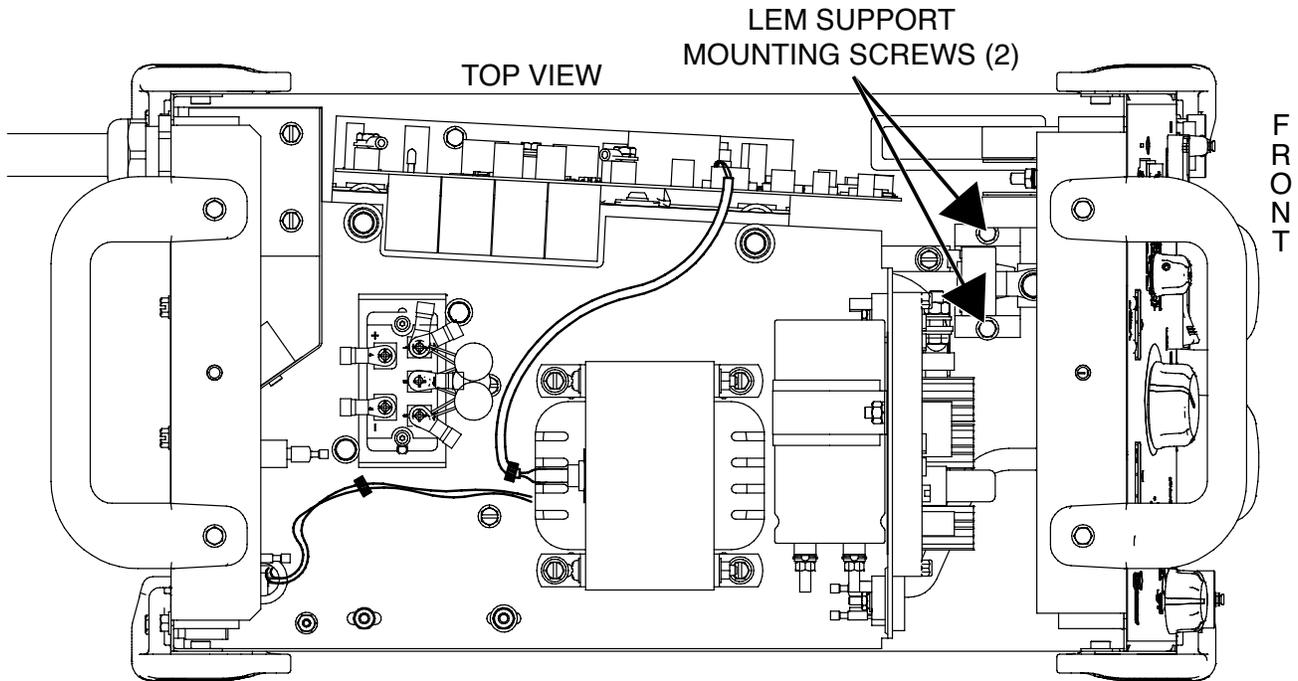
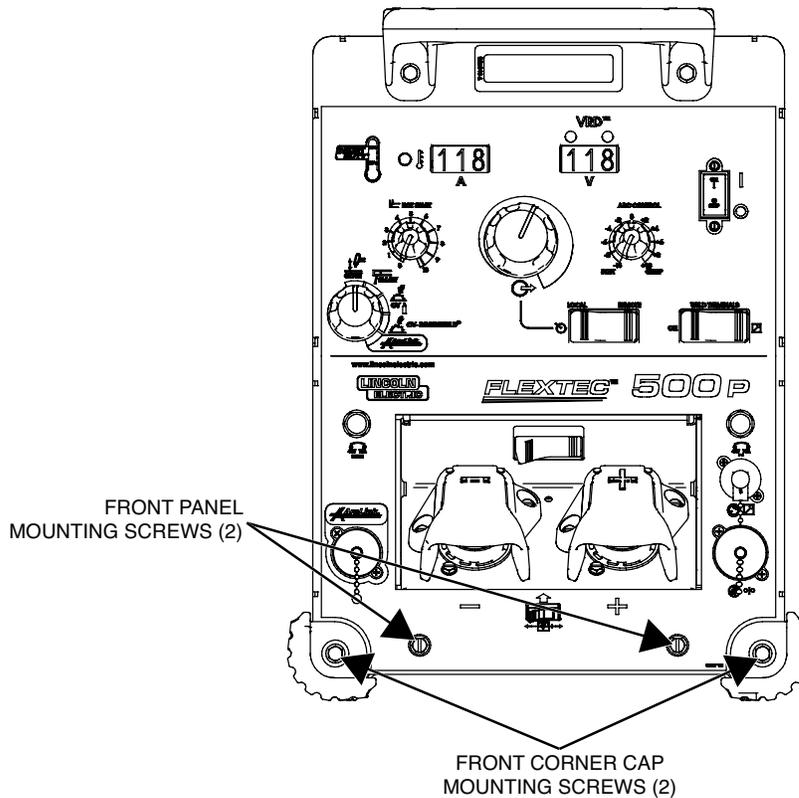


Figure F.68 – Front panel mounting screw locations



# CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.69 – Lead #221 connection point

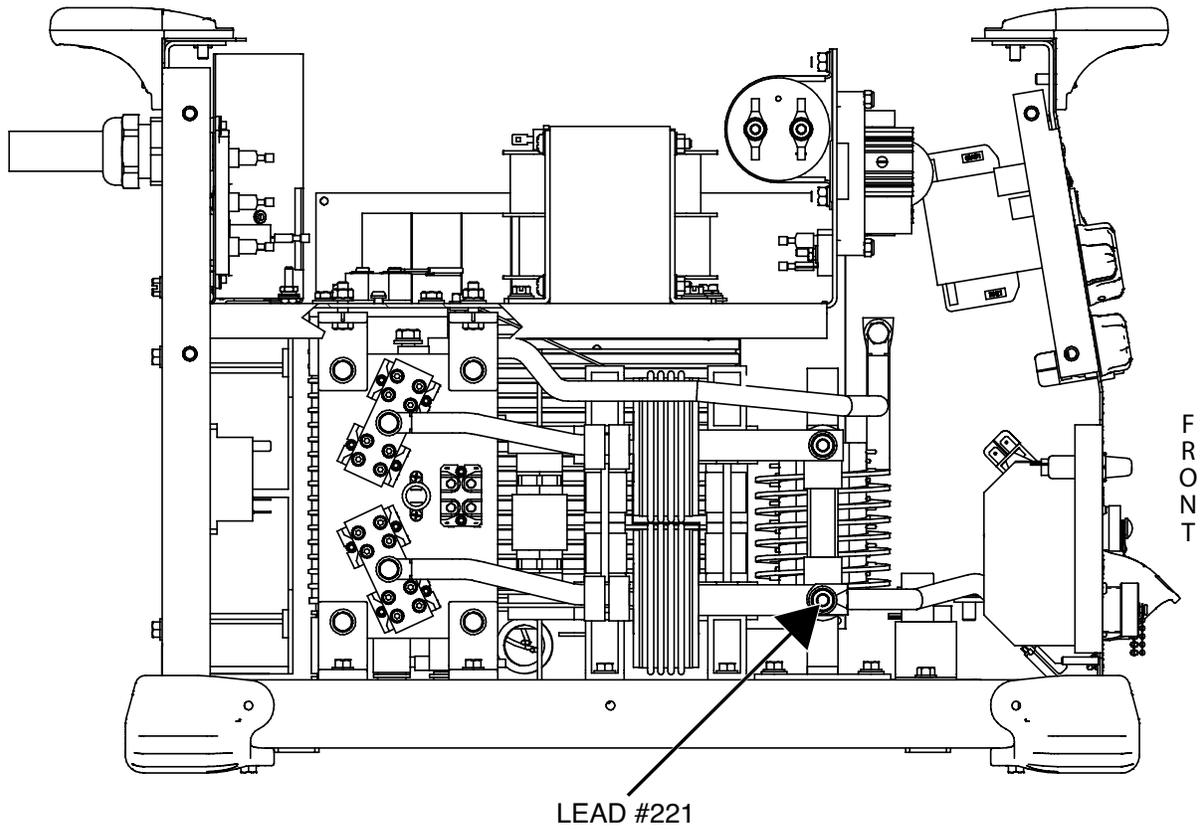
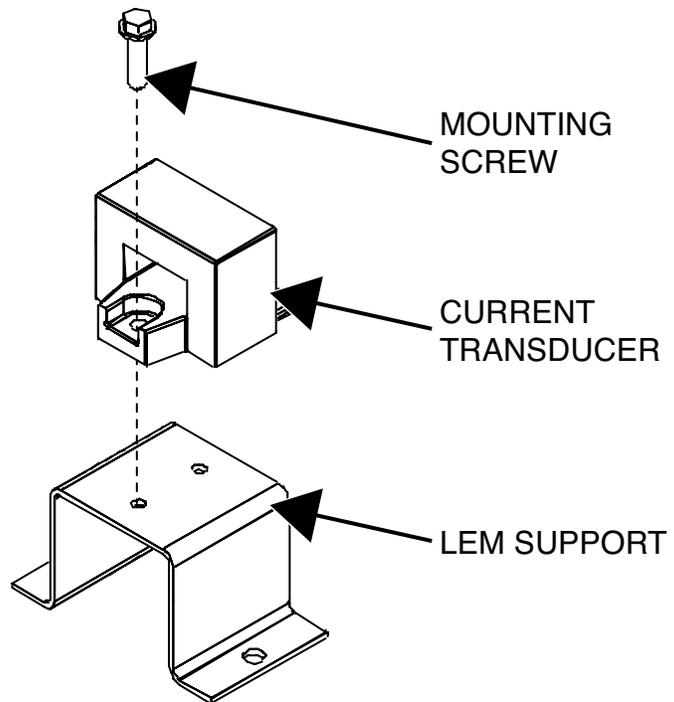


Figure F.70 – Current transducer mounting screw location



## CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

### REPLACEMENT PROCEDURE

1. Using a 1/4" nutdriver, attach the screw securing the current transducer to the LEM support. Make sure the arrow on the LEM is pointing towards the front of the machine.
2. Apply a thin coating of Penetrox heat sink compound (Lincoln part #T12837-1) to the choke connection point and lead #221 connection point.
3. Carefully position the current transducer and LEM support into the machine. Be sure the current transducer is placed with the plug connector facing the rear of the machine and with the output choke lead going thru it.
4. Using a 3/8" nutdriver, attach the two screws securing the LEM support to the base assembly.
5. Carefully position the front panel back into position on the machine.
6. Using a 3/8" nutdriver, attach the two screws and washers securing the front corner caps to the machine.
7. Using a 3/8" nutdriver, attach the two screws securing the front panel to the base assembly.
8. Using a 1/2" wrench, attach the bolt, lockwasher and washer securing the choke lead to the positive output stud. See Wiring Diagram.
9. Using a 1/2" wrench, connect lead #221 (heavy lead) to the main transformer. See Wiring Diagram.
10. Connect the plug to the rear of the current transducer. See Wiring Diagram.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform the ***Retest After Repair 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 troubleshooting assistance before you proceed. Call 1-888-935-3877.

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### **TEST DESCRIPTION**

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

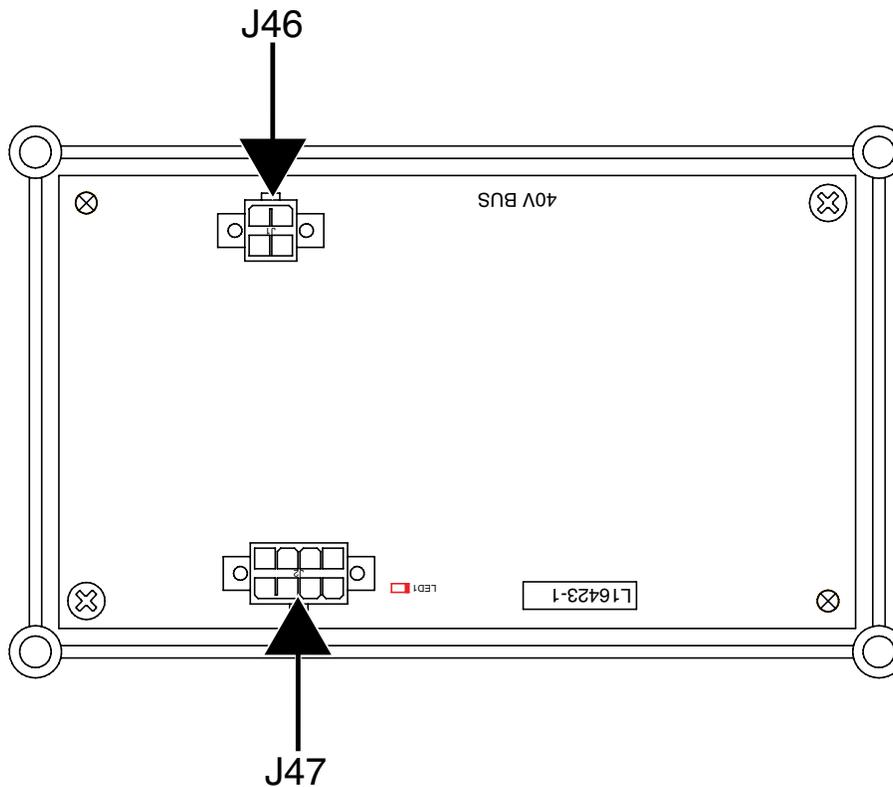
### **MATERIALS NEEDED**

3/8" Nutdriver  
Wiring Diagram

## DC BUS BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.71 – DC bus board plugs



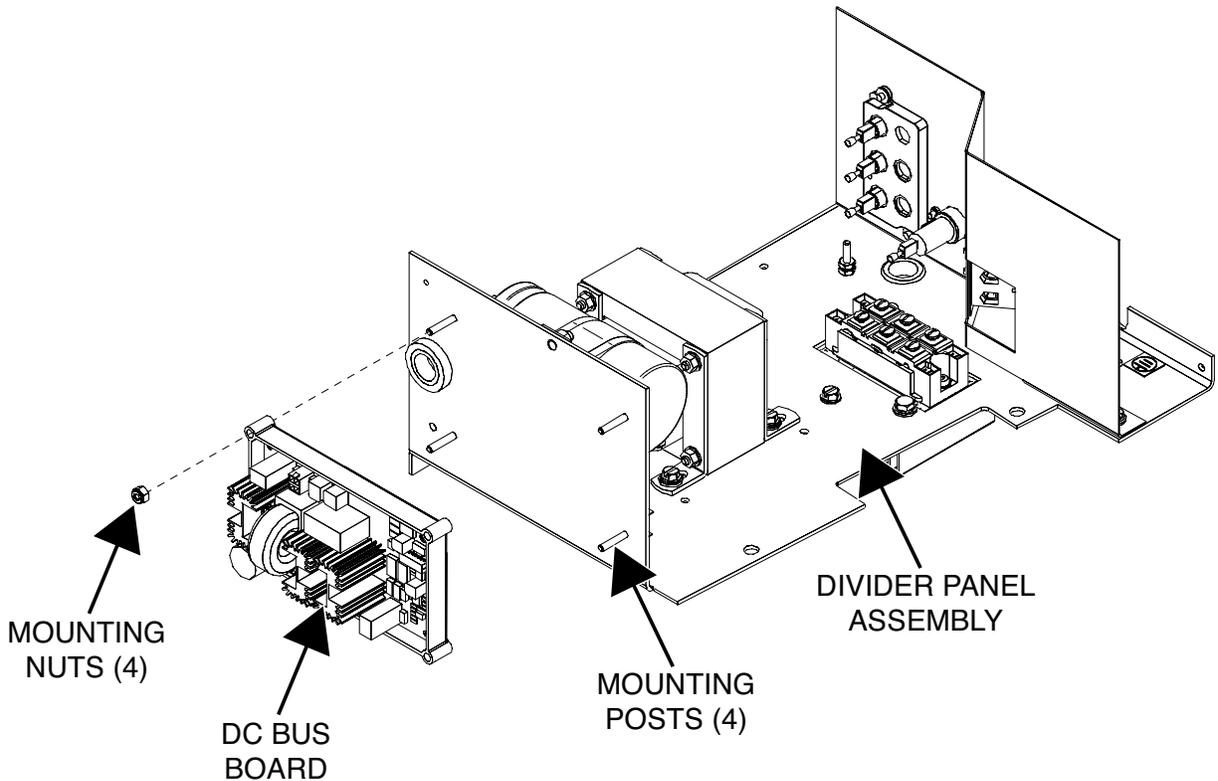
### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect plugs J46 and J47 from the DC bus board.  
See Figure F.71. See Wiring Diagram.
5. Using a 3/8" nutdriver, remove the four nuts securing the DC bus board to the divider panel assembly. See **Figure F.72**.
6. Carefully slide the DC bus board off the mounting posts.
7. The DC bus board can now be removed and replaced.

## DC BUS BOARD

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.72 – DC bus board mounting nut locations



### REPLACEMENT PROCEDURE

1. Carefully position the DC bus board onto the mounting posts of the divider panel assembly.
2. Using a 3/8" nutdriver, attach the four nuts securing the DC bus board to the divider panel assembly. Torque to 9-11 in/lbs.
3. Connect plugs J46 and J47 to the DC bus board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.
5. Perform the ***Retest After Repair Procedure***.



## D3 AND D4 RECTIFIERS REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the D3 and/or D4 Rectifiers.

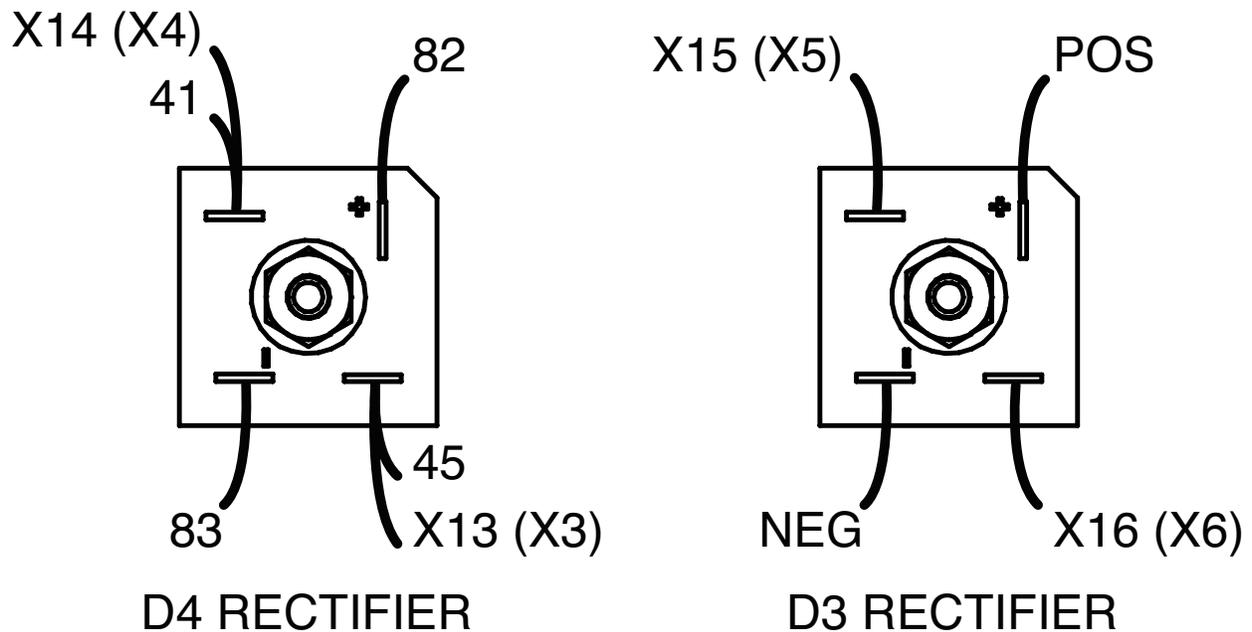
### **MATERIALS NEEDED**

3/8" Deep Well Nutdriver  
Dow Corning 340 Heat Sink Compound (Lincoln Part #T12837)  
Wiring Diagram

## D3 AND D4 RECTIFIERS

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.73 – D3 and D4 rectifier lead locations



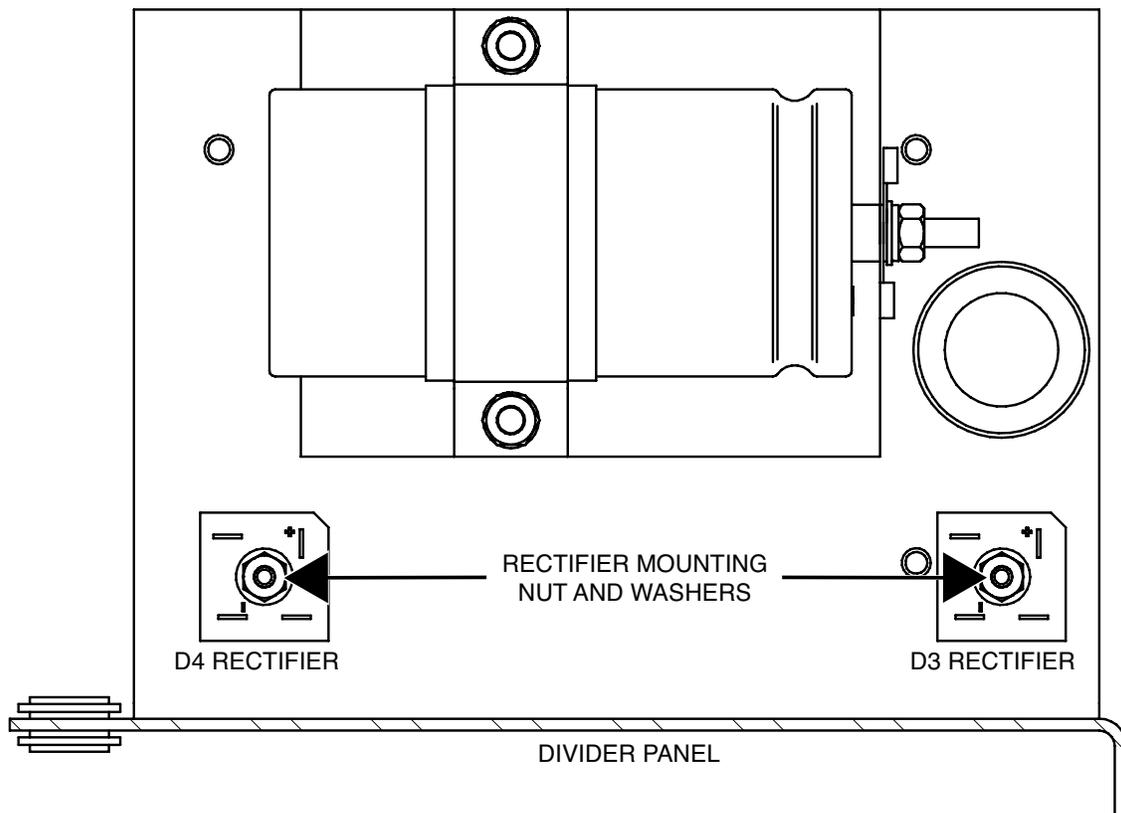
### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect leads X15 (X5), POS, NEG and X16 (X6) from the D3 rectifier. See Figure F.73. See Wiring Diagram.
5. Label and disconnect leads X14 (X4), 41, 82, 83, X13 (X3) and 45 from the D4 rectifier. See Figure F.73. See Wiring Diagram.
6. Using a 3/8" deep well nutdriver, remove the nut, lockwasher and washer securing the D3 rectifier to the divider panel. See **Figure F.74**. Repeat for D4 rectifier if necessary.
7. The rectifier(s) can now be removed and replaced.

## D3 AND D4 RECTIFIERS

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.74 – Rectifier mounting nut and washers locations



### REPLACEMENT PROCEDURE

1. Clean the mating surface on the divider panel before installing the new rectifier.
2. Apply a coating of Dow Corning 340 heat sink compound (Lincoln part #T12837) to the rear of the rectifier.
3. Using a 3/8" deep well nutdriver, attach the nut, lockwasher and washer securing the D3 rectifier to the divider panel. Repeat for D4 rectifier if necessary. Torque to 20 in/lbs.
4. Connect leads X14 (X4), 41, 82, 83, X13 (X3) and 45 to the D4 rectifier. See Wiring Diagram.
5. Connect leads X15 (X5), POS, NEG and X16 (X6) to the D3 rectifier. See Wiring Diagram.
6. Perform the **Case Cover Replacement Procedure**.
7. Perform the **Retest After Repair Procedure**.



## BOOST RELAY REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the Boost Relay.

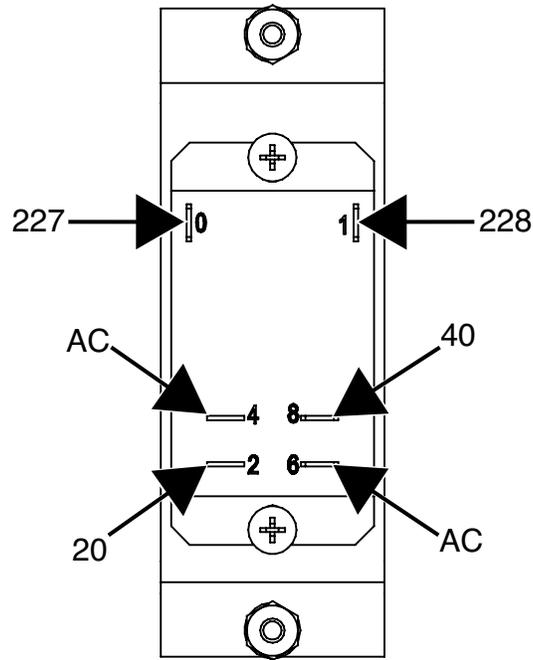
### **MATERIALS NEEDED**

1 1/32" Nutdriver  
Phillips Screwdriver  
Wiring Diagram

## BOOST RELAY

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.75 – Boost relay lead locations



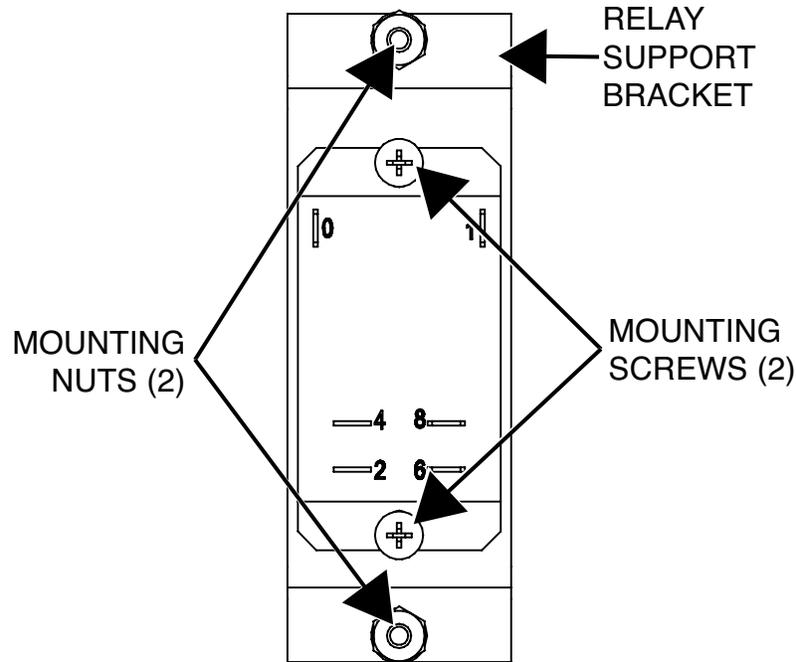
### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Label and disconnect leads 227, 228, AC, 40, 20 and AC from the boost relay terminals. See Figure F.75. See Wiring Diagram.
5. Using a 11/32" nutdriver, remove the two nuts, lockwashers and washers securing the relay support bracket to the machine. See **Figure F.76**.
6. Carefully slide the relay support bracket and the boost relay off the mounting posts.
7. Using a phillips screwdriver, remove the two screws securing the boost relay to the relay support bracket. See **Figure F.76**.
8. The boost relay can now be removed and replaced.

## BOOST RELAY

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.76 – Boost relay mounting hardware



### REPLACEMENT PROCEDURE

1. Carefully position the new boost relay onto the relay support bracket.
2. Using a phillips screwdriver, attach the two screws securing the boost relay to the relay support bracket. Torque to 10-12 in/lbs.
3. Carefully slide the relay support bracket and the boost relay onto the mounting posts.
4. Using a 11/32" nutdriver, attach the two nuts, lockwashers and washers securing the relay support bracket to the machine.
5. Connect leads 227, 228, AC, 40, 20 and AC to the boost relay terminals. See Wiring Diagram.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.



## MAIN TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE

### **WARNING**

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

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

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### **TEST DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the Main Transformer.

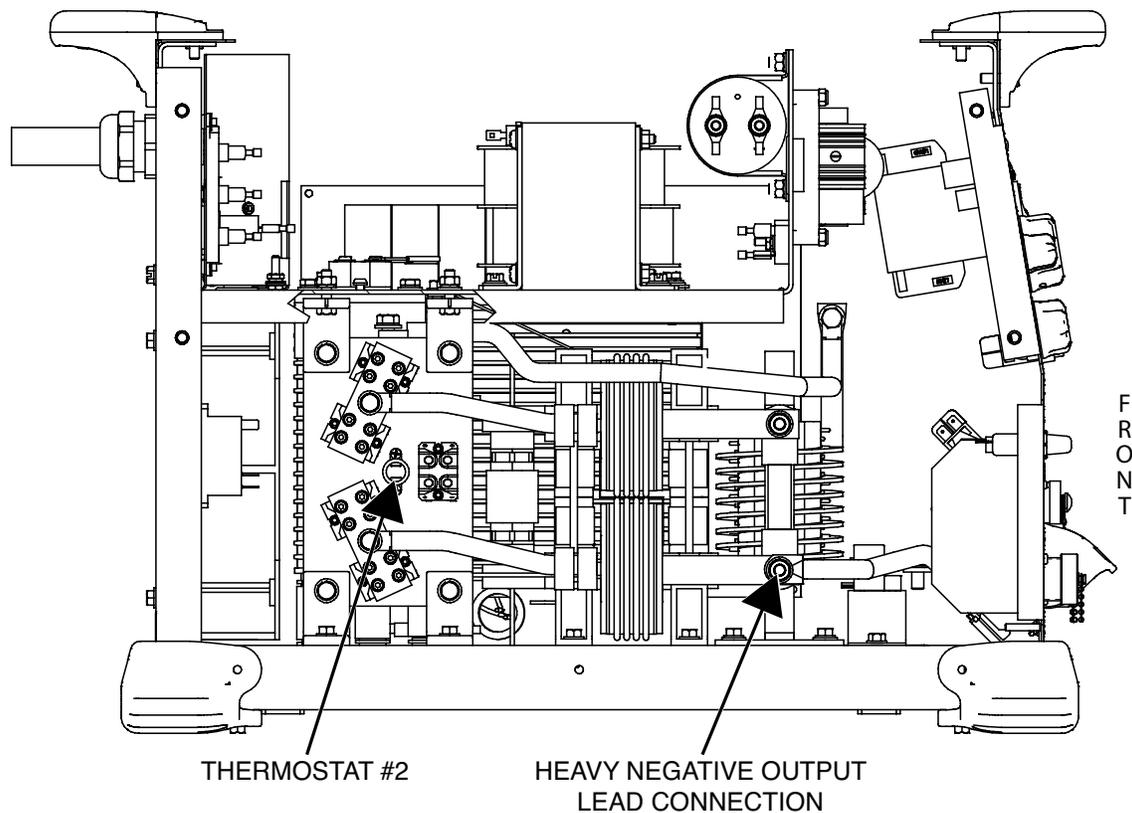
### **MATERIALS NEEDED**

- 7/16" Nutdriver
- 3/8" Nutdriver
- Penetrox Heat Sink Compound (Lincoln Part #T12837-1)
- Wiring Diagram

## MAIN TRANSFORMER

### REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.77 – NEG lead and thermostat #2 locations



#### REMOVAL PROCEDURE

1. Remove the input power to the Flextec 500P machine.
2. Perform the **Case Cover Removal Procedure**.
3. Perform the **Capacitor Discharge Procedure**.
4. Perform the **Choke Removal Procedure**.
5. Label and disconnect the heavy negative output lead from the main transformer. See Figure F.77. See Wiring Diagram.
6. Label and disconnect the red lead from thermostat #2. See Figure F.77. See Wiring Diagram.
7. Label and disconnect the other red thermostat lead from lead 225 at the quick disconnect located in the plastic flex wire shielding. Cut any cable ties as necessary.
8. Label and disconnect leads 40 and 20 from the boost relay terminals. See **Figure F.78**. See Wiring Diagram.
9. Using a 7/16" nutdriver, remove the bolt and associated washers securing leads X1 and X3 to the output rectifier. See **Figure F.79**. See Wiring Diagram.
10. Using a 3/8" nutdriver, remove the four screws securing the main transformer to the base. See **Figure F.79**.
11. Carefully route leads 201 and 204 thru the hole in the switch board brace. See **Figure F.80**. See Wiring Diagram.
12. Cut cable ties and move wiring to allow for the removal of the main transformer. See Wiring Diagram.
13. Carefully maneuver the main transformer out of the machine.
14. The main transformer can now be removed and replaced.

# MAIN TRANSFORMER

## REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.78 – Boost relay lead 40 and 20 locations

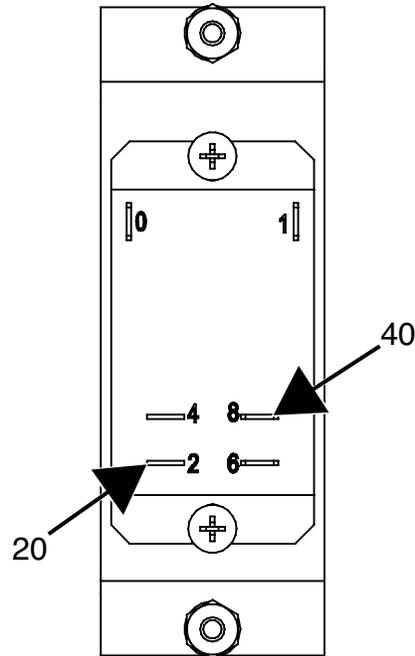
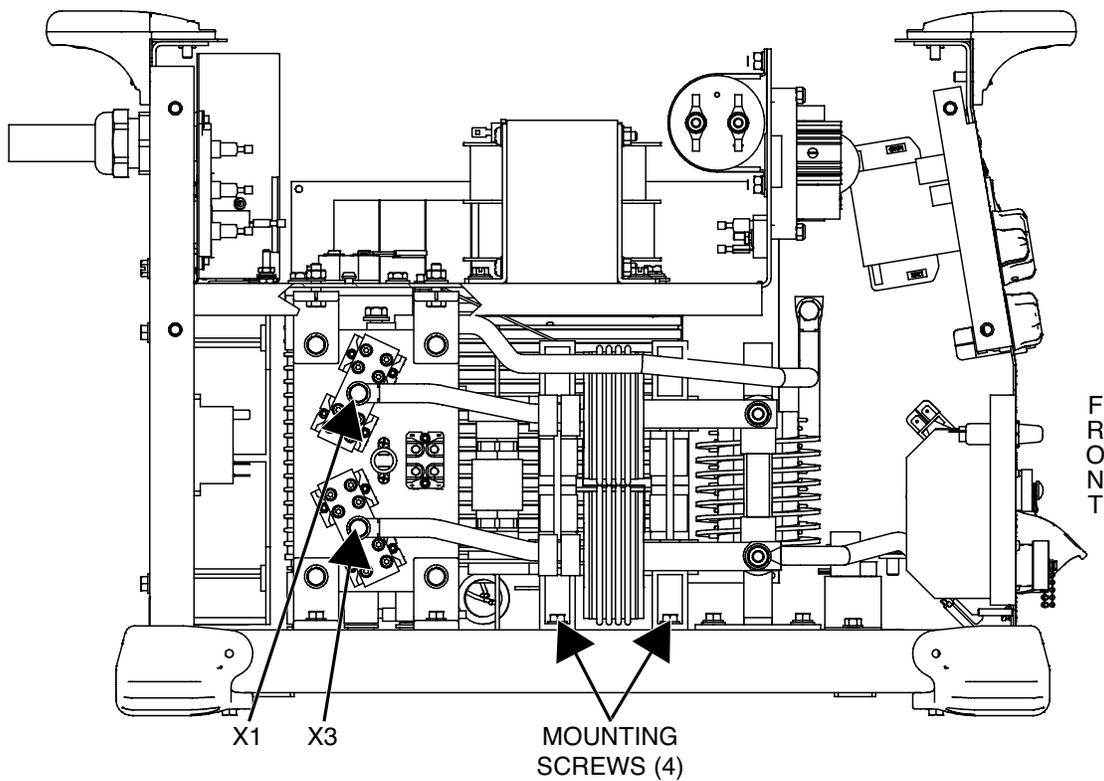
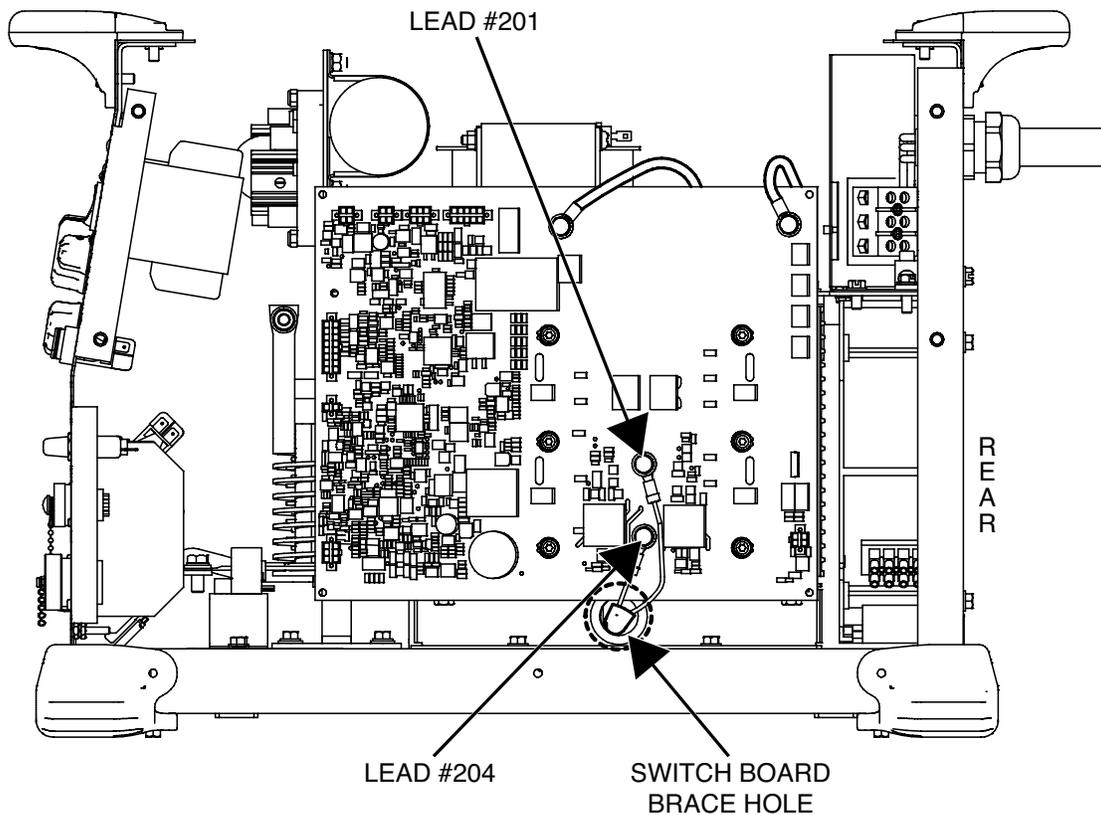


Figure F.79 – X1, X3 and main transformer mounting screw locations



## MAIN TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.80 – Switch board brace hole location



### REPLACEMENT PROCEDURE

1. Carefully position the new main transformer into the machine. Be sure to route all cables and leads in the same manner as they were removed.
  2. Replace any previously removed cable ties.
  3. Carefully route leads 201 and 204 thru the hole in the switch board brace. See Wiring Diagram.
  4. Using a 3/8" nutdriver, attach the four screws securing the main transformer to the base.
  5. Using a 7/16" nutdriver, attach the bolt and associated washers securing leads X1 and X3 to the output rectifier. See Wiring Diagram.
- NOTE:** Apply a thin coating of Penetrox heat sink compound (Lincoln part #T12837-1) to the X1 and X3 connection points.
6. Connect leads 40 and 20 to the boost relay terminals. See Wiring Diagram.
  7. Connect the red thermostat lead to the quick connect lead #225. Replace any previously removed cable ties. See Wiring Diagram.
  8. Connect the transformer lead to thermostat #2. See Wiring Diagram.
  9. Connect the NEG lead to the main transformer. See Wiring Diagram.
  10. Perform the **Choke Replacement Procedure**.
  11. Perform the **Case Cover Replacement Procedure**.
  12. Perform the **Retest After Repair Procedure**.
- NOTE:** Apply a thin coating of Penetrox heat sink compound to the NEG lead connection point.

## RETEST AFTER REPAIR PROCEDURE

Testing is required after the removal of any component that could affect the machine's electrical characteristics or if any electrical components are repaired or replaced.

VOLTAGES	IDLE WATTS	CONDITIONS
380 / 460 / 575	150 W	FAN ON
50 / 60 Hz 3 PHASE	70 W	FAN OFF

MINIMUM ACCEPTABLE OUTPUTS		
PROCESS	VOLTS	AMPERAGE
GMAW (CV)	39 V	500 A
GMAW-P (CV)	39 V	500 A
GTAW (CC)	30 V	500 A
SMAW (CC)	40 V	500 A
FCAW (CV)	39 V	500 A



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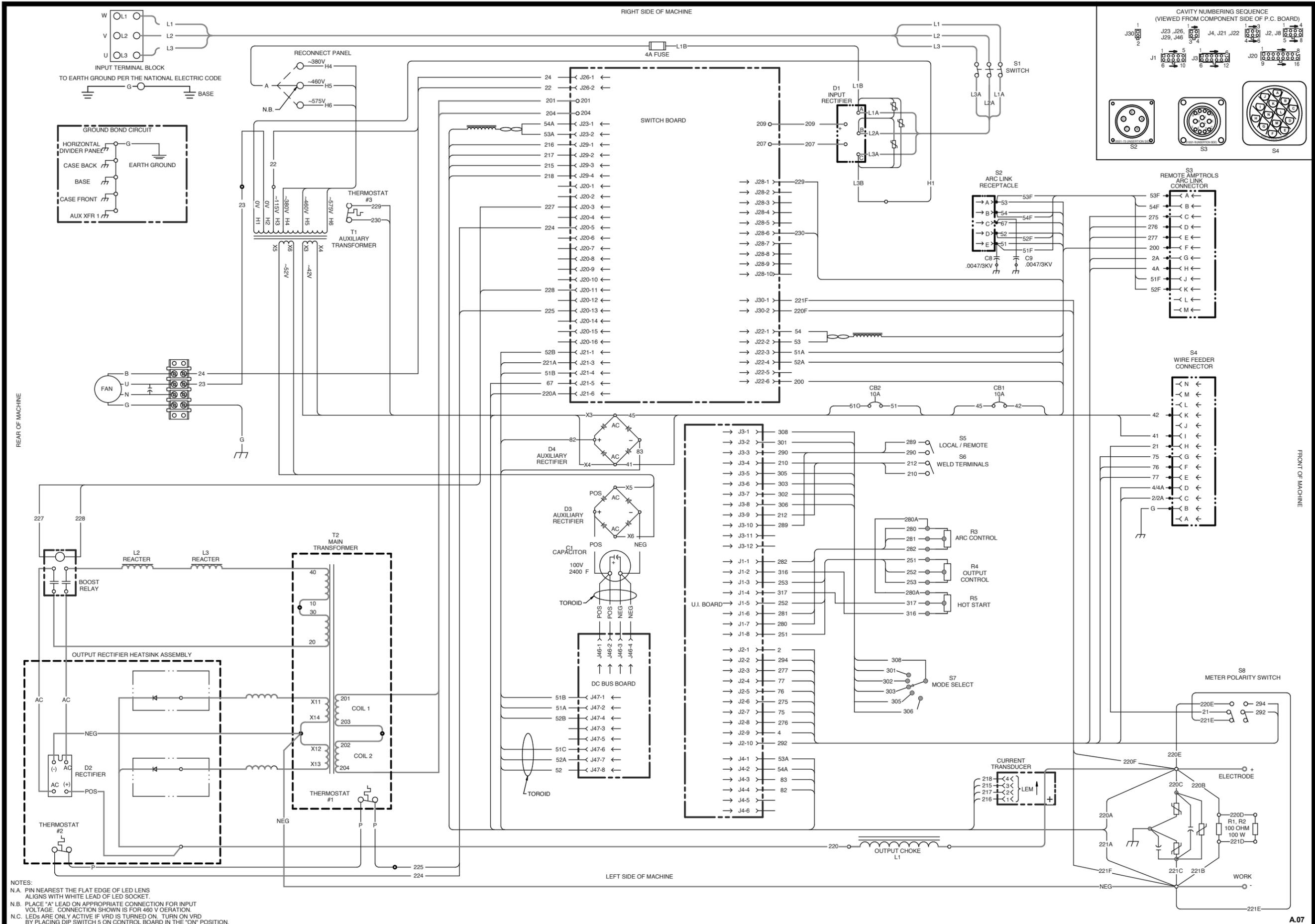
# TABLE OF CONTENTS - DIAGRAMS SECTION -

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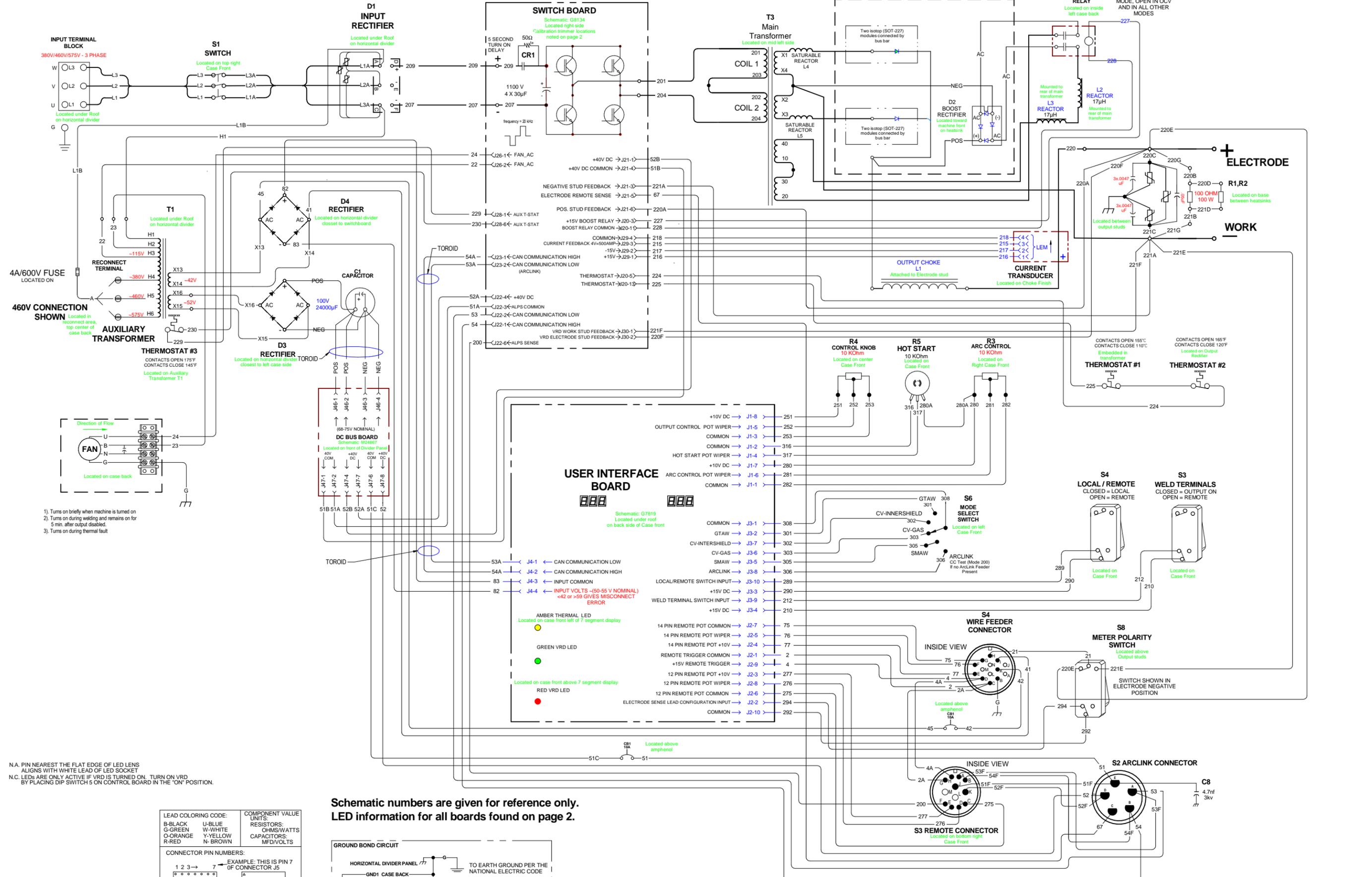
Diagrams .....Section G

Diagrams ..... G-2

# FLEXTEC 500 P WIRING DIAGRAM (CODE 12246)



NOTES:  
 N.A. PIN NEAREST THE FLAT EDGE OF LED LENS  
 ALIGNS WITH WHITE LEAD OF LED SOCKET.  
 N.B. PLACE "1" LEAD ON APPROPRIATE CONNECTION FOR INPUT  
 VOLTAGE. CONNECTION SHOWN IS FOR 480 V OPERATION.  
 N.C. LEDs ARE ONLY ACTIVE IF VRD IS TURNED ON. TURN ON VRD  
 BY PLACING DIP SWITCH 5 ON CONTROL BOARD IN THE "ON" POSITION.



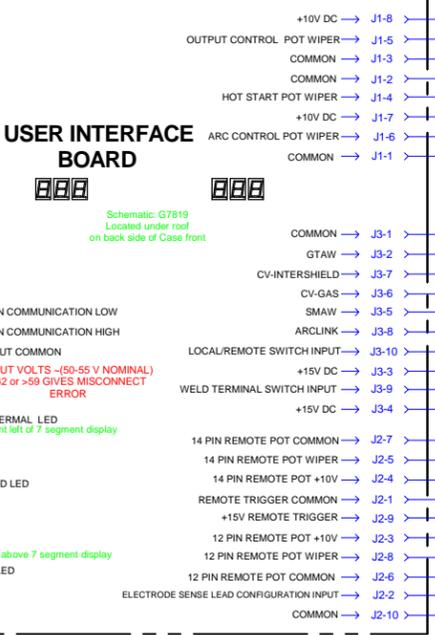
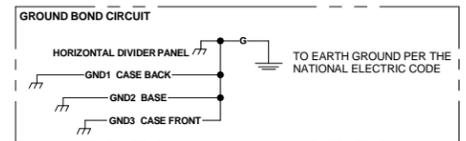
- 1). Turns on briefly when machine is turned on
- 2). Turns on during welding and remains on for 5 min. after output disabled.
- 3). Turns on during thermal fault

N.A. PIN NEAREST THE FLAT EDGE OF LED LENS  
ALIGNS WITH WHITE LEAD OF LED SOCKET  
N.C. LEDs ARE ONLY ACTIVE IF VRD IS TURNED ON. TURN ON VRD  
BY PLACING DIP SWITCH 5 ON CONTROL BOARD IN THE "ON" POSITION.

LEAD COLORING CODE:		COMPONENT VALUE UNITS:	
B-BLACK	U-BLUE	RESISTORS:	OHMS/WATTS
G-GREEN	W-WHITE	CAPACITORS:	MFD/VOLTS
O-ORANGE	Y-YELLOW		
R-RED	N-BROWN		

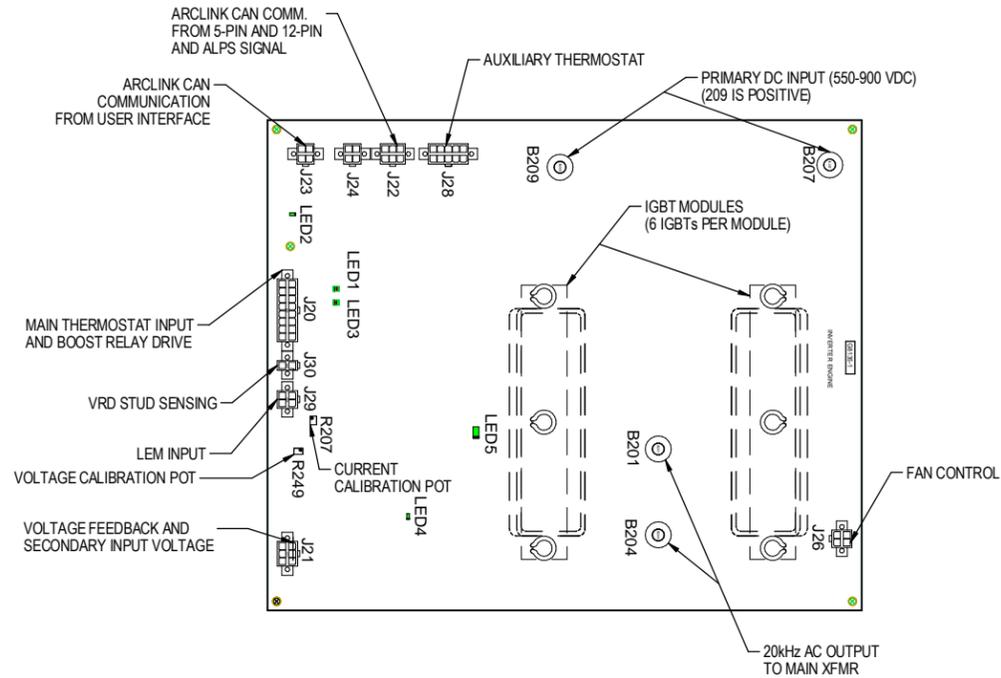
CONNECTOR PIN NUMBERS:  
 1 2 3 → 7 ← EXAMPLE: THIS IS PIN 7 OF CONNECTOR J5  
 8 → 14 ←  
 J5 LATCH  
 VIEW OF CONNECTOR ON PC BOARD ELECTRICAL SYMBOLS PER E1537.

Schematic numbers are given for reference only.  
LED information for all boards found on page 2.



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MANUFACTURING TOLERANCE PER EX206 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± 0.2 mm (± 0.010 in) ON 3 PLACE DECIMALS IS ± 0.025 mm (± 0.0010 in) ON 4 PLACE DECIMALS IS ± 0.0127 mm (± 0.0005 in) ON 5 PLACE DECIMALS IS ± 0.00254 mm (± 0.00010 in) MATERIAL TOLERANCE (1") TO AGREE WITH PUBLISHED STANDARDS	ENGINEER: A MEHLMAN	APPROVED: BS	INCH	SUBJECT: MACHINE SCHEMATIC	DOCUMENT NUMBER: G7815
DO NOT SCALE THIS DRAWING	APPROVAL DATE: 9/11/2015	PROJECT NUMBER: CRM50096-A	REFERENCE: G6462-5	REVISION: B	INSIGHT

# SWITCHBOARD P.C. BOARD

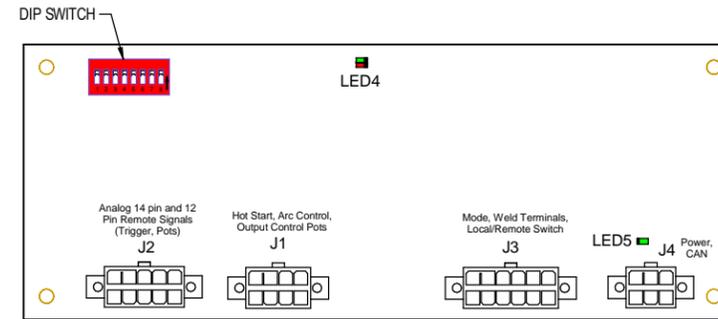


S30146 SWITCHBOARD		
LED #	COLOR	FUNCTION
1	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
1	GREEN	STATUS "OK"
2	GREEN	15V CAN POWER SUPPLY "OK"
3	GREEN	STATUS "OK"
3	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
4	GREEN	+15V DC POWER SUPPLY "OK"
5	GREEN	+5V DC PRIMARY POWER SUPPLY "OK"

### USING THE FLEXTec 500 SWITCHBOARD STATUS LED

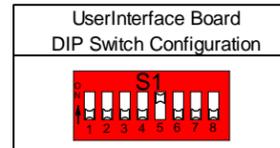
LIGHT CONDITION	MEANING
Steady Green	System OK.
Blinking Green	Occurs during startup or reset, and indicates that the switchboard is waiting for communication from the control board. Normal for the first 1-10 seconds after power is turned on.
Alternating Green and Red	A system fault has occurred. If the switchboard status LED is flashing any combination of red and green, errors are present.  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.  See Page 3 for an Error Code Troubleshooting Guide.

# USER INTERFACE P.C. BOARD



S31126 USER INTERFACE P.C. BOARD		
LED #	COLOR	FUNCTION
4	GREEN	STATUS "OK"
4	RED	STATUS "ERROR" (CHECK CODE FOR SPECIFIC ERROR)
5	GREEN	+15 V DC POWER SUPPLY "OK"

### VRD Setup

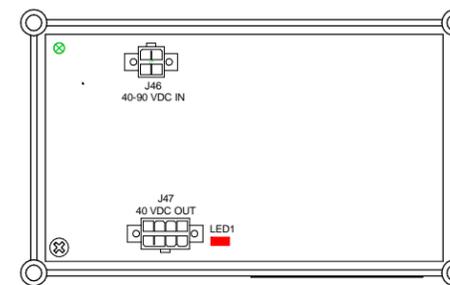


TURN ON PIN FIVE TO ENABLE VDR  
ALL SWITCHES ARE OFF BY FACTORY DEFAULT

### USING THE FLEXTec 500 USER INTERFACE BOARD STATUS LED

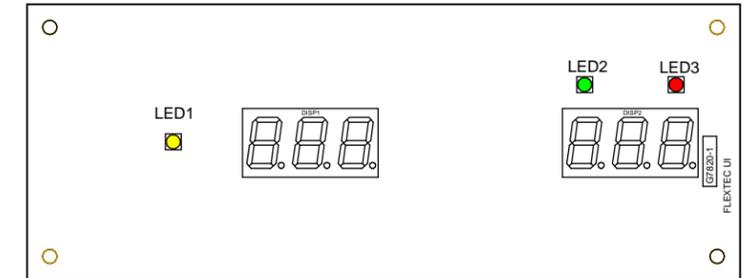
LIGHT CONDITION	MEANING
Steady Green	System OK.
Alternating Green and Red	A system fault has occurred. If the User Interface Board status LED is flashing any combination of red and green, errors are present.  Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light.  See Page 3 for an Error Code Troubleshooting Guide.

# 40V BUS BOARD



L16423 40VDC BUS P.C. BOARD		
LED #	COLOR	FUNCTION
1	RED	40VDC PRESENT ON OUTPUT

# USER INTERFACE P.C. BOARD (DISPLAY SIDE)



S29937 USER INTERFACE P.C. BOARD		
LED #	COLOR	FUNCTION
1	AMBER	THERMAL LED
2	GREEN	VRD LED VOLTAGE REDUCED
3	RED	VRD LED VOLTAGE NOT REDUCED

### ACCESS ERROR LOG

To access the Error Log:

- Dip Switch #8 in the ON position; All other Dip Switch positions OFF.
- Switches and potentiometers should be set to the following positions:
  - Weld Terminals On/Remote Switch - On Position
  - Process Selection Switch - GTAW Position
  - Local / Remote Switch - Local Position
  - Output Control Potentiometer - Fully Counter-Clockwise
  - Arc Control Potentiometer - Fully Counter-Clockwise
  - Hot Start knob - "0" position.
- Turn on Power. The displays will show "...".
- The weld terminal switch will be used to step through the test steps and the error log.
- The left display will show the test step number
- Cycle the weld terminals switch until the left display shows "17". The right display will show "...".
- Rotate the output control potentiometer clockwise
- The left display will show numbers between 1 and 25
- The right display will show the 25 most recent **Weld Sequencer** errors
- Return the output control potentiometer to zero
- Cycle the weld terminals switch again. The left display will show "18". The right display will show "...".
- Rotate the output control potentiometer clockwise
- The left display will show numbers between 1 and 25
- The right display will show the 25 most recent **Weld Controller** errors
- Return the output control potentiometer to zero
- Cycle the weld terminals switch again. The left display will show "19". The right display will show "...".
- Rotate the output control potentiometer clockwise
- The left display will show numbers between 1 and 25
- The right display will show the 25 most recent **User Interface** errors
- Return the output control potentiometer to zero

### ACCESSING CONSTANT CURRENT TEST MODE (MODE 200)

TO ACCESS CONSTANT CURRENT TEST MODE, PLACE THE MODE SWITCH IN "ARCLINK" POSITION WITHOUT AN ARCLINK FEEDER CONNECTED TO THE 5-PIN CONNECTOR.

THE DISPLAY WILL THEN SHOW "Cur" AND "xxx" WHERE "xxx" IS THE WORKPOINT.

WORKPOINT CAN BE ADJUSTED BY USING THE OUTPUT CONTROL KNOB.

OUTPUT CAN BE TURNED "ON" OR "OFF" BY USING THE "WELD TERMINALS" SWITCH.

# ERROR CODE TROUBLESHOOTING GUIDE

Flextec 500/500P Error Codes	
<b>6</b>	<b>User Interface not Connected to Switchboard</b>
Description	CAN communication between switchboard and User Interface PCB has timed out.
Possible Solution 1	Check the physical wiring and connections between User Interface PCB and switchboard.
Possible Solution 2	Verify power supply to switchboard.
Possible Solution 3	Replace defective switchboard assembly or User Interface PCB.
<b>31</b>	<b>Primary Overcurrent</b>
Description	Peak current through the transformer primary has exceeded threshold (140 amps).
Possible Solution 1	Verify connections to the switchboard, transformer and output rectifier assemblies are made correctly and there are no damaged components in the machine.
Possible Solution 2	Replace shorted Output Rectifier Diode
Possible Solution 3	Replace defective main transformer.
Possible Solution 4	Replace defective switchboard assembly.
<b>36</b>	<b>Thermal Fault</b>
Description	Thermostat on output rectifier heat sink or embedded in transformer has tripped.
Possible Solution 1	Do not exceed allowable ambient temperature or duty cycle limits.
Possible Solution 2	Verify that fan is operating and airflow is not being blocked.
Possible Solution 3	Measure thermostats at Switchboard and replace if defective.
<b>45</b>	<b>Output Voltage High Limit Exceeded</b>
Description	During OCV, the voltage at the studs exceeded the allowable levels. (35V if VRD enabled, 113V if VRD not enabled)
Possible Solution 1	Verify that voltage feedback leads are connected inside the machine.
Possible Solution 2	Verify that boost relay is open during OCV.
Possible Solution 3	Replace Defective Switchboard.
<b>213</b>	<b>Switchboard is Offline</b>
Description	Switchboard auxiliary supply voltage is too high at machine power-up.
Possible Solution 1	Mapping error. Cycle power to attempt to clear error.
Possible Solution 2	Switchboard has a fatal error. Read error code at on-board status LED and decode error.
Possible Solution 3	Replace defective Switchboard assembly.
<b>713</b>	<b>Misconnection - Primary Supply Voltage too High</b>
Description	Switchboard auxiliary supply voltage is too high at machine power-up.
Possible Solution 1	Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation.
Possible Solution 2	Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem.
Possible Solution 3	Replace defective User Interface PCB assembly.
<b>714</b>	<b>Misconnection - Primary Supply Voltage too Low</b>
Description	Switchboard auxiliary supply voltage is too low at machine power-up.
Possible Solution 1	Improper input voltage configuration. Verify primary reconnect position, measure input voltage level and check three phase operation.
Possible Solution 2	Damaged auxiliary transformer or intermittent "A" lead connection. Verify 42 VAC output at 14 pin connector to determine the source of the problem.