

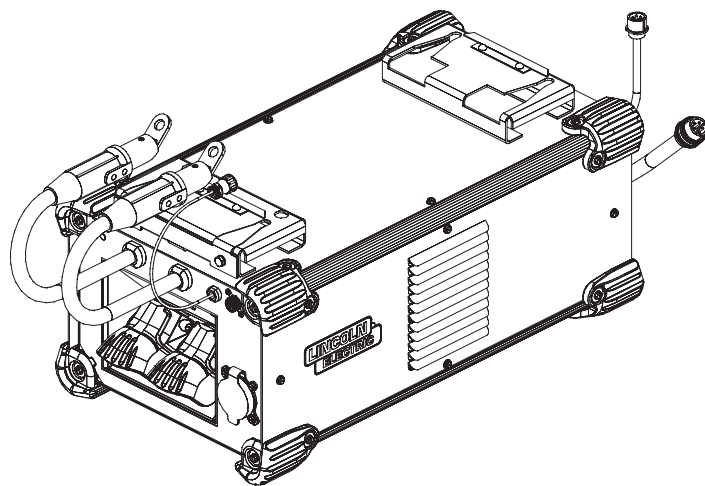
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

POWER WAVE[®] ADVANCED MODULE

For use with machines having Code Numbers:

**Power Wave Advanced Module: 11935,
12376**

SERVICE MANUAL



THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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

SAFETY DEPENDS ON YOU

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

WARNING

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

CAUTION

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



KEEP YOUR HEAD OUT OF THE FUMES.

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

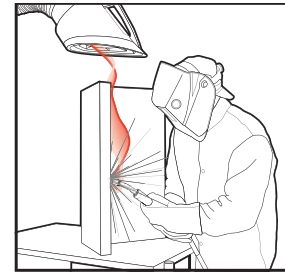
READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

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.

SAFETY



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.

SAFETY

**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.

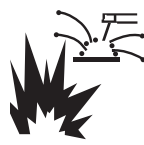
**ARC RAYS CAN BURN.**

- 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 hardfacing (see instructions on container or SDS) 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 unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also 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 Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.

SAFETY

**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, 14501 George Carter Way Chantilly, VA 20151.

**FOR ELECTRICALLY
POWERED EQUIPMENT.**

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

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

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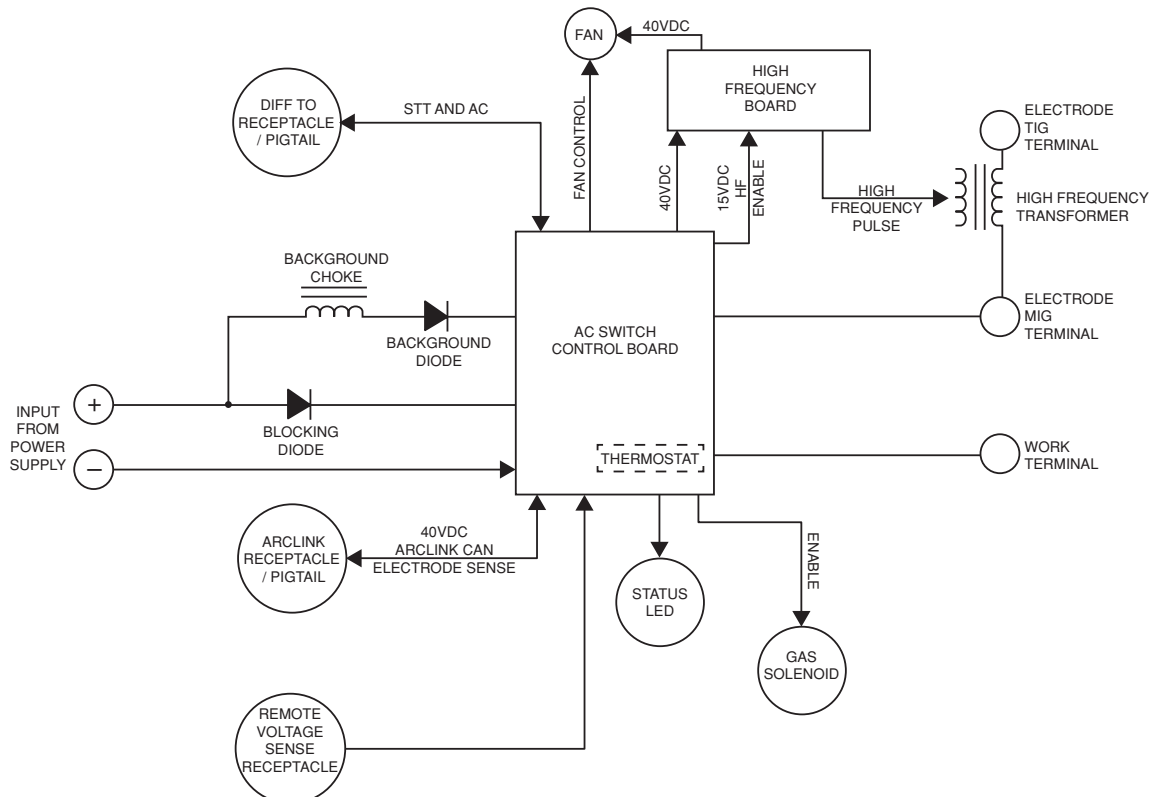
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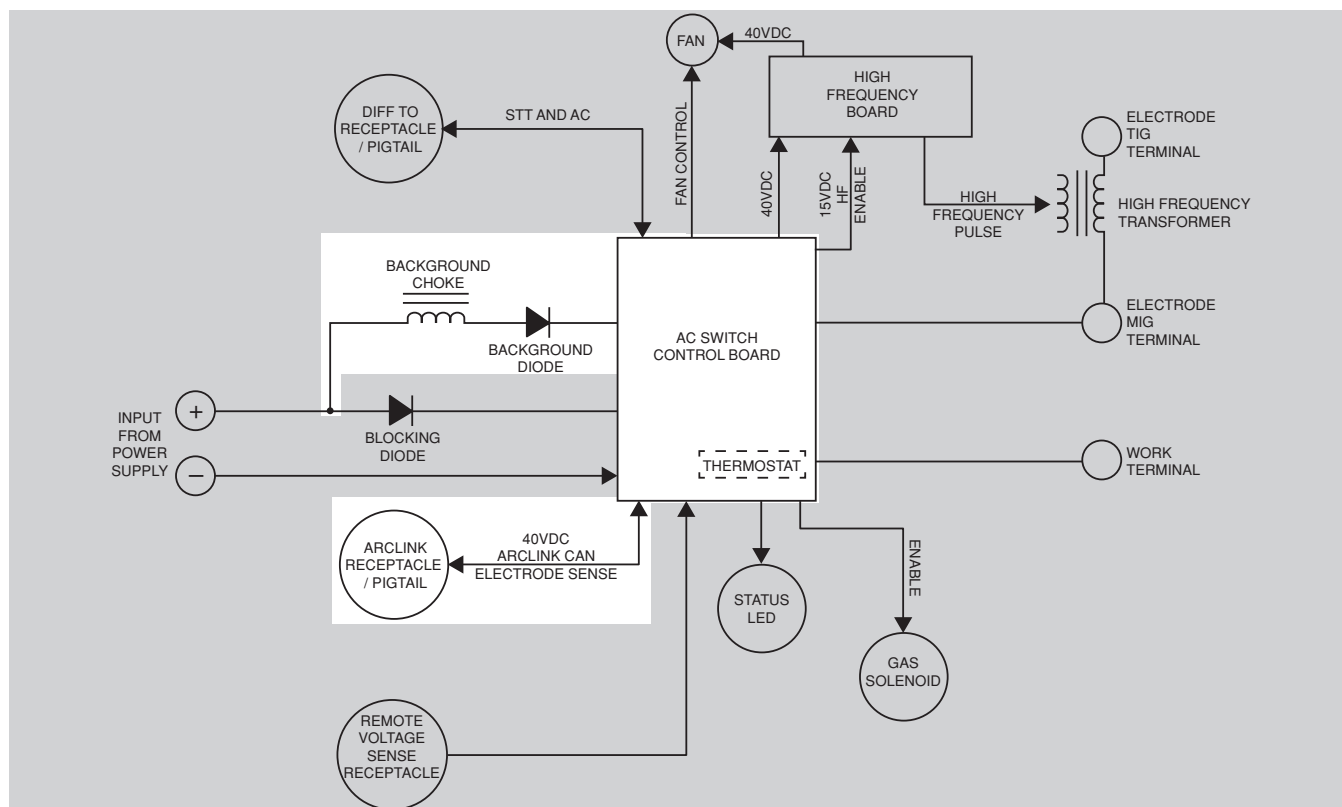
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Figure E.1 - Power Wave advanced module block logic diagram

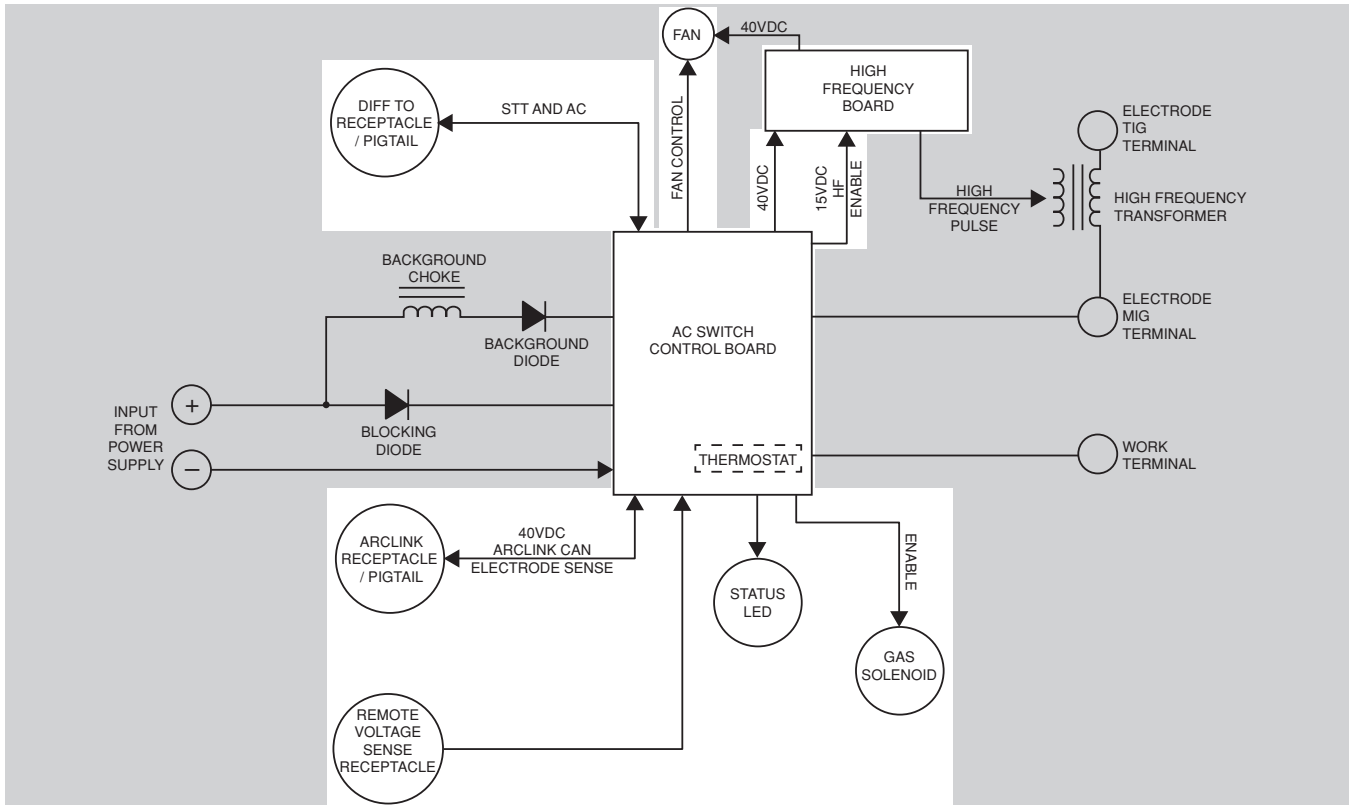




OUTPUT

The output of a compatible Power Wave power source is connected to the AC switch control board via a background choke circuit and a blocking diode. An ArcLink receptacle / pigtail located at the rear of the machine provides 40VDC, ArcLink / CAN communication and remote electrode sense to the AC switch control board. When welding in an AC mode, the background choke, diode and AC switch control board work together to keep the arc established during zero crossing.

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

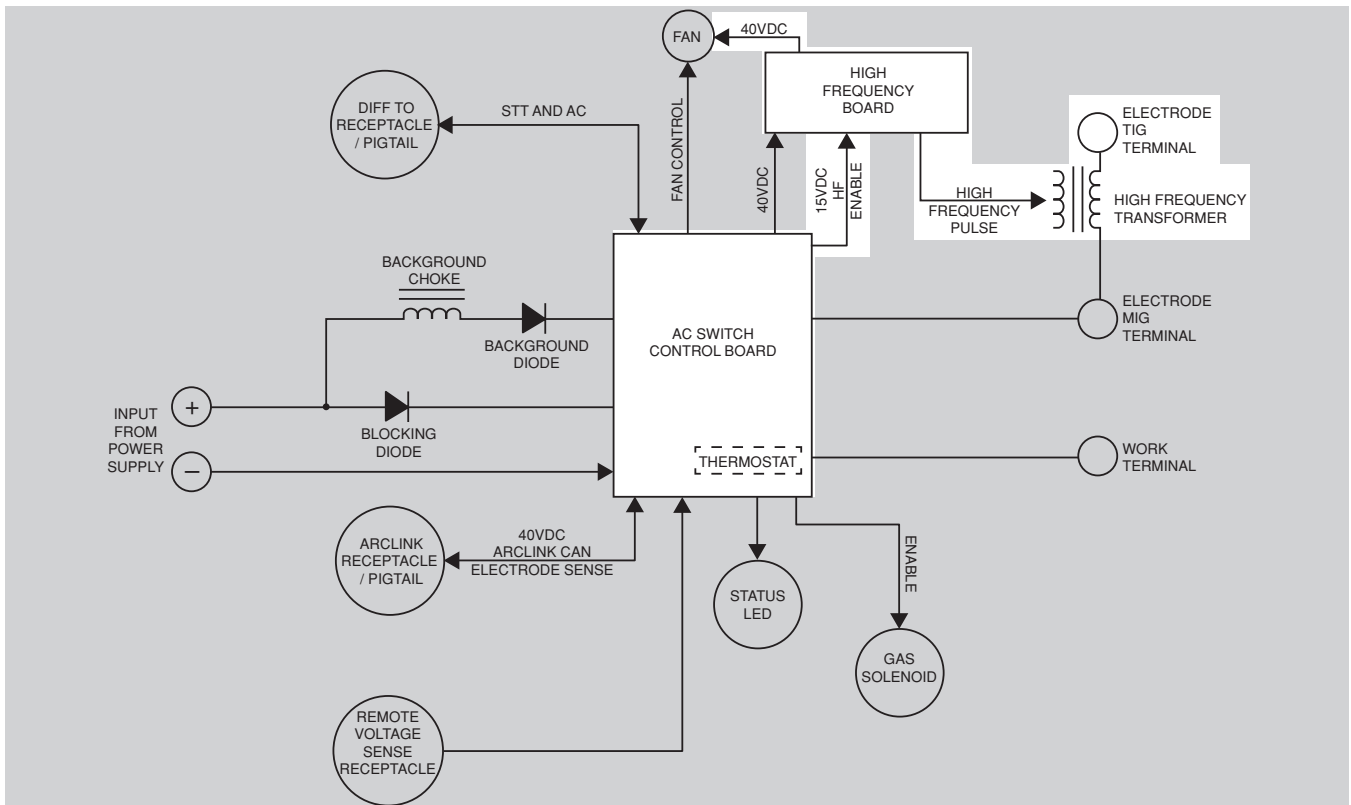


AC SWITCH CONTROL BOARD

The AC Switch Control Board controls the output of the Power Wave Advanced Module. It interfaces and communicates with the power source via the ArcLink receptacle and differential IO receptacle. It also identifies the Power Wave Advanced Module to the ArcLink network. The AC Switch Control Board enables fan control, the gas solenoid, the high frequency board and the status LED. It monitors the onboard thermostat and the remote voltage sense receptacle. If an error arises, the AC Switch Control Board notifies the power source via ArcLink communication. The welding output of the Power Wave Advanced Module (DC+, DC-, AC, STT) is applied to the output terminals. The AC output has a variable ramp rate and the maximum frequency is 500 Hz.

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

Figure E.4 - Tig welding and high frequency circuit



TIG WELDING AND HIGH FREQUENCY CIRCUIT

If a TIG process is being utilized, the TIG torch is connected to the TIG electrode terminal. The high frequency board, that is powered and enabled by the AC switch control board, is used for starting purposes only while in a TIG welding mode. The high frequency pulses (MHz. range) that are generated on the high frequency board are applied to the high frequency transformer. Through transformer action these high frequency pulses are impressed upon the TIG welding output. The high frequency board also supplies 40VDC to the fan motor.

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.

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 three main categories: Welding problems and Output and Function 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.

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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT AND FUNCTION PROBLEMS		
Major physical or electrical damage is evident when the Power Wave Advanced Module case cover is removed.	1. Contact your local authorized Lincoln Electric Service Facility.	1. Contact the Lincoln Electric Service Department at 1-888-935-3877.
The input fuses to the power source repeatedly fail or the input circuit breakers keep tripping. Or, when the output of the Power Wave power supply is connected to the Advanced Module there is an immediate current draw when the output terminals of the power source are energized.	<ol style="list-style-type: none"> 1. The Power Wave Advanced Module may be drawing too much current from the power source. Make certain the fuses or breakers are properly sized. 2. The welding procedure may be drawing too much input current or the duty cycle may be too high. Reduce the welding current and/or reduce the duty cycle. 3. Check for error codes. (See Status LED Troubleshooting in this section.) Also see lookup page in Power Wave Manager to determine the error. 	<ol style="list-style-type: none"> 1. Perform the Input Blocking Diode Test. 2. Perform the AC Switch Control Board Test. 3. Perform the Background Diode Test.
The machines will not power up. No lights or displays on power source, Power Wave Advance Module or wire feeder. The machines appear to be off.	<ol style="list-style-type: none"> 1. Make sure the proper input voltage is being applied to the Power Wave power source (check fuses or breakers). 2. Make sure the input supply disconnect has been turned ON. 3. Make certain the input power switch on the Power Wave power source is in the ON position. 	<ol style="list-style-type: none"> 1. Check the input switch on the Power Wave power source for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check to make sure that 40VDC is present at the ArcLink receptacle on the Power Wave power source. See the Wiring Diagram. 3. Check to make sure 40VDC is present at the Arlink pigtail and receptacle on the Power Wave Advanced Module. See the Wiring 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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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT AND FUNCTION PROBLEMS		
<p>The status LED on the Power Wave Advanced Module is not lit.</p>	<ol style="list-style-type: none"> 1. If the symptom is accompanied by an error code see the Status LED Troubleshooting section. Also see lookup page in Power Wave Manager to determine the error. 2. If the wire feeder is functional and connected through the Power Wave Advanced Module there may be a connection problem within the Power Wave Advanced Module. See the Wiring Diagram. 3. Verify that the status LED is properly installed and has not been disengaged from the lens. 	<ol style="list-style-type: none"> 1. Check to make sure 40VDC is present at the ArcLink pigtail and receptacle on the Power Wave Advanced Module. See the Wiring Diagram 2. Perform the AC Switch Control Board Test.
<p>There is no welding output from the Power Wave Advanced Module. The Power Wave power source is functioning correctly.</p>	<ol style="list-style-type: none"> 1. If the symptom is accompanied by an error code see the Status LED Troubleshooting section. Also see lookup page in Power Wave Manager to determine the error. 2. If the status LED on the Power Wave Advanced Module is not lit, make sure the ArcLink cable is connected properly. 3. Make sure the Power Wave Advance Module is connected correctly (polarity) to a compatible Power Wave power source. 	<ol style="list-style-type: none"> 1. Check for loose or faulty connections in the Power Wave Advanced Module weld circuit. See the Wiring Diagram. 2. Perform the Input Blocking Diode Test. 3. Perform the AC Switch Control Board Test. 4. Perform the Background Diode Test.

 **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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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT AND FUNCTION PROBLEMS		
<p>There is a thermal error (36) indicated on the status LED.</p>	<ol style="list-style-type: none"> 1. Make sure the process and duty cycle are within the limitations of the Power Wave Advanced Module. 2. Check for proper fan operation. The fan typically runs whenever there is welding current present. 3. Check for material blocking the intake and/or exhaust louvers or excessive dirt and debris within the machine. 	<ol style="list-style-type: none"> 1. There is a normally closed thermostat on the AC Switch board heat sink. Check leads #401 and #402 for continuity to plug J4 pin 1 and plug J4 pin 2. See the Wiring Diagram. 2. If the fan does not operate correctly, check for the presence of 40VDC at leads #51C and #52C. See the Wiring Diagram. When there is welding current present there should be a DC voltage enable signal (<15VDC) present at lead #405 to lead #51C. If these voltages are present and the fan motor does not operate, the fan motor may be faulty. 3. If the above voltages are not present, check the associated leads for loose or faulty connections. See the Wiring Diagram. 4. If the 40VDC is not present at leads #51C to #51B, perform the High Frequency Board Test. 5. If the fan enable signal is not present when welding current is present, perform the AC Switch Control Board Test.

 **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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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT AND FUNCTION PROBLEMS		
<p>No high frequency present when starting to weld in the TIG mode.</p>	<ol style="list-style-type: none"> 1. Make sure the TIG Torch and weld cables are in good condition. 2. Make sure the TIG torch is connected to the TIG output terminal. 3. Make sure the Power Wave power source and Advanced Module are configured for the TIG mode. 	<ol style="list-style-type: none"> 1. Perform the High Frequency Board Test. 2. Perform the High Frequency Transformer Test. 3. Perform the AC Switch Board Test.
<p>The welding modes do not function correctly.</p>	<ol style="list-style-type: none"> 1. If the symptom is accompanied by an error code see the Status LED Troubleshooting section. Also see lookup page in Power Wave Manager to determine the error. 2. Check the ArcLink cables and connections. 3. There may be a software problem. See Power Wave Manager. 	<ol style="list-style-type: none"> 1. Perform the AC Switch Control Board Test.

 **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.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
<p>General degradation of the welding performance.</p>	<ol style="list-style-type: none"> 1. Check for proper wire feeding. Make certain that the actual speed is the same as the preset. 2. Verify that the correct wire drive and gear ratio have been selected. 3. Check the welding cables for loose or faulty connections. 4. Check for adequate gas shielding. 5. Make sure the welding process is correct for the wire feed and voltage settings. 6. If welding in an AC mode check for excess inductance in the welding cables. 	<ol style="list-style-type: none"> 1. Perform the Current and Voltage Calibration Procedure on the Power Wave power source.

 **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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Observe Safety Guidelines detailed in the beginning of this manual.
ERROR CODES FOR THE ADVANCED MODULE

The following is a partial list of possible error codes for the Power Wave Advanced Module.

Table F.2

ERROR CODE #		INDICATION
36	Thermal Error (Advanced Module)	Indicates over temperature in module. Accompanied by Thermal LED and thermal error in power source. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
36	Thermal Error (Advanced Module)	Indicates over temperature in power source. Accompanied by Thermal LED. Status LED in Advanced Module will be steady green.
39	Misc. Hardware Fault	Unknown glitch has occurred on the fault interrupt circuitry. Sometimes caused by primary over current fault, or intermittent connections in the thermostat circuit.
99	Advanced Module Status Error	Error reported by the H-Bridge PC Board. Generally caused by overvoltage protection or violation of minimum switching requirements. May also be caused by loss of input voltage or board failure. Observe diagnostic LEDs on the H-Bridge PC Board to determine the exact cause.
Other		A complete list of error codes is available in the Power Wave Manager Utility (available at www.power-wavesoftware.com). Some error codes that contain three or four digits are defined as fatal errors. These codes generally indicate internal errors on the Advanced Module Status PC Board. If cycling the input power on the machine does not clear the error, contact the Service Department.



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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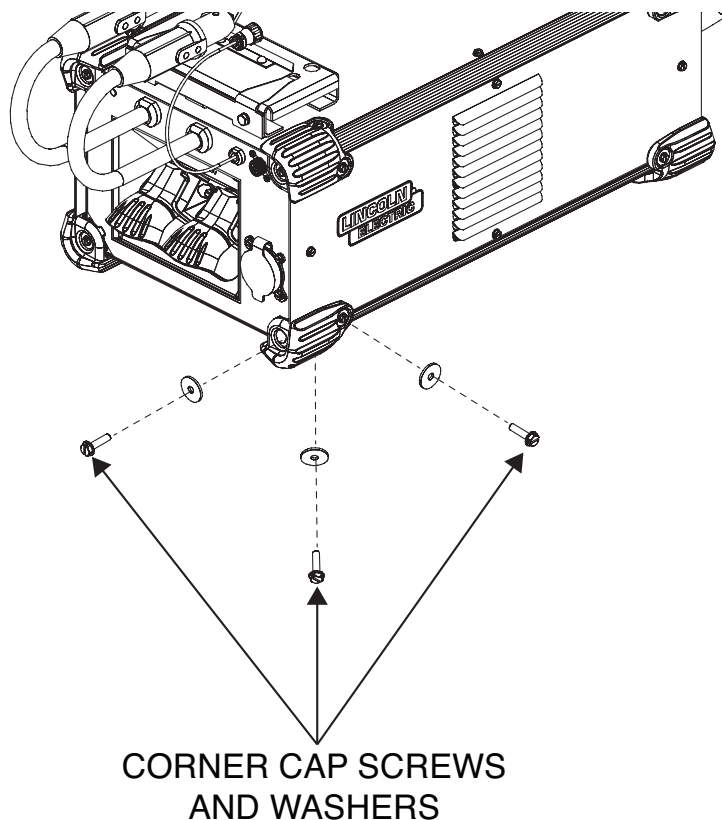
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CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.1 – Corner cap removal



REMOVAL PROCEDURE

CORNER CAP REMOVAL

1. Using a 5/16" nutdriver, remove the three screws and associated washers securing each corner cap. See Figure F.1.
2. Remove the desired corner cap(s).

RIGHT CASE SIDE REMOVAL

1. Remove the four right side corner caps.
2. Using a 5/16" nutdriver, remove the four case cover mounting screws securing the right case side. See Figure F.2.
3. The right case side can now be removed.

LEFT CASE SIDE REMOVAL

1. Remove the four left side corner caps.
2. Using a 5/16" nutdriver, remove the four case cover mounting screws securing the left case side. See Figure F.2.
3. The left case side can now be removed.

ROOF REMOVAL

1. Remove all corner caps and both case sides.
2. Using a 7/16" nutdriver, remove the two bolts and associated washers securing the locking bracket to the front mounting bracket assembly. See Figure F.3.
3. Using a T-25 torx wrench, remove the four screws and associated washers securing the front mounting bracket assembly to the machine. See Figure F.3.
4. Using a T-25 torx wrench, remove the four screws and associated washers securing the rear mounting bracket assembly to the machine. See Figure F.3.
5. Using a 5/16" nutdriver, remove the two screws securing the roof. See Figure F.3.
6. The roof can now be removed.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.2 – Case side removal

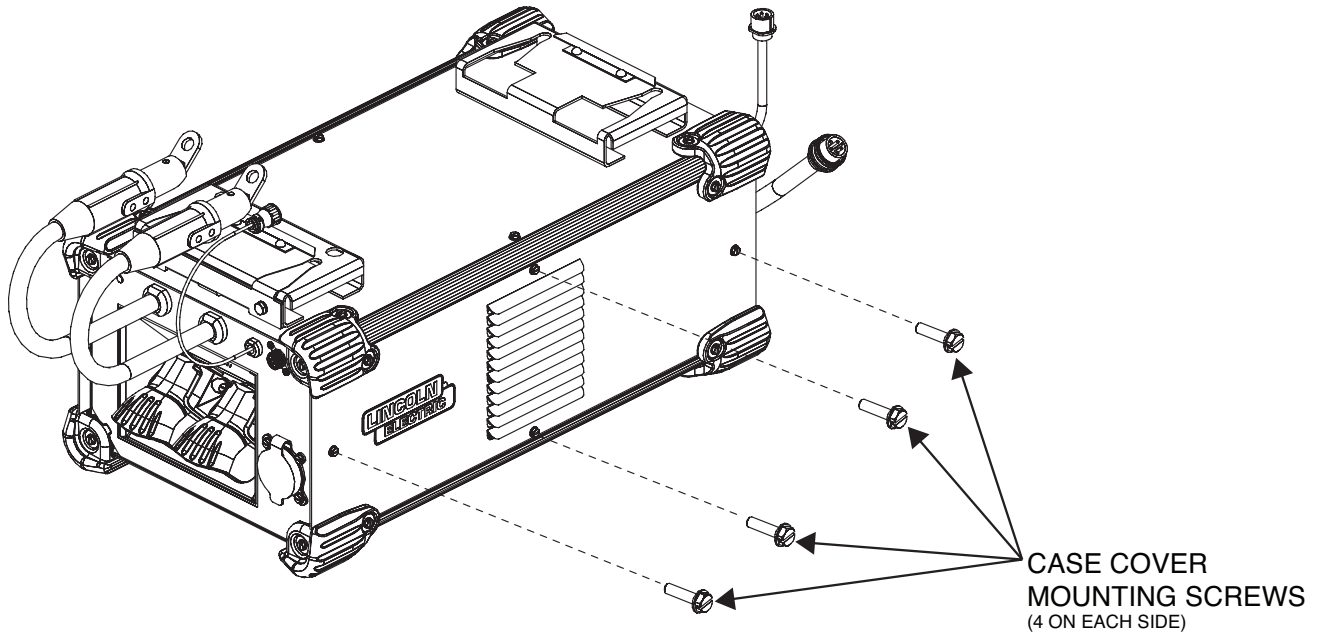
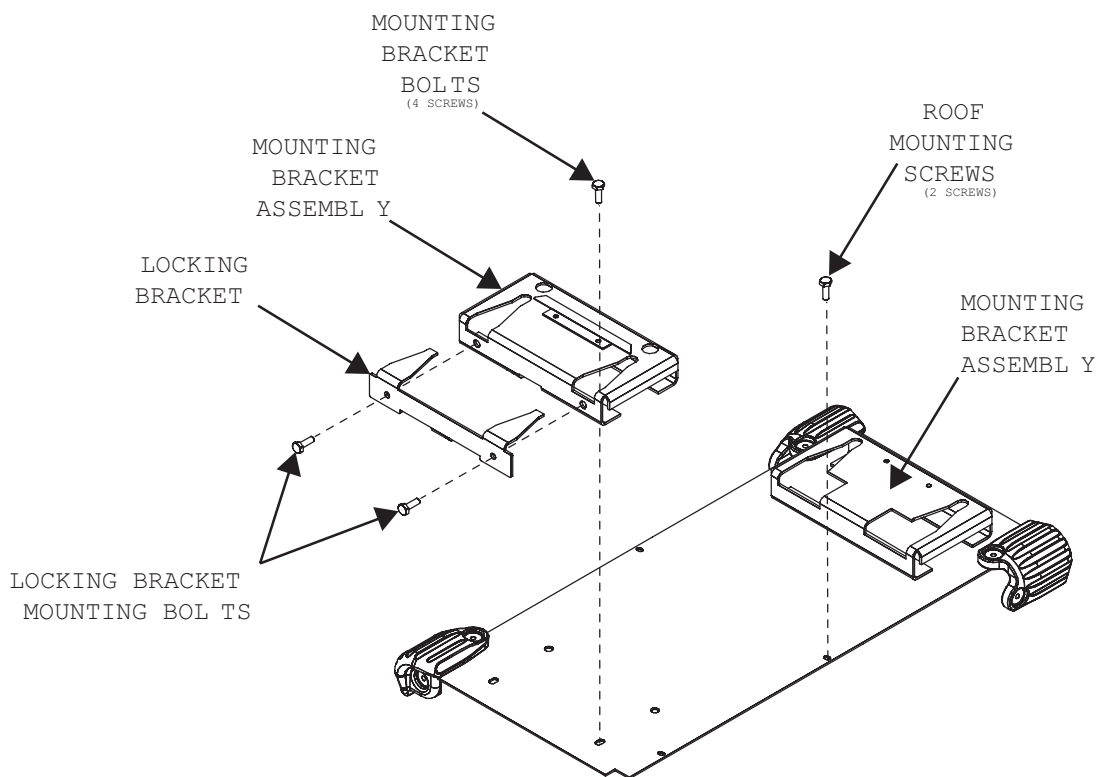


Figure F.3 – Roof removal



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CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

(continued)

REPLACEMENT PROCEDURE

ROOF REPLACEMENT

1. Carefully position the roof onto the machine.
2. Using a 5/16" nutdriver, attach the two screws securing the roof.
3. Using a T-25 torx wrench, attach the four screws and associated washers securing the rear mounting bracket assembly to the machine.
4. Using a T-25 torx wrench, attach the four screws and associated washers securing the front mounting bracket assembly to the machine.
5. Using a 7/16" nutdriver, attach the two bolts and associated washers securing the locking bracket to the front mounting bracket assembly.

LEFT CASE SIDE REPLACEMENT

1. Carefully position the left case side onto the machine.
2. Using a 5/16" nutdriver, attach the four case cover mounting screws securing the left case side.
3. Replace corner caps as needed.

RIGHT CASE SIDE REPLACEMENT

1. Carefully position the right case side onto the machine.
2. Using a 5/16" nutdriver, attach the four case cover mounting screws securing the right case side.
3. Replace corner caps as needed.

CORNER CAP REPLACEMENT

1. Position corner caps onto machine. Be sure all screw holes are aligned properly.
2. Using a 5/16" nutdriver, attach the three screws and associated washers securing each corner cap.

HIGH FREQUENCY TRANSFORMER TEST



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 High Frequency Transformer is damaged and if the coils are open. It will also test the inductance of the secondary coil.

MATERIALS NEEDED

- Multimeter With Inductance Testing Capabilities
- Wiring Diagram
- 7/16" Nutdriver

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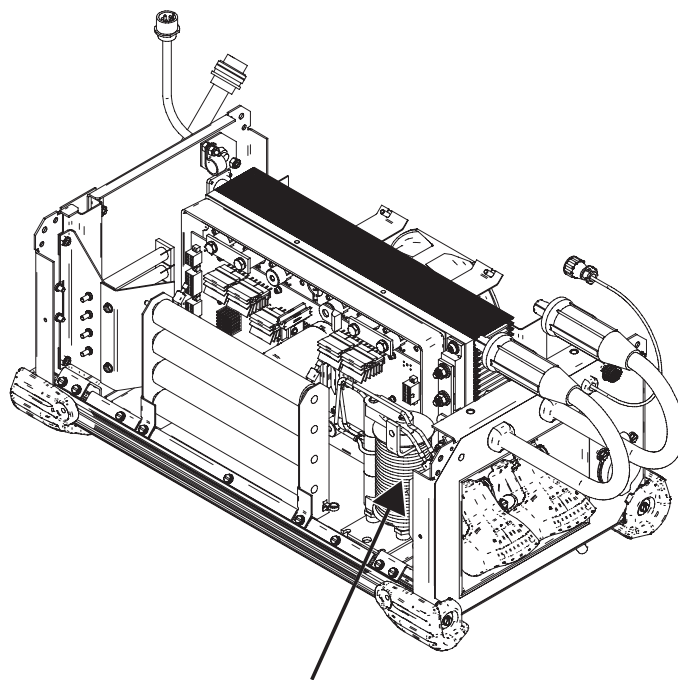
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HIGH FREQUENCY TRANSFORMER TEST

(continued)

Figure F.4 – High frequency transformer location



HIGH FREQUENCY TRANSFORMER

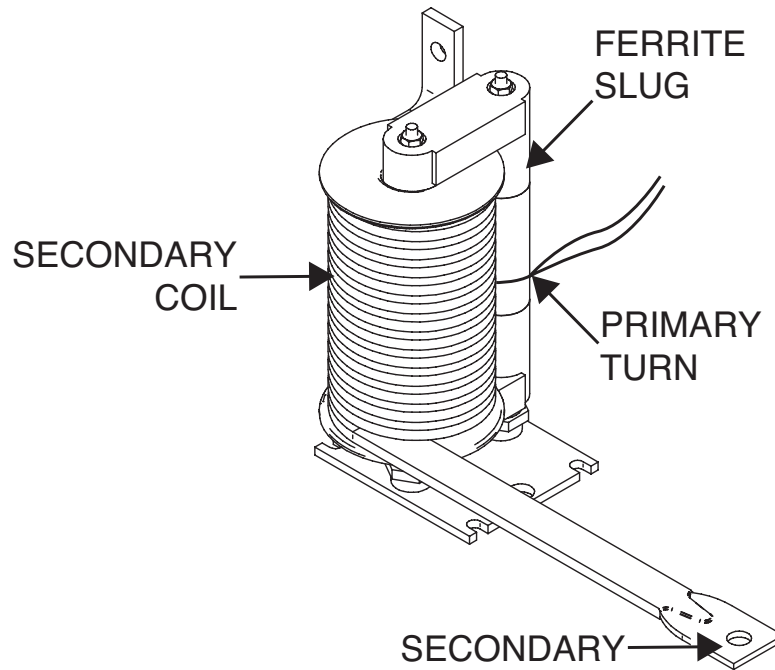
PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the high frequency transformer. See Figure F.4.
4. Visually inspect the high frequency transformer. Make sure the turns of the secondary edge wound coil are not touching together.
5. Visually inspect the ferrite slug to make sure it is not cracked or damaged.
6. Make sure the primary flex lead makes only one complete turn around the ferrite slug and the leads are connected to terminals B1 and B2 on the high frequency board.
7. Using a 7/16" wrench, label and disconnect the secondary leads to isolate the high frequency transformer. Also, label and disconnect the primary leads from terminals B1 and B2 on the high frequency board.
8. Using the multimeter, check the resistance of the secondary coil and the primary turn. See [Figure F.5](#). They both should measure less than 0.2 ohms. Also check the resistance of the two coils to chassis ground. There should be at least 500,000 ohms of resistance from either of the two coils to chassis ground.
9. Using the multimeter inductance test, measure the inductance of the secondary coil. It should be approximately 180uH to 280uH. See [Figure F.5](#).
10. Using a 7/16" wrench, attach the secondary leads.
11. Attach the two primary leads to terminals B1 and B2.
12. Perform the [Case Cover Replacement Procedure](#).

HIGH FREQUENCY TRANSFORMER TEST

(continued)

Figure F.5 – High frequency transformer test points



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GAS SOLENOID 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 Gas Solenoid is faulty.

MATERIALS NEEDED

- Multimeter
- Wiring Diagram
- 12VDC Power Supply

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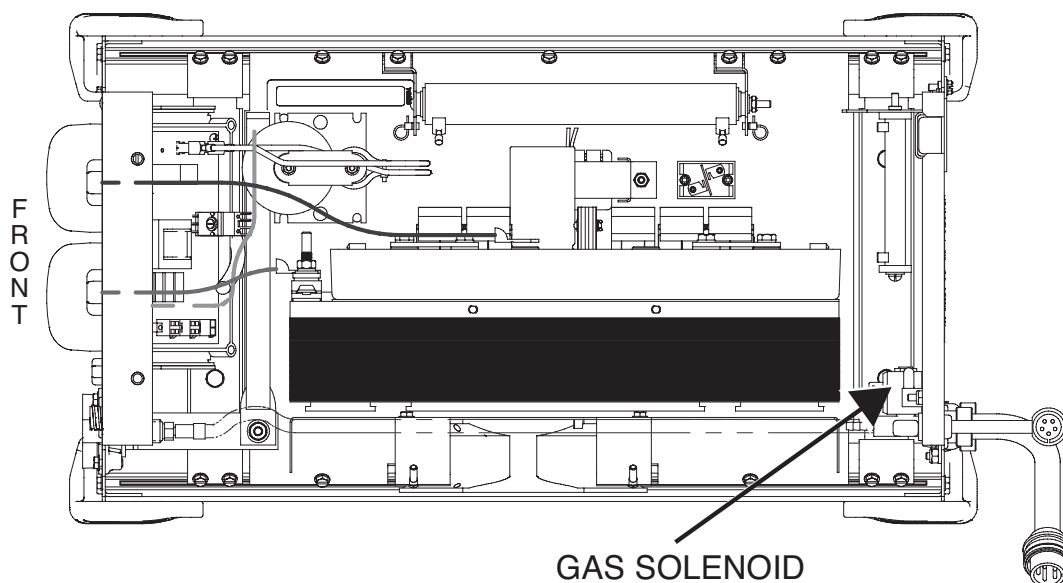
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GAS SOLENOID TEST (continued)

Figure F.6 – Gas solenoid location

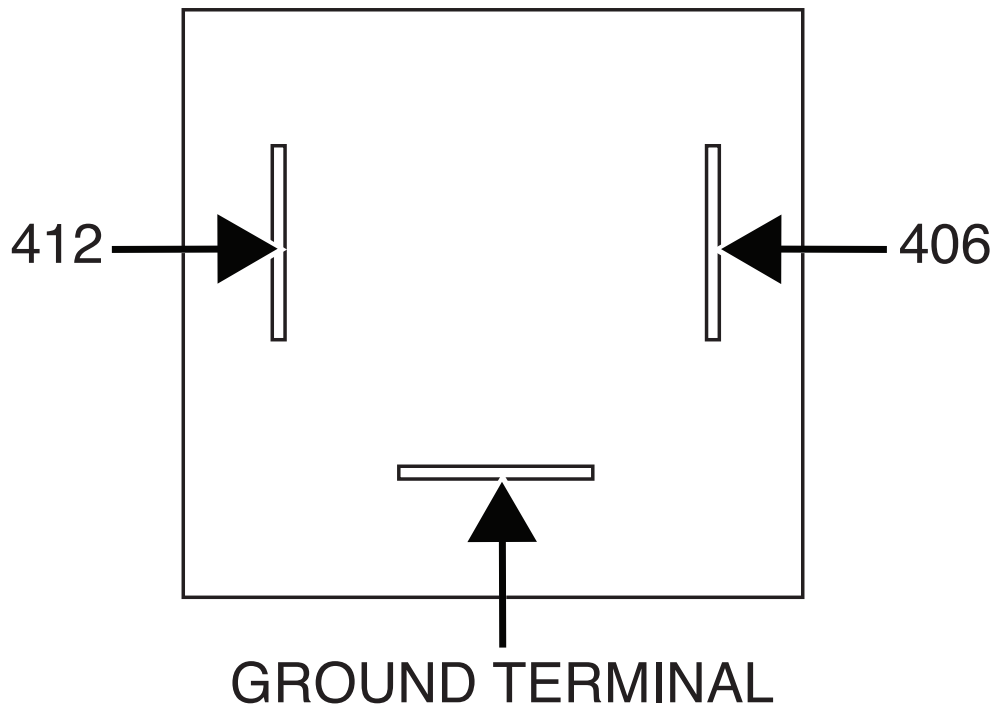


PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the gas solenoid. See Figure F.6.
4. Label and remove the two leads (412 and 406) from the gas solenoid. See [Figure F.7](#). See the Wiring Diagram.
5. Using a multimeter, check the coil resistance of the gas solenoid. Normal resistance is approximately 18.5 ohms.
6. Using the multimeter, check the resistance from either of the coil terminals to the ground terminal. The resistance should be very high. At least 500,000 ohms.
7. To further check the gas solenoid apply an external 12VDC to the solenoid coil terminals. The solenoid should activate.
8. If the gas solenoid fails either of the above tests the gas solenoid may be faulty.
9. If the gas solenoid activates when the external 12VDC is applied to the coil terminals, but the gas solenoid does not function when leads 412 and 406 are connected to the gas solenoid the AC Switch Control board may be faulty. **Make sure the machines are in a TIG Welding Mode and the outputs are enabled.**
10. Connect the two previously removed leads (412 and 406) to the gas solenoid.
11. Perform the [Case Cover Replacement Procedure](#).

GAS SOLENOID TEST *(continued)*

Figure F.7 – Gas solenoid lead location



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AC SWITCH CONTROL BOARD TEST

 **WARNING**

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

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

TEST DESCRIPTION

This test will help determine if the AC Switch Control Board is faulty. This test will not test all of the circuitry in the AC Switch Control Board Assembly.

MATERIALS NEEDED

- Multimeter
- Wiring Diagram

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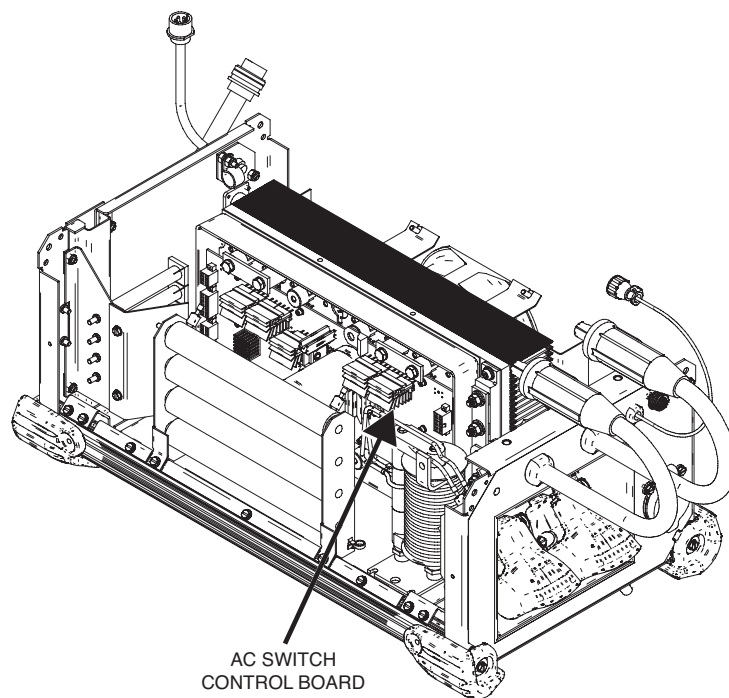
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AC SWITCH CONTROL BOARD TEST *(continued)*

Figure F.8 – AC switch control board assembly location



PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the AC switch control board assembly. See [Figure F.8](#).
4. Check AC switch control board status LED functions. See [Figure F.11](#) and [Table F.5](#).
5. Label and remove the leads from the four STT snubber resistors. See [Figure F.9](#). Electrically isolate the leads from all adjacent circuitry and the case ground.
6. Using the multimeter diode test, perform the tests detailed in [Table F.3](#) and [Table F.4](#). See [Figures F.10](#) and [F.11](#) for test point locations.
7. If the above tests indicate a failure perform the [AC Switch Control Board Assembly Removal And Replacement Procedure](#).
8. Connect the four leads previously removed from the four STT snubber resistors.
9. Connect all leads and cables previously removed.
10. Perform the [Case Cover Replacement Procedure](#).

AC SWITCH CONTROL BOARD TEST *(continued)*

Figure F.9 – STT snubber resistor lead location

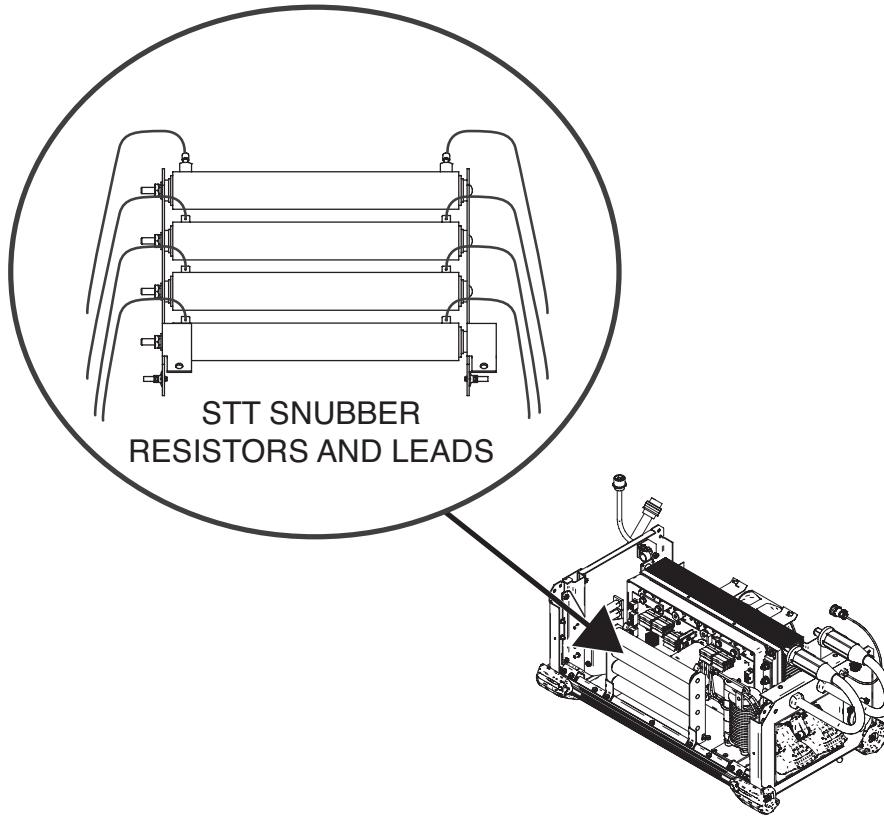
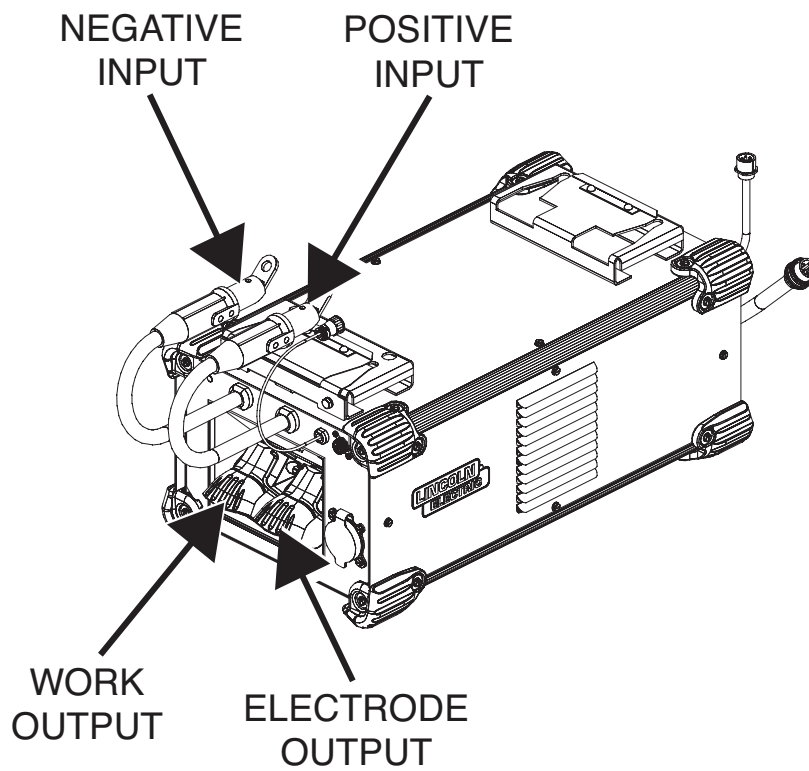


Figure F.10 – Advance module test points



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AC SWITCH CONTROL BOARD TEST *(continued)*

Table F.3 – Advance module (DMM diode test function)

With all output (weld) cables disconnected from the module and all input cables disconnected from the power source, perform the following tests at the specified locations:

DEVICES TESTED ON SWITCH CONTROL BOARD	RED PROBE	BLACK PROBE	EXPECTED READING APPROXIMATE
A2, Q30	NEGATIVE INPUT	ELECTRODE OUTPUT	0.35V
A3, Q32	NEGATIVE INPUT	WORK OUTPUT	0.35V
A1, Q26	ELECTRODE OUTPUT	NEGATIVE INPUT	0.80V
A4, Q35	WORK OUTPUT	NEGATIVE INPUT	0.80V

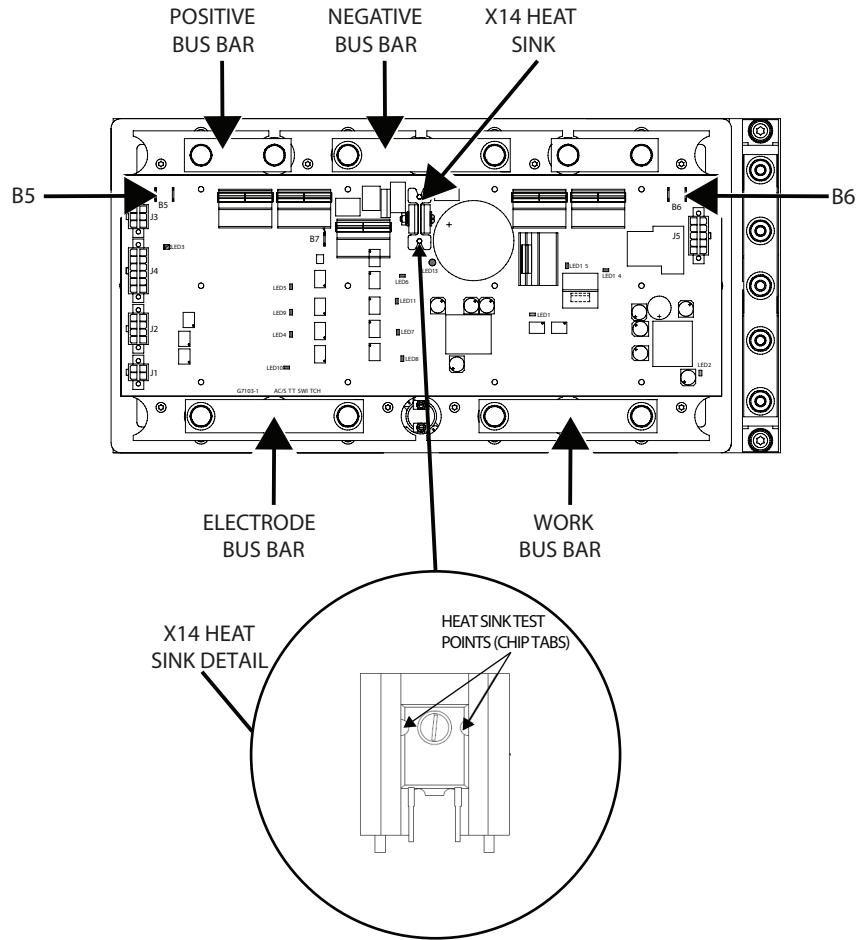
If any of the tests in Table F.3 fail, a more thorough test of the internal components of the advanced module should be conducted to pinpoint the problem. See Table F.4.

Table F.4 – Advance module (DMM diode test function)

DEVICES TESTED ON SWITCH CONTROL BOARD	RED PROBE	BLACK PROBE	EXPECTED READING APPROXIMATE
A1	ELECTRODE BUS BAR	POSITIVE BUS BAR	0.35V
A4	WORK BUS BAR	POSITIVE BUS BAR	0.35V
A2	NEGATIVE BUS BAR	ELECTRODE BUS BAR	0.35V
A3	NEGATIVE BUS BAR	WORK BUS BAR	0.35V
Q26	B5	POSITIVE BUS BAR	0.35V
Q35	B6	POSITIVE BUS BAR	0.35V
Q30	NEGATIVE BUS BAR	B5	0.35V
Q32	NEGATIVE BUS BAR	B6	0.35V
X14	POSITIVE BUS BAR	HEAT SINK OF X14 (See Figure F.11 for test point detail)	0.35V

AC SWITCH CONTROL BOARD TEST (continued)

Figure F.11 – AC switch control board test points and LED locations



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AC SWITCH CONTROL BOARD TEST *(continued)*

Table F.5 – Status LEDs function

LED	COLOR	FUNCTION	INDICATION
1	GREEN	H-BRIDGE STATUS	<u>Normal Status:</u> ON <u>Fault Condition:</u> If the snubber capacitor voltage exceeds its threshold, the acceptable voltage across the switch is exceeded or the power supplies voltages are insufficient, the LED will be off.
2	GREEN	POWER SUPPLY	<u>Normal Status:</u> ON <u>Fault Condition:</u> If there is a short on any of the power supplies, this LED will blink. If no power is present, this LED will be OFF.
3	RED/GREEN	STATUS	<u>Normal Status:</u> SOLID GREEN <u>Fault Condition:</u> If the switch encounters an error, this LED will flash an error code.
4 & 7	RED	NEG. SWITCH	Indicates switch is configured for NEGATIVE polarity or AC output.
5 & 6	RED	POS. SWITCH	Indicates switch is configured for POSITIVE polarity or AC output.
8 & 10	RED	NEG. STT	Indicates switch is closed in NEGATIVE polarity, will detect slight dimming if performing NEGATIVE STT.
9 & 11	RED	POS. STT	Indicates switch is closed in POSITIVE polarity, will detect slight dimming if performing POSITIVE STT.
13	RED	SNUBBER VOLTAGE	Indicates that high voltage is present on the snubber capacitor.
14	RED	MAIN BUS OVERVOLTAGE	Indicates that a voltage > 120VDC was present across the bridge (Latched Error).
15	RED	SNUBBER CAP OVERVOLTAGE	Indicates that a voltage > 500VDC was present on the snubber capacitor (Latched Error).

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BACKGROUND DIODE 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 Background Diode is open or shorted.

MATERIALS NEEDED

- Multimeter
- Wiring Diagram
- Phillips Screwdriver

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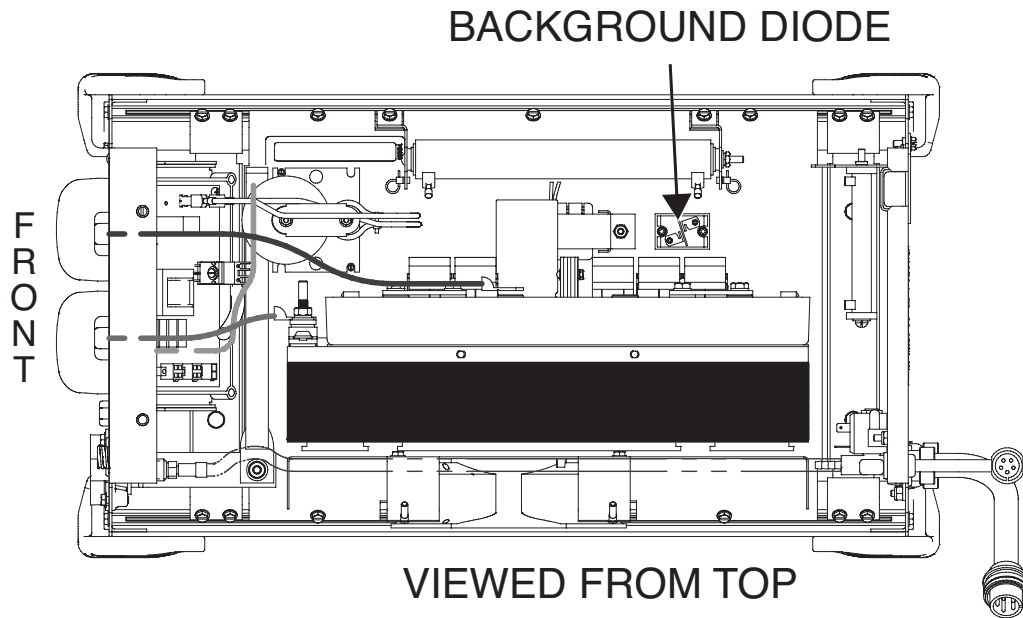
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BACKGROUND DIODE TEST *(continued)*

Figure F.12 – Background diode location

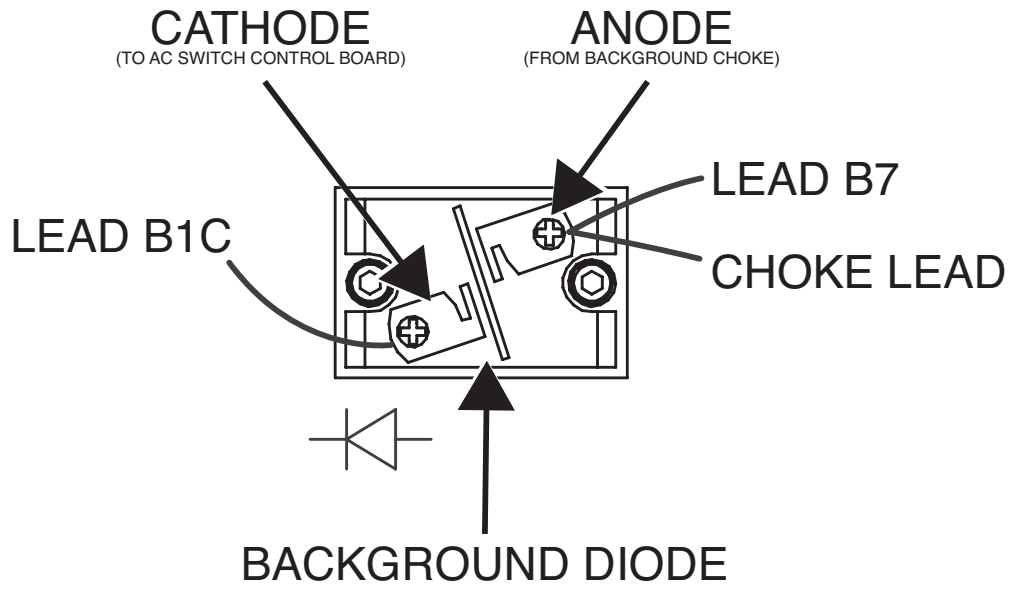


PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the background diode. See Figure F.12.
4. Using a phillips screwdriver, label and disconnect leads from the background diode.
5. Using a multimeter diode test, measure the back ground diode drop from the anode to cathode on the background diode. The expected reading should be approximately 255mv. **The positive meter probe should be connected to the anode of the blocking diode.** See [Figure F.13](#). If an open or short is measured the background diode is faulty.
6. Reversing the meter probes should indicate an open reading on the meter.
7. Using a phillips screwdriver, attach the previously removed leads to the background diode. See Wiring Diagram.
8. Perform the [Case Cover Replacement Procedure](#).

BACKGROUND DIODE TEST *(continued)*

Figure F.13 – Background diode test point locations



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INPUT BLOCKING DIODE TEST

 **WARNING**

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

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

TEST DESCRIPTION

This test will help determine if the Input Blocking Diodes are open or shorted.

MATERIALS NEEDED

- Multimeter
- Wiring Diagram

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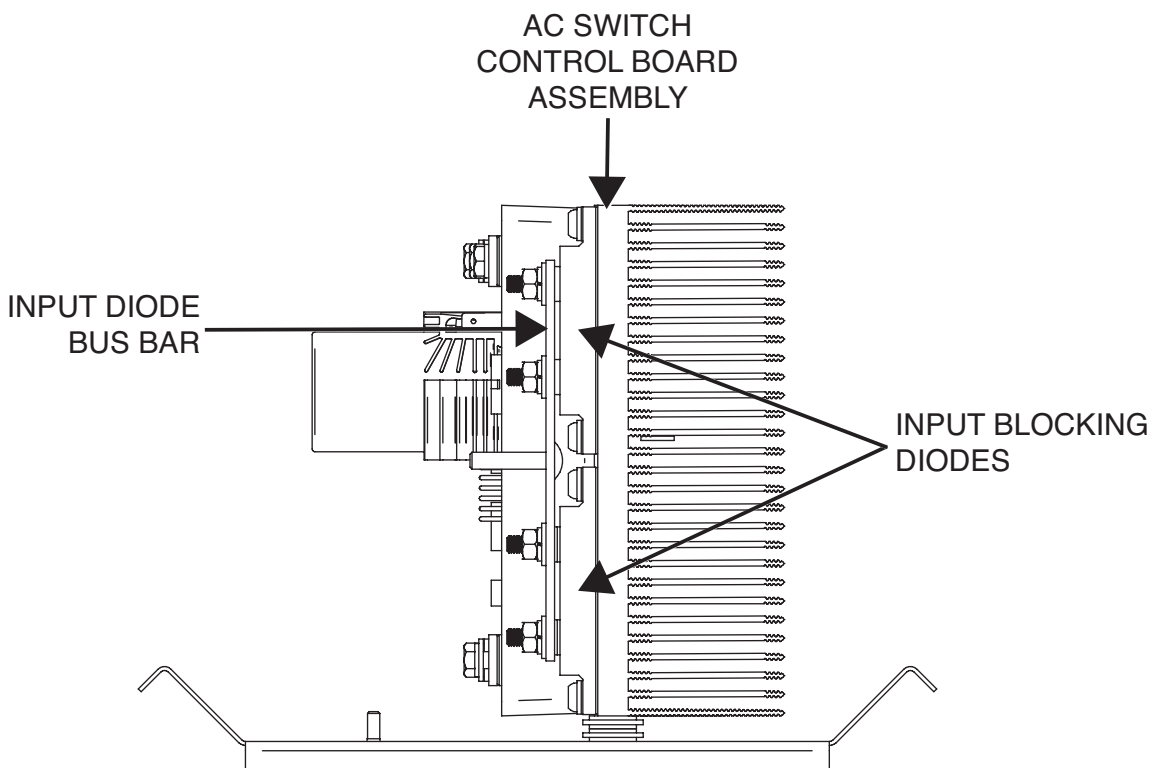
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INPUT BLOCKING DIODE TEST *(continued)*

Figure F.14 – Input blocking diode locations



PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the input blocking diodes. See Figure F.14.
4. Using the multimeter diode test, measure the diode drop from the positive input lead (anode of the blocking diodes) to the diode heat sink (cathode of the blocking diodes). The expected reading should be approximately 255mv. **The positive meter probe should be connected to the anode of the blocking diodes.** If a short is measured, one or the both of the diodes is faulty.
5. Reversing the meter probes should indicate an open reading on the meter.
6. There are two diode modules. To test them individually for an open, the paralleling bus bar must be removed from the anodes of the diode modules.
7. Perform the [Case Cover Replacement Procedure](#).

POWER WAVE ADVANCED MODULE FUNCTIONAL TEST

WARNING

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

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

TEST DESCRIPTION

This test will help determine if the Power Wave Advanced Module is functioning as expected from a “high level”. This test will not test all of the circuitry.

MATERIALS NEEDED

- Power Wave Wirefeeder and Power Source
- Wiring Diagram

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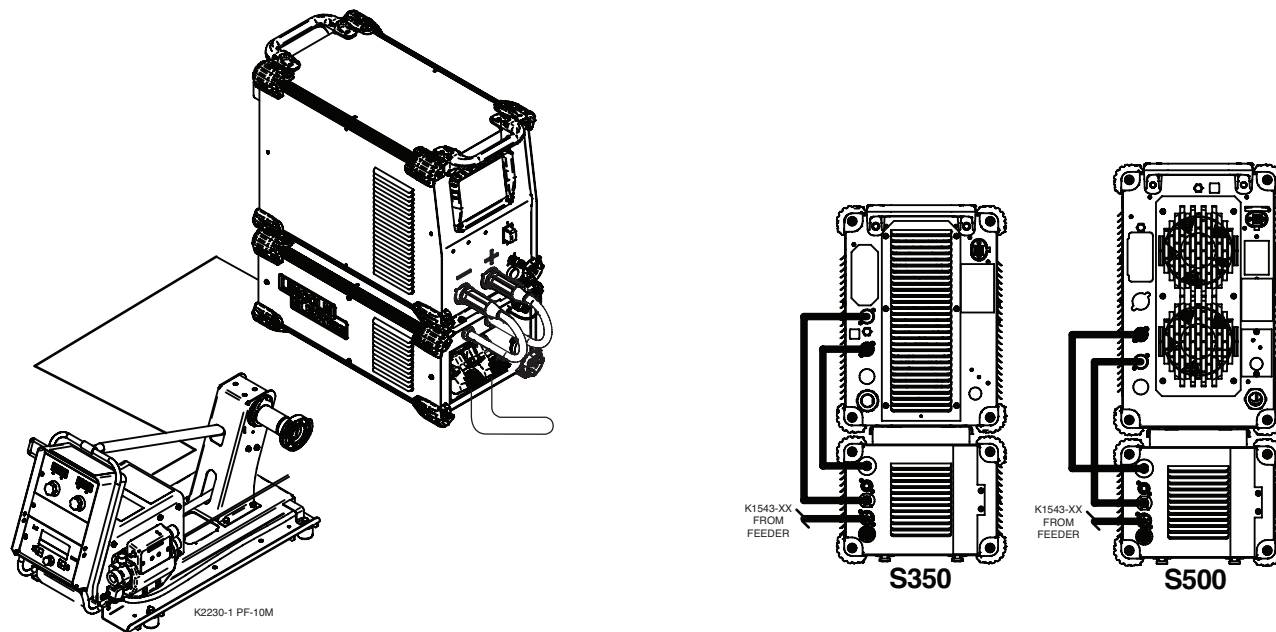
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POWER WAVE ADVANCED MODULE FUNCTIONAL TEST *(continued)*

Figure F.15 – Short circuit test



PROCEDURE

SHORT CIRCUIT TEST

(See Figure F.15)

1. Connect Advanced module to a Power Wave S350/500 or other compatible machine. Test assumes the host power source has been calibrated.
2. Verify the latest software is loaded in the Power Wave machine. Updated STT test mode (208). Can be verified by confirming DC negative test mode (213) and AC test mode (219) are present.
3. Short the work to electrode on the advanced module. Total cable length ≤ 10 ft.
4. Enable test modes on the UI of the power source or wire feeder. See wire feeder instruction manual (set-up menu selection P.99).
5. Select test mode 208 (STT Test Mode).
6. Enable the output. Pulling the trigger or turn the trim knob clockwise.

NOTE: An audible “buzz” from the advanced module is normal.

7. Read voltage feedback displayed on the wire feeder display. See [Table F.6](#).

OPEN CIRCUIT TEST

(See [Figure F.16](#))

1. With the output disabled, remove short from work and electrode studs of the advanced module.
2. Attach a digital multimeter across the work and electrode studs of the advanced module.
3. Select test mode 208 (STT Test Mode).
4. Enable the output. Pulling the trigger or turn the trim knob clockwise.

NOTE: An audible “buzz” from the advanced module is normal.

5. Read the voltage measured on the digital multimeter. See [Table F.8](#).

POWER WAVE ADVANCED MODULE FUNCTIONAL TEST *(continued)*

Figure F.16 – Open circuit test

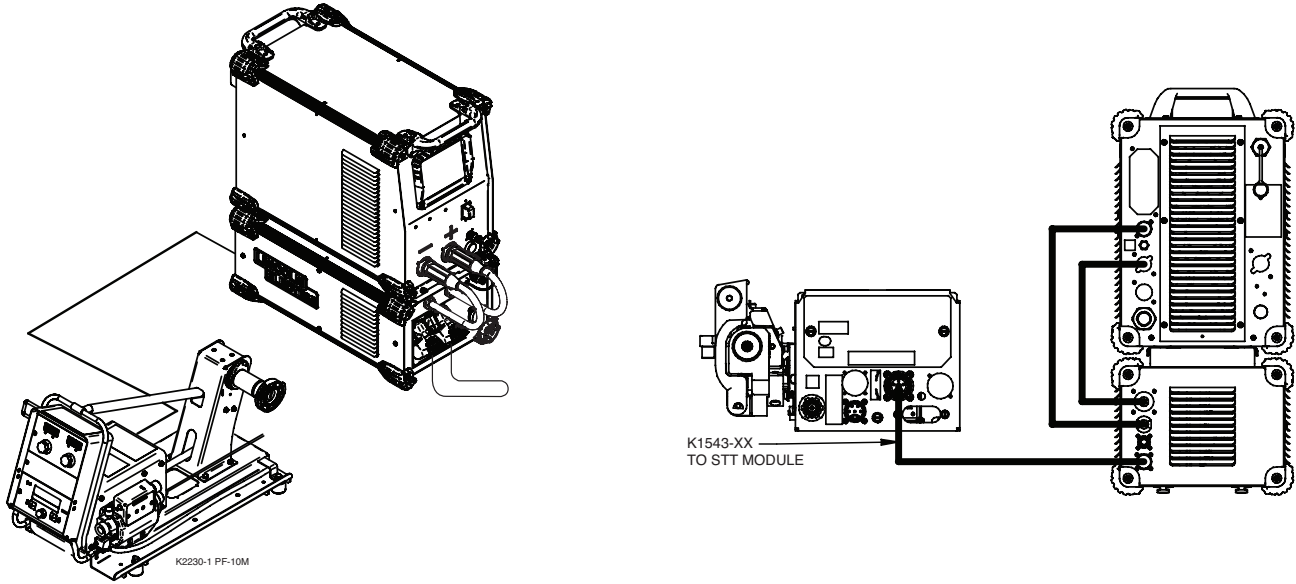


Table F.6 – Short circuit test

VOLTAGE	INDICATION / POSSIBLE CAUSE
< 2V	<p>AC Switch Shorted:</p> <ul style="list-style-type: none"> Faulty or disconnected differential I/O control signal (grey cable located at rear of module). <ul style="list-style-type: none"> - Verify cable connections (including those internal to the module and host power source). AC Switch Shorted (typically accompanied by Error 99). <ul style="list-style-type: none"> - Disconnect and perform the AC Switch Control Board Test.
10 - 15 VAC	<p>Normal Operation</p>
> 40V	<p>AC Switch Open:</p> <ul style="list-style-type: none"> Loose or open connection. <ul style="list-style-type: none"> - Verify weld cable connections (both internal and external to the module – including quick connections). AC Switch not closing (may be accompanied by error 99). <ul style="list-style-type: none"> - Verify status of the AC switch control board via the “on board” diagnostic LEDs. See Figure F.17 and Table F.7.

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

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Return to Master TOC

Return to Master TOC

POWER WAVE ADVANCED MODULE FUNCTIONAL TEST *(continued)*

Figure F.17 – Status LED locations

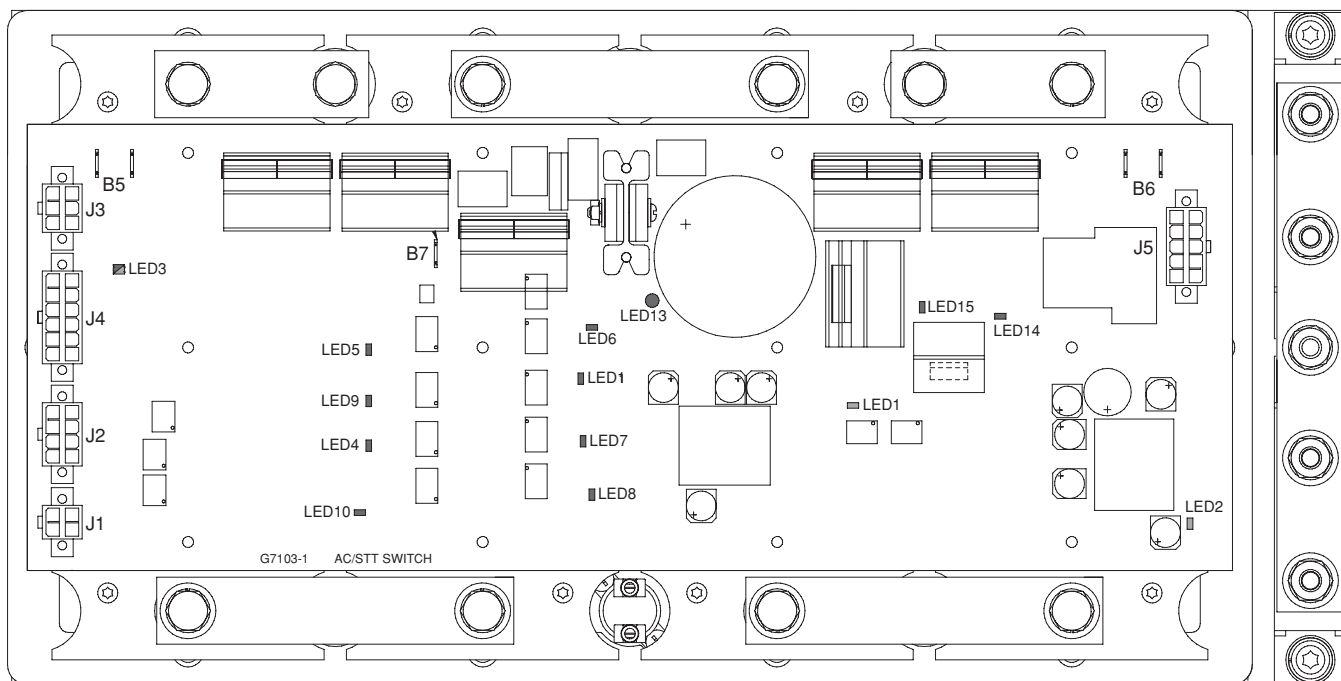


Table F.7 – Status LEDs function

LED	COLOR	FUNCTION	INDICATION
1	GREEN	H-BRIDGE STATUS	<u>Normal Status:</u> ON <u>Fault Condition:</u> If the snubber capacitor voltage exceeds its threshold, the acceptable voltage across the switch is exceeded or the power supplies voltages are insufficient, the LED will be off.
2	GREEN	POWER SUPPLY	<u>Normal Status:</u> ON <u>Fault Condition:</u> If there is a short on any of the power supplies, this LED will blink. If no power is present, this LED will be OFF.
3	RED/GREEN	STATUS	<u>Normal Status:</u> SOLID GREEN <u>Fault Condition:</u> If the switch encounters an error, this LED will flash an error code.
4 & 7	RED	NEG. SWITCH	Indicates switch is configured for NEGATIVE polarity or AC output.
5 & 6	RED	POS. SWITCH	Indicates switch is configured for POSITIVE polarity or AC output.
8 & 10	RED	NEG. STT	Indicates switch is closed in NEGATIVE polarity, will detect slight dimming if performing NEGATIVE STT.
9 & 11	RED	POS. STT	Indicates switch is closed in POSITIVE polarity, will detect slight dimming if performing POSITIVE STT.
13	RED	SNUBBER VOLTAGE	Indicates that high voltage is present on the snubber capacitor.
14	RED	MAIN BUS OVERVOLTAGE	Indicates that a voltage > 120VDC was present across the bridge (Latched Error).
15	RED	SNUBBER CAP OVERVOLTAGE	Indicates that a voltage > 500VDC was present on the snubber capacitor (Latched Error).

POWER WAVE ADVANCED MODULE FUNCTIONAL TEST (continued)

Table F.8 – Open circuit test

VOLTAGE	INDICATION / POSSIBLE CAUSE
< 70 VAC	<p>AC Switch Shorted:</p> <ul style="list-style-type: none"> • Faulty or disconnected differential I/O control signal (grey cable located at rear of module). <ul style="list-style-type: none"> - Verify cable connections (including those internal to the module and host power source). • AC Switch Shorted (typically accompanied by Error 99). <ul style="list-style-type: none"> - Disconnect and perform the AC Switch Control Board Test. • Background Circuit Shorted <ul style="list-style-type: none"> - Disconnect and perform the Background Diode Test. • Loss of Active Snubber Resistors (typically accompanied by error 99). <ul style="list-style-type: none"> - Disconnect and measure snubber resistors at J5 pin 3 (lead 453) and J5 pin 5 (lead 455) on the AC switch control board (should be 100 ohms).
≥ 70 VAC	Normal Operation

Return to Section TOC

Return to Master TOC

Return to Section TOC

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Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

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

HIGH FREQUENCY 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 High Frequency Board is functional. It will not test all of the circuits on the High Frequency board.

MATERIALS NEEDED

- Multimeter
- Wiring Diagram

 **WARNING**

High voltage is present in the High Frequency Circuit and can damage measuring equipment. It is recommended that you do NOT attempt to measure any voltages until the High Frequency Circuit is disabled.

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

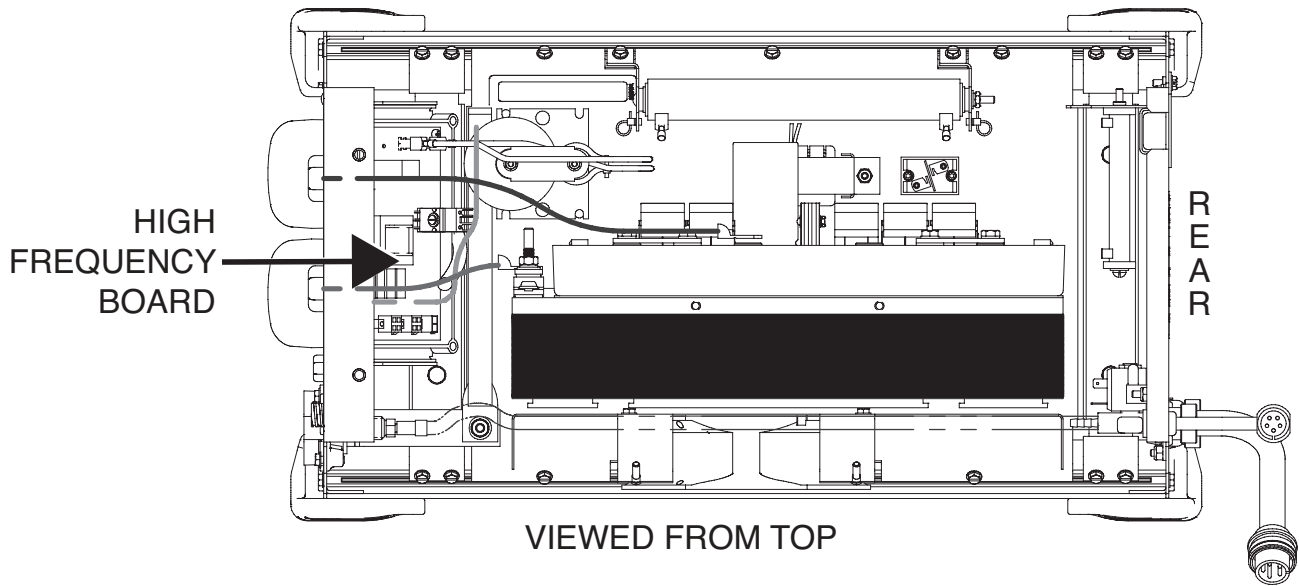
Return to Master TOC

Return to Section TOC

Return to Master TOC

HIGH FREQUENCY BOARD TEST *(continued)*

Figure F.18 – High frequency board location



PROCEDURE

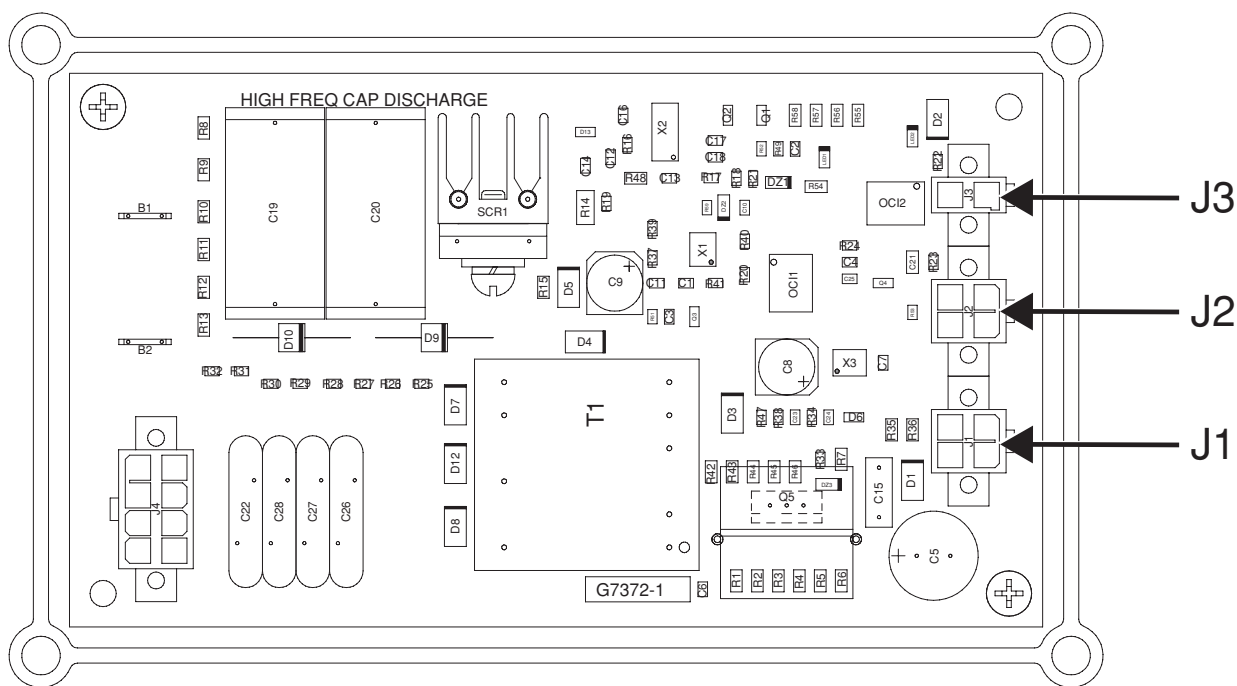
1. Perform the [Case Cover Removal Procedure](#).
2. Locate the high frequency board. See Figure F.18.
3. Carefully apply the correct input power to the Power Wave Advanced Module via the Arlink receptacle. See the Wiring Diagram and appropriate connection diagrams.
4. Check the status of the LEDs on the high frequency board. See [Figure F.19](#), and Table F.9.

Table F.9 – High frequency board LEDs

LED	COLOR	FUNCTION	INDICATION
1	RED	POWER SUPPLY	40VDC ArcLink supplied to board and 15VDC supply functioning on board.
2	GREEN	HIGH FREQUENCY ENABLE	Indicates the high frequency enable signal is being applied from the AC switch control board to the high frequency board. The Power Wave must be in TIG mode and the output enabled (triggered).

HIGH FREQUENCY BOARD TEST *(continued)*

Figure F.19 – High frequency board LED and test point locations



5. If the LEDs are lit and high frequency is not present at the torch, perform the [High Frequency Transformer Test](#). The TIG torch may be faulty.
6. To further test the high frequency board remove all input power to the Power Wave Advanced Module.
7. Carefully locate and remove plug J3 from the high frequency board. See Figure F.19. This will prevent the high frequency board from turning on and damaging measuring equipment.
8. Carefully apply the correct input power to the Power Wave Advanced Module via the Arlink receptacle. See the Wiring Diagram and appropriate connection diagrams. Note: If LED 2 (Green) is on with plug J3 removed from the high frequency board the board may be faulty.
9. With plug J3 removed, carefully check for the presence of 40VDC at plug J1 pin 4 (+Lead 52B) to plug J1 pin 3 (-Lead 51B) input supply from AC switch control board. See Wiring Diagram.
10. With plug J3 removed, carefully check for the presence of 40VDC at plug J2 pin 4 (+Lead 52C) to plug J2 pin 3 (-Lead 51C) supply from high frequency board to Fan.
11. Remove all input power to the Power Wave Advanced Module.
12. Locate and remove the two high frequency transformer primary leads from terminals B1 and B2. See Figure F.19.
13. Check the resistance from terminals B1 to B2. Normal resistance is 2830 ohms. See the Wiring Diagram.
14. Connect the two leads previously removed onto terminals B1 and B2.
15. Perform the [Case Cover Replacement Procedure](#).

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

STT SNUBBER RESISTORS ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the STT Snubber Resistors Assembly.

MATERIALS NEEDED

- 5/16" Nutdriver
- Wiring Diagram

Return to Section TOC

Return to Master TOC

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Return to Section TOC

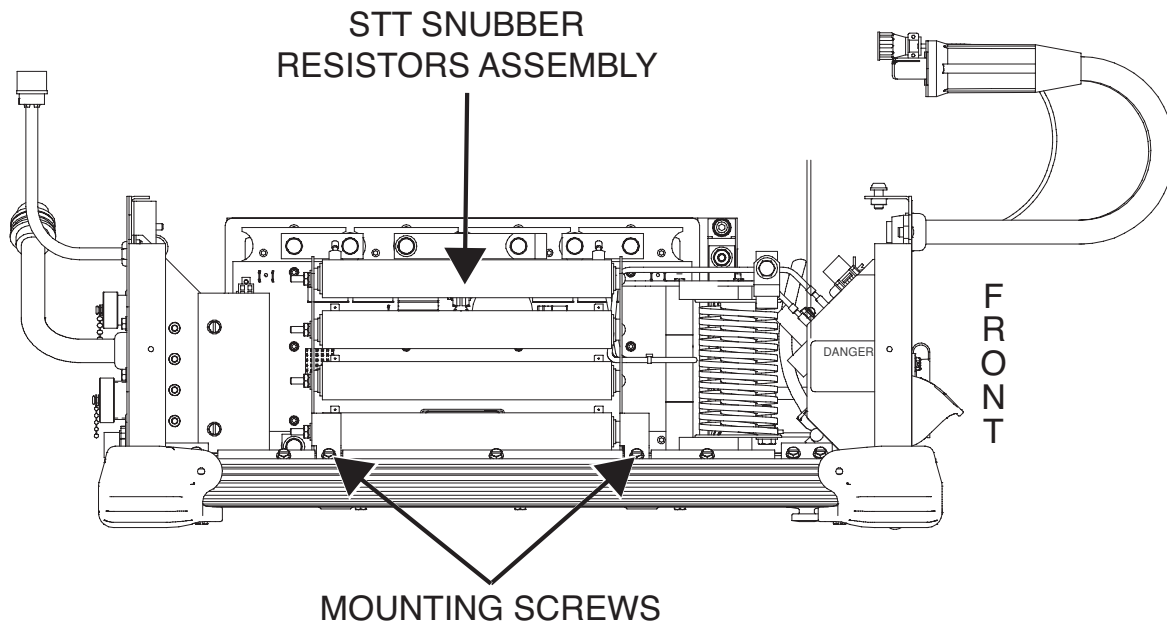
Return to Master TOC

Return to Section TOC

Return to Master TOC

STT SNUBBER RESISTORS ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.20 – STT snubber resistors and mounting screw locations

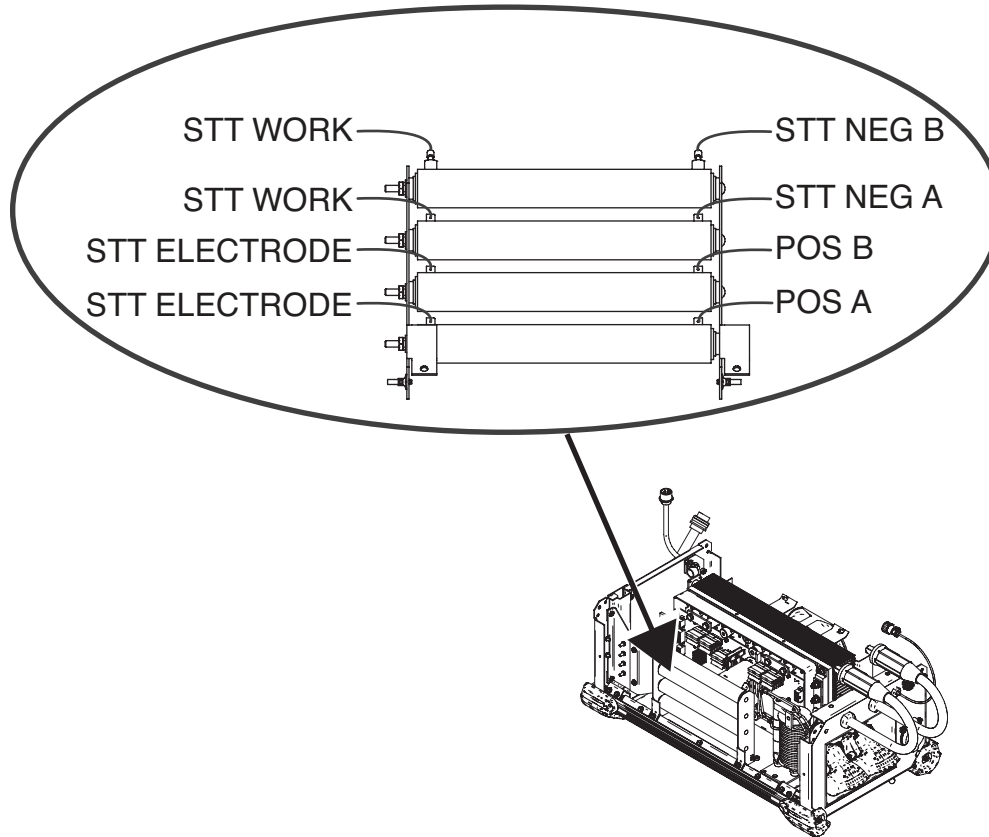


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate STT snubber resistors assembly. See Figure F.20.
4. Using a 5/16" nutdriver, remove the two screws securing the STT snubber resistor bracket to the machine. See Figure F.20.
5. Label and disconnect the two STT work leads and the two STT electrode leads from the left side of the STT snubber resistors assembly. See Wiring Diagram. See [Figure F.21](#).
6. Label and disconnect the STT NEG A, STT NEG B, POS B and POS A leads from the right side of the STT snubber resistors assembly. See Wiring Diagram. See [Figure F.21](#).
7. Remove any cable ties necessary to allow for the removal of the STT snubber resistors assembly. Note placement of cable ties for reassembly.
8. The STT snubber resistors assembly can now be removed and replaced.

STT SNUBBER RESISTORS ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.21 – STT snubber resistors leads



REPLACEMENT PROCEDURE

1. Position new STT snubber resistors assembly near the machine.
2. Attach any previously removed cable ties.
3. Connect the STT NEG A, STT NEG B, POS B and POS A leads to the right side of the STT snubber resistors assembly. See Wiring Diagram.
4. Connect the two STT work leads and the two STT electrode leads to the left side of the STT snubber resistors assembly. See Wiring Diagram.
5. Carefully position the STT snubber resistors assembly into the machine.
6. Using a 5/16" nutdriver, attach the two screws securing the STT snubber resistors bracket to the machine.
7. Perform the [Case Cover Replacement Procedure](#).

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

FAN ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

WARNING

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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

- 5/16" Nutdriver
- Wiring Diagram
- Cable ties

Return to Section TOC

Return to Master TOC

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Return to Master TOC

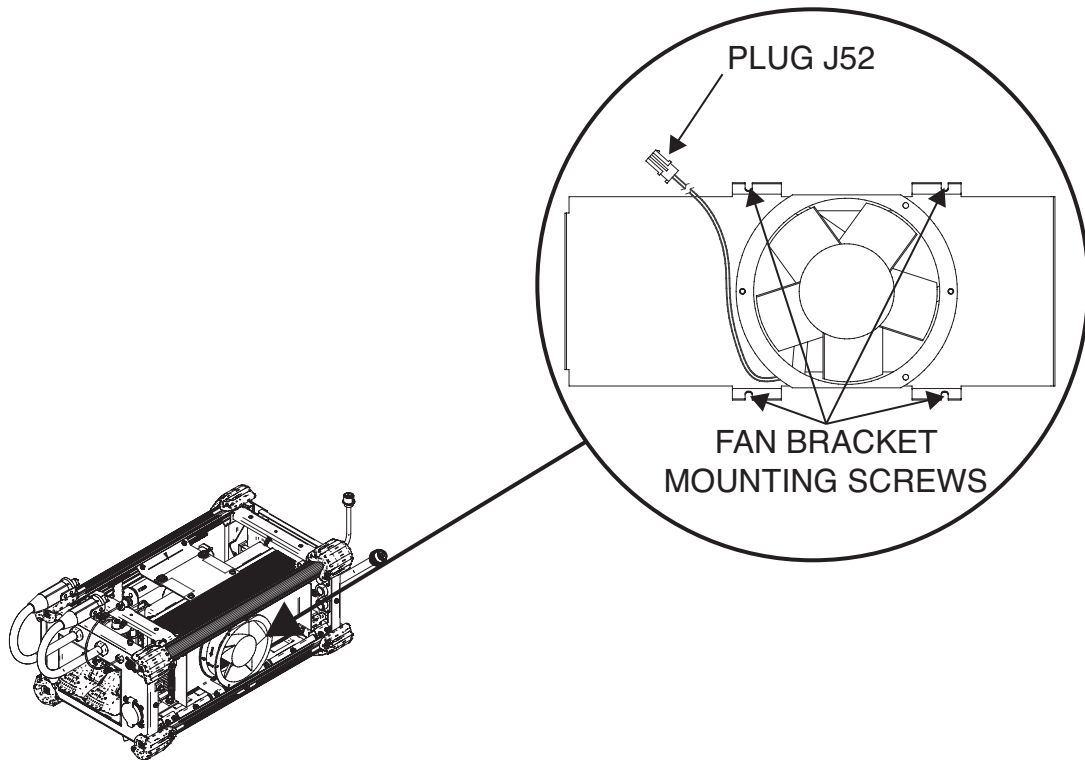
Return to Section TOC

Return to Master TOC

FAN ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.22 – Fan assembly, plug J52 and fan bracket mounting screw locations



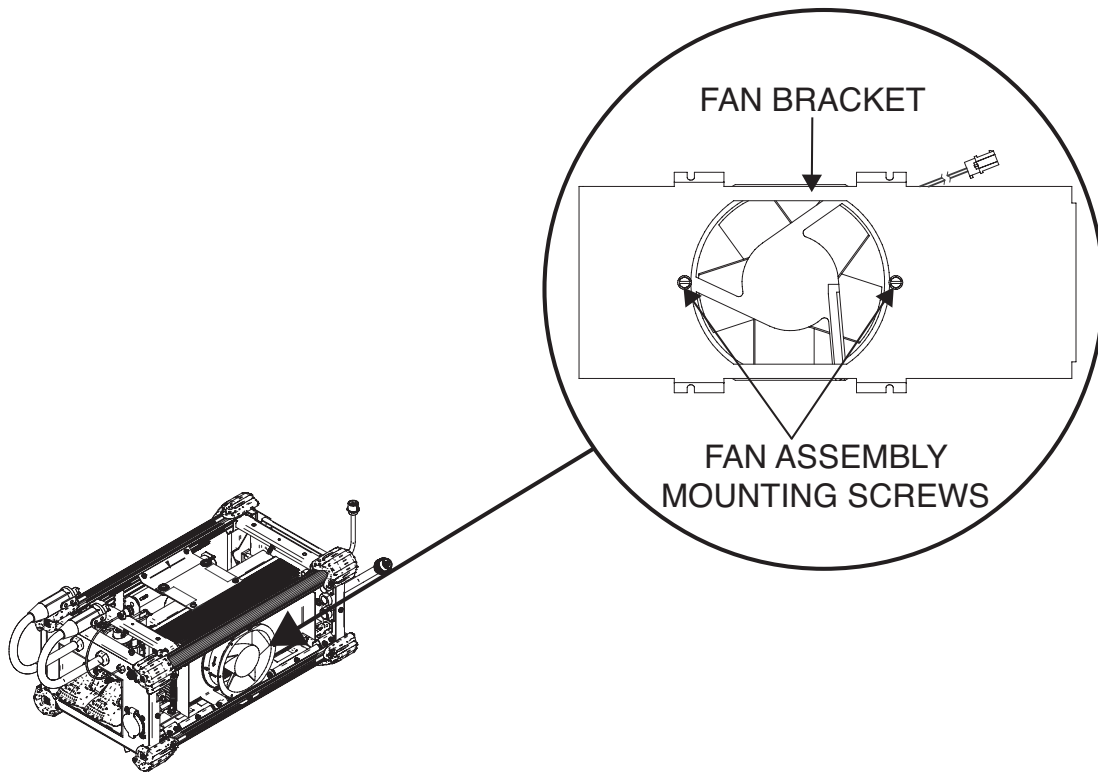
REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate fan assembly. See Figure F.22.
4. Label and disconnect plug J52. See Wiring Diagram. See Figure F.22. Carefully remove any necessary cable ties.
5. Using a 5/16" nutdriver, remove the four screws securing the fan bracket to the machine. See Figure F.22.
6. Using a 5/16" nutdriver, remove the two screws securing the top front extrusion assembly to the front panel. See [Figure F.23](#). Note airflow and rotation indications for reassembly.
7. Lift the extrusion assembly and remove the fan assembly. See [Figure F.23](#).

FAN ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.23 – Fan assembly screw locations



REPLACEMENT PROCEDURE

1. Position new fan onto the fan bracket. Note airflow and rotation indications.
2. Using a 5/16" nutdriver, attach the two screws securing the fan to the fan bracket. Torque to 23 - 27 in-lbs.
3. Using a 5/16" nutdriver, attach the four screws securing the fan bracket to the machine.
4. Lower the top front extrusion assembly securing the fan in place then using a 5/16" nutdriver replace the two screws holding it to the front panel. See [Figure F.22](#).
5. Connect plug J52.
6. Replace any previously removed cable ties.
7. Perform the [Case Cover Replacement Procedure](#).

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

HIGH FREQUENCY 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.

TEST DESCRIPTION

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

MATERIALS NEEDED

- 7/16" Deep Well Socket
- 7/16" Open End Wrench
- 5/16" Nutdriver
- Wiring Diagram

Return to Section TOC

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Return to Section TOC

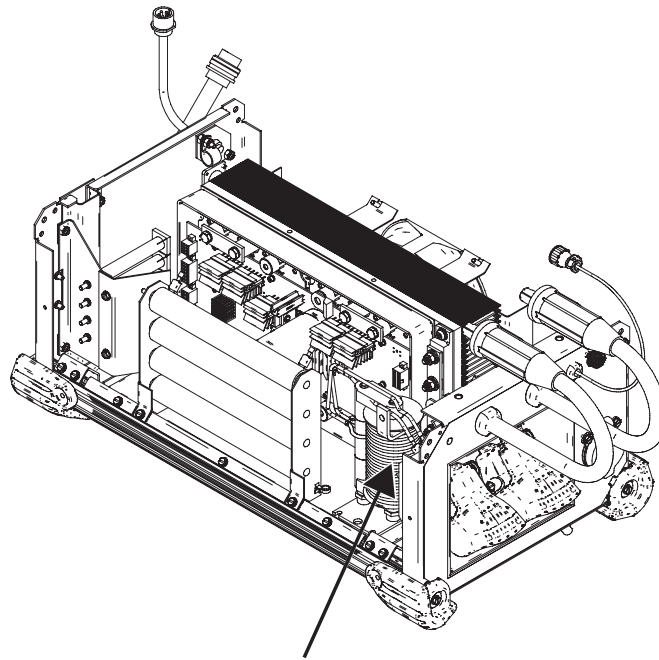
Return to Master TOC

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Return to Master TOC

HIGH FREQUENCY TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.24 – High frequency transformer location



HIGH FREQUENCY TRANSFORMER

REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Perform the [STT Snubber Resistors Removal Procedure](#).
4. Locate the high frequency transformer. See Figure F.24.
5. Using a 7/16" deep well socket and 7/16" open end wrench, remove the mounting bolt and associated washers securing the high frequency transformer to the high frequency bus bar (TIG output terminal). Note washer placement for reassembly. See [Figure F.25](#).
6. Using a 7/16" deep well socket and 7/16" open end wrench, remove the nut, bolt and associated washers securing the heavy black lead to the high frequency transformer. See Wiring Diagram. See [Figure F.26](#).
7. Using a 5/16" nutdriver, remove the two screws securing the high frequency transformer to the base of the machine. See [Figure F.25](#).

NOTE: A slotted screwdriver may be necessary if a nutdriver cannot access the mounting screws.

8. Label and disconnect leads B1 and B2 (HF leads) from the high frequency board. See Wiring Diagram.
9. The high frequency transformer can now be removed.

HIGH FREQUENCY TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.25 – High frequency transformer mounting bolt and screws

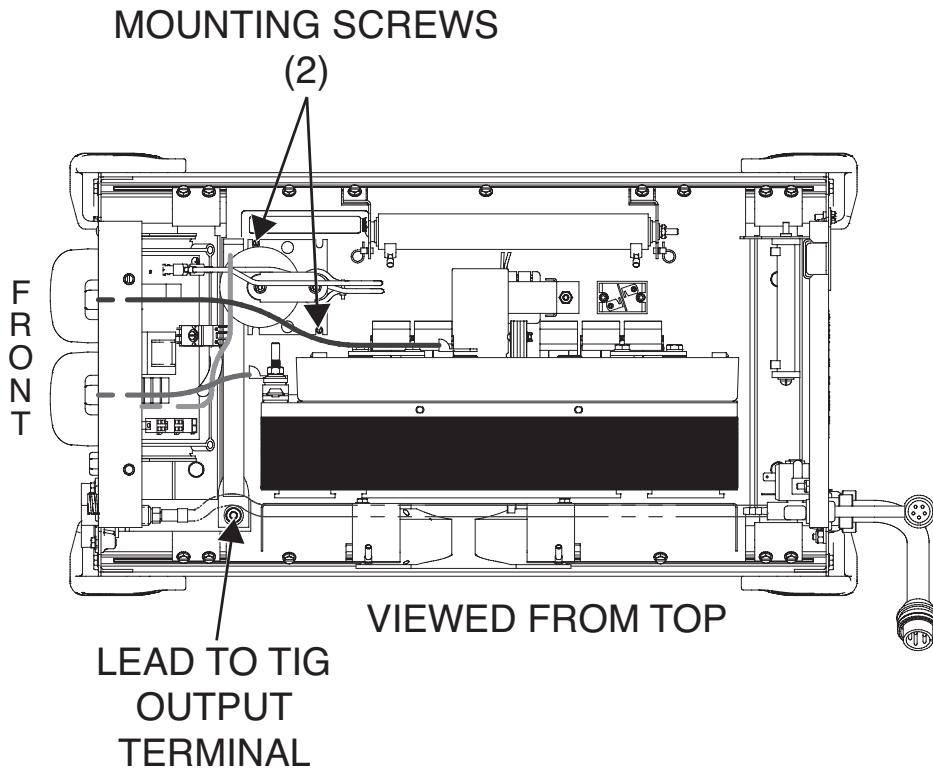
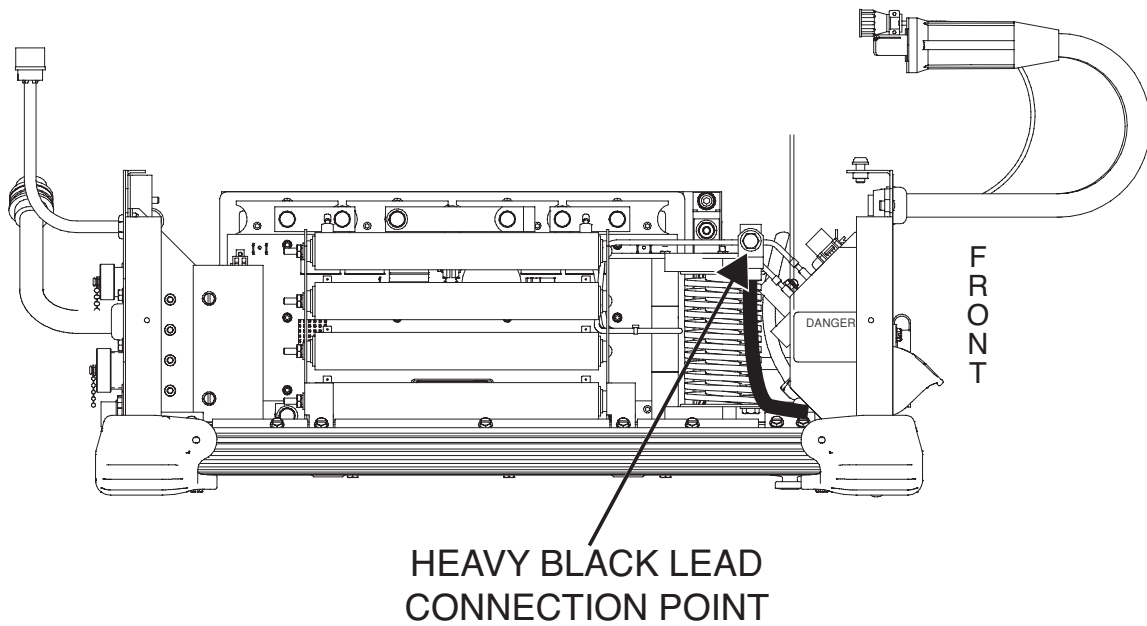


Figure F.26 – Heavy black lead connection point



Return to Section TOC

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Return to Master TOC

HIGH FREQUENCY TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

REPLACEMENT PROCEDURE

1. Carefully position the new high frequency transformer into the machine.
2. Using a 5/16" nutdriver, attach the two screws securing the high frequency transformer to the base of the machine.

NOTE: A slotted screwdriver may be necessary if a nutdriver cannot access the mounting screws.

3. Using a 7/16" deep well socket and 7/16" open end wrench, attach the nut, bolt and associated washers securing the heavy black lead to the high frequency transformer. See Wiring Diagram.
4. Using a 7/16" deep well socket and 7/16" open end wrench, attach the mounting bolt and associated washers securing the high frequency transformer to the high frequency bus bar (TIG output terminal).
5. Connect the previously removed leads B1 and B2 (HF leads) to the high frequency board. See Wiring Diagram.
6. Perform the [STT Snubber Resistors Replacement Procedure](#).
7. Perform the [Case Cover Replacement Procedure](#).

HIGH FREQUENCY BOARD REMOVAL AND REPLACEMENT PROCEDURE



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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

3/8" Nutdriver

Return to Section TOC

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Return to Section TOC

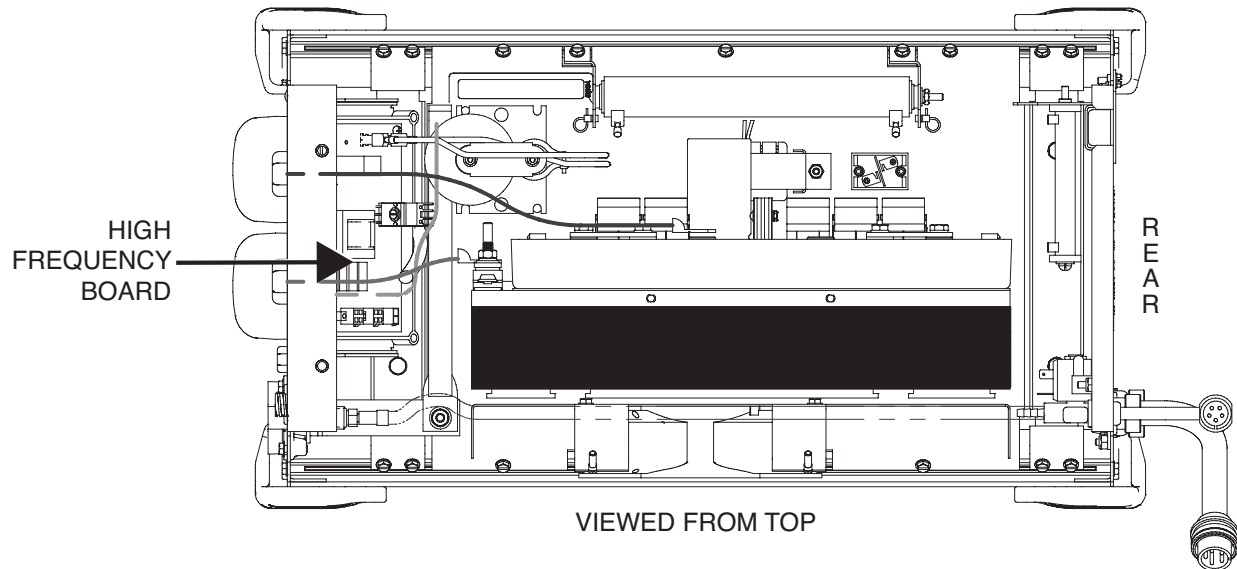
Return to Master TOC

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Return to Master TOC

HIGH FREQUENCY BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.27 – High frequency board location



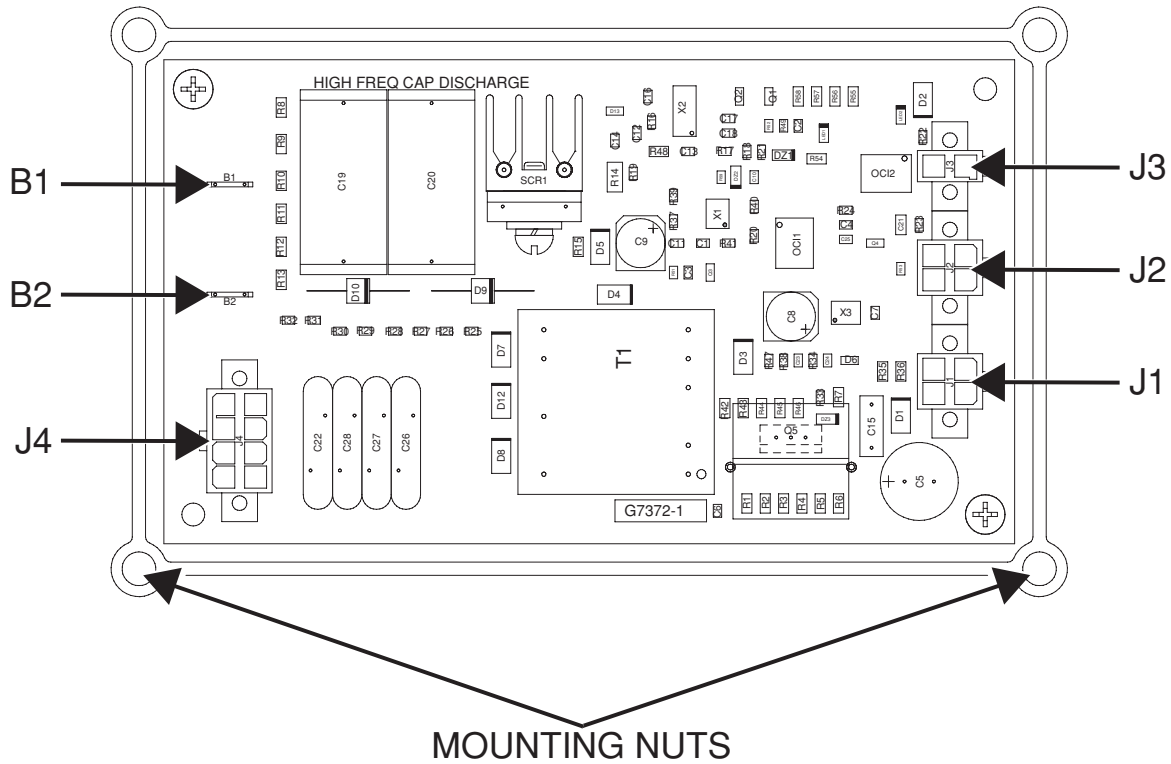
REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Perform the [STT Snubber Resistors Removal Procedure](#).
4. Locate the high frequency board. See Figure F.27.
5. Perform the [High Frequency Transformer Removal Procedure](#).
6. Label and remove leads B1 and B2 from the high frequency board. See Wiring Diagram. See [Figure F.28](#).
7. Label and remove plugs J1, J2, J3 and J4 from the high frequency board. See Wiring Diagram. See [Figure F.28](#).
8. Using a 3/8" nutdriver, remove the two mounting nuts securing the high frequency board to the machine. See [Figure F.28](#).
9. The high frequency board can now be removed and replaced.

HIGH FREQUENCY BOARD

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.28 – High frequency board leads, plugs and mounting nut locations



REPLACEMENT PROCEDURE

1. Carefully position the new high frequency board into the machine.
2. Using a 3/8" nutdriver, attach the two mounting nuts securing the high frequency board to the machine.
3. Connect the previously removed plugs J1, J2, J3 and J4 to the high frequency board. See Wiring Diagram.
4. Connect the previously removed leads B1 and B2 to the high frequency board. See Wiring Diagram.
5. Perform the [High Frequency Transformer Replacement Procedure](#).
6. Perform the [STT Snubber Resistors Replacement Procedure](#).
7. Perform the [Case Cover Replacement Procedure](#).

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

BACKGROUND 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.

TEST DESCRIPTION

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

MATERIALS NEEDED

- 3/8" Nutdriver
- 7/16" Deepwell Nutdriver
- Slotted Screwdriver
- Wiring Diagram

Return to Section TOC

Return to Master TOC

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Return to Master TOC

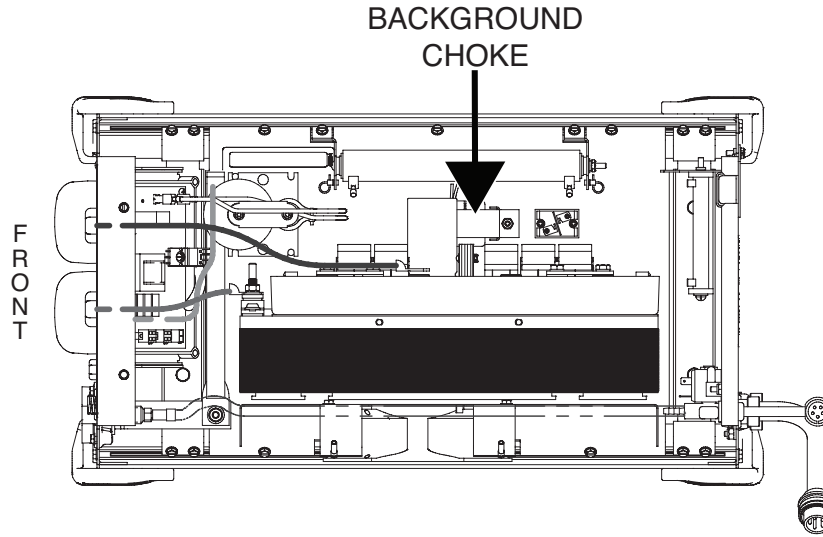
Return to Section TOC

Return to Master TOC

BACKGROUND CHOKE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.29 – Background choke location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the background choke. See Figure F.29.
4. Perform the [STT Snubber Resistors Removal Procedure](#).
5. Using a 7/16" nutdriver, label and disconnect the choke lead connected to the input diode bus bar. See Wiring Diagram. See [Figure F.30](#). Note washer placement for reassembly.
6. Using a slotted screwdriver, label and disconnect the choke lead connected to the background diode. See Wiring Diagram. See [Figure F.31](#).
7. Using a 3/8" nutdriver, remove the two mounting nuts securing the background choke to the machine. See [Figure F.32](#).
8. The background choke assembly can now be removed and replaced.

BACKGROUND CHOKE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.30 – Choke lead connected to input diode bus bar

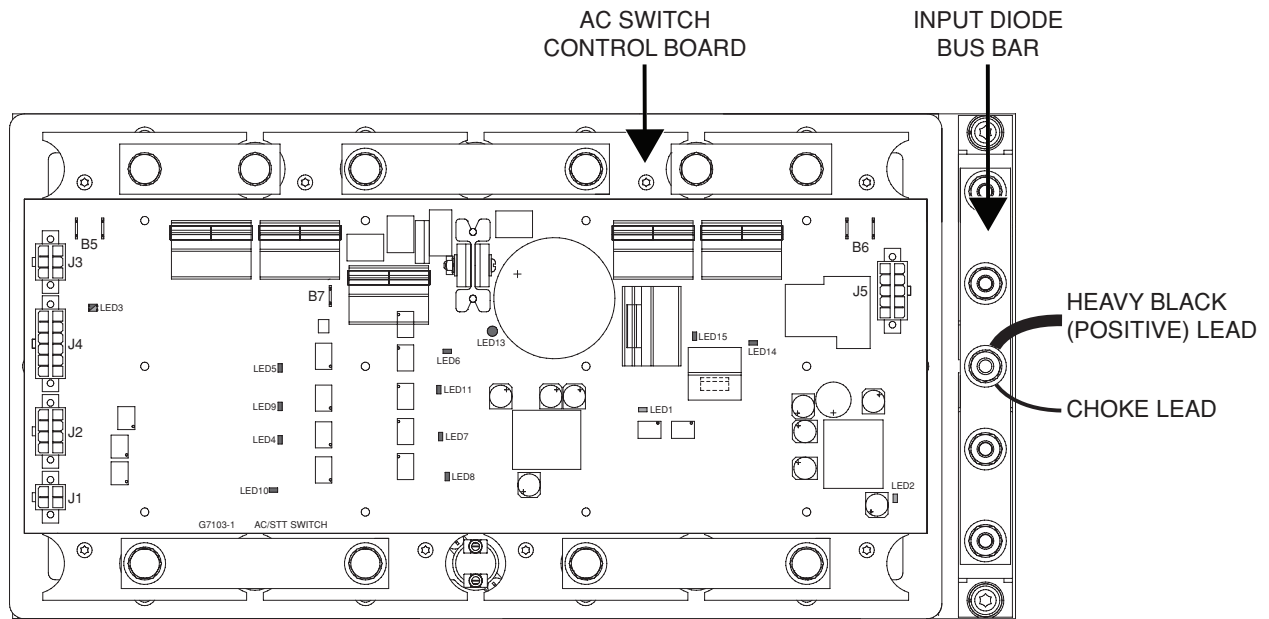
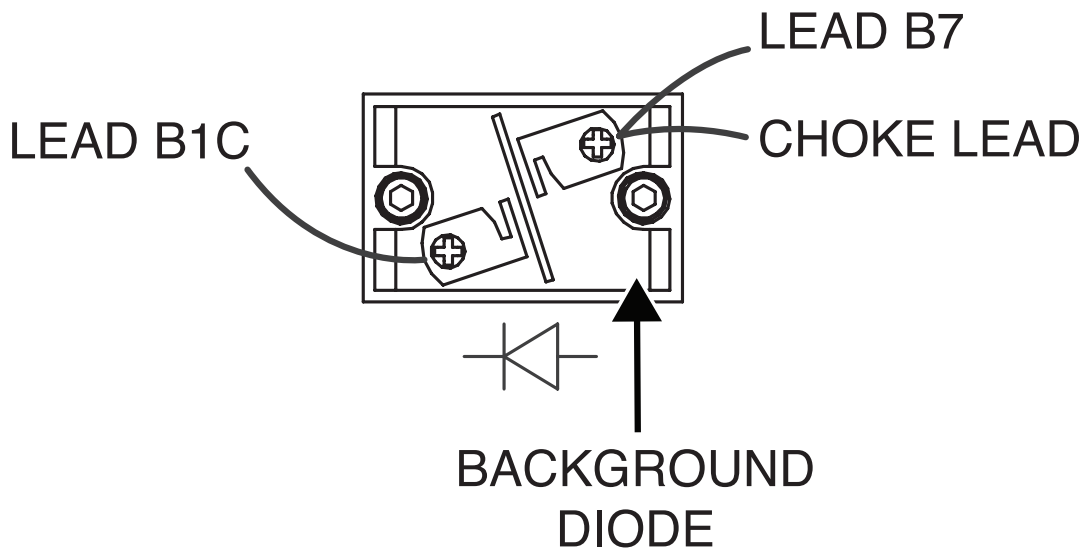


Figure F.31 – Choke lead connected to background diode



Return to Section TOC

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Return to Master TOC

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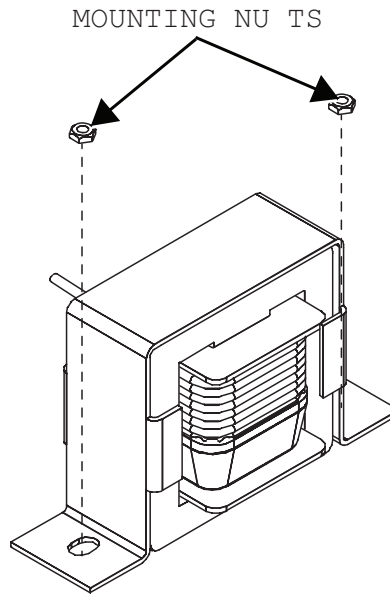
Return to Master TOC

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BACKGROUND CHOKE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.32 – Background choke mounting nut location



REPLACEMENT PROCEDURE

1. Carefully position the new background choke into the machine.
2. Using a 3/8" nutdriver, attach the two mounting nuts securing the background choke to the machine.
3. Using a slotted screwdriver, connect the previously removed choke lead to the background diode. See Wiring Diagram.
4. Using a 7/16" nutdriver, connect the previously removed choke lead to the input diode bus bar. See Wiring Diagram. Note washer placement.
5. Perform the [STT Snubber Resistors Replacement Procedure](#).
6. Perform the [Case Cover Removal Procedure](#).

GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

WARNING

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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

- Hammer
- Slotted Screwdriver
- Needle Nose Pliers
- Wiring Diagram

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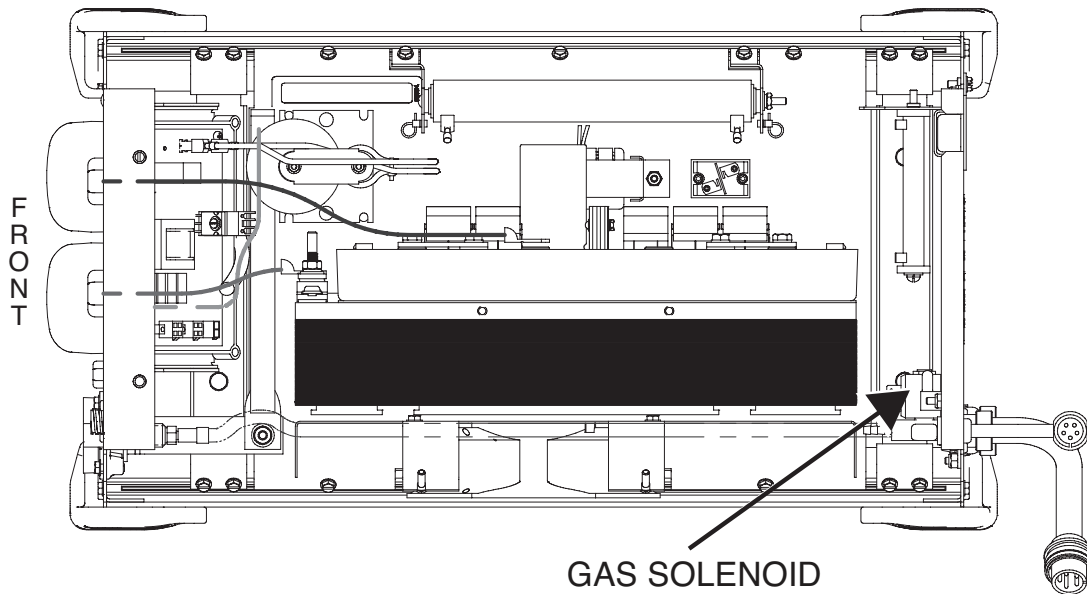
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GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.33 – Gas solenoid location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the gas solenoid. See Figure F.33.
4. Perform the [Fan Assembly Removal Procedure](#).
5. Label and disconnect leads 412 and 406 from the gas solenoid. Needle nose pliers may be necessary for removal. See Wiring Diagram. See [Figure F.34](#).
6. Using needle nose pliers, compress hose clamp and disconnect gas hose from back of solenoid.
7. Using a hammer and slotted screwdriver, carefully loosen nut on the back of the machine securing the gas solenoid to the case back. Note washer placement for reassembly. See [Figure F.35](#).
8. The gas solenoid can now be removed and replaced.

GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

(continued)

Figure F.34 – Gas solenoid leads

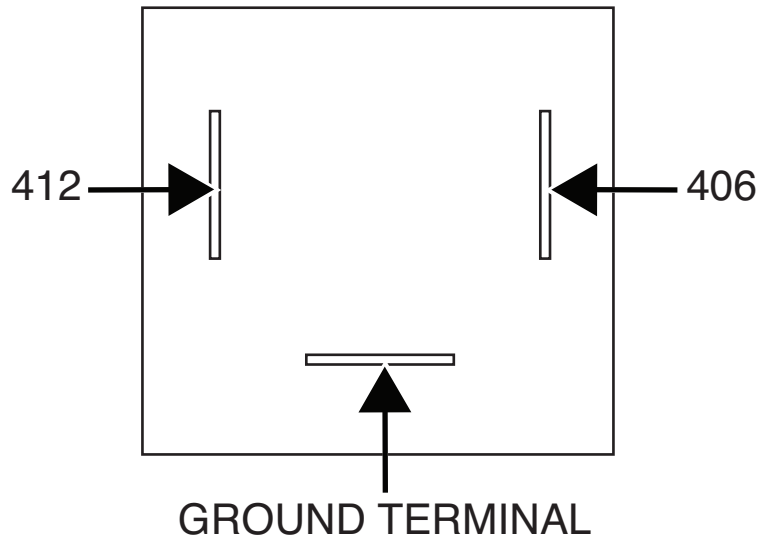
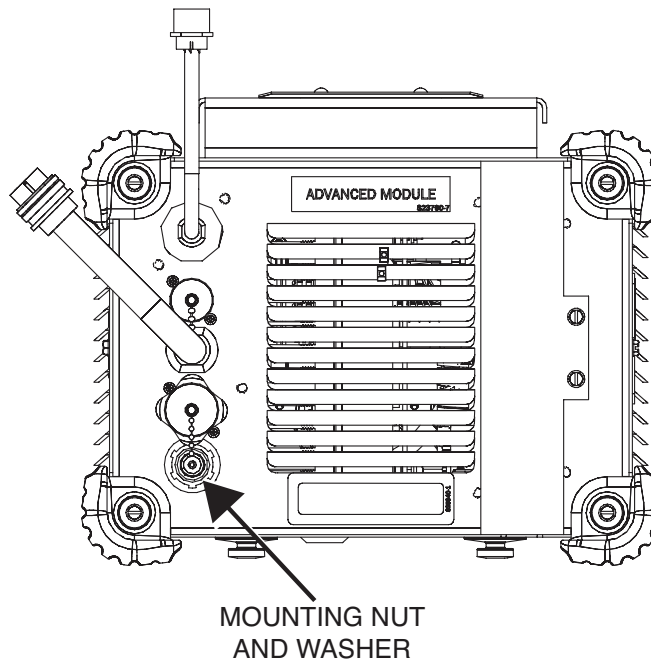


Figure F.35 – Gas solenoid mounting nut



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GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

(continued)

REPLACEMENT PROCEDURE

1. Carefully position the new gas solenoid into the case back of the machine.
2. Carefully tighten nut and washer securing the gas solenoid to the case back.
3. Using needle nose pliers, compress hose clamp and connect gas hose to the back of solenoid.
4. Connect leads 412 and 406 to the gas solenoid. Needle nose pliers may be necessary for reassembly. See Wiring Diagram.
5. Perform the [Fan Assembly Replacement Procedure](#).
6. Perform the [Case Cover Replacement Procedure](#).

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BACKGROUND DIODE REMOVAL AND REPLACEMENT PROCEDURE

WARNING

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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

- 5/16" Nutdriver
- Slotted Screwdriver
- 7/64" Allen Wrench

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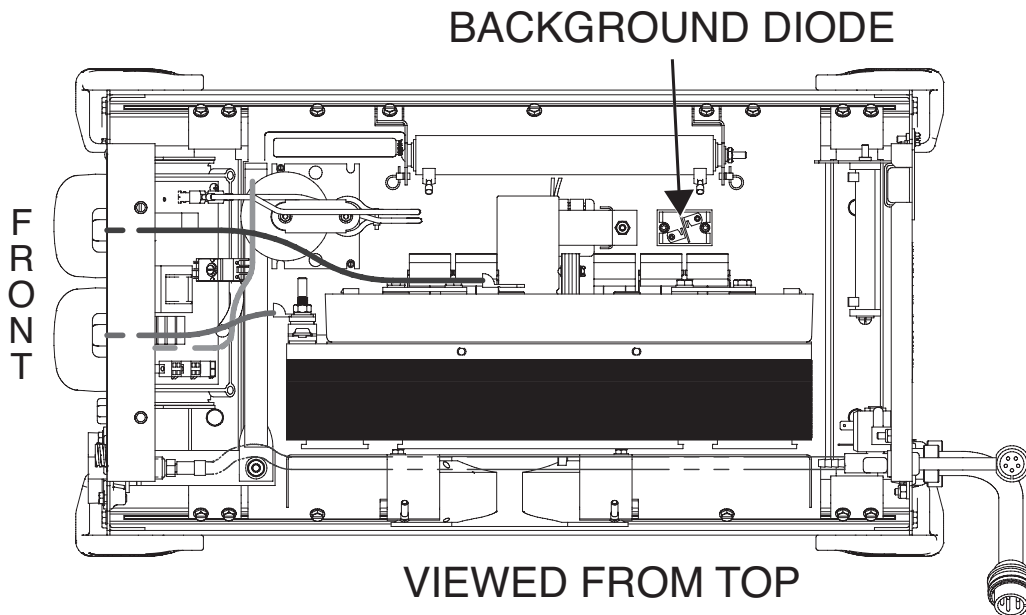
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BACKGROUND DIODE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.36 – Background diode location



REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Locate the background diode. See Figure F.36.
4. Perform the [STT Snubber Resistors Removal Procedure](#).
5. Using a slotted screwdriver, remove the screws and washers securing leads B1C, B7 and the choke lead to the background diode. See Wiring Diagram. See [Figure F.37](#).
6. Using a 7/64" allen wrench, remove the two screws and washers securing the background diode to the base of the machine. See [Figure F.38](#). Note polarity of background diode for reassembly.
8. The background diode can now be removed and replaced.

BACKGROUND DIODE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.37 – Background diode leads

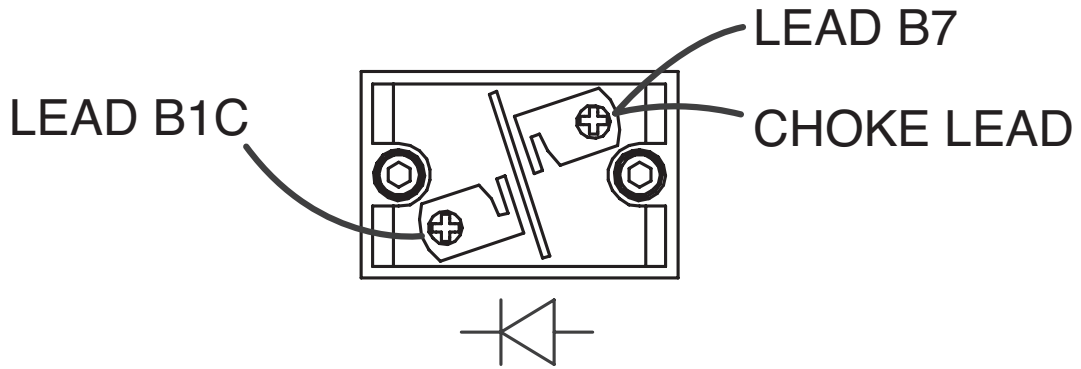
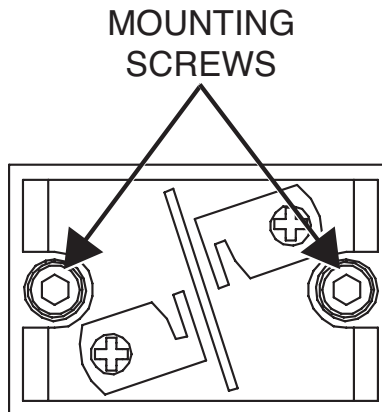


Figure F.38 – Background diode mounting screws



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AC SWITCH CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

WARNING

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

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

TEST DESCRIPTION

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

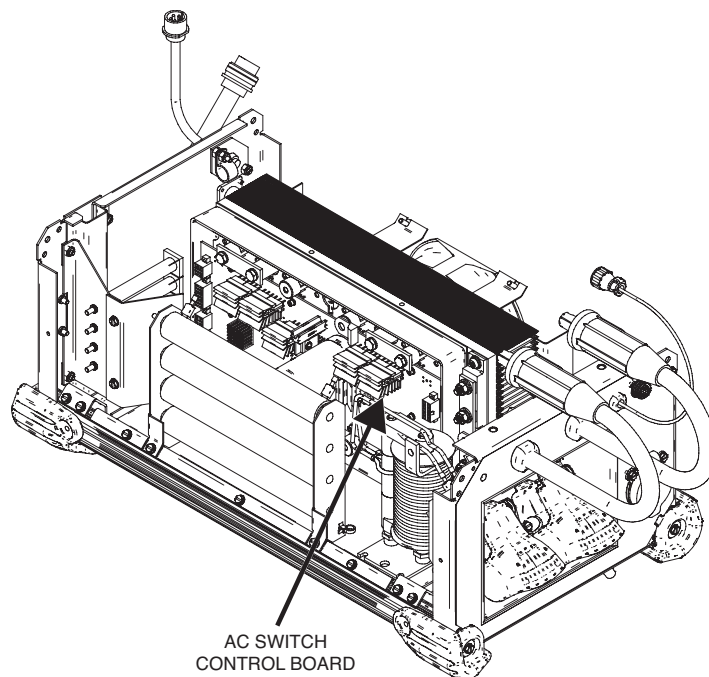
MATERIALS NEEDED

- T-25 Torx Wrench
- 5/16" Nutdriver
- 7/16" Nutdriver
- 7/16" Deepwell Nutdriver
- Slotted Screwdriver
- Wiring Diagram

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AC SWITCH CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.39 – AC switch control board location

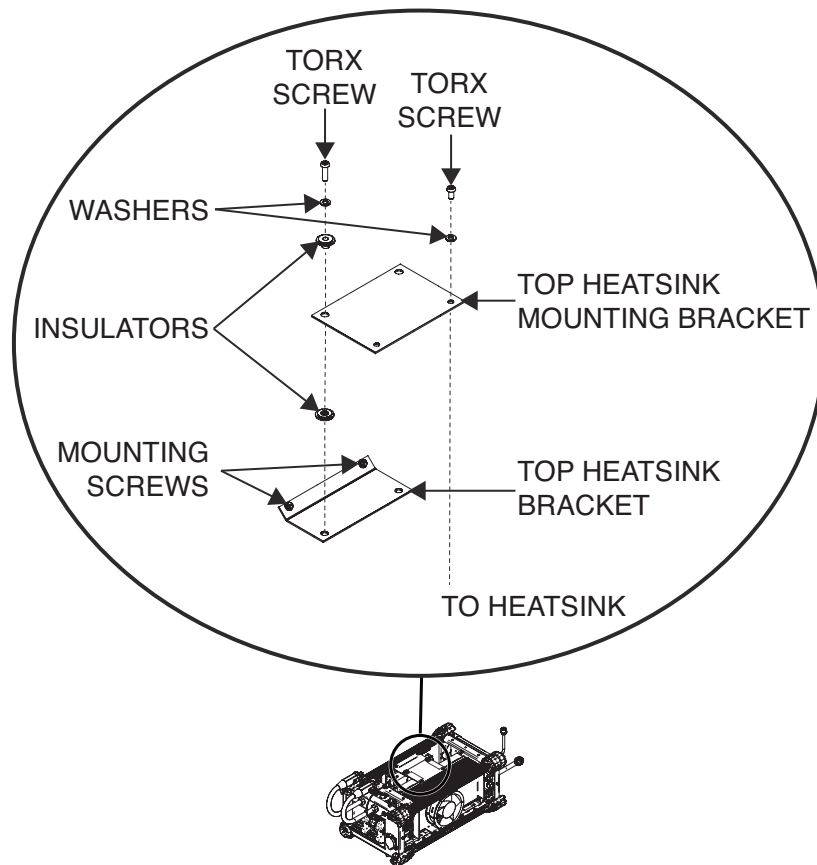


REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the [Case Cover Removal Procedure](#).
3. Perform the [STT Snubber Resistors Removal Procedure](#).
4. Perform the [High Frequency Transformer Removal Procedure](#).
5. Perform the [Background Choke Removal Procedure](#).
6. Locate the AC switch control board assembly. See Figure F.39.
7. Using a T-25 torx wrench, remove the two torx screws and washers securing the top heatsink mounting bracket to the AC switch control board heatsink. See [Figure F.40](#).
8. Using a T-25 torx wrench, remove the two torx screws, insulators and washers securing the top heatsink mounting bracket to the top heatsink bracket. See [Figure F.40](#).
9. Using a 5/16" nutdriver, remove the two screws securing the top heatsink bracket to the frame of the machine. See [Figure F.40](#).
10. Label and disconnect plugs J3, J4, J2, J1 and J5 from the AC switch control board. See Wiring Diagram. See [Figure F.41](#).
11. Label and disconnect leads B5, B6, B7, 401 and 402 (401 & 402 quick connects) from the AC switch control board. See Wiring Diagram. See [Figure F.41](#).
12. Using a 7/16" nutdriver, remove the bolt and washers securing the two STT leads attached to the bottom right copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label leads for reassembly.
13. Using a 7/16" nutdriver, remove the bolt and washers securing the heavy black lead attached to the bottom right copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label lead for reassembly.
14. Using a 7/16" nutdriver, remove the bolt and washers securing the two STT leads attached to the bottom left copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label leads for reassembly.
15. Using a 7/16" nutdriver, remove the bolt and washers securing the heavy black lead attached to the bottom left copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label lead for reassembly.

AC SWITCH CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.40 – Heatsink bracket removal



16. Using a 7/16" nutdriver, remove the bolt and washer securing lead B1C to the top left copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label lead for reassembly.
17. Using a 7/16" nutdriver, remove the bolt and washers securing the heavy black (negative) input lead to the middle copper bus bar. See Wiring Diagram. See [Figure F.42](#). Label lead for reassembly.
18. Using a 7/16" deepwell nutdriver, remove the bolt and washer securing the choke lead and the heavy black (positive) input lead to the input diode bus bar. See [Figure F.42](#). See Wiring Diagram. Label leads for reassembly.
19. Rotate machine on its side to gain access to the bolts securing the AC switch control board assembly to the base.
20. Using a slotted screwdriver, carefully remove the two button plugs from the base of the machine. See [Figure F.43](#). This will allow access to the two bottom heatsink mounting bolts.
21. Using a T-25 torx wrench, remove the two bolts securing the AC switch control board to the base. See [Figure F.43](#). Note washer and insulator placements for reassembly.
22. The AC switch control board can now be removed and replaced.

AC SWITCH CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.41 – AC switch control board plug locations

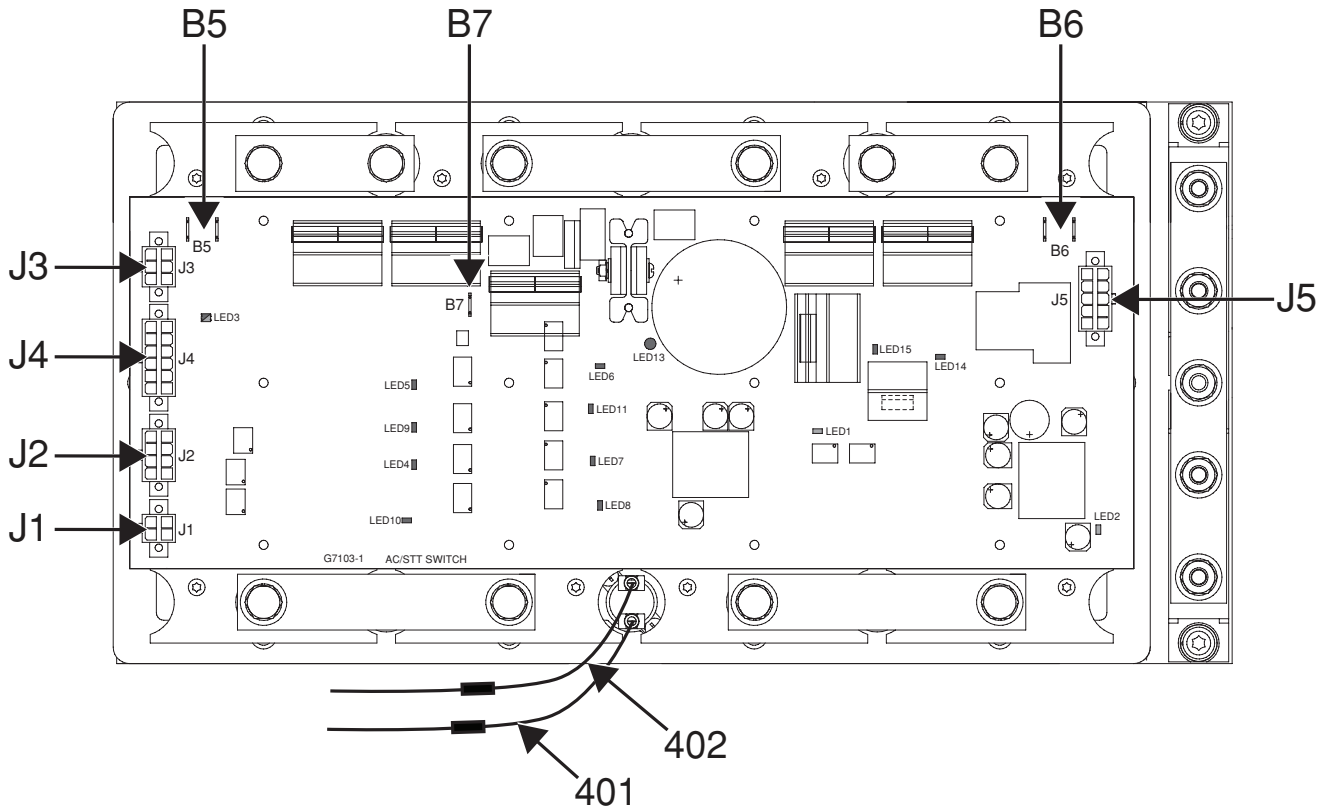
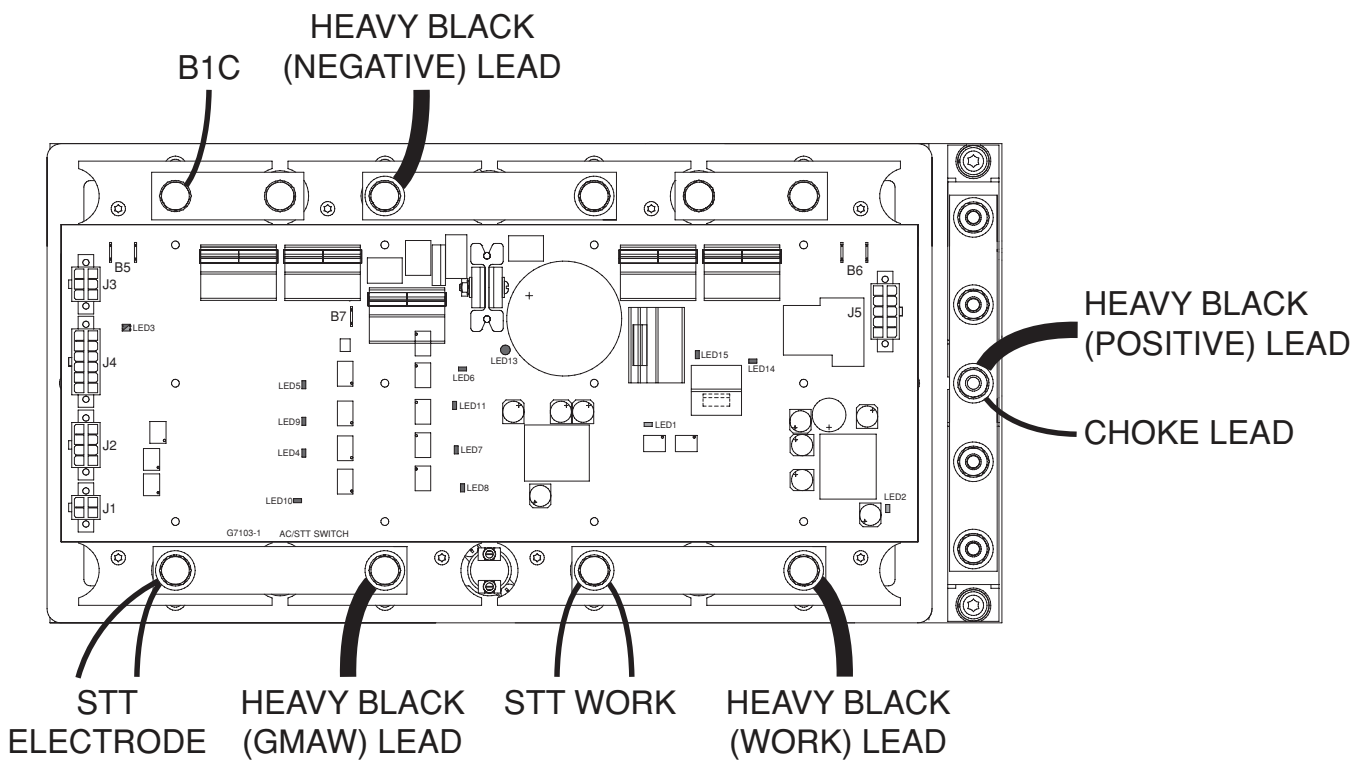


Figure F.42 – AC switch control board lead locations



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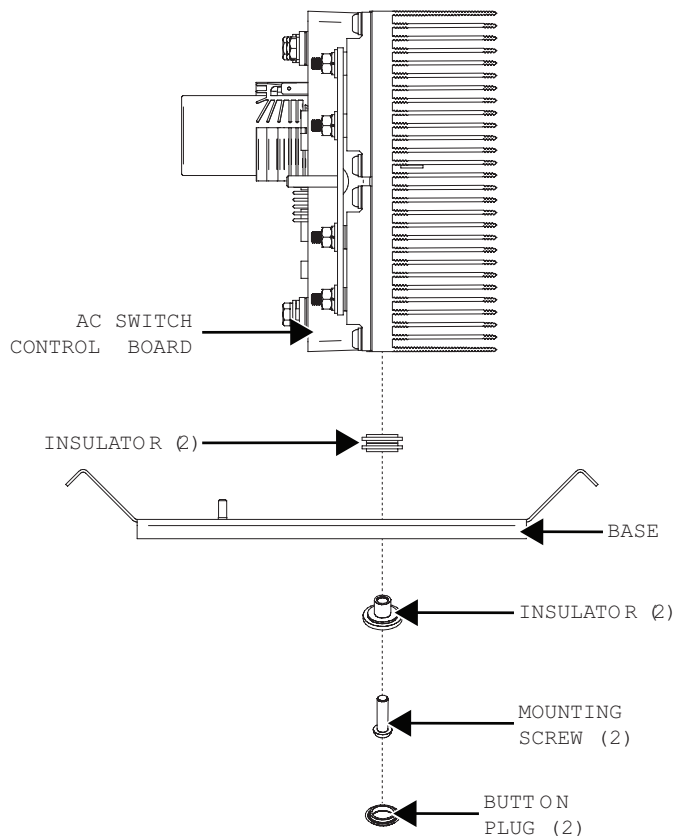
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AC SWITCH CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure F.43 – AC switch control board base mounting



REPLACEMENT PROCEDURE

NOTE: Torque all electrical connections to 24 - 28 in/lbs.

- Carefully position the new AC switch control board into the machine.
- Rotate machine on its side to allow the bolts securing the AC switch control board to the base to be attached.
- Using a T-25 torx wrench, attach the two bolts, washers and insulators securing the AC switch control board to the base. **Be sure insulators are placed properly.**
- Attach the two previously removed button plugs to the base of the machine.
- Rotate the machine back on its base.
- Using a 7/16" deepwell nutdriver, attach the bolt and washer securing the choke lead and the heavy black (positive) input lead to the input diode bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the heavy black (negative) input lead to the middle copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washer securing lead B1C to the top left copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the heavy black lead to the bottom left copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the two STT leads to the bottom right copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the heavy black lead to the bottom right copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the two STT leads to the bottom right copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the heavy black lead to the bottom right copper bus bar.
- Using a 7/16" nutdriver, attach the bolt and washers securing the two STT leads to the bottom right copper bus bar.
- Using a 5/16" nutdriver, attach the two screws securing the top heatsink bracket to the frame of the machine.
- Using a T-25 torx wrench, attach the two torx screws, insulators and washers securing the top heatsink mounting bracket to the top heatsink bracket. Be sure insulators are placed properly.
- Using a T-25 torx wrench, attach the two torx screws and washers securing the top heatsink mounting bracket to the AC switch control board heatsink.
- Perform the [Background Choke Replacement Procedure](#).
- Perform the [High Frequency Transformer Replacement Procedure](#).
- Perform the [STT Snubber Resistors Replacement Procedure](#).
- Perform the [Case Cover Replacement Procedure](#).

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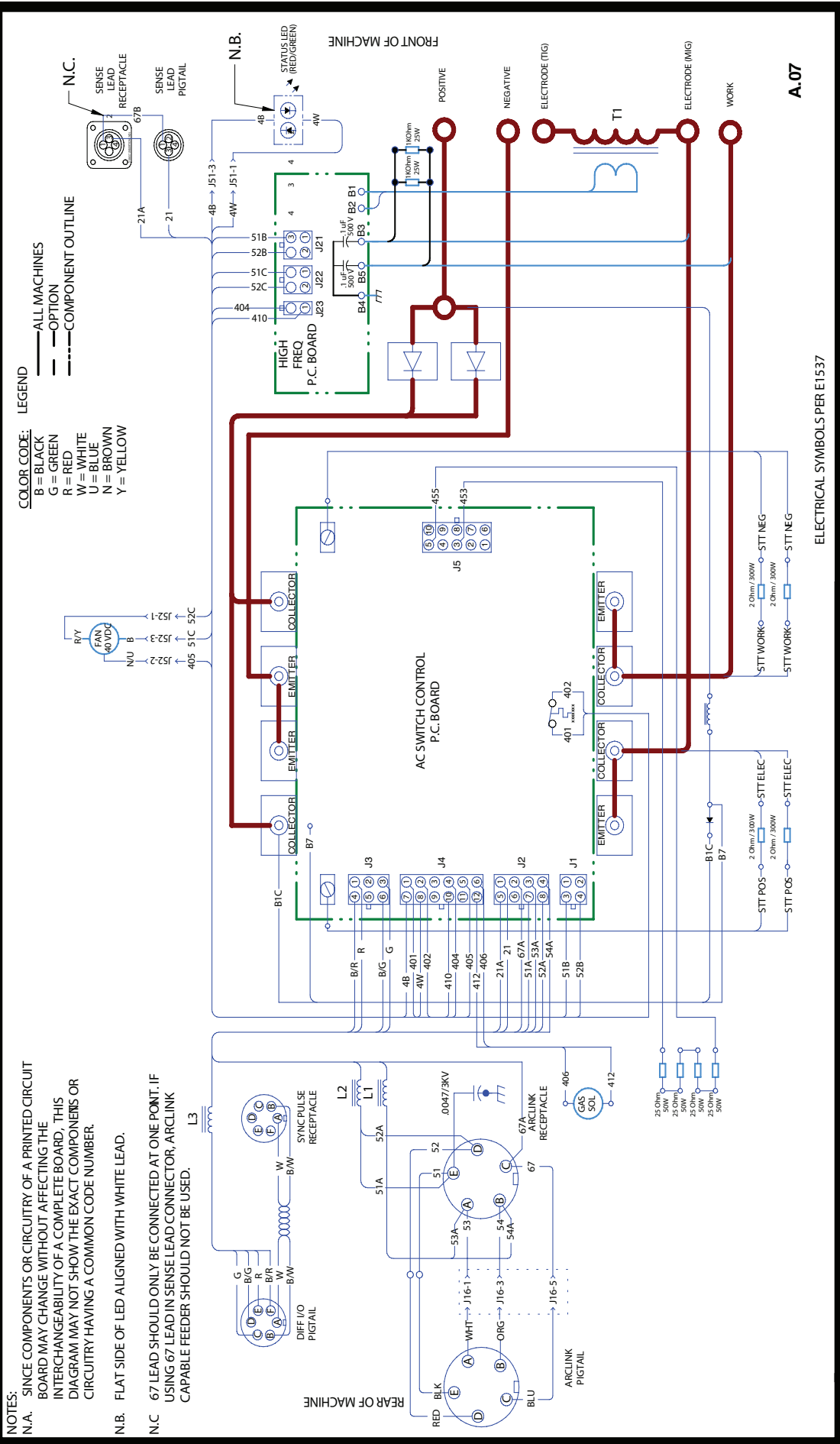
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WIRING DIAGRAM - POWER WAVE ADVANCED MODULE



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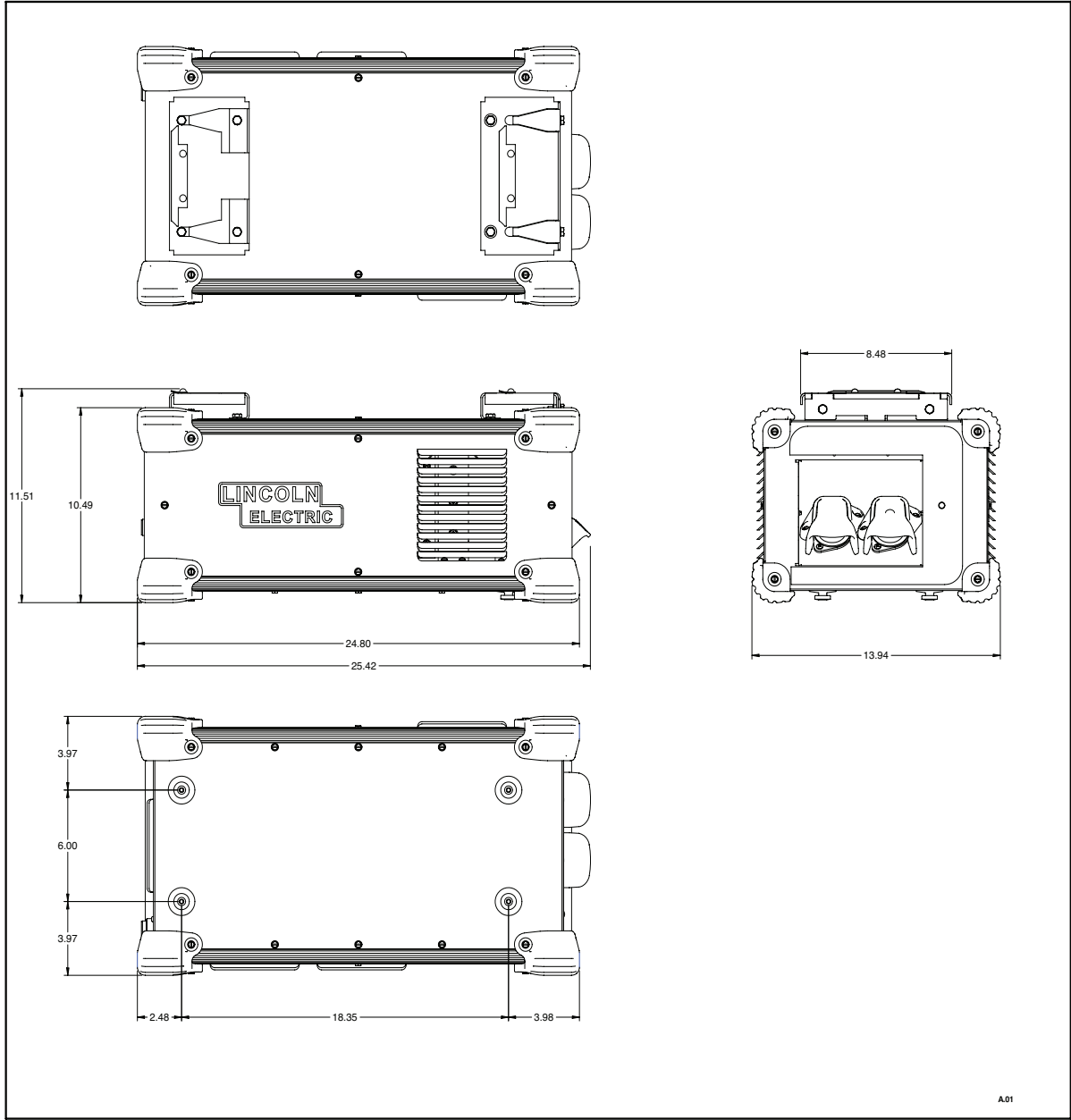
ELECTRICAL SYMBOLS PER EI 537

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment code number.

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