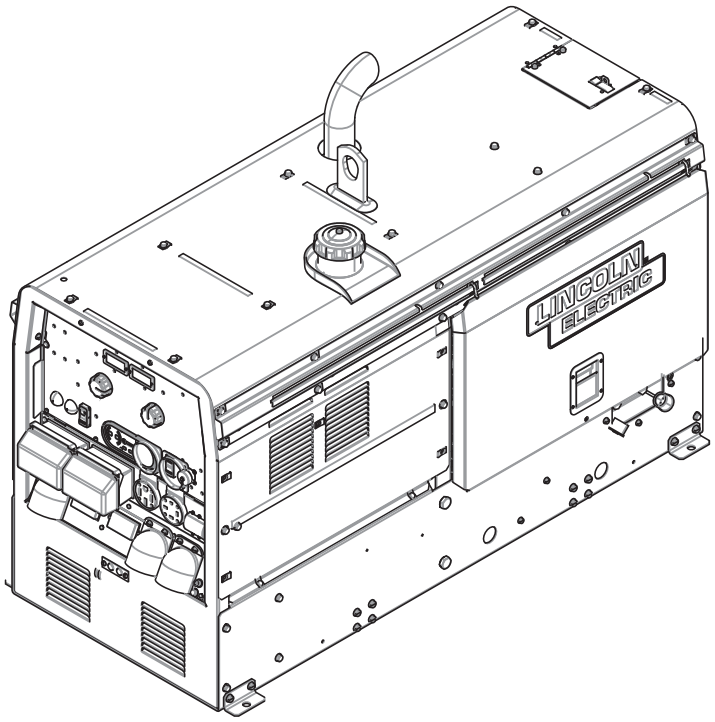
Cross Country ® 300

For use with machines having Code Numbers:

Cross Country® 300: 12362, 12554, 12555

SERVICE MANUAL



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

THANK YOU FOR SELECTING A QUALITY 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.

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65 warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.)*

WARNING: Cancer and Reproductive Harm www.P65warnings.ca.gov

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

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

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

FOR ENGINE POWERED EQUIPMENT.

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

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

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

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

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

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

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

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

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

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

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

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

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

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

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

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

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

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

ELECTRIC SHOCK CAN KILL.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS CAN BURN.

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

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

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

FUMES AND GASES CAN BE DANGEROUS.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding 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.

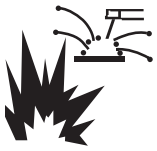
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER MAY EXPLODE IF DAMAGED.

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

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

7.c. Cylinders should be located:

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

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

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

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

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 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.

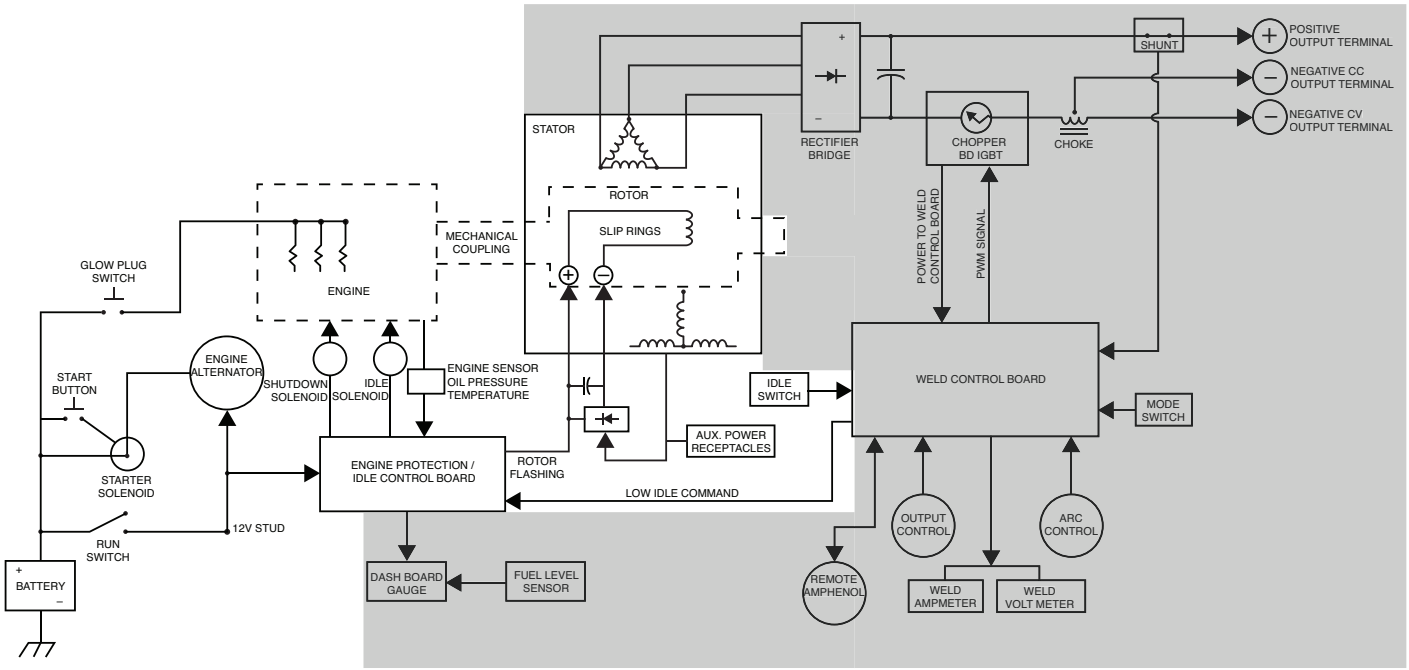
Cross Country™ 300

Service Manual

Last update: 2018/10/01

Theory of Operation

Figure E.1 – Battery, engine, rotor, stator and engine protection



Battery, Engine, Rotor, Stator and Engine Protection

The 12-volt battery supplies power to the engine starter motor solenoid, the momentary start switch, the run stop switch and the glow plug switch. When the momentary glow plug switch is closed the glow plugs are energized. When the run stop switch is closed, the engine protection/idle control board and the engine battery charging alternator receive 12 VDC from the battery. When the start switch is closed the starter motor is activated and the fuel shutdown solenoid is opened to allow fuel flow to the engine.

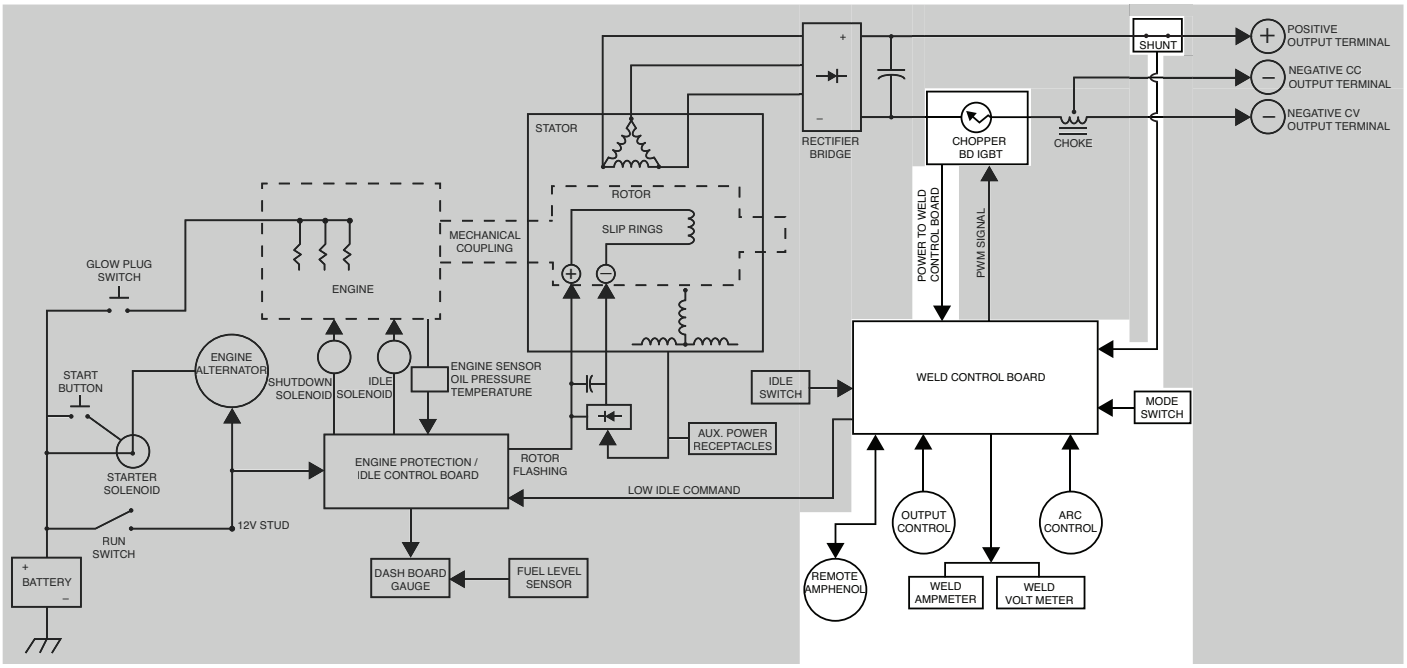
When the engine, which is mechanically coupled to the rotor, is started and running, the 12 VDC battery voltage is fed through the engine protection/idle control board to the rotor field coil via a brush and slip ring configuration. This excitation or flashing voltage magnetizes the rotor lamination. This rotating magnet induces a voltage in the stationary windings of the main alternator stator. The stator houses a three-phase weld winding, a 120/240 VAC single-phase auxiliary winding and a three-phase 240 VAC auxiliary winding. One of the 120 VAC windings is also used to supply the field rectifier and capacitor that provide a fixed DC voltage (approx. 160 VDC) to the rotor.

The engine alternator supplies charging current for the battery circuit. The engine protection/idle control board monitors the engine sensors and will shut the engine off in the event of low oil pressure or high engine coolant temperature.

The idler solenoid is mechanically connected to the engine's throttle linkage. If no welding or auxiliary current is being drawn from the Cross Country 300 and the idle switch is in the auto idle position, the

engine protection/idle control board receives a signal from the weld control board that activates the idler solenoid that brings the engine to a low idle condition. When output current is sensed, either weld or auxiliary, the weld control board deactivates the idler solenoid and the engine returns to a high-speed condition.

Figure E.2 – Weld control board

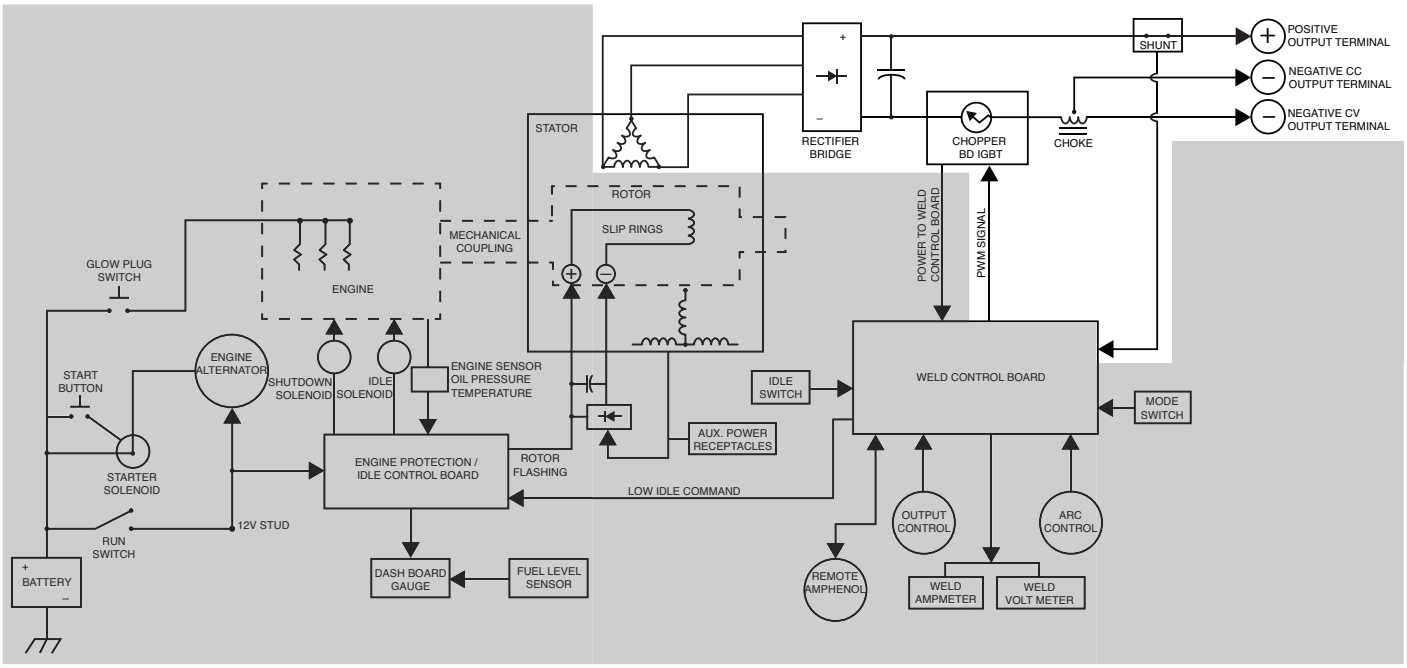


Weld Control Board

The three-phase rectifier supplies the welding power through the chopper module. It also supplies 80 VDC to the weld control board. The weld control board in turn, develops regulated DC voltages to operate it's circuitry and the IGBT driver circuitry on the power module.

The weld control board monitors the operator controls (arc control, output control and weld mode switch). It compares these commands to the current and voltage feedback information it receives from the shunt and the output terminal circuits. The circuitry on the weld control board determines how the output should be controlled to optimize welding results and it sends the correct PWM signals to the IGBT driver circuits. The weld control board also controls the voltmeter and ammeter.

Figure E.3 – Weld windings, rectifier, chopper module and feedback



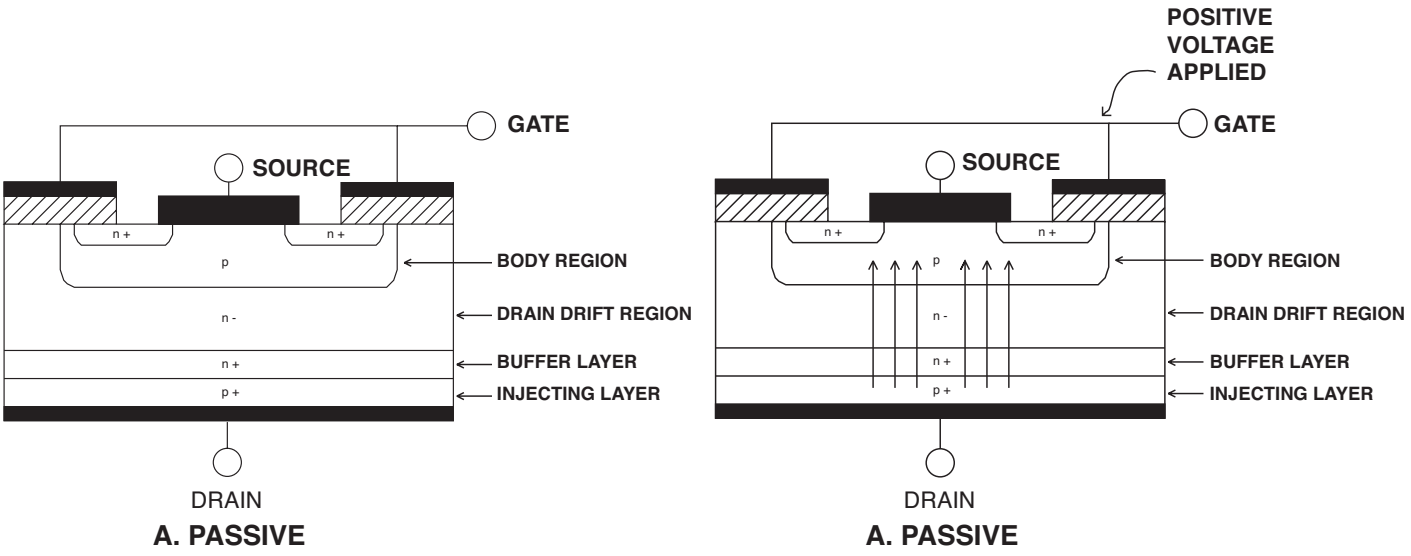
Weld Windings, Rectifier, Chopper Module and Feedback

The three-phase stator weld windings are connected to a three-phase rectifier bridge. The resultant DC voltage is applied to four paralleled capacitors incorporated within the chopper module. These capacitors function as filters and also as power supplies for the IGBT's. See ***IGBT Operation*** in this section. The IGBT's act as high-speed switches operating at 20Khz. These devices are switched on and off by the weld control board through pulse width modulation circuitry. See ***Pulse Width Modulation*** in this section.

This "chopped" DC output is applied through choke coil and a shunt to the welding output terminals. The choke functions as a current filter. Free-wheeling diodes are incorporated in the power module to provide a current path for the stored energy in the choke when the IGBTs are turned off. See ***Chopper Technology*** in this section.

Output voltage and current feedback information is fed to the weld control board. This information is sensed from the output terminal circuits and the shunt.

Figure E.4 – Insulated gate bipolar transistor (IGBT) operation



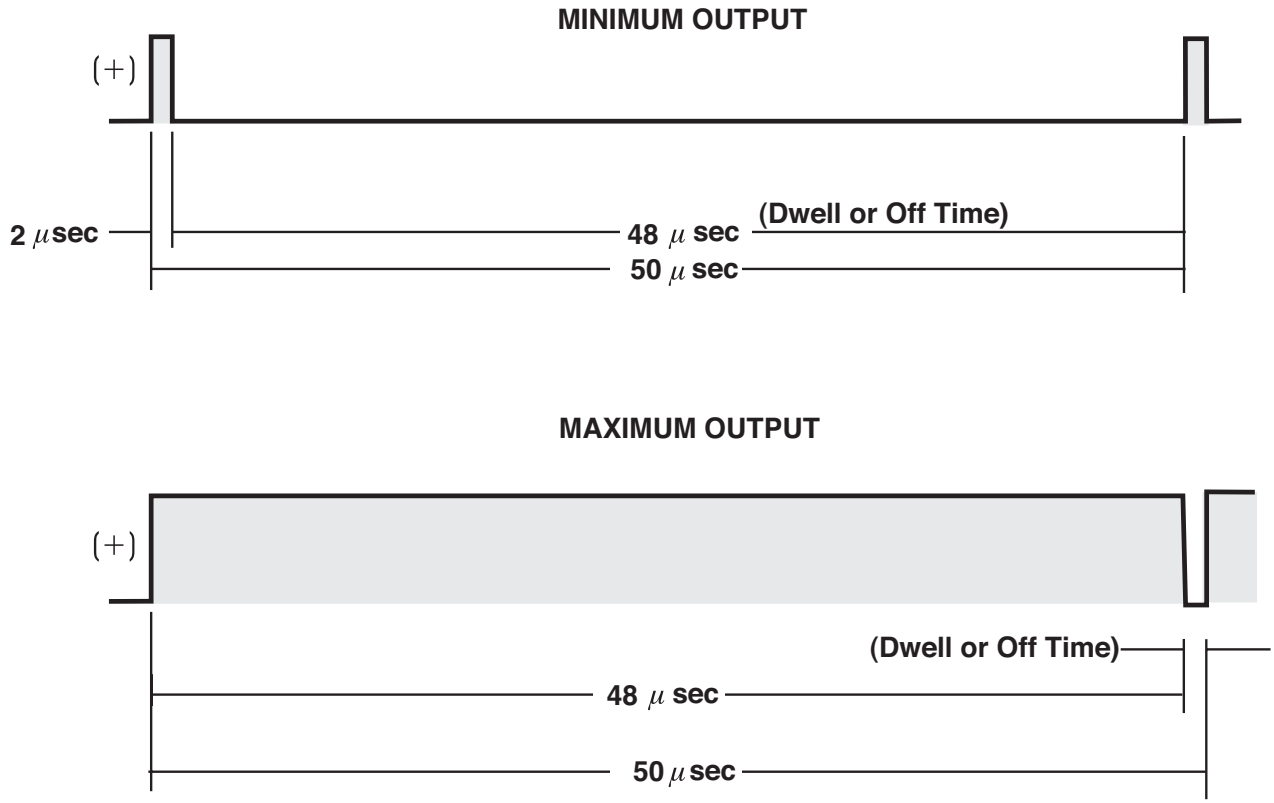
Insulated Gate Bipolar Transistor (IGBT) Operation

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

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

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

Figure E.5 – Pulse width modulation



Pulse Width Modulation

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

Minimum Output

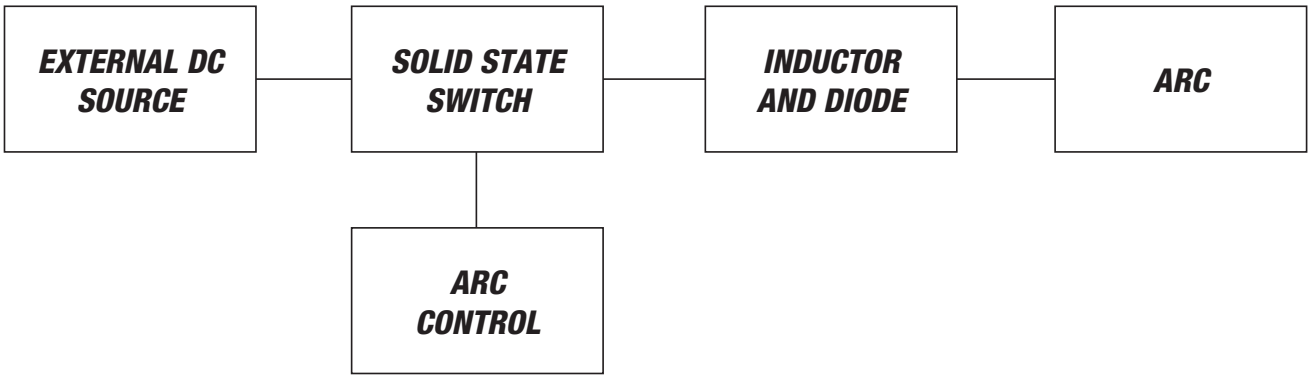
By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing shows the minimum output signal possible over a 50-microsecond time period. The positive portion of the signal represents one IGBT group conducting for 2 microsecond. The dwell time (off time) is 48 microseconds. Since only 2 microseconds of the 50-microsecond time period is devoted to conducting, the output power is minimized.

Maximum Output

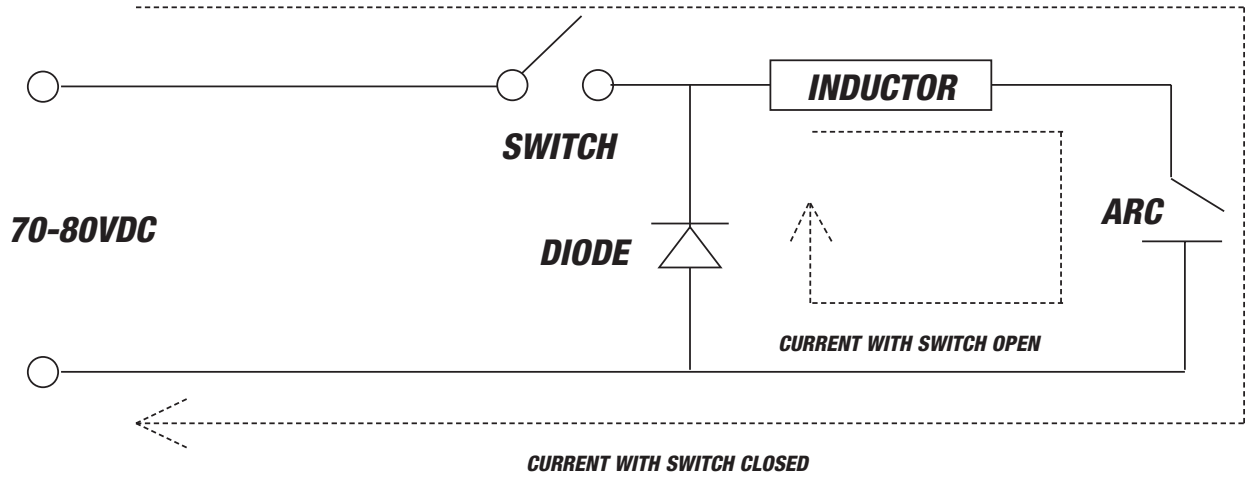
By holding the gate signals on the 48 microseconds and allowing only 2 microseconds of dwell time (off time) during the 50-microseconds cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the bottom curve. The more darkened area under the curve, the more power is present.

Chopper Technology Fundamentals

The new era of welding machines such as the Cross Country 300, employ a technology whereby a DC source is turned on and off (chopped up) at high speed, then smoothed though an inductor to control an arc. Hence the name "Chopper." The biggest advantage of chopper technology is the high-speed control of the arc, similar to the inverter machines. A block diagram for this is as follows:



In this system, the engine drives a three-phase alternator, which generates power that is rectified and filtered to produce approximately 85 VDC. The current is applied through a solid-state switch to an inductor. By turning on and off, current in the inductor and the arc can be controlled. The following diagram depicts the current flow in the system when the switch is open and closed.



When the switch is closed, current is applied through the inductor to the arc. When the switch opens, current stored in the inductor sustains flow in the arc and through the diode. The repetition rate of switch closure is 200Khz, which allows ultra-fast control of the arc. By varying the ratio of on time versus off time of the switch (Duty Cycle), the current applied to the arc is controlled. This is the basis for chopper technology: controlling the switch in such a way as to produce superior welding.

Troubleshooting & Repair

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 four main categories: Output Problems, Function Problems, Welding Problems and Engine 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.

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.

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

Reusable Container
Do Not Destroy

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

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

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

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

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

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

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

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

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

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

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

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

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

Troubleshooting guide

Observe Safety Guidelines detailed in the beginning of this manual.		**TROUBLESHOOTING GUIDE**
PROBLEMS (SYMPTOMS)	**POSSIBLE AREAS OF MISADJUSTMENT(S)**	**RECOMMENDED COURSE OF ACTION**
OUTPUT PROBLEMS		
Major physical or electrical damage is evident.	1. Contact your local authorized Lincoln Electric Service Facility.	1. Contact the Lincoln Electric Service Department at 1-888-935-3877.
No welding output or auxiliary power. The engine operates normally.	1. Check for loose or faulty connections in the auxiliary circuit to the output receptacles and/or the weld circuit to the output terminals. 2. Check the brushes for wear and proper contact to the rotor slip rings.	1. Perform the ***Brush And Slip Ring Service Procedure***. 2. Check for flashing voltage at the slip rings (3-5 Volts DC @ .5 amp until generator builds up, the 160 Volts). 3. Perform the ***Flashing Voltage Test Procedure***. 4. Perform the ***Field Bridge Rectifier Test Procedure***. 5. Perform the ***Rotor Voltage Test Procedure***. 6. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***. 7. Perform the ***Rotor Resistance And Ground Test Procedure (Dynamic)***.
⚠ 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**
OUTPUT PROBLEMS		
No welding output in any mode. The auxiliary output is normal. The engine operates normally.	1. If the correct OCV is present at the weld output terminals, check the welding cables, connectors, work clamp, electrode holder, etc. for loose or faulty connections. 2. Check for damaged conductors or faulty connections on the heavy current carrying leads that connect the output studs to the chopper module and to the output rectifier bridge. Also check the shunt and the choke assemblies for damage and faulty connections.	1. Check gate leads 23 and 25 and weld control board power leads 13 and 14 for loose or faulty connections. See Wiring Diagram. 2. Perform the ***Chopper Module Function Test Procedure***. 3. Perform the ***Stator Voltage Test Procedure***. 4. Perform the ***Stator Short Circuit And Ground Test Procedure***. 5. Perform the ***Output Rectifier Bridge Test Procedure***. 6. The weld control board may be faulty. Perform the ***Weld Control Board Voltage Test Procedure***. 7. Perform the ***Choke Test Procedure***. 8. Perform the ***Weld Control Board PWM Gate Signal Test Procedure***.
The machine has low welding output and low auxiliary output.	1. The engine RPM may be low. The brushes may be sticking or poorly seated or the slip rings may be dirty.	1. The engine high idle speed may be low. Full load speed should be about 1800 RPM. Inspect and if necessary, service the brushes and slip rings per the ***Brush And Slip Ring Service Procedure***. 2. Perform the ***Rotor Voltage Test Procedure***. 3. Perform the ***Stator Voltage Test Procedure***.
⚠ 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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PROBLEMS (SYMPTOMS)	**POSSIBLE AREAS OF MISADJUSTMENT(S)**	**RECOMMENDED COURSE OF ACTION**
OUTPUT PROBLEMS		
The machine will weld but the welding arc is "COLD". The engine runs normally and the auxiliary power is normal.	1. Make sure the machine is properly set for the electrode and process being used. Check electrode size, weld mode selector switch setting and amps or voltage setting. If shielding gas is used make sure of correct type and gas flow. 2. Make sure the process does not demand more power than the machine can produce. 3. If the current is correct try increasing the "ARC CONTROL" setting. 4. Check for loose or faulty connections at the weld output terminals and welding cable connections. 5. Check for good connections between the work cable and the work piece. 6. The weld cables may be too long or too small diameter causing excessive voltage drop. 7. The weld cables should not be coiled or wrapped around metal racks or reels. This can cause excessive inductance in the weld circuit. Try welding with a short set of adequately sized weld cables.	1. Disconnect all external equipment and perform a "load" test using a resistive load bank and accurate meters. Adjust the load for about 300 amps at 32 volts; check that the engine speed holds at 1800 RPM. If not perform engine maintenance. 2. Perform the ***Weld Control Feedback Test Procedure***. 3. If the maximum weld output cannot be obtained and the front panel displays are reading accurately, check for damaged conductors or loose connections in the large current carrying conductors of the stator, output rectifier bridge, chopper module, choke, shunt and output terminals. See Wiring Diagram. 4. If all these connections are good perform the ***Rotor Voltage Test Procedure***, the ***Stator Voltage Test Procedure***, the ***Output Rectifier Bridge Test Procedure***, the ***Chopper Module Resistance Test Procedure*** and the ***Chopper Module Function Test Procedure***. 5. Perform the ***Weld Mode Selector Switch Test Procedure***.
⚠ 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**
OUTPUT PROBLEMS		
The machine welds but it will not maintain a steady output.	1. Check that the electrode is of good quality, dry and free from contamination. Try using some Lincoln electrode and setting the machine per Lincoln's recommendation. 2. If shielding gas is used, check that the gas and gas flow are correct. Check for damaged, pinched or leaking gas lines. 3. Check for proper work and electrode leads and connections (size, length, coils or bad connections).	1. If the engine will not maintain the correct load RPM, the engine may be in need of service. Air and fuel filters should be checked. 2. Check large current carrying leads that connect to the stator, chopper module, shunt, choke and output terminals. See Wiring Diagram. Look for damaged conductors or faulty connections. 3. Check the connections at the control board and the chopper module. 4. The output control or the arc control potentiometer may be defective or grounded. The mode switch may also be faulty. Perform the ***Weld Mode Selector Switch Test Procedure***. 5. Perform the ***Chopper Module Function Test Procedure***. 6. Perform the ***Output Rectifier Bridge Test Procedure***.

⚠ 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**
FUNCTION PROBLEMS		
The weld output cannot be adjusted with the front panel output control knob in one or more weld modes. The weld output terminals have normal OCV (open circuit voltage). The AC auxiliary power is normal and the engine operates normally.	1. Remote control devices completely disable the front output in all modes except 'TOUCH START TIG' mode. *Make sure there is nothing plugged into the Amphenol receptacles. 2. Check for dirt or moisture contamination in 6-pin remote receptacle.	1. The output control potentiometer may be defective. Perform the ***Remote Receptacle Test Procedure***. 2. Perform the ***Weld Mode Selector Switch Test Procedure***. 3. Check the shunt and associated leads and the voltage feedback leads for loose or faulty connections. See Wiring Diagram. 4. The weld control PC board may be faulty.
The machine front panel output control is still active when the remote control unit is connected to the 6-pin Amphenol.	1. This condition is normal in the 'TOUCH START TIG' mode. See the operators manual. 2. The remote control unit may be defective. 3. Check the Amphenol receptacles. Look for damaged or corroded contact pins in the receptacle and in the plug of the remote control unit.	1. Check connector J1 on the weld control board to see that it is properly seated and the pins in both the plug and the board receptacle are in good condition. 2. Check plug J1 for continuity between the J1 connector and the Amphenol connector. See Wiring Diagram. 3. Perform the ***Remote Receptacle Test Procedure***. 4. The weld control board may be defective.

⚠ CAUTION

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PROBLEMS (SYMPTOMS)	**POSSIBLE AREAS OF MISADJUSTMENT(S)**	**RECOMMENDED COURSE OF ACTION**
FUNCTION PROBLEMS		
The machine seems to be locked into the 'CC-stick' mode of operation.	1. Check the position of the weld mode selector switch. The switch should positively snap into each mode position and should not feel 'gritty' or get stuck between positions.	1. Check connector J7 on the weld control board to see that it is properly seated and the pins in both the plug and the board receptacle are in good condition. 2. Perform the ***Weld Mode Selector Switch Test Procedure***. 3. The weld control board may be faulty.
The arc quality is poor with excessive spatter. The arc heat can be controlled and maintained normally, the auxiliary output is normal and the engine operates normally.	1. The 'Arc Control' may be set too high. 2. The output control may be set too high for the electrode being used. 3. Check that the electrode is of good quality, dry and free from contamination. Try using some Lincoln electrode and setting the machine per Lincoln's recommendations. 4. If shielding gas is used, check that the gas and gas flow are correct. 5. Check for damaged, pinched or leaking gas lines. 6. Check for proper work and electrode leads and connections (size, length, coils or bad connections).	1. Perform the ***Weld Mode Selector Switch Test Procedure***. 2. Perform the ***Output Rectifier Bridge Test Procedure***. 3. Perform the ***Chopper Module Function Test Procedure***. 4. The weld control board may be faulty.

⚠ CAUTION

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PROBLEMS (SYMPTOMS)	**POSSIBLE AREAS OF MISADJUSTMENT(S)**	**RECOMMENDED COURSE OF ACTION**
WELDING PROBLEMS		
An across-the-arc type wire feeder does not function when connected to the weld output of the machine. The machine operates normally in the CC-Stick mode and has normal AC auxiliary output.	1. Check that the weld mode selector switch is in the correct position for the process being used, typically 'CV-WIRE' mode. 2. Check for poor weld cable connections between the feeder and the welder output terminal and between the work piece and the other output terminal. 3. Check that the wire feeder's work sensing lead is properly connected to work piece and is in good condition. 4. If there is a voltage reading on the wire feeder voltmeter, the wire feeder may be defective.	1. Use a voltmeter to check for the presence of about 58 VDC open circuit voltage (OCV) across the output studs of the machine. 2. If the OCV is low, there may be a problem with the mode switch. 3. Perform the ***Weld Mode Selector Switch Test Procedure***.

⚠ CAUTION

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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**
ENGINE PROBLEMS		
The engine will not crank when the start button is pushed.	1. Check the circuit breaker (CB5). Reset if tripped. 2. Make sure the run/stop switch is in the 'RUN' position. 3. Check for loose or faulty battery cable connections. 4. The battery may be low or faulty. If the battery will not accept a charge, replace it.	1. Check the wiring and the connections at the starter motor, glow plug button, circuit breaker (CB5), run/stop switch and start button. See Wiring Diagram. 2. Check the chassis ground connections between the engine block and the negative battery terminal. 3. Place the run/stop switch to the 'Run' position. Press the start button, while checking for voltage between a good clean chassis ground connection (-) and lead 231 (+) at the starter solenoid. See Wiring Diagram. 4. If battery voltage is present, the starter motor or solenoid may be defective or the engine may be prevented from turning due to a mechanical failure.

⚠ CAUTION

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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**
ENGINE PROBLEMS		
The battery does not stay charged.	1. Check for loose, corroded or faulty connections at the battery. 2. Check for loose or damaged alternator drive belt. 3. The battery may be faulty.	1. Perform the ***Engine Alternator Test Procedure***. 2. There may be a defective component or faulty wiring causing a current draw when the run/stop switch is in the 'Stop' position. 3. Check the Run/Stop switch, the glow plug button, the alternator and the starter solenoid. Also check for damaged wiring and insulation. 4. If the engine charging system is operating properly but the battery is not staying charged, the battery is defective and should be replaced.
The engine shuts down shortly after starting and trips the battery circuit breaker (CB5).	1. Try resetting the breaker. If it trips again do not attempt to use the machine. **NOTE:** Repeated tripping and resetting of the circuit breaker can damage it or alter its trip point. If the breaker has been tripped and reset many times, it should be replaced once the cause is determined.	1. Examine the circuit breaker (CB5), run/stop switch, start button, shutdown solenoid, idle solenoid, engine protection board, fuel gauge, fuel sender and all the wiring connecting these components. Look for damaged or out of place wiring that may be in contact with other conductors or chassis ground. See Wiring Diagram. 2. Perform the ***Idler Solenoid Test Procedure***. 3. Perform the ***Fuel Shutdown Solenoid Test Procedure***. 4. The engine protection board may be defective.

⚠ CAUTION

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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**
ENGINE PROBLEMS		
The engine cranks when the start button is pressed but will not start.	1. The battery voltage may be low (normally results in slow cranking speed). The battery should be checked and recharged if it is not producing adequate voltage and replaced if it will not accept a full charge. 2. Make sure the glow plug button is pressed while pressing the start button. See the operator's manual, for proper starting procedure. 3. Make sure the fuel valve on the fuel sediment filter is in the open position. 4. Check that the machine has an adequate supply of fresh, clean fuel.	1. The fuel filter may be clogged, replace if necessary. 2. Fuel pump may be faulty. Check for fuel flow through filters. Contact local authorized engine service shop. 3. Check engine oil level. 4. The ON/OFF switch may be on for more than 60 seconds before starting. The ON/OFF switch will need to be switched OFF and turned back ON again. 5. The fuel solenoid may be faulty or not operating properly. Check lead 233 and 262 and perform the ***Fuel Shutdown Solenoid Test Procedure***. 6. The engine protection board may be faulty, check the engine protection relay. 7. The engine may be in need of mechanical repairs. 8. Perform the ***Stop / (Auto Idle/Run) / (High Idle/Run) Switch Test Procedure***.
The engine will not develop full power.	1. The fuel may be old or contaminated. Supply the engine with clean fresh fuel. 2. The fuel filter may be clogged replace if necessary. 3. The air filter may be clogged replace if necessary.	1. The engine may be in need of adjustment or repair.

⚠ CAUTION

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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**
ENGINE PROBLEMS		
The engine starts but shuts down immediately when the start button is released.	1. Make sure the glow plug button is pressed while pushing the button (10 seconds maximum after the engine starts). See the operators manual for proper starting procedure. 2. Check the engine oil level. 3. Be certain that the engine is not overheated. 4. Check that the machine has an adequate supply of fresh, clean fuel. 5. The fuel filter may be clogged. Replace if necessary. 6. High coolant temperature or low oil pressure (indicator light lit). Check oil and coolant levels to proper level. 7. Check for loose or broken fan belt. 8. Start engine and check for fuel leaks. 9. Faulty oil pressure switch, temperature switch or other engine component. 10. Faulty idler protection board.	1. The shut down fuel solenoid may be faulty or not operating properly. 2. Check leads 233 and 262 and perform the ***Fuel Shutdown Solenoid Test Procedure***. See Wiring Diagram. 3. Check for 12 volts at lead 233 when start button is pushed. Check circuit breaker (CB5) and lead 231. 4. The engine may have inadequate oil pressure. 5. Check the oil and temperature sensors.

⚠ CAUTION

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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**
ENGINE PROBLEMS		
The engine will not idle down to low RPM. The machine has normal weld and auxiliary output.	1. Make sure the idle switch is in the 'Auto Idle' position. 2. Make sure there is no external load on the weld terminals or the auxiliary power receptacles. 3. Check for mechanical restrictions in the idler solenoid linkage.	1. Perform the ***Idler Solenoid Test Procedure***. 2. Check for damaged wiring or faulty connections at the idle solenoid, the engine protection board, the run/stop switch and the start button. 3. Check for loose or damaged wiring or faulty connections at leads 405, 226, 227 and connections J/P-55-2 and J/P-55-4, (control board J32-2, B3 and J31-8). See Wiring Diagram. 4. Perform the ***Weld Control Board Voltage Test***. 5. Check that leads 3 and 6 are properly routed thru the toroidal current sensor. See Wiring Diagram. The leads should be wrapped tightly and tie wrapped in place. 6. Check the toroidal current sensor for any signs of damage. 7. Check leads 260 and 261 for poor connections and damage to the conductors and insulation between the toroid current sensor and the J3 connector in the control board. Unplug plug J3 from the control board and check for damaged, dirty or corroded pins. 8. Measure the resistance of toroidal current sensor. Measure between J3-3 and J3-4, the resistance should be 3-4 ohms. If the sensor is shorted or open replace it.

Observe Safety Guidelines detailed in the beginning of this manual.		**TROUBLESHOOTING GUIDE**
PROBLEMS (SYMPTOMS)	**POSSIBLE AREAS OF MISADJUSTMENT(S)**	**RECOMMENDED COURSE OF ACTION**
ENGINE PROBLEMS		
The engine will not go to high idle when using auxiliary power. Auxiliary power is normal when the idler switch is in the 'High' idle position, the automatic idle function works properly when welding.	1. The load on the auxiliary receptacle may be too low. 2. The automatic idle system will not function reliably if the load is less than 100 watts. 3. The device connected to the auxiliary power may be defective. Try another device. 4. Make sure the connections to the auxiliary device are secure. 5. Some devices are designed to sense for adequate input power. Product of this type may not turn on due to low voltage and frequency of the machine at low idle. If this happens the current draw will likely be insufficient to activate the automatic idle system. Devices of this type may require that the automatic idle switch be in the 'High Idle' position.	1. Check that leads 3 and 6 are properly routed through the toroidal current sensor. Each lead must have three turns and must pass through the sensor in the opposite directions. See Wiring Diagram. The leads should be wrapped tightly and tie wrapped in place. 2. Check the toroidal sensor for any signs of damage. 3. Check leads 260 and 261 for poor connections and damage to the conductors and insulation between the toroid current sensor and the J3 connector in the control board. Unplug plug J3 from the control board and check for damaged, dirty or corroded pins. 4. Measure the resistance of toroidal current sensor. Measure between J3-3 and J3-4, the resistance should be 3-4 ohms. If the sensor is shorted or open replace it. The control board may be defective.

⚠ 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**
ENGINE PROBLEMS		
The engine will not go to high idle when striking arc. The automatic idle system functions normally when using auxiliary power. Welding and auxiliary outputs are normal when the idle switch is in the 'High Idle' position.	1. Check that the welding cables are in good working condition and the connections are tight. Make sure the work clamp is attached to clean, bare material.	1. Check the leads and connections at the shunt at the positive output stud. Check lead 204S and 206S for continuity from the shunt to J6-1 and J6-2 on the weld control board. Check the pins and connections at J6. 2. Perform the ***Weld Control Board Voltage Test Procedure***.
The engine will not go to high idle when attempting to strike an arc or when a load is applied to any of the auxiliary power receptacles.	1. Check that the welding cables and the auxiliary power lead connections are tight.	1. Perform the ***Weld Control Board Voltage Test Procedure***.
The engine goes to low idle, but will not stay at low idle.	1. Make sure there are no auxiliary loads on either the weld terminals or auxiliary receptacles. 2. Check that the welding cables and auxiliary power lead connections are tight and that the insulation is not damaged.	1. The idler solenoid linkage may be damaged or out of adjustment. Make sure the solenoid plunger is able to fully ease against the internal stop of the solenoid coil assembly. 2. Perform the ***Idler Solenoid Test Procedure***. 3. Perform the ***Weld Control Board Voltage Test Procedure***.
Engine will not shut off.	1. Fuel shutdown solenoid not functioning properly. Linkage may be binding. Stop engine by shutting off valve on main fuel filter. Contact authorized local engine service shop.	1. Contact local authorized engine service facility.
⚠ 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.		

Test Procedures

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

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

MATERIALS NEEDED

1/2” Nutdriver
1/2” Open-End Wrench
3/8” Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Unlatch and open the engine service access door. Align the hooks at the door with the notches in the door slide rail. Lift the door up and out to remove. See ***Figure F.1***. Repeat this step for each door.
3. Using a 1/2” nutdriver, remove eight (of the ten) screws securing the door slide rail to the machine. See ***Figure F.1.*** Repeat this step for each door slide rail.
4. Using a 1/2” nutdriver and a 1/2” open-end wrench, remove the two remaining bolts, nuts, flat washers and lock washers securing the door slide rail to the machine. See ***Figure F.1***. The door slide rail can now be removed and replaced. Repeat this step for each door slide rail.
5. Using a 1/2” nutdriver, remove the five screws securing the left case side to the machine. See ***Figure F.2***.
6. Using a 3/8” nutdriver, loosen (do not remove) the two screws securing the left case side to the machine. See ***Figure F.2***. The left case side can now be removed and replaced.
7. Using a 1/2” nutdriver, remove the five screws securing the right case side to the machine. See ***Figure F.2***.
8. Using a 3/8” nutdriver, loosen (do not remove) the two screws securing the right case side to the machine. See ***Figure F.2***. The right case side can now be removed and replaced
9. Carefully remove the fuel cap and fuel trough from the machine. See ***Figure F.1***.
10. Carefully remove the lift bail cover seal from around the lift bail. See ***Figure F.1***.

11. Carefully remove the exhaust rain cap from the exhaust pipe. See ***Figure F.1***.
12. Using a 1/2" nutdriver, remove the ten screws securing the roof panel to the machine. See ***Figure F.1***.
13. With the help of an assistant, carefully lift the roof panel off of the machine.
14. Place the previously removed fuel cap on to the fuel tank.

REPLACEMENT PROCEDURE

1. Remove the fuel cap from the machine.
2. With the help of an assistant, carefully position the roof panel on to the machine.
3. Using a 1/2" nutdriver, attach the ten screws securing the roof panel to the machine.
4. Attach the exhaust rain cap to the exhaust pipe.
5. Attach the lift bail cover seal.
6. Attach the fuel trough and the fuel cap to the fuel tank.
7. Using a 1/2" nutdriver, attach the five screws securing the right case side to the machine.
8. Using a 3/8" nutdriver, tighten the two screws securing the right case side to the machine.
9. Using a 1/2" nutdriver, attach the five screws securing the left case side to the machine.
10. Using a 3/8" nutdriver, tighten the two screws securing the left case side to the machine.
11. Using a 1/2" nutdriver, attach eight (of the ten) screws securing the door slide rail to the machine. Repeat this step for each door slide rail.
12. Using a 1/2" nutdriver and a 1/2" open-end wrench, attach the two remaining bolts, nuts, flat washers and lock washers securing the door slide rail to the machine. Repeat this step for each door slide rail.
13. Align the hooks on the door with the notches in the door slide rail and position the door on the rail. Repeat this step for each door.
14. Carefully attach the fuel gasket and fuel cap to the machine.

Figure F.1 – Fuel cap, lift bail cover seal, rain cap, door slide rail, engine service access door, roof panel and fuel trough locations

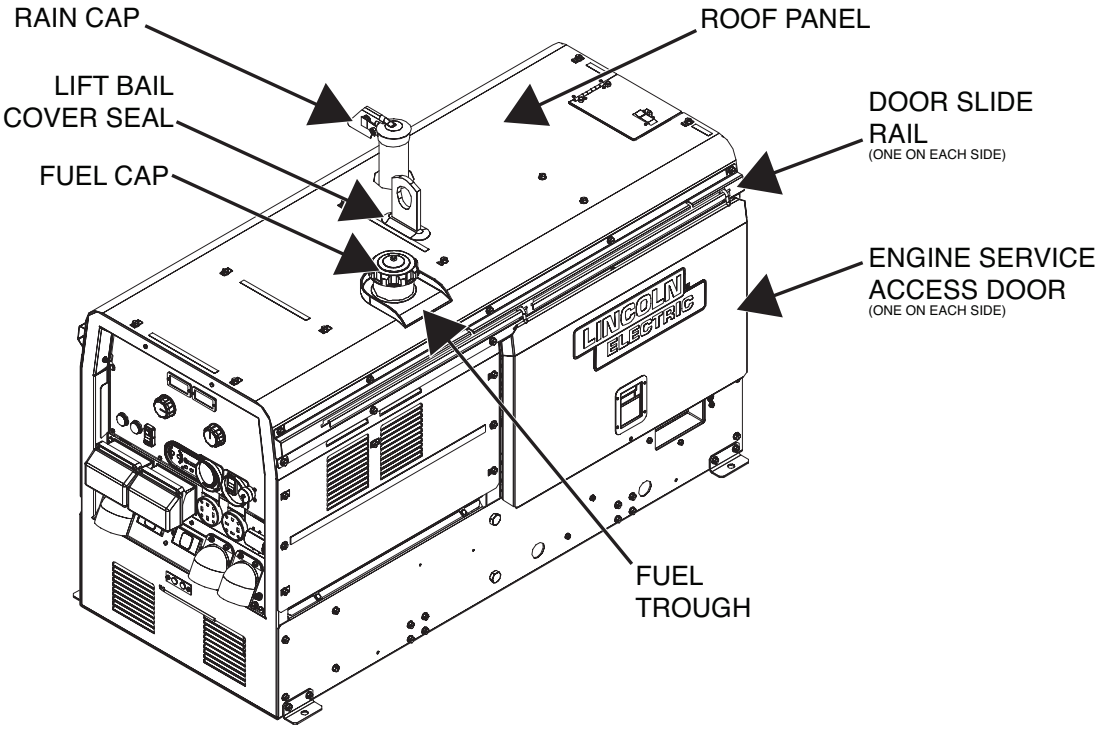
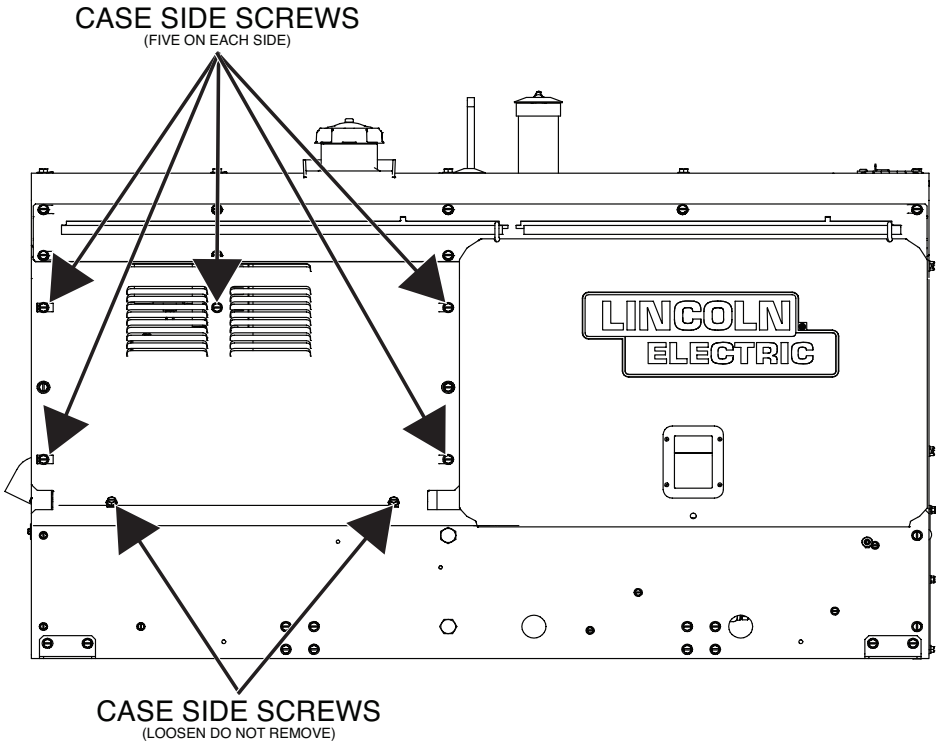


Figure F.2 – Case side mounting hardware locations



CAPACITOR DISCHARGE PROCEDURE

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 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 ensure that the Field Capacitor and the large Capacitors in the Chopper Module have been discharged.

MATERIALS NEEDED

Volt/Ohmmeter
Resistor (25-1000 ohms and 25 watts minimum) Lincoln Part #S01404-114 works well for this purpose
Electrically Insulated Gloves
Electrically Insulated Pliers
Jumper Leads
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the field capacitor. See ***Figure F.3***. See Wiring Diagram.
4. Using a volt/ohmmeter, check the DC voltage at the terminals of the field capacitor. See ***Figure F.4***. See Wiring Diagram.
5. If any voltage is present, discharge the capacitor using the high wattage resistor (25-1000 ohms @ 25 watts minimum), electrically insulated gloves and pliers. Hold the resistor on the capacitor terminals for ten seconds. See ***Figure F.4***. See Wiring Diagram.
6. Using a volt/ohmmeter, check the DC voltage at the terminals of the filed capacitor. The voltage should be zero. If any voltage remains, repeat the discharge procedure until the voltage is zero.
7. Locate the chopper module and capacitor assembly on the power module panel. See ***Figure F.5***. See Wiring Diagram.
   NOTE: NEVER USE A SHORTING STRAP TO DISCHARGE CAPACITORS.
8. If the Lincoln recommended resistor or an equivalent resistor is used, the capacitors can be discharged by holding the resistor terminals with insulated pliers and using the resistor terminals to bridge chopper module terminals B1 to B2 and B4 to B5. See ***Figure F.6***. See Wiring Diagram. **DO NOT TOUCH THE TERMINALS OR METAL PARTS OF THE PLIERS WITH YOUR BARE HANDS**. Hold the resistor in place for about ten seconds.

9. If another type of resistors is used, jumper leads may need to be attached to the resistor. The leads can then be used to connect the resistor from terminals B1 to B2 and B4 to B5. See ***Figure F.6***. See Wiring Diagram.
10. Using the volt/ohmmeter, check the voltage across terminals B1 and B2 then B4 and B5. It should be zero volts in both cases. See ***Figure F.6***. See Wiring Diagram. If not, repeat the discharge procedure.
11. Perform the ***Case Cover Replacement Procedure***.

Figure F.3 – Field capacitor location

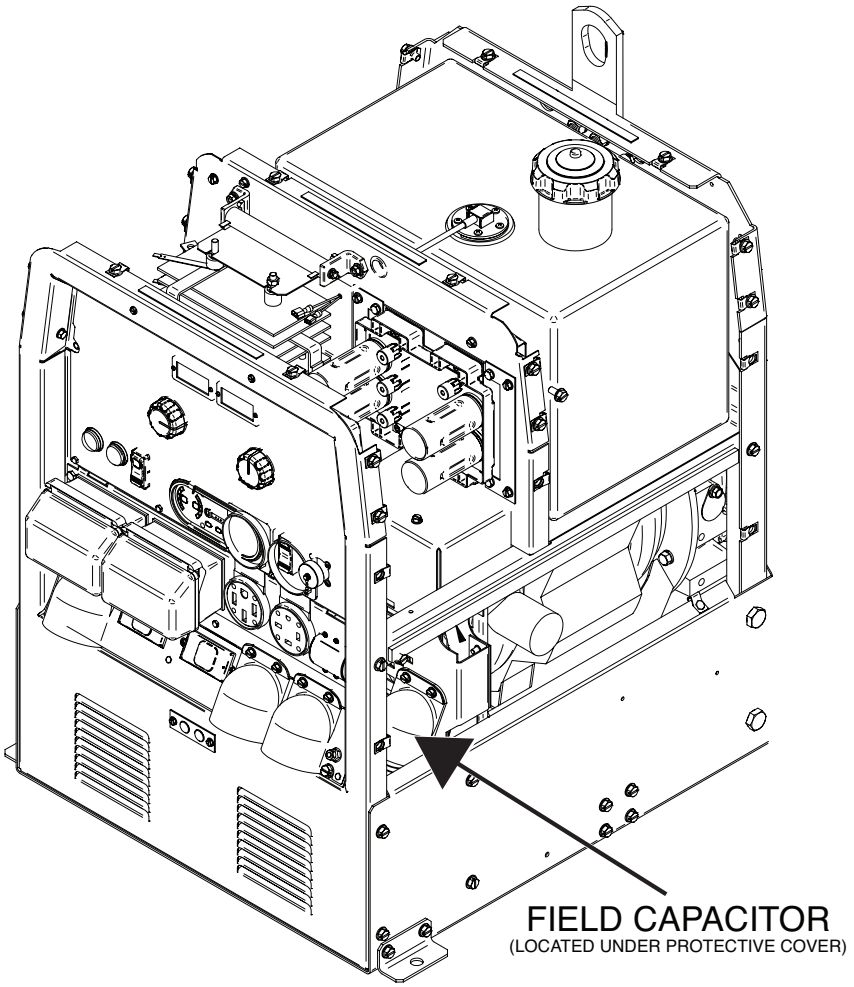


Figure F.4 – Field capacitor terminal location and discharge components

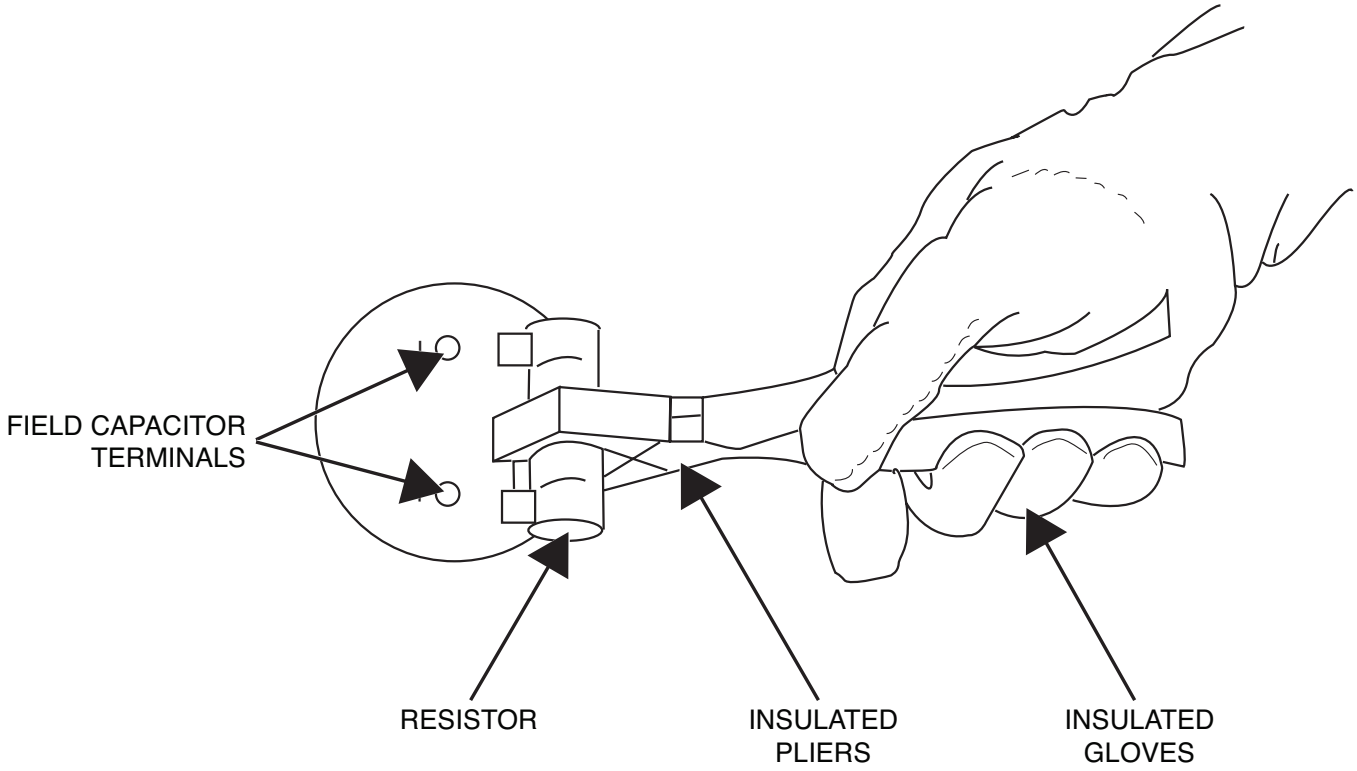


Figure F.5 – Chopper module location

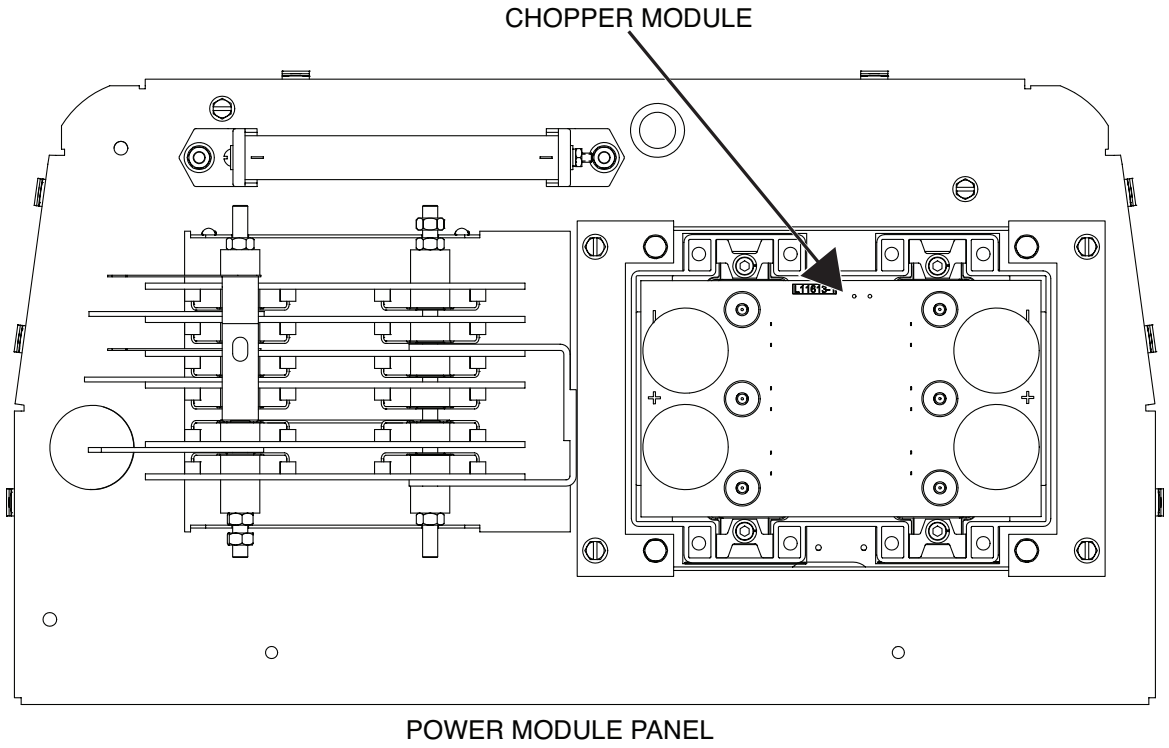
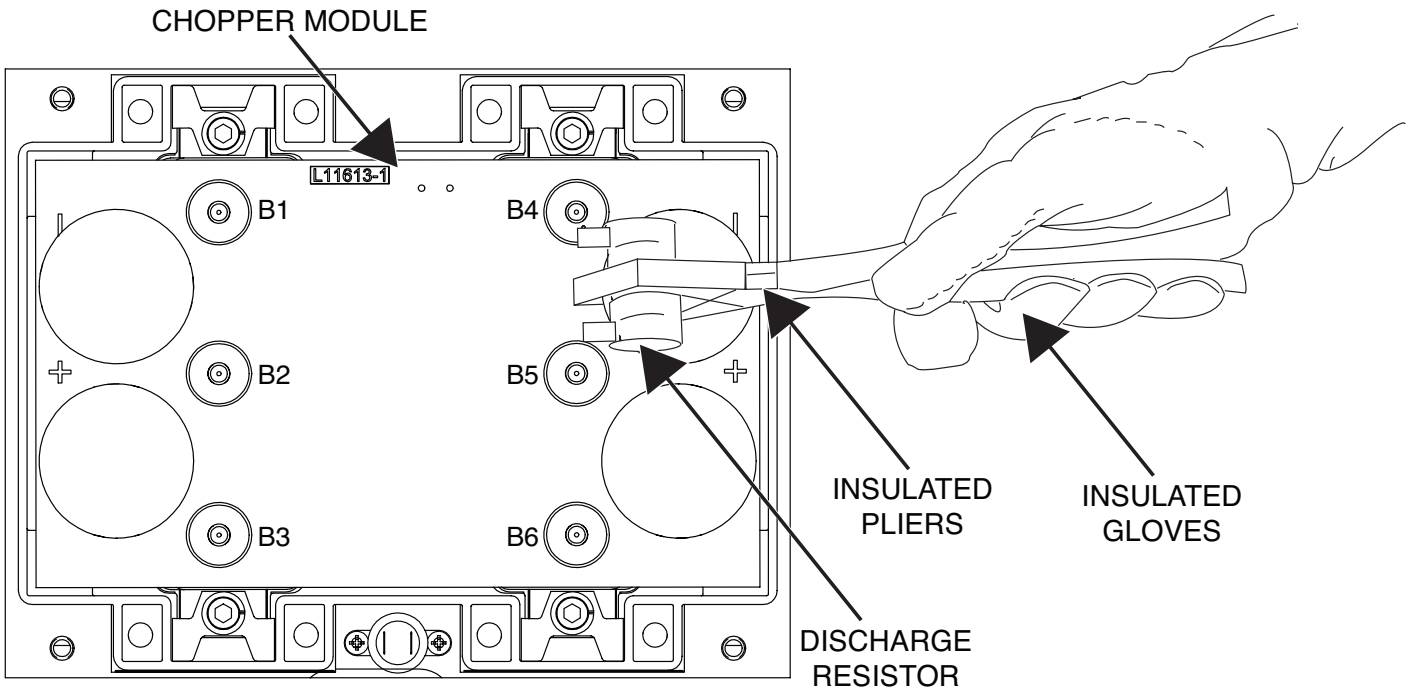


Figure F.6 – Chopper module terminal locations



BRUSH AND SLIP RING SERVICE PROCEDURE

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 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 provides guidance in testing and maintaining the Brush and Slip Ring System.

MATERIALS NEEDED

Volt/Ohmmeter
Miscellaneous Hand Tools
500 or 600 Grit Sand Paper
180 Grit Sand Paper
220 or 320 Grit Commutator Stone
Low Pressure Compressed Air

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Examine brushes and slip rings. The slip rings, brush holder and brushes should be clean and free from oil or grease. The brushes should be making good, continuous contact with the slip rings.
5. The brushes should be of sufficient length and have adequate spring tension. Generally, the brushes should be replaced if either brush has less than 1/4” remaining before it reaches the end of its travel. Spring tension should be sufficient to hold the brushes firmly against the slip rings.
6. If the slip rings are discolored, display evidence of excessive sparking or the brushes have worn prematurely; these may be signs of a grounded or shorted rotor. Perform the ***Rotor Resistance And Ground Test Procedure (Dynamic)*** and the ***Rotor Resistance And Ground Test Procedure (Static)***.
7. Check for evidence of sticking brushes. Sticking brushes will normally result in the slip rings being pitted and discolored from excessive arcing. Another sign of sticking brushes is intermittent instability or loss of both weld and auxiliary output. If there is any evidence that the brushes may have been sticking in the brush holders, a new brush holder and brush assembly should be installed.
   Cleaning Slip Rings:
8. In the event that the slip rings have become dirty, discolored or mildly pitted, it will be necessary to clean them, using very fine, 500 or 600 grit sand paper or a 220 or 320 grit commutator stone.
   Seating Brushes:

9. If brushes have been replaced, repositioned or are not making full contact with the slip rings, it may be necessary to re-seat them. This can be done by placing a strip of 180 grit sandpaper between the slip rings and the brushes, with the abrasive side against the brushes. Pull the sandpaper strip around the circumference of the slip rings in the direction of rotor rotation only. Repeat this procedure until the surface of each brush is in full contact with its matching slip ring.
10. Use a low pressure compressed air to thoroughly blow the carbon, commutator stone and/or sandpaper dust from the machine before operating.
11. Replace the brush holder bracket and perform the ***Case Cover Replacement Procedure***.

ENGINE ALTERNATOR TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Engine Alternator is properly charging the Battery.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Open the engine access door to gain access to the alternator.
3. Using a volt/ohmmeter, measure the voltage at the battery terminals. Normal voltage is approximately 12 VDC. See Wiring Diagram.
4. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in the 'High Idle/Run' position. See ***Figure F.7***.
5. Start the engine and allow it to run at high idle speed for approximately 15 to 30 seconds.
6. Using a volt/ohmmeter, measure the voltage at the battery terminals. Voltage should read approximately 13.7 to 14.2 VDC. See Wiring Diagram.
7. If the meter reads correctly, the engine alternator is producing adequate power to charge the battery and this test is complete.
8. Turn off the engine on the Cross Country 300 machine
9. If the voltage is significantly higher than the above values, the alternator is not properly regulating the battery charging voltage and should be replaced. If the voltage reads the same or less than the measurement taken in step three, proceed with the following tests.
10. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in the 'High Idle/Run' position, start the engine and allow it to run at high idle speed for about 15 to 30 seconds.
11. Using a volt/ohmmeter, place the negative meter probe on a good chassis ground or the negative battery terminal. Place the positive meter probe on the positive terminal of the alternator. See ***Figure F.7***. See Wiring Diagram. The measured reading should be about 13.7 to 14.2 VDC.
12. Place the positive meter probe to the IGN terminal on the rear of the alternator. See ***Figure F.8***. The meter should read about 13.7 to 14.2 VDC.
13. If the meter reads correctly, check the connections between the alternator and the battery. See Wiring Diagram.

14. If the voltage at both alternator test points reads the same as or less than battery voltage, the alternator is faulty and needs or be repaired or replaced.
15. If battery voltage is present at the positive terminal of the alternator, but not at the “IGN” terminal; check the Stop / (Auto Idle/Run) / (High Idle/Run) switch and the wiring connecting the “IGN” terminal to the switch. See Wiring Diagram.
16. When testing is complete, turn off the engine on the Cross Country 300 machine and close and secure the service door.

Figure F.7 – Stop / (auto idle/run) / (high idle/run) switch locations

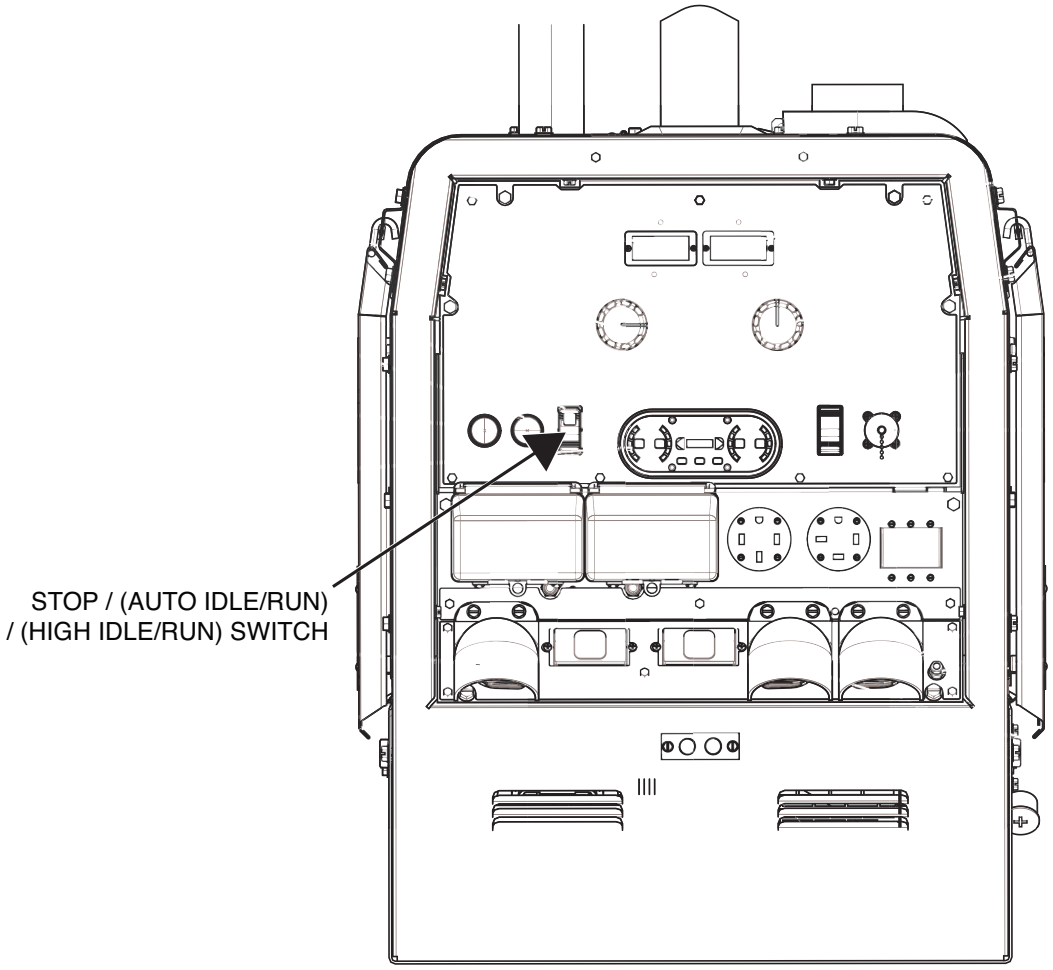
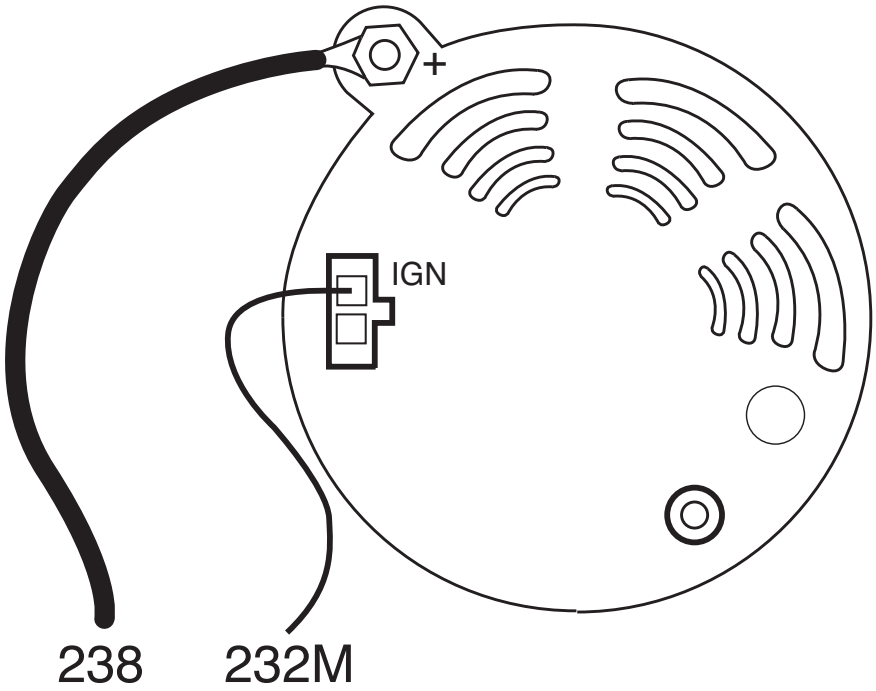


Figure F.8 – Engine alternator terminal locations



STOP / (AUTO IDLE/RUN) / (HIGH IDLE/RUN) SWITCH TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Stop / (Auto Idle/Run) / (High/Idle/Run) Switch is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Disconnect the lead from the negative battery terminal.
5. Locate the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch. See ***Figure F.9***. See Wiring Diagram.
6. Label and disconnect leads 5R, 256, 257, 232A, 232B and 236A from terminals 7, 5, 6, 3, 2 and 8 of the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch. See ***Figure F.10***. See Wiring Diagram.
7. Using a volt/ohmmeter, perform the resistance tests outlined in ***Table F.1***. See ***Figure F.10***. See Wiring Diagram.
8. Using a volt/ohmmeter, perform the diode test outlined in ***Table F.2***. See ***Figure F.10***. See Wiring Diagram.
9. If any of the tests fail, the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch may be faulty.
10. If faulty, perform the ***Stop / (Auto Idle/Run) / (High Idle/Run) Switch Removal And Replacement Procedure***.
11. Connect leads 5R, 256, 257, 232A, 232B and 236A to terminals 7, 5, 6, 3, 2 and 8 of the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch. See Wiring Diagram.
12. Connect the previously removed lead to the negative battery terminal.
13. Perform the ***Case Cover Replacement Procedure***.

Table F. 1 – Stop / (auto idle/run) / (high idle/run) switch resistance tests

TEST POINT (+)	TEST POINT (–)	EXPECTED READING	POSITION
TERMINAL 2	TERMINAL 3	LESS THAN ONE OHM (LOW RESISTANCE)	HIGH IDLE/RUN
TERMINAL 5	TERMINAL 6	LESS THAN ONE OHM (LOW RESISTANCE)	HIGH IDLE/RUN
TERMINAL 2	TERMINAL 3	LESS THAN ONE OHM (LOW RESISTANCE)	AUTO IDLE/RUN
TERMINAL 5	TERMINAL 6	AT LEAST 500K OHMS (HIGH RESISTANCE)	AUTO IDLE/RUN
TERMINAL 2	TERMINAL 3	AT LEAST 500K OHMS (HIGH RESISTANCE)	STOP/OFF
TERMINAL 5	TERMINAL 6	AT LEAST 500K OHMS (HIGH RESISTANCE)	STOP/OFF

Table F. 2 – Stop / (auto idle/run) / (high idle/run) switch diode test

TEST POINT (+)	TEST POINT (–)	EXPECTED READING
TERMINAL 8	TERMINAL 7	FORWARD BIAS
TERMINAL 7	TERMINAL 8	REVERSE BIAS

Figure F.9 – Stop / (auto idle/run / (high idle/run) switch location

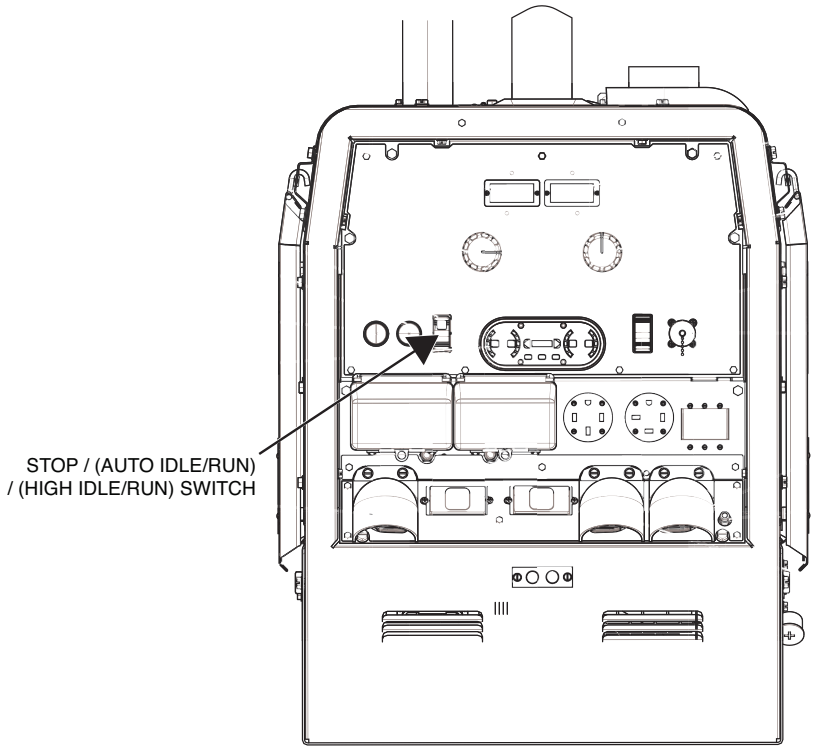
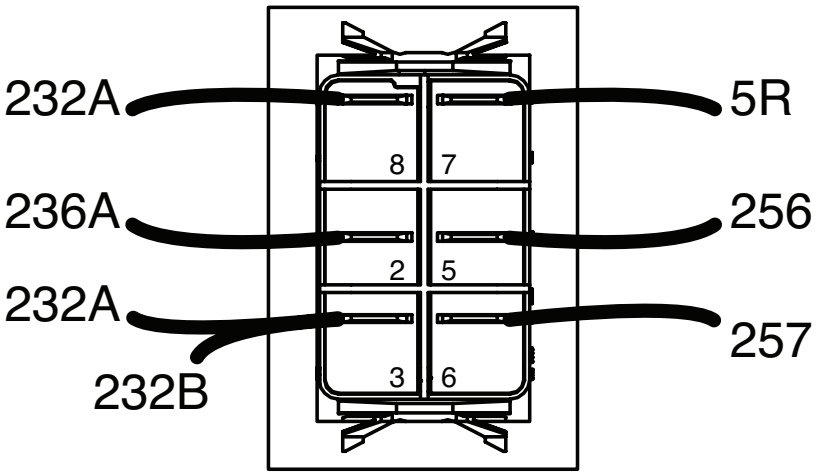


Figure F.10 – Stop / (auto idle/run / (high idle/run) switch terminal and lead locations



START / (AUTO IDLE/RUN)
/ (HIGH IDLE/RUN) SWITCH
(VIEWED FROM THE REAR)

WELD MODE SELECTOR SWITCH TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Weld Mode Selector Switch is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Locate the weld mode selector switch. See ***Figure F.11***. See Wiring Diagram.
5. Using a volt/ohmmeter, perform the voltage tests outlined in ***Table F.3***. See ***Figures F.12***. See Wiring Diagram.
6. If any of the tests fail, the weld mode selector switch may be faulty.
7. If faulty, perform the ***Weld Mode Selector Switch Removal And Replacement Procedure***.
8. Perform the ***Case Cover Replacement Procedure***.

Table F. 3 – Weld mode selector switch tests

TEST POINT (+)	TEST POINT (–)	EXPECTED READING	POSITION
TERMINAL 2	TERMINAL 3	LESS THAN ONE OHM (LOW RESISTANCE)	STICK
TERMINAL 5	TERMINAL 6	LESS THAN ONE OHM (LOW RESISTANCE)	STICK
TERMINAL 5	TERMINAL 4	AT LEAST 500K OHMS (HIGH RESISTANCE)	STICK
TERMINAL 2	TERMINAL 3	LESS THAN ONE OHM (LOW RESISTANCE)	TIG
TERMINAL 5	TERMINAL 4	LESS THAN ONE OHM (LOW RESISTANCE)	TIG
TERMINAL 5	TERMINAL 6	AT LEAST 500K OHMS (HIGH RESISTANCE)	TIG
TERMINAL 1	TERMINAL 2	LESS THAN ONE OHM (LOW RESISTANCE)	CV
TERMINAL 5	TERMINAL 4	LESS THAN ONE OHM (LOW RESISTANCE)	CV
TERMINAL 5	TERMINAL 6	AT LEAST 500K OHMS (HIGH RESISTANCE)	CV

Figure F.11 – Weld mode selector switch location

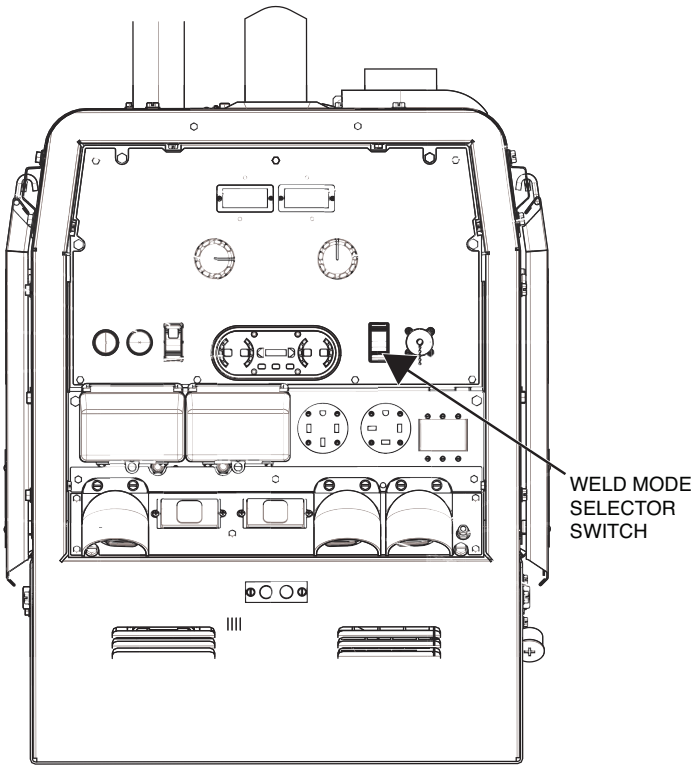
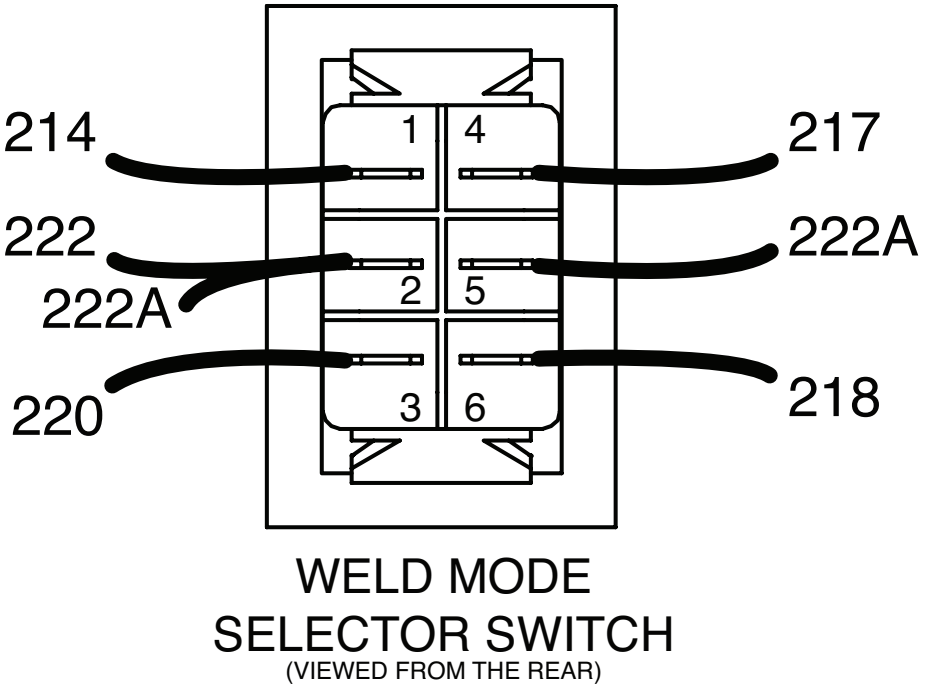


Figure F.12 – Weld control board terminal and lead locations



IDLER SOLENOID TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Idler Solenoid resistance values are normal and also determine if it will function normally when it is energized with 12 VDC.

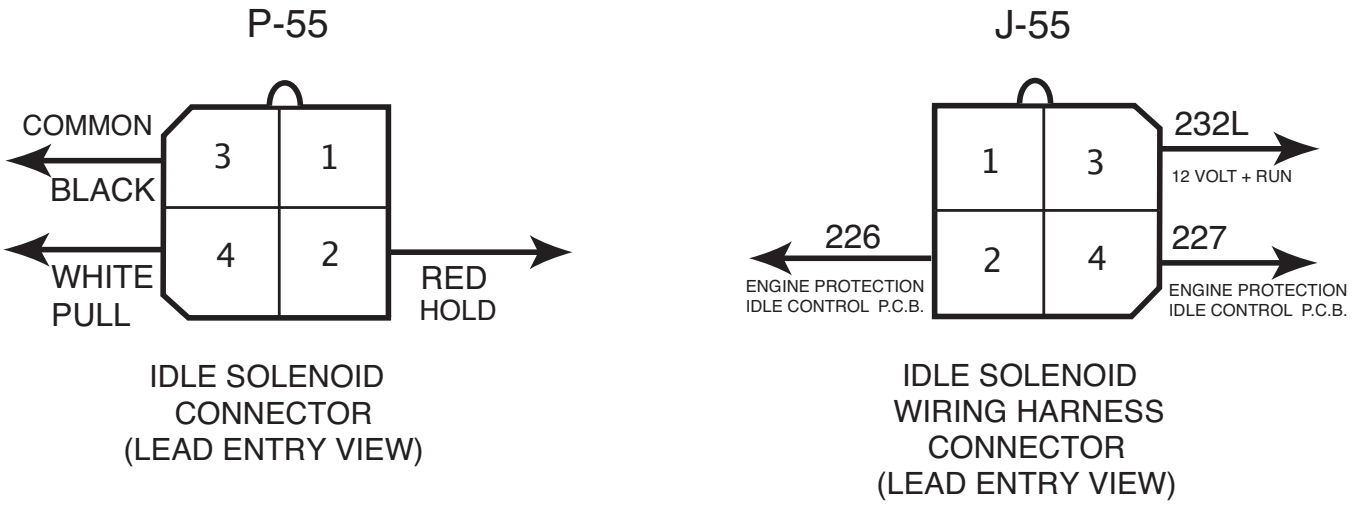
MATERIALS NEEDED

External 12 VDC Supply (30 Amps) (Automotive Battery Works Well)
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Open the right side engine service door.
3. Locate the idler solenoid, mounted on the fuel injection pump. See Wiring Diagram.
4. Locate and unplug harness connection P55/J55. Cut cable ties as necessary. See Wiring Diagram.
5. Using a volt/ohmmeter, check the pull-in coil resistance, pins 3 and 4 (black wire to white wire). The normal resistance is less than 0.2 ohms. Check the hold-in coil resistance, pins 3 and 2 (black wire to red wire). The normal resistance is approximately 11 ohms. Check the resistance between pin 3 (black wire) and a clean, unpainted chassis ground. See ***Figure F.13***. The resistance should be very high 500,000 Ohms or more. If any of the above resistance values are incorrect, the solenoid may be faulty. Replace.
6. Using the external 12 VDC supply, apply 12 VDC to the pull-in coil leads at pins 3+ and 4- (black wire to white wire). The solenoid should activate. REMOVE THE VOLTAGE IMMEDIATELY to avoid damage to the unit.
7. Apply 12 VDC to the hold-in coil at pin 3 (black wire +) and pin 2 (red wire -). While the voltage is applied, manually move the solenoid to the low idle position. The solenoid plunger should hold this position until the voltage is removed. See ***Figure F.13***.
8. If either coil does not operate as described, check for mechanical restrictions or other problems with the linkage.
9. If the linkage is intact and the solenoid does not operate correctly when the 12 VDC is applied, the solenoid may be faulty. Replace.
10. Re-connect idle solenoid and replace any previously removed cable ties.

Figure F.13 – Idler solenoid terminal locations



FUEL SHUTDOWN SOLENOID TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Fuel Shutdown Solenoid resistance values are normal.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Open the right side engine service door.
3. Locate the fuel shutdown solenoid, on the right side of the engine behind the idle solenoid. See Wiring Diagram.
4. Locate harness connection P54/J54. Cut cable ties as necessary. See Wiring Diagram.
5. Using a volt/ohmmeter, check the pull-in coil resistance (lead 233 to ground), normal resistance is less than 0.5 ohms. See Wiring Diagram.
6. Using a volt/ohmmeter, check the resistance of hold-in coil (lead 262 to ground), normal resistance is approximately 15 ohms. See Wiring Diagram.
7. If any of the tests fail, replace the fuel shutdown solenoid.
8. Replace previously cut cable ties as necessary.
9. When testing is complete, close the right side engine service door.

REMOTE RECEPTACLE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if there is a problem with the Remote Receptacle control wiring relating to electrical tracking between other control conductors, power conductors or ground.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Locate the 6-pin remote receptacle on the front panel. See ***Figure F.14***. See Wiring Diagram.
3. Make sure there are no devices plugged into the 6-pin Amphenol.
4. Using a volt/ohmmeter, perform the test outlined on ***Table F.4***. See ***Figures F.14*** and ***F.15***. See Wiring Diagram.
5. If any of the tests fail, the remote receptacle may be faulty.
6. Perform the ***Case Cover Replacement Procedure***.

Table F. 4 – Remote receptacle tests

TEST POINT (+)	TEST POINT (–)	EXPECTED READING	MACHINE CONDITION
TERMINAL C (LEAD 75A)	TERMINAL A (LEAD 77A)	10 V	MACHINE RUNNING AT HIGH IDLE WITH NO REMOTE DEVICES CONNECTED.

Figure F.14 – Remote receptacle location

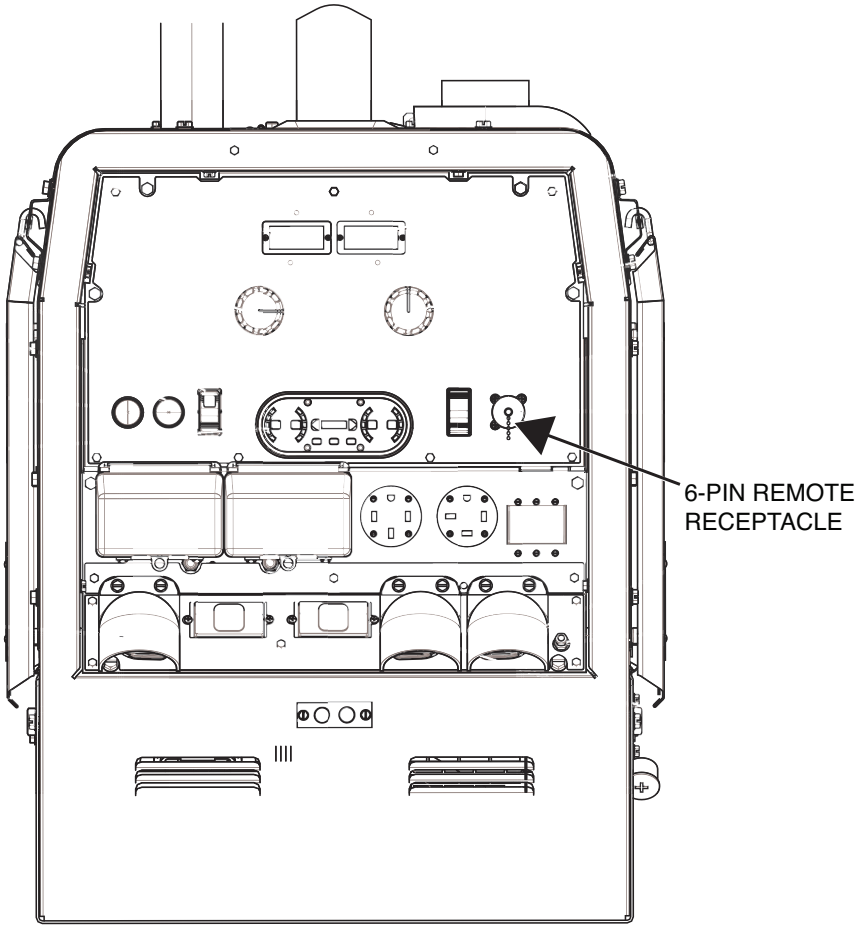
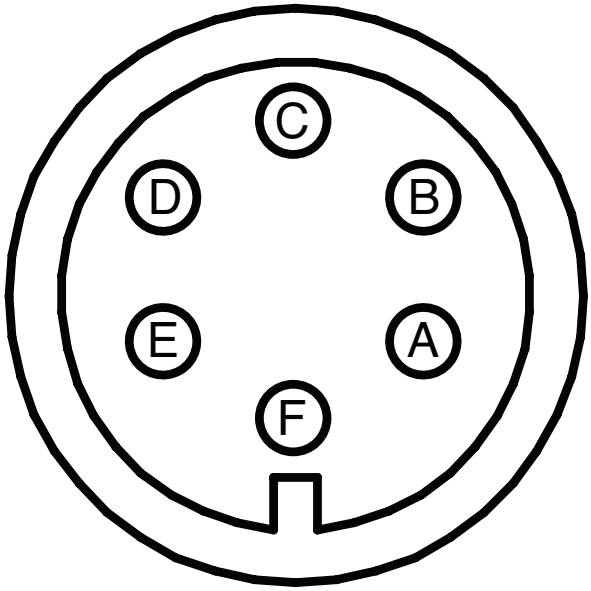


Figure F.15 – Remote receptacle pin locations



FIELD BRIDGE RECTIFIER TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Input Rectifier is receiving AC input voltage and is converting it to the correct DC output voltage.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Locate the field bridge rectifier. See ***Figure F.16***. See Wiring Diagram.
5. Label and disconnect leads 200, 200A, 5H, 201A and 6A from the field bridge rectifier. See ***Figure F.17***. See Wiring Diagram.
6. Using a volt/ohmmeter, perform the forward voltage drop tests outlined in ***Table F.5***. See ***Figure F.17***. See Wiring Diagram.
7. If any of the tests fail, the field bridge rectifier may be faulty.
8. If faulty, perform the ***Field Bridge Rectifier Removal And Replacement Procedure***.
9. Connect the previously removed leads 200, 200A, 5H, 201A and 6A to the field bridge rectifier. See Wiring Diagram.
10. Perform the ***Case Cover Replacement Procedure***.

Table F. 5 – Field bridge rectifier forward voltage drop tests

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

Figure F.16 – Field bridge rectifier location

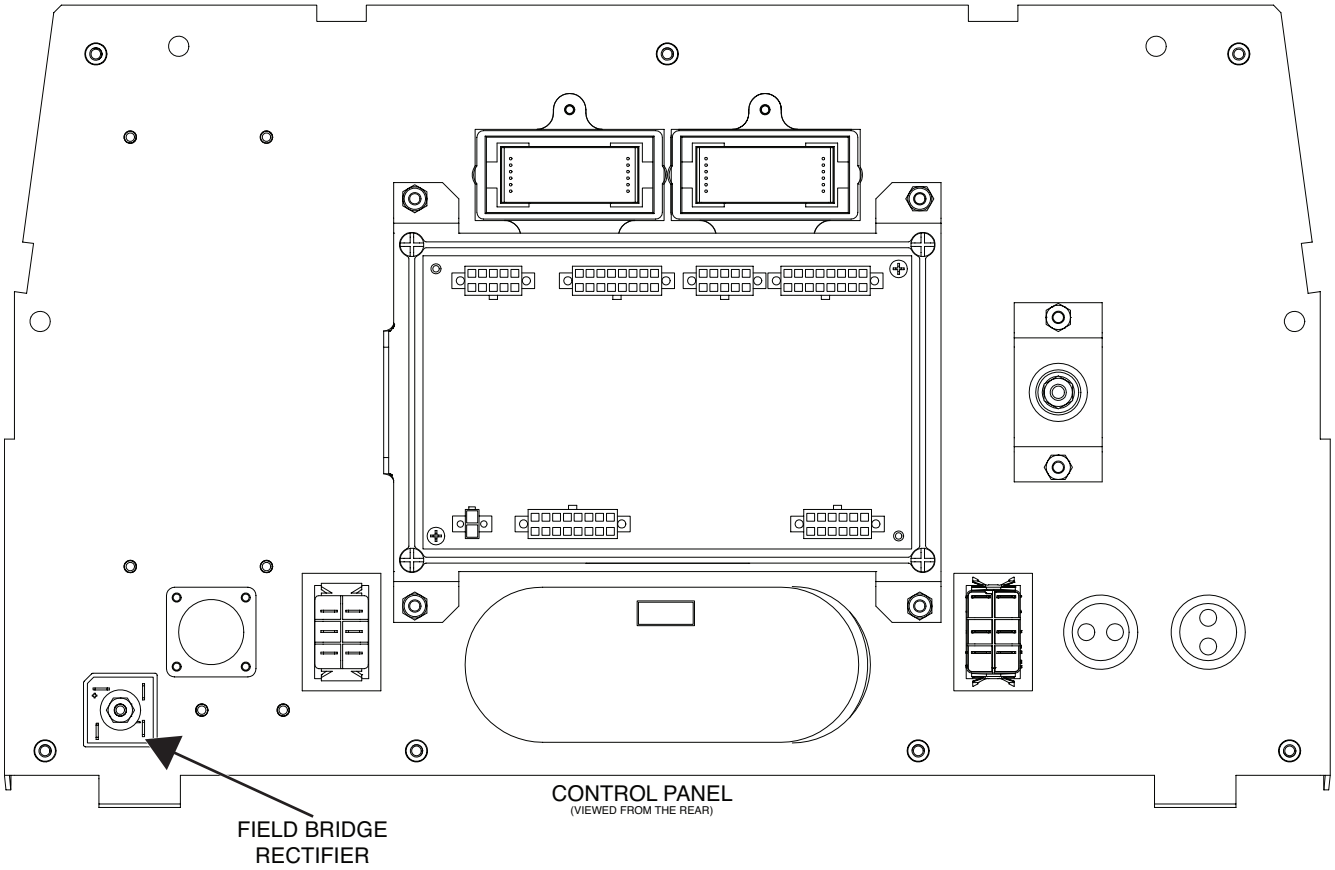
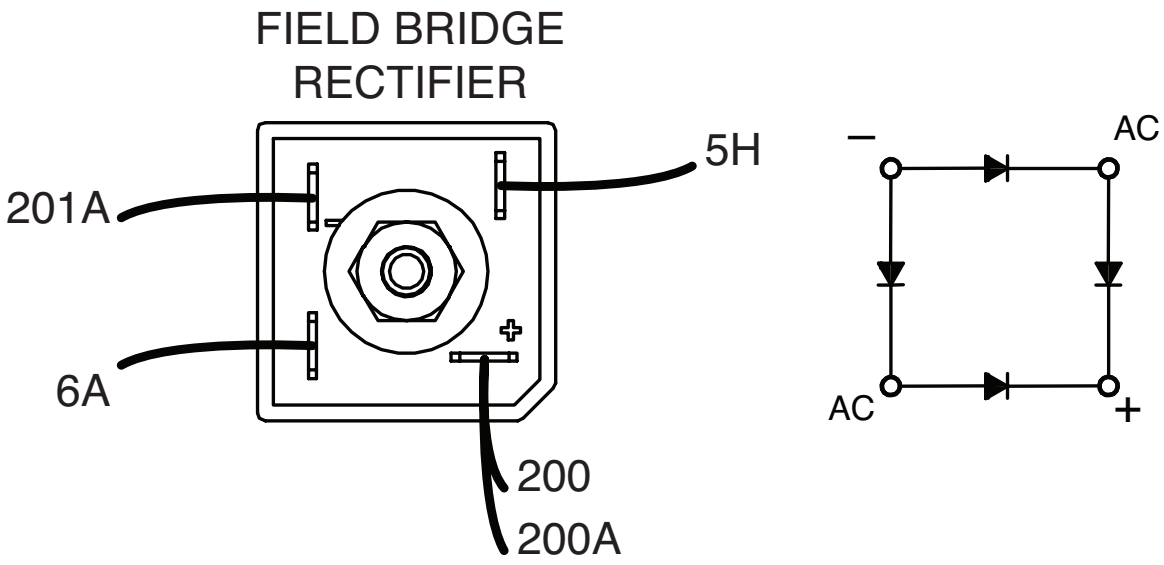


Figure F.17 – Field bridge rectifier lead locations



CHOPPER MODULE FUNCTION TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Chopper Module is functioning properly and receiving the correct input from the Output Rectifier and Weld Control PC Board. This test can only provide meaningful results if the machine is producing normal AC auxiliary output.

MATERIALS NEEDED

Frequency Counter or Digital Multimeter With Frequency Counter Function
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Make sure there is nothing plugged into the Amphenol receptacle.
4. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in the 'High Idle/Run' position. See ***Figure F.18***.
5. Place the weld mode selector switch in the 'CC-Stick' position. See ***Figure F.18***.
6. Start the engine and allow it to stabilize at high idle RPM.
7. Locate the chopper module board. See ***Figure F.19***. See Wiring Diagram.
8. Visually verify the LED's on the board are illuminated according to ***Table F.6***. See ***Figure F.20***. See Wiring Diagram.
9. Check for 80 to 100 VDC at terminals B1- to B2+ and B4- to B5+ of the chopper module. See ***Figure F.20***. See Wiring Diagram.
10. If the correct DC voltage is not present at terminals B1- to B2+ and B4- to B5+, check for damaged conductors or faulty connections between the chopper module, the output rectifier and stator weld winding. See Wiring Diagram. Perform the ***Stator Voltage Test Procedure*** and the ***Output Rectifier Bridge Test Procedure***.
11. If the correct voltage is present at terminals B1- to B2+ and B4- to B5+ of the chopper module, check for DC voltage at the chopper module terminals B2+ to B3- and B5+ to B6-. If significant voltage is present, disconnect leads 23 and plug J3 from the chopper module. If voltage is still present, the chopper is shorted and should be replaced.

12. If the voltage drops to 0 VDC after the leads 23 and plug J3 have been disconnected, the weld control board is driving the chopper module when it should not be doing so. Reconnect lead 23 and plug J3 and perform the ***Weld Control Board PWM Gate Signal Test Procedure***.
13. Reconnect leads 23 and plug J3. See Wiring Diagram.
14. Check for about 58 VDC between chopper module terminals B2+ to B3- and B5+ to B6 and across the welder output terminals. See ***Figure F.20***. See Wiring Diagram.
15. If about 58 VDC is present at chopper module terminals B2+ to B3- and B5+ to B6-, but not at the weld output terminals, there is a problem between the chopper module and one of the output terminals. Check for damaged conductors or faulty connections. Also check the shunt, the choke and the connections at the back of the output terminals. See Wiring Diagram.
16. If the voltage at terminals B2+ to B3- and B5+ to B6- of the chopper module is significantly higher than 58 VDC, check for an open R4 load resistor. See Wiring Diagram.
17. If the voltage at terminals B2+ to B3- and B5+ to B6- of the chopper module are very low or not present, use the frequency counter to check for the presence of a 20 kHz PWM signal between leads 23 +and plug J3, where they connect to the chopper module board.
18. If the 20 kHz signal is present, the chopper module is defective. Perform the ***Chopper Module PC Board Removal And Replacement Procedure***.
19. If the 20 kHz signal is not present, perform the ***Weld Control Board PWM Gate Signal Test Procedure***.
20. If the weld control board is producing a PWM gate signal, check lead 23 and plug J3 for damaged conductors and faulty connections between the weld control board and the chopper module board.
21. If testing is complete, perform the ***Case Cover Replacement Procedure***.

Table F. 6 – Chopper module LED tests

LED	COLOR	INDICATION
1	GREEN	PWM INPUT PRESENT
2	GREEN	15 VDC POWER SUPPLY PRESENT
3	GREEN	CHOPPER OUTPUT PRESENT

Figure F.18 – Stop / (auto idle/run) / (high idle/run) switch and weld mode selector switch locations

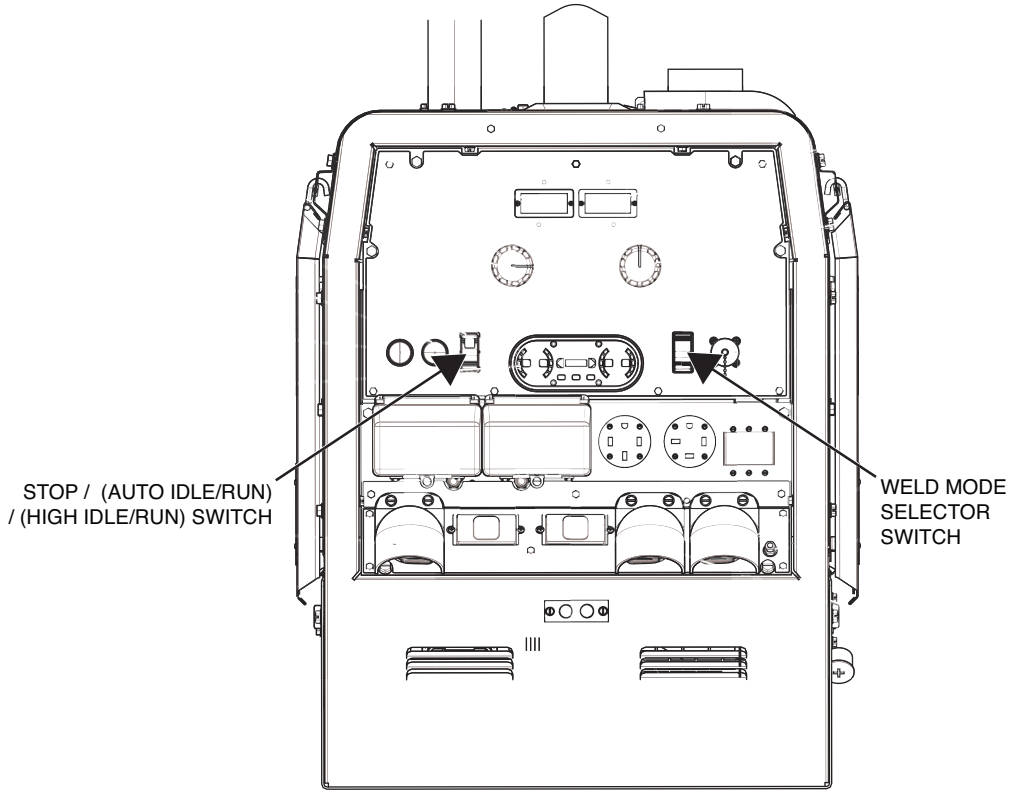


Figure F.19 – Chopper module board location

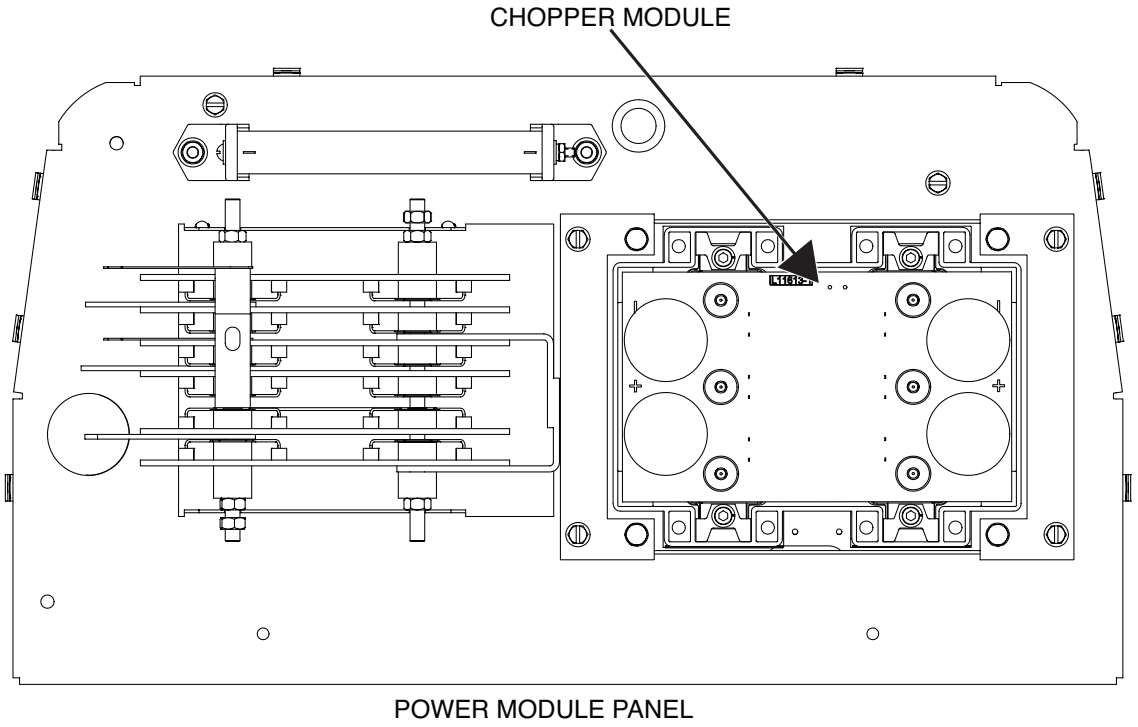
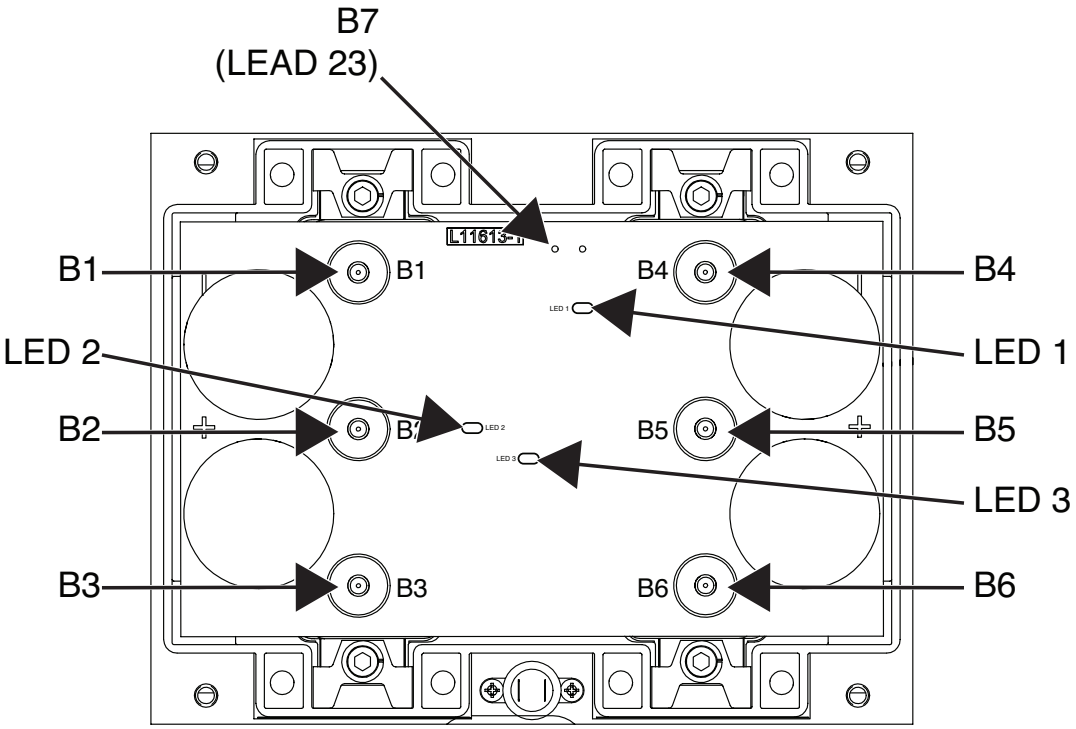


Figure F.20 – Chopper module board terminal locations



CHOPPER MODULE RESISTANCE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Chopper Module is shorted. This test can only detect some problems in the "Power" section of the module. Problems in some other PC board components may not be detected.

MATERIALS NEEDED

7/16"Nutdriver
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Locate the chopper module PC board. See ***Figure F.21***. See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the six screws, lock washers and flat washers securing the heavy leads to terminals B1, B2, B3, B4, B5 and B6 of the chopper module PC board. See ***Figure F.22***. See Wiring Diagram. Label leads for reassembly.
6. Using a volt/ohmmeter, perform the wide diode tests outlined in ***Table F.7***. See ***Figures F.21*** and ***F.22***. See Wiring Diagram.
7. If any of the tests fail, the chopper module pc board may be faulty.
8. If faulty, perform the ***Chopper Module PC Board Removal And Replacement Procedure***.
9. Using a 7/16" nutdriver, attach the six screws, lock washers and flat washers securing the heavy leads to terminals B1, B2, B3, B4, B5 and B6 of the chopper module PC board. See Wiring Diagram. Torque to 50-60 inch/lbs.
10. Perform the ***Case Cover Replacement Procedure***.

Table F. 7 – Chopper module diode tests

OHMMETER (+) PROBE	OHMMETER (–) PROBE	OHMMETER READING EXPECTED READING
B6	B5	0.3 – 0.5 mv
B4	B6	1.50 – 1.90
B4	B5	0.5 mv
B3	B2	0.3 – 0.5 mv
B1	B3	1.5 – 1.90
B1	B3	0.5 mv

Figure F.21 – Chopper module board location

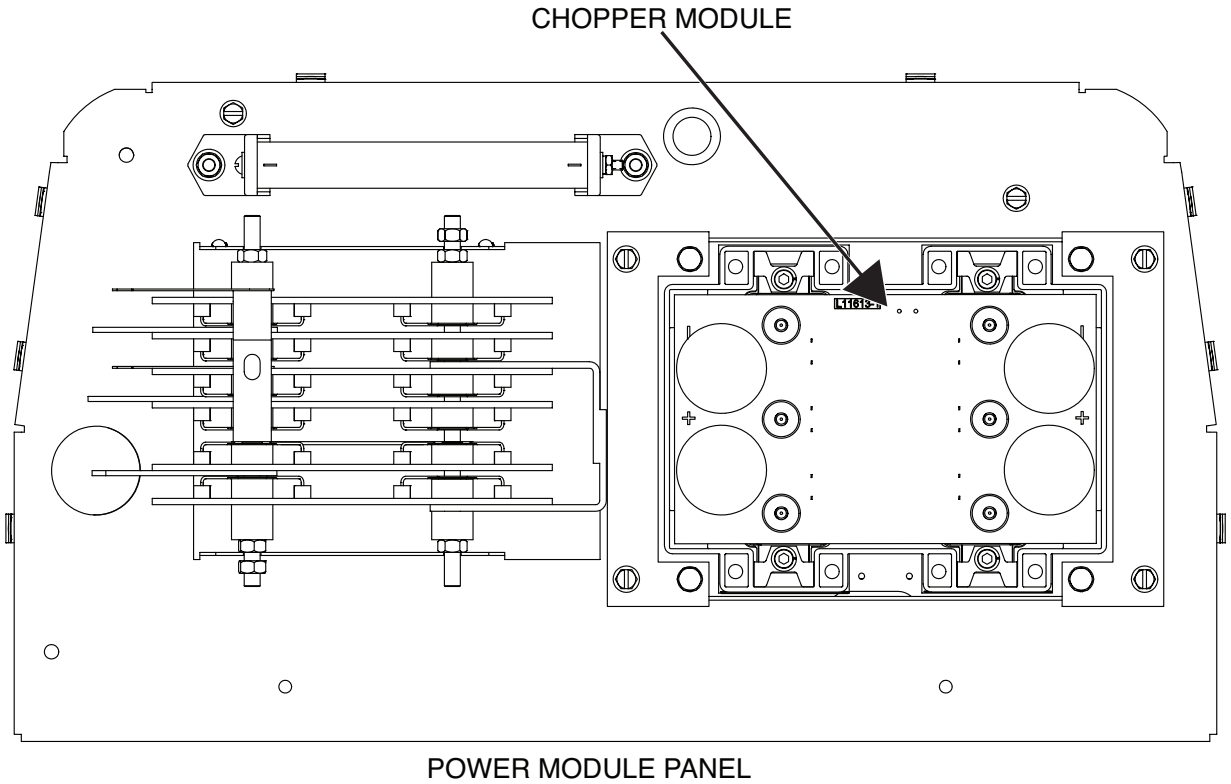
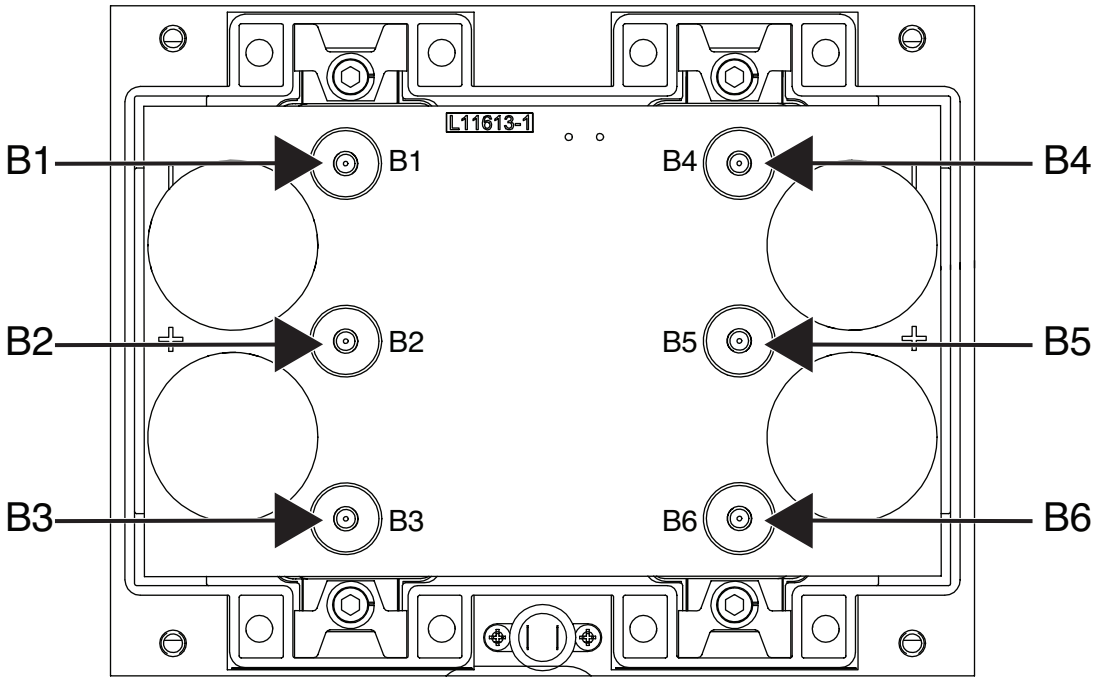


Figure F.22 – Chopper module board terminal locations



CHOKE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Choke is shorted turn to turn or grounded.

MATERIALS NEEDED

7/16" Nutdriver
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Locate the chopper module board. See ***Figure F.23***. See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the bolt, lock washer and flat washer securing the heavy lead to terminal B6 of the chopper module. See ***Figure F.23***. See Wiring Diagram.
6. **Open:** No weld output. Using a volt/ohmmeter, measure the resistance from the heavy lead to the negative CV output terminal. See ***Figure F.24***. See Wiring Diagram. Resistance should be very low (less than one ohm). Using a volt/ohmmeter, measure the resistance from the heavy lead to the negative CC output terminal. See ***Figure F.24***. See Wiring Diagram. Resistance should be very low (less than one ohm).
7. **Turn To Turn Short:** Reduced inductance, arc instability, excessive heating of the choke. Check for any physical signs of arcing within the choke assembly.
8. **Choke Coil Grounded:** Reduced inductance, alternate weld current path. Using a volt/ohmmeter, measure the resistance from the heavy choke lead (B6 on the chopper module board) to chassis ground. Resistance should be at least 500,000 (500k ohms). See Wiring Diagram.
9. If any of the tests fail, the choke may be faulty.
10. If faulty, perform the ***Choke Removal And Replacement Procedure***.
11. Using a 7/16" nutdriver, attach the bolt, lock washer and flat washer securing the heavy lead to terminal B6 of the chopper module. See Wiring Diagram.
12. Perform the ***Case Cover Replacement Procedure***.

Figure F.23 – Chopper module board and B6 terminal locations

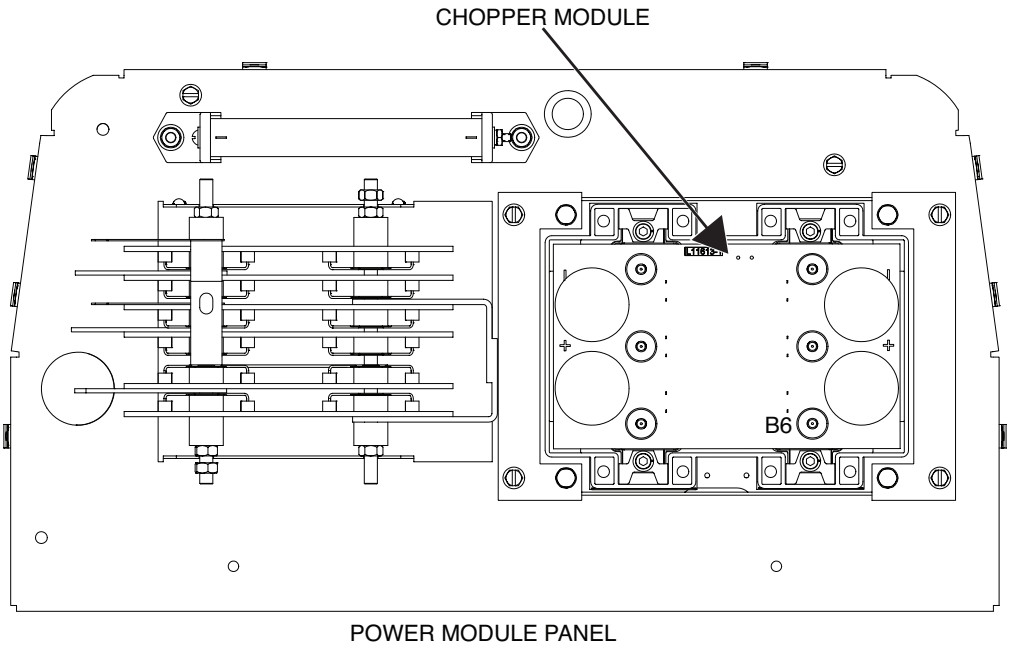
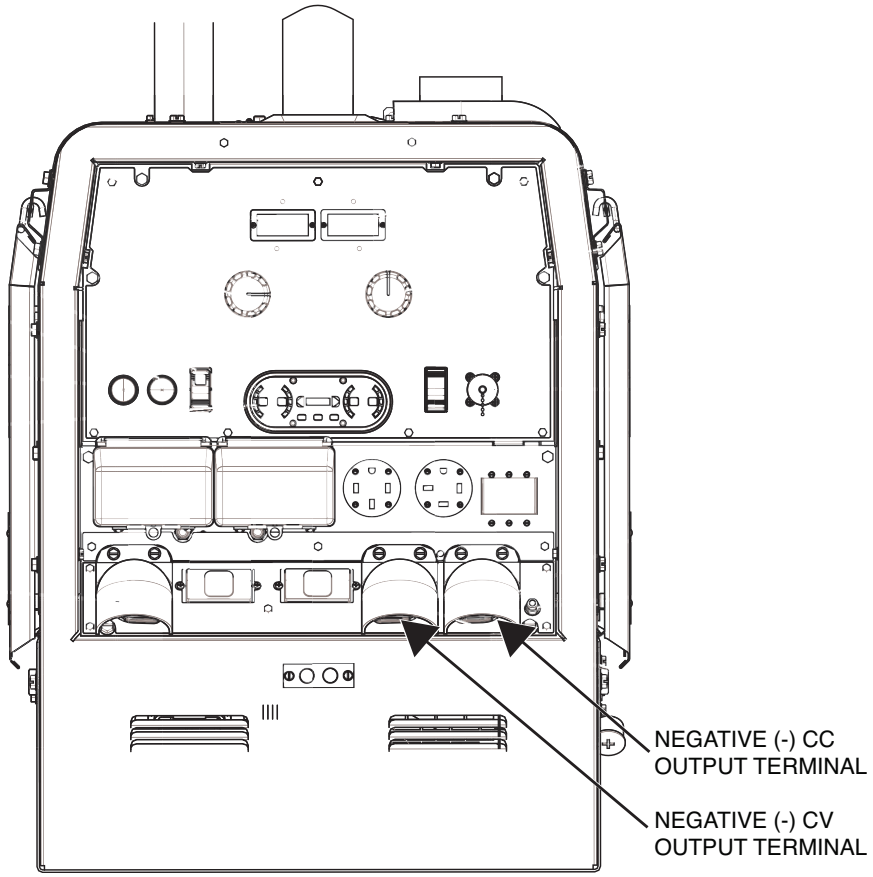


Figure F.24 – Negative CC & CV output terminal locations



WELD CONTROL FEEDBACK TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Weld Control PC Board is receiving accurate current and voltage feedback from the Weld Circuit. This test will only yield usable information if the machine is producing some weld output.

MATERIALS NEEDED

Digital Multimeter Suitable For Accurate Readings In Both The Millivolt And Normal Weld Voltage Ranges
Resistive Load Bank
Ammeter Suitable For Accurate Readings Of Normal Welding Current (Often Built Into The Load Bank)
Wiring Diagram

TEST PROCEDURE

1. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in the "High Idle/Run" position. See ***Figure F.25***.
2. Place the weld mode selector switch in the "CC-STICK" position. See ***Figure F.25***.
3. Make sure that nothing is plugged into the Amphenol receptacle.
4. Connect the resistive load bank and the ammeter to the weld output terminals per the equipment manufacturer's instructions; also connect the voltmeter probes across the weld output terminals. See ***Figure F.25***.
   NOTE: If the optional Weld Meter Kit is not installed, proceed to step 9.
5. Start the machine and apply a load of about 200 amps, as shown on the external ammeter. If the machine will not produce 200 amps, apply as much load as you can.
6. Compare the readings shown on the external ammeter and voltmeter to the amps and volts displayed on the front panel of the machine.
7. If the readings shown on the front panel displays are about the same or very close to the reading on the external meters, the feedback is probably good, and this test is complete.
8. If the readings differ significantly, continue with this procedure.
9. Remove the load from the weld terminals and turn off the engine. (The load bank and ammeter can remain connected.)
10. Perform the ***Case Cover Removal Procedure***.

11. Locate plugs J3 and J6 on the weld control board. See ***Figure F.26***. Remove the plugs and check for dirt, corrosion, damaged, expanded or incorrectly positioned terminals. Repair or replace wiring components as needed and reconnect the plugs to the control board.
12. Restart the machine and apply a load across the weld terminals that measures about 200 amps. If the machine will not produce 200 amps of current, apply as much load as you can.
13. Using the voltmeter, measure and note the DC voltage at the weld output terminals.
14. Check the voltage between lead 204S+ (J6-1) and lead 208A- (J3-15) at the weld control board Molex plugs. The voltage should be the same as was measured at the weld terminals. See ***Figures F.26*** and ***F.27***.
15. If the voltage readings are different, check the wiring and connections between the welding terminals and the weld control board. See the Wiring Diagram.
16. Connect the millivolt meter probes between lead 206S+ (J6-2) and lead 204S- (J6-1). See Wiring Diagram. See ***Figures F.26*** and ***F.27***. If the machine is currently producing 200 amps the millivolt meter should read about 25 millivolts.
17. If the machine cannot produce 200 amps of weld current, the correct millivolt signal will need to be calculated by dividing the reading displayed on the external ammeter by 8. See the following explanation.

    The shunt used in this machine will produce 50 millivolts at a load of 400 amps, or 8 amps per millivolt.

    To calculate the correct millivolt signal for a given load, you divide the number of amps displayed on the ammeter by 8.

    Example: If your ammeter reads 75, (75/8 = 9.4) If the shunt is working correctly, and the wiring between the shunt and the control PC board is in good condition, the meter connected at the control PC board should be reading about 9.4 millivolts.
18. If the millivolt reading is incorrect, check the wiring between the shunt and the control PC board for damage, grounds, and faulty connections. If the wiring is good, the shunt and lead assembly is faulty and should be replaced.
19. Perform the ***Case Cover Replacement Procedure***.

Figure F.25 – Stop / (auto idle/run) / (high idle/run) switch and weld mode selector switch locations

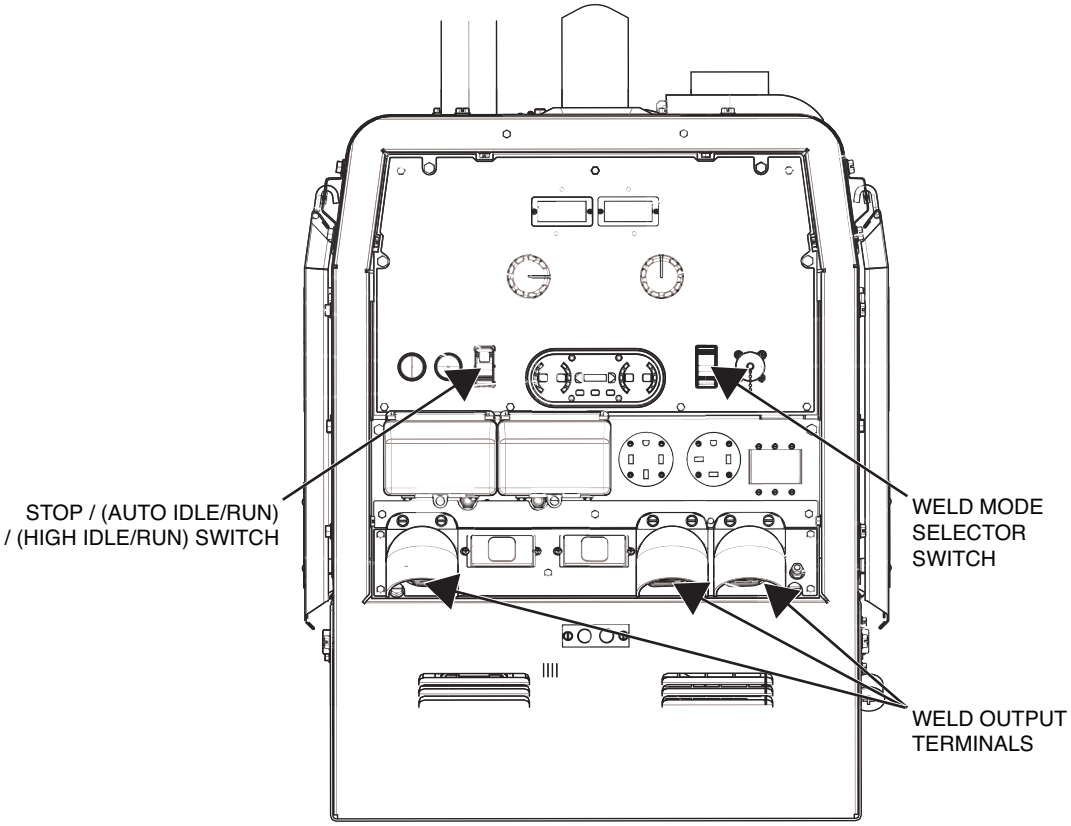


Figure F.26 – Weld control board and plug locations

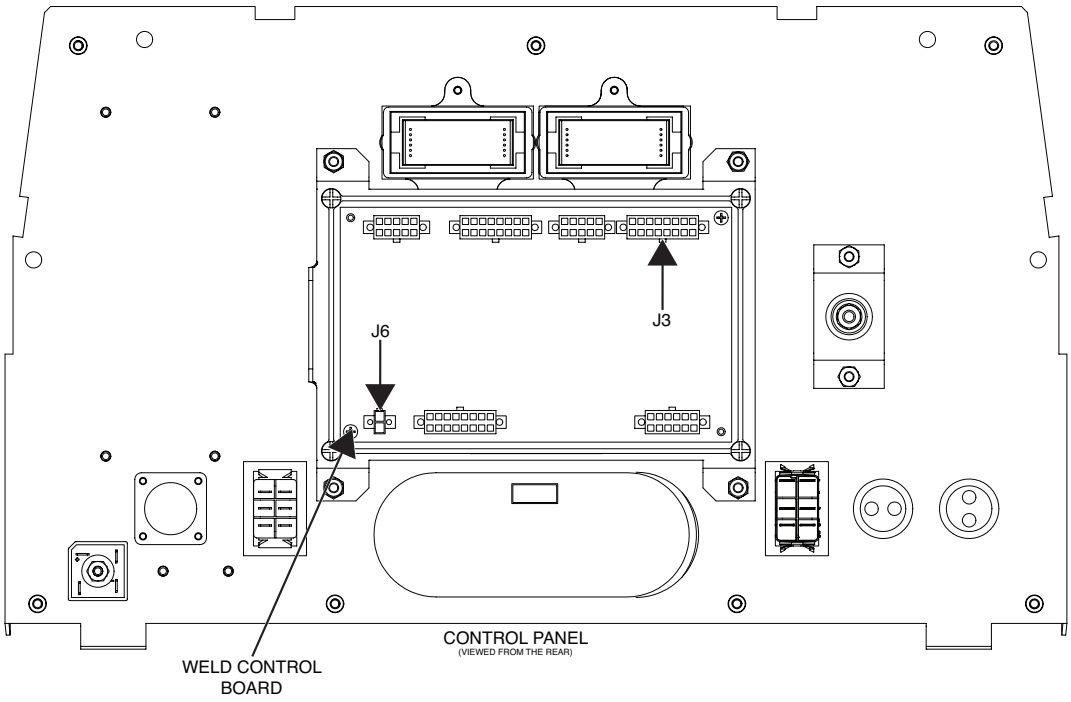
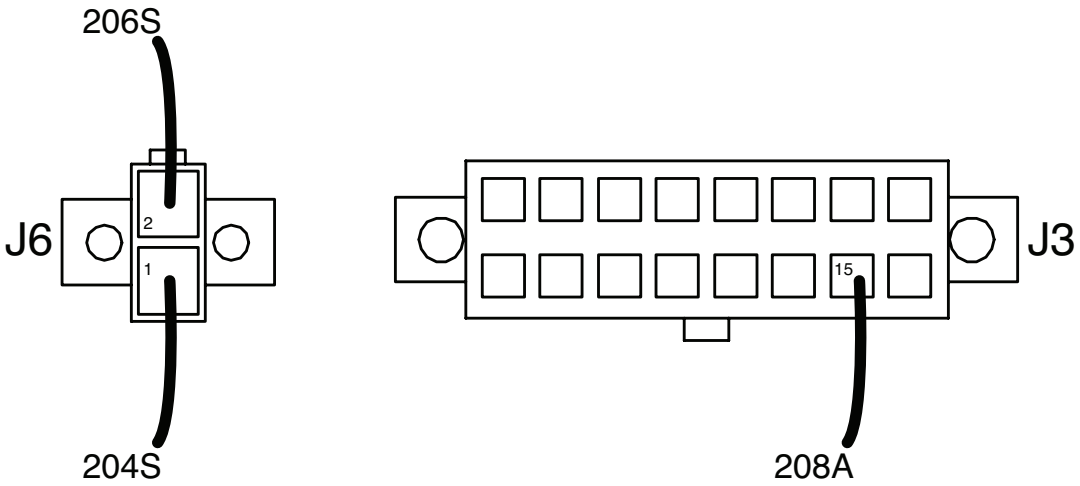


Figure F.27 – Weld control board lead locations



WELD CONTROL BOARD PWM GATE SIGNAL TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Weld Control PC Board is able to produce the PWM (Pulse Width Modulated) gate signal needed to control the IGBTs (Insulated Gate Bipolar Transistor) on the Chopper Module. This test will also verify that the Weld Control PC Board can turn the PWM gate signal on and off properly.

MATERIALS NEEDED

Frequency Counter, or Multimeter With Frequency Counter Function
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in the 'High Idle/Run' position. See ***Figure F.28***.
4. Place the weld mode selector switch in the 'CC-Stick' position. See ***Figure F.28***.
5. Start the engine and let it run and stabilize at high idle.
6. Locate the weld control board. See ***Figure F.29***. See Wiring Diagram.
7. Locate plug J3 on the weld control board. See ***Figure F.29***. See Wiring Diagram.
8. Using a frequency counter, test for the presence of the 20kHz PWM gate signal between leads 23+ (J3-10) and lead 25- (J3-9). See ***Figure F.30***. See Wiring Diagram.
9. If the 20 kHz gate signal is present, the test is complete.
10. If there is no 20 kHz gate signal, test for the presence of 80 to 100 VDC at leads 13+ (J3-8) to lead 14- (J3-16) of the weld control board. See ***Figure F.30***. See Wiring Diagram.
11. If voltage is very low or not present, check leads 13 and 14 for faulty or damaged wiring or connections between the weld control board and the chopper module.
12. Test for 80 to 100 VDC at the terminals B2 and B1 where leads 13 and 14 connect to the chopper module. See Wiring Diagram. If there is no voltage at the chopper module, perform the ***Chopper Module Function Test Procedure***.
13. If the 80 to 100 VDC supply voltage is present at the weld control board, but there is no PWM gate signal, check the voltage between leads 2+ (J1-4) and 4 (J1-3). The voltage should be about 0 VDC.

14. If about 15 VDC is detected, the welding terminal control circuit is open. Check for damaged leads for faulty connections at leads 2 and 4. See Wiring Diagram.
15. If the wiring and components are undamaged and functioning properly, the weld control board is defective and should be replaced.
16. Perform the ***Case Cover Replacement Procedure***.

Figure F.28 – Stop / (auto idle/run) / (high idle/run) switch and weld mode selector switch locations

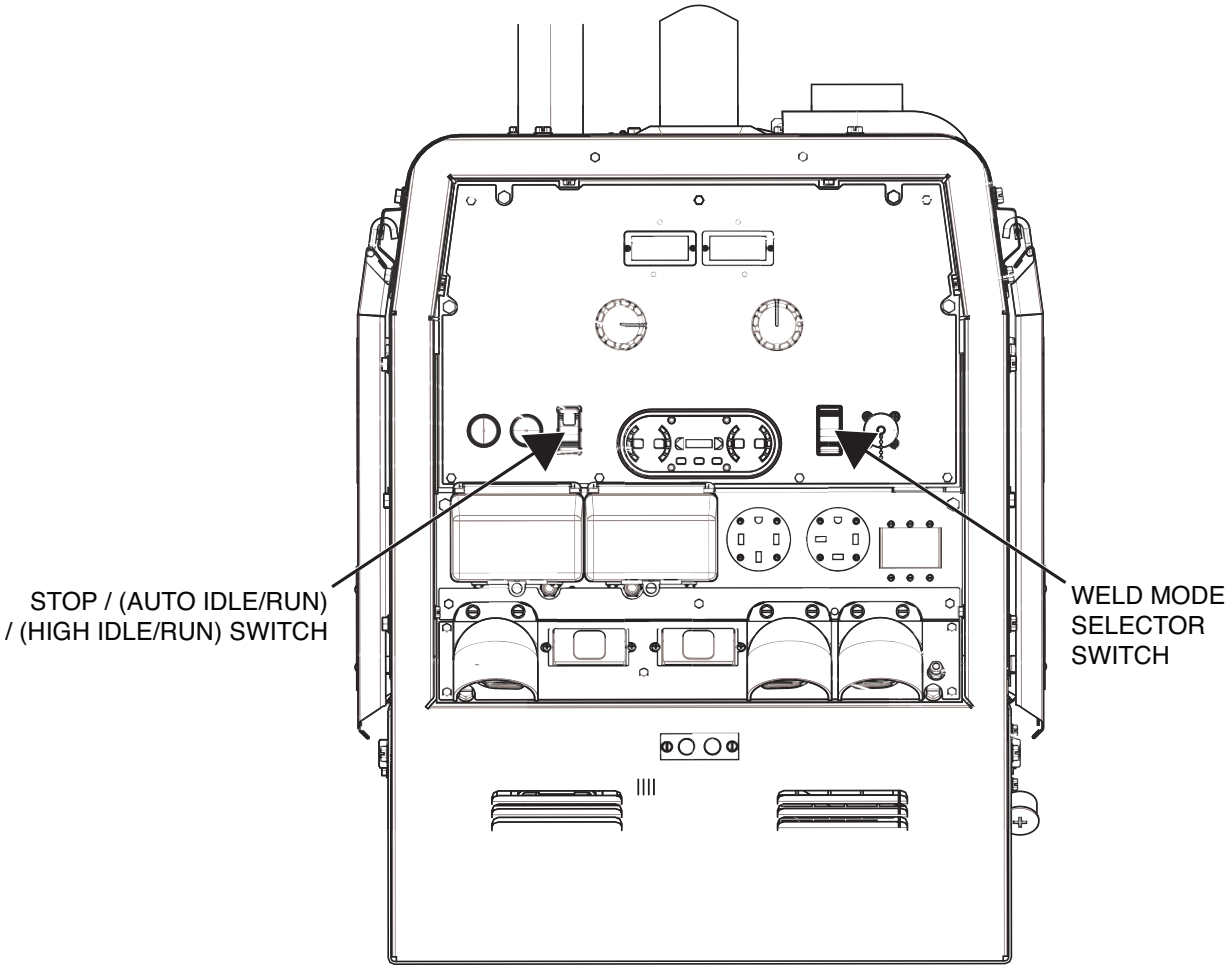


Figure F.29 – Weld control board and plug locations

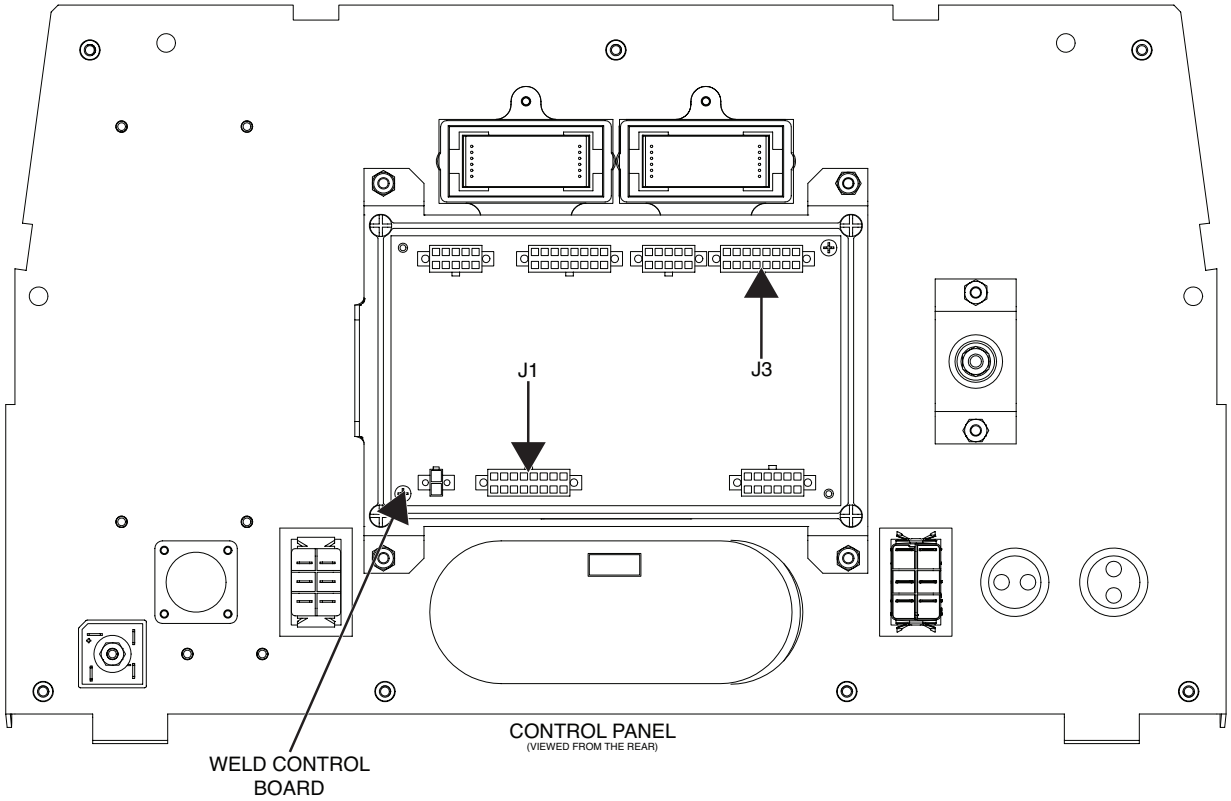
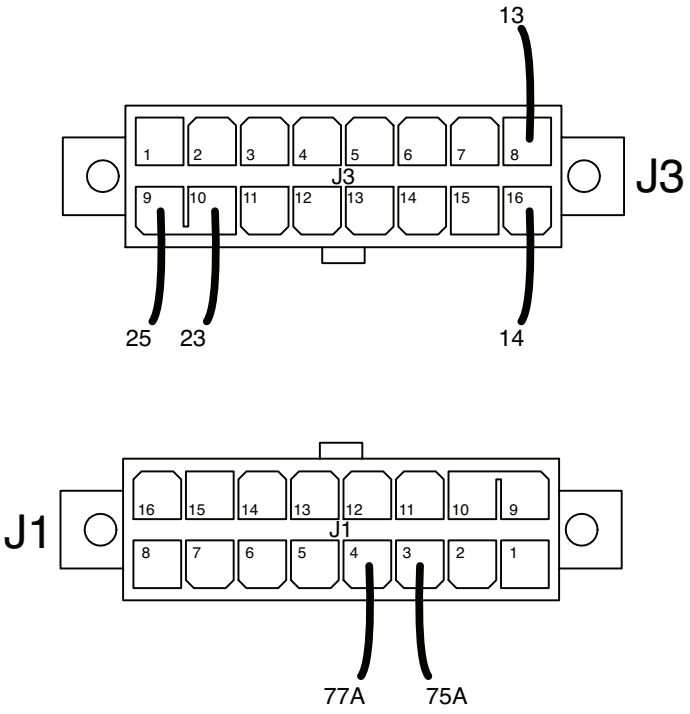


Figure F.30 – Weld control board lead locations



WELD CONTROL BOARD VOLTAGE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Weld Control Board is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the weld control board. See ***Figure F.31***. See Wiring Diagram.
4. Using a volt/ohmmeter, perform the tests outlined in ***Table F.8***. See ***Figures F.32*** and ***F.33***. See Wiring Diagram.
5. If any of the tests fail, the weld control board may be faulty.
6. If faulty, perform the ***Weld Control Board Removal And Replacement Procedure***.
7. Perform the ***Case Cover Replacement Procedure***.

Table F. 8 – Weld control board voltage checks

TEST DESCRIPTION	TEST POINTS (+)	TEST POINTS (–)	EXPECTED READING	CONDITIONS
OUTPUT CONTROL CIRCUIT	PLUG J7 PIN 1 (LEAD 75)	PLUG J7 PIN 5 (LEAD 77)	10 VDC	NO REMOTE CONTROL DEVICE IN 6 PIN AMPHENOL AND ENGINE RUNNING AT HIGH IDLE.
OUTPUT CONTROL CIRCUIT	PLUG J7 PIN 4 (LEAD 76)	PLUG J7 PIN 5 (LEAD 77)	0 TO 10 VDC DEPENDENT ON POSITION OF OUTPUT CONTROL (R1)	NO REMOTE CONTROL DEVICE IN 6 PIN AMPHENOL AND ENGINE RUNNING

				AT HIGH IDLE.
REMOTE CONTROL CIRCUIT	PLUG J1 PIN 11 (LEAD 77A)	PLUG J1 PIN 10 (LEAD 75A)	10 VDC	NO REMOTE CONTROL DEVICE IN 6 PIN AMPHENOL AND ENGINE RUNNING AT HIGH IDLE.
ARC CONTROL CIRCUIT	PLUG J7 PIN 12 (LEAD 277)	PLUG J7 PIN 3 (LEAD 279)	0 – 5 VDC DEPENDENT ON POSITION OF ARC CONTROL (R2)	ENGINE RUNNING AT HIGH IDLE.
PWM SIGNAL TO CHOPPER BOARD	PLUG J3 PIN 9 (LEAD 25)	PLUG J3 PIN 10 (LEAD 23)	15 VDC AT 20 KHZ PWM SIGNAL	ENGINE RUNNING AT HIGH IDLE.
POWER TO CONTROL BOARD	PLUG J3 PIN 8 (LEAD 13)	PLUG J3 PIN 16 (LEAD 14)	90 TO 100 VDC	ENGINE RUNNING AT HIGH IDLE.
IDLE COMMAND TO ENGINE PROTECTION/IDLE BOARD	PLUG J2 PIN 5 (LEAD 405)	PLUG J2 PIN 3 (LEAD 5G)	10 VDC	ENGINE RUNNING AT HIGH IDLE.
IDLE COMMAND TO ENGINE PROTECTION/IDLE BOARD	PLUG J2 PIN 5 (LEAD 405)	PLUG J2 PIN 3 (LEAD 5G)	LESS THAN 1 VDC	ENGINE RUNNING AT LOW IDLE.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 14 (LEAD 218)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN STICK POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 14 (LEAD 218)	15 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN TIG POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 14 (LEAD 218)	15 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN CV WIRE POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 11 (LEAD 217)	15 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN STICK POSITION.

MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 11 (LEAD 217)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN TIG POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 11 (LEAD 217)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN CV WIRE POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 15 (LEAD 220)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN STICK POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 15 (LEAD 220)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN TIG POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 15 (LEAD 220)	15 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN CV WIRE POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 9 (LEAD 214)	15 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN STICK POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 9 (LEAD 214)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN TIG POSITION.
MODE SWITCH CIRCUIT	PLUG J7 PIN 16 (LEAD 222)	PLUG J7 PIN 9 (LEAD 214)	0 VDC	ENGINE RUNNING AT HIGH IDLE AND WELD MODE SELECTOR SWITCH IN CV WIRE POSITION.

Figure F.31 – Weld control board location

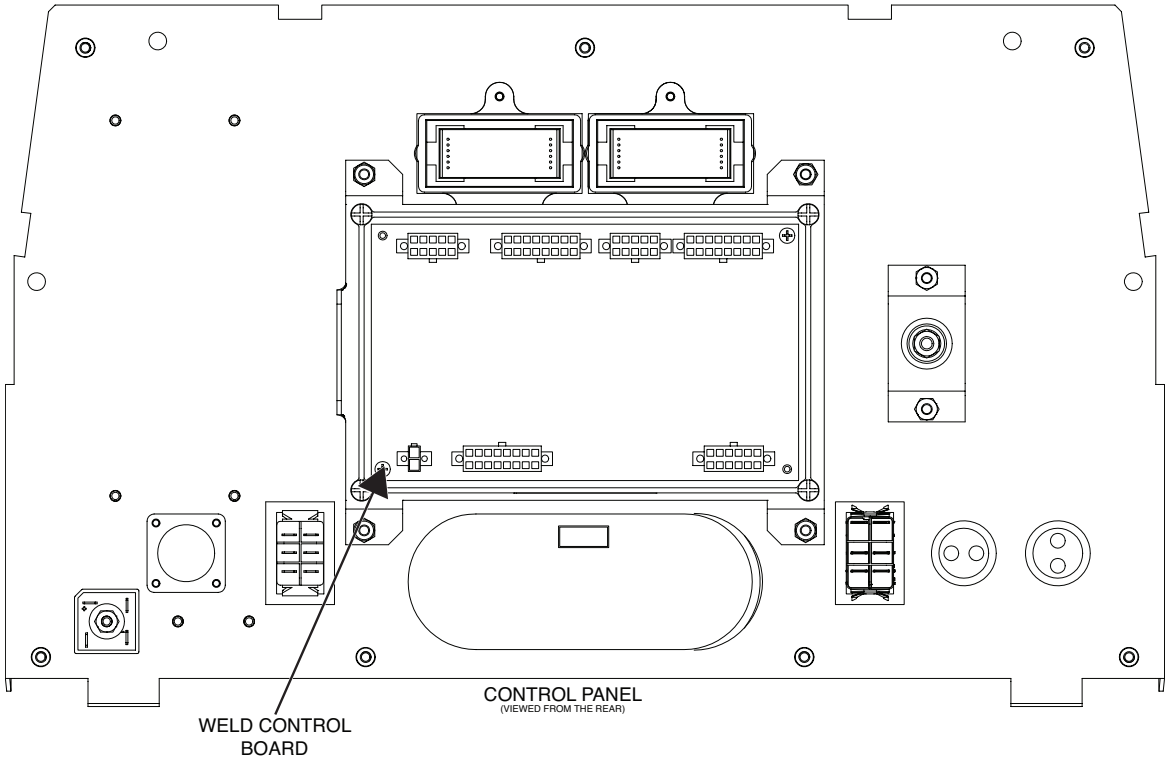


Figure F.32 – Weld control board plug locations

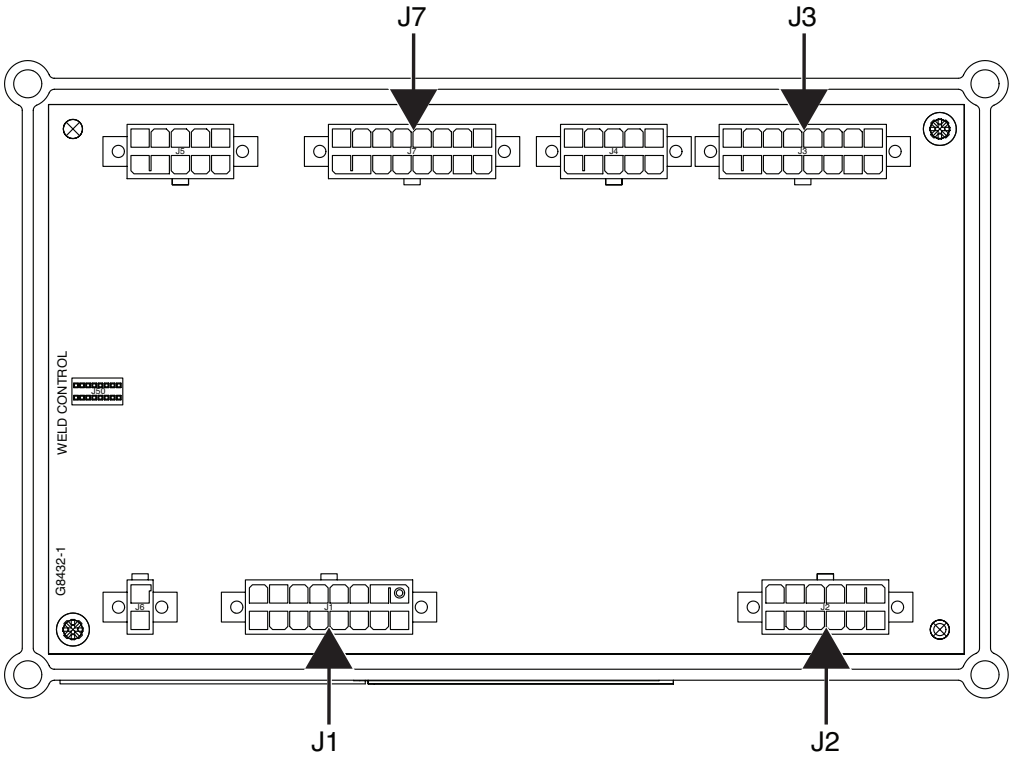
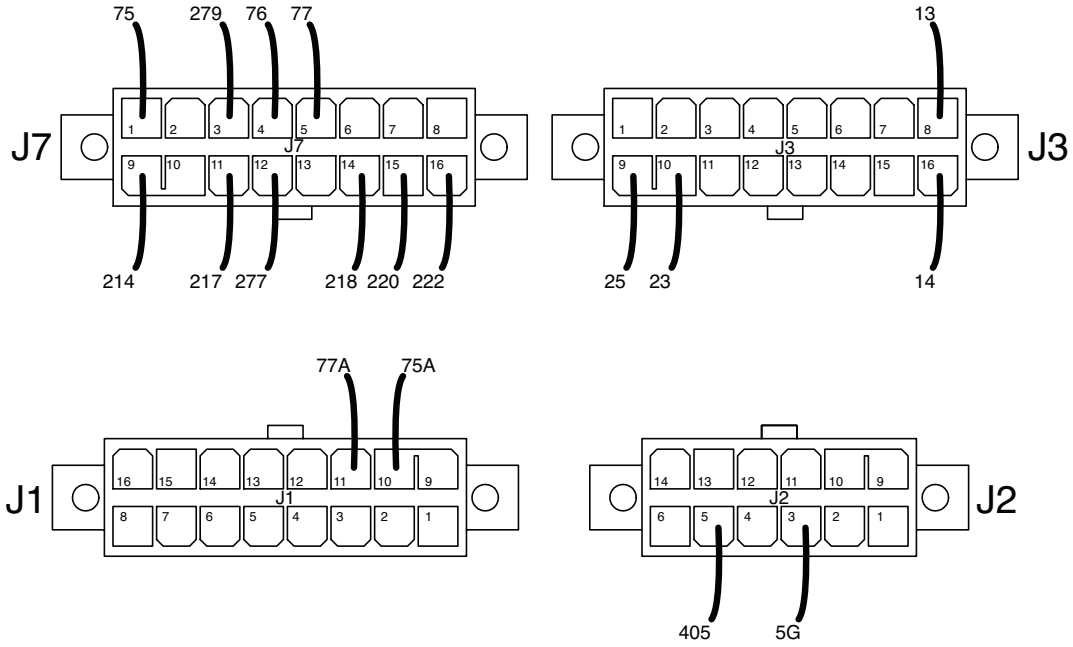


Figure F.33 – Weld control board lead locations



OUTPUT RECTIFIER BRIDGE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Three-Phase Output Rectifier Bridge is grounded or if there are any failed diode groups.

MATERIALS NEEDED

7/16” Nutdriver
7/16” Open-End Wrench
1/2” Nutdriver
1/2” Open-End Wrench
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Locate the output rectifier bridge. See ***Figure F.34***. See Wiring Diagram.
5. Using a 7/16” nutdriver and 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W1 and W6 to the top terminal of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. Label leads for reassembly.
6. Using a 7/16” nutdriver and 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W2 and W3 to the middle terminal of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. Label leads for reassembly.
7. Using a 7/16” nutdriver and 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W4 and W5 to the bottom terminal of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. Label leads for reassembly.
8. Using a 1/2” nutdriver and 1/2” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing the two heavy leads to the positive terminal of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. Label leads for reassembly.
9. Using two 1/2” open-end wrenches, remove the bolt, nut, lock washer and two flat washers securing the two heavy leads to the negative terminal of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. Label leads for reassembly.

10. Using a volt/ohmmeter, check for grounds by placing one of the ohmmeter probes on a clean, unpainted metal surface of the machine. Place the probe on each of the five terminals of the rectifier bridge. See ***Figure F.35***. See Wiring Diagram. The resistance should be very high, 500,00 (500K) ohms minimum. If the resistance reading is less than specified, the rectifier is grounded and should be replaced.
11. If using a diode checker or a multi-meter with diode check functionality, read and understand the instructions that accompany your test equipment.
12. If using an analog ohmmeter, the forward bias test will indicate low resistance and the reverse bias test will indicate high resistance. Precise ohm values for this test will vary depending on the test equipment used.
13. Using a volt/ohmmeter, perform the diode tests outlined in ***Table F.9***. See ***Figure F.35***. See Wiring Diagram.
14. If any of the tests fail, the rectifier bridge may be faulty.
15. If faulty, perform the ***Output Rectifier Bridge Removal And Replacement Procedure***.
16. Using two 1/2” open-end wrenches, attach the bolt, nut, lock washer and two flat washers securing the two heavy leads to the negative terminal of the rectifier bridge. See Wiring Diagram.
17. Using a 1/2” nutdriver and 1/2” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing the two heavy leads to the positive terminal of the rectifier bridge. See Wiring Diagram.
18. Using a 7/16” nutdriver and 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W4 and W5 to the bottom terminal of the rectifier bridge. See Wiring Diagram.
19. Using a 7/16” nutdriver and 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W2 and W3 to the middle terminal of the rectifier bridge. See Wiring Diagram.
20. Using a 7/16” nutdriver and 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W1 and W6 to the top terminal of the rectifier bridge. See Wiring Diagram.
21. Perform the ***Case Cover Replacement Procedure***.

Table F. 9 – Rectifier bridge diode tests

OHMMETER (+) PROBE	OHMMETER (–) PROBE	OHMMETER READING EXPECTED READING
W1	DC(+)	FORWARD BIAS (LOW RESISTANCE)
W2	DC(+)	FORWARD BIAS (LOW RESISTANCE)
W3	DC(+)	FORWARD BIAS (LOW RESISTANCE)
DC(–)	W1	FORWARD BIAS (LOW RESISTANCE)
DC(–)	W2	FORWARD BIAS (LOW RESISTANCE)
DC(–)	W3	FORWARD BIAS (LOW RESISTANCE)
W1	DC(–)	REVERSE BIAS (HIGH RESISTANCE)
W2	DC(–)	REVERSE BIAS (HIGH RESISTANCE)
W3	DC(–)	REVERSE BIAS (HIGH RESISTANCE)
DC(+)	W1	REVERSE BIAS (HIGH RESISTANCE)
DC(+)	W2	REVERSE BIAS (HIGH RESISTANCE)
DC(+)	W3	REVERSE BIAS (HIGH RESISTANCE)

Figure F.34 – Rectifier bridge location

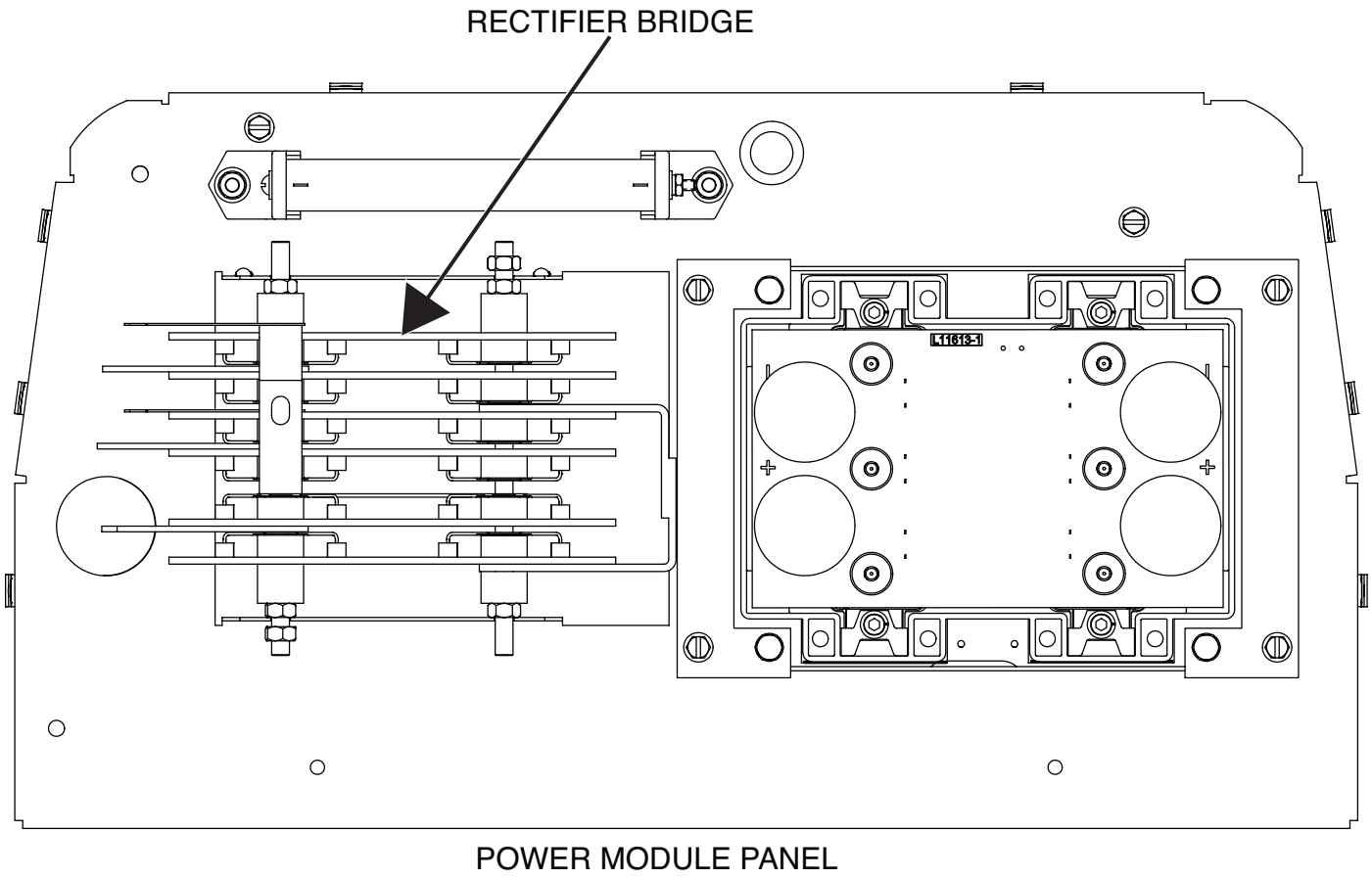
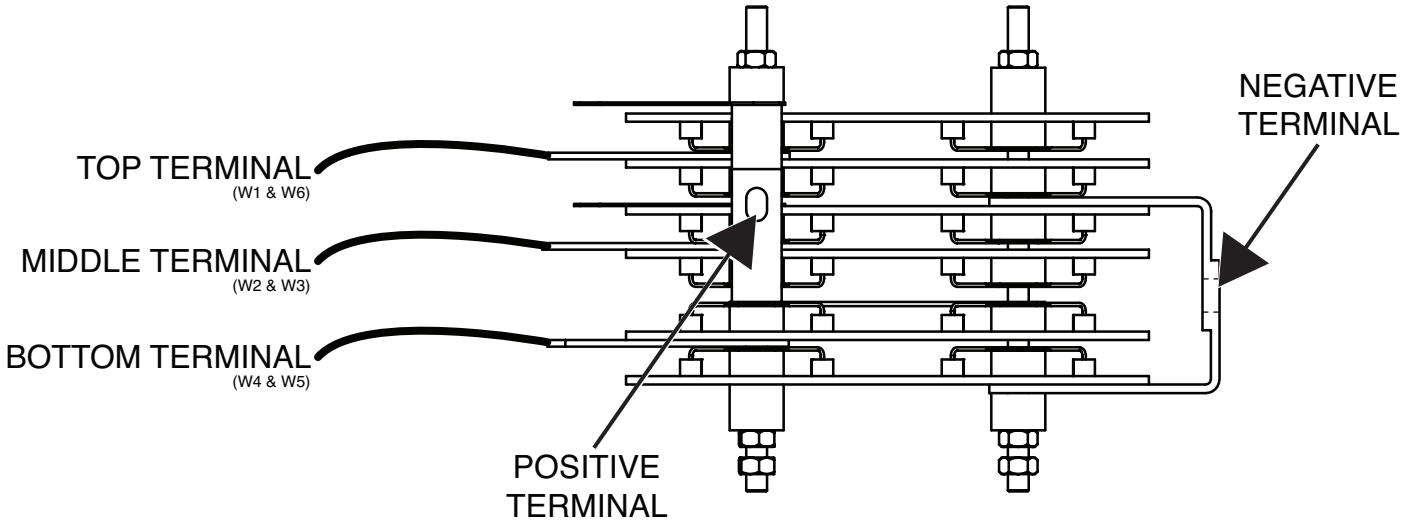


Figure F.35 – Rectifier bridge terminal locations



FLASHING VOLTAGE TEST PROCEDURE (ENGINE NOT RUNNING)

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 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 checks the Flashing Voltage with the engine stopped, by simulating a running condition.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Make sure the battery is fully charged and in good condition and the battery connections are clean and tight.
4. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in to the 'High Idle/Run' position. See ***Figure F.36***.
5. Using a volt/ohmmeter, measure the voltage across the terminals of the field capacitor. See ***Figure F.37***. See Wiring Diagram.
6. If the meter reads normal voltage of three to five volts, this test is complete.
7. Turn off the engine and perform the ***Case Cover Replacement Procedure***.
8. If the meter reading indicates battery voltage, about 12 to 14 VDC, the rotor may be open or the brushes may be faulty or not making proper contact with the slip rings.
9. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***, the ***Rotor Resistance And Ground Test Procedure (Dynamic)***. Perform the ***Brush and Slip Ring Service Procedure***.
10. If the voltage measures zero or very near zero; this condition could be caused by a poor connection or a defective component in the flashing circuit or a shorted or grounded rotor winding.
11. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***, the ***Rotor Resistance And Ground Test Procedure (Dynamic)***.
12. Locate the engine protection/idle control PC board and inspect each terminal. See Wiring Diagram. Make sure that all terminals both on the board and in the plug are clean and in good condition and that the pins are securely crimped to the flex leads. Perform the following additional test.
13. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch in to the 'High Idle/Run' position. See ***Figure F.36***.

14. Using a volt/ohmmeter, perform the tests outlined in ***Table F.10***, at the following locations on the engine protection/idle control PC board. See ***Figures F.38*** and ***F.39***. See Wiring Diagram.
15. If battery voltage is present at leads 232, 232F but not present at lead 200, the PC board may be faulty.
16. If battery voltage is present at lead 232, but not at leads 232F or 200, check the engine protection wiring. See Wiring Diagram.
17. If battery voltage is not present at lead 232, check wiring per wiring diagram and check the Run/Stop switch. Also check the PC board chassis ground wire.
18. Turn off the engine and perform the ***Case Cover Replacement Procedure***.

Table F. 10 – Engine protection/idle pc board voltage tests

TEST POINT POSITIVE METER PROBE	TEST POINT NEGATIVE METER PROBE	EXPECTED READING
LEAD 232 (J31-1)	LEAD 5 (B1)	12 VDC
LEAD 232F (J31-2)	LEAD 5 (B1)	12 VDC
LEAD 200 (J33-5)	LEAD 5 (B1)	5 VDC

Figure F.36 – Stop / (auto idle/run) / (high idle/run) switch location

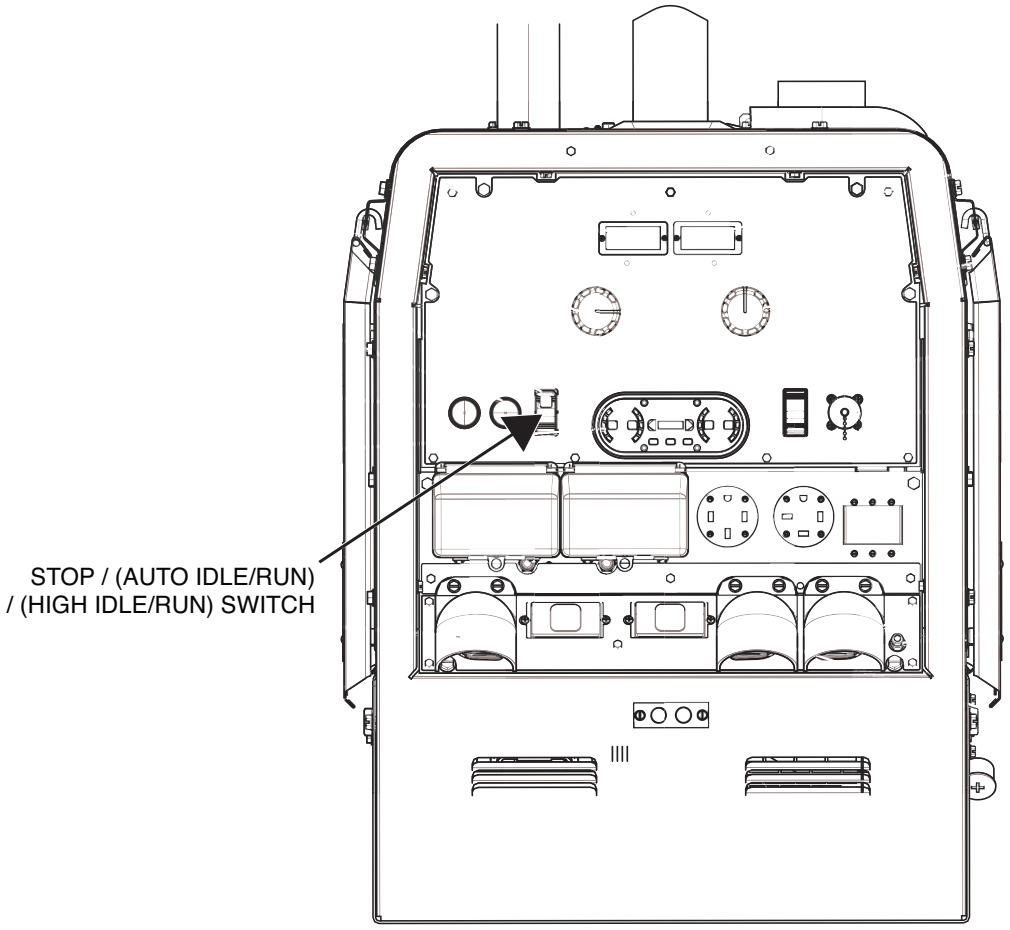


Figure F.37 – Field capacitor terminal locations

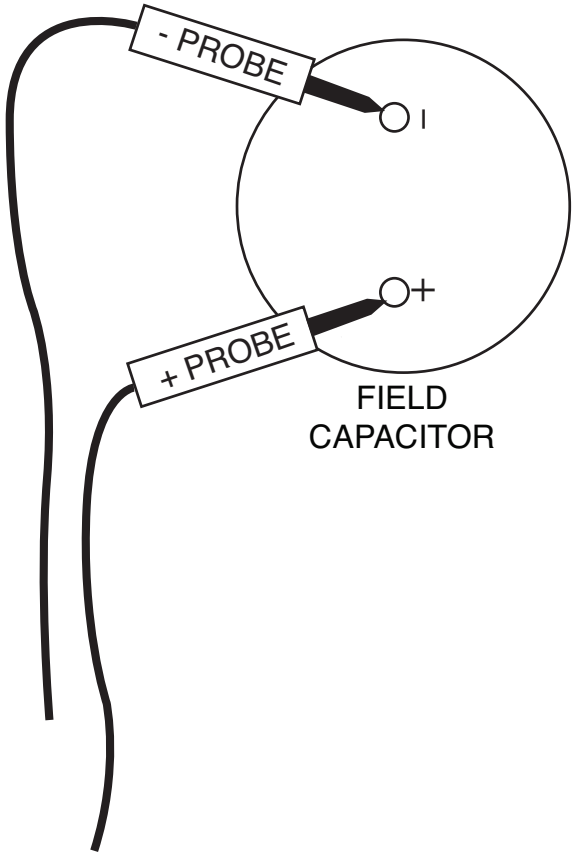


Figure F.38 – Engine protection/idle PC board terminal locations

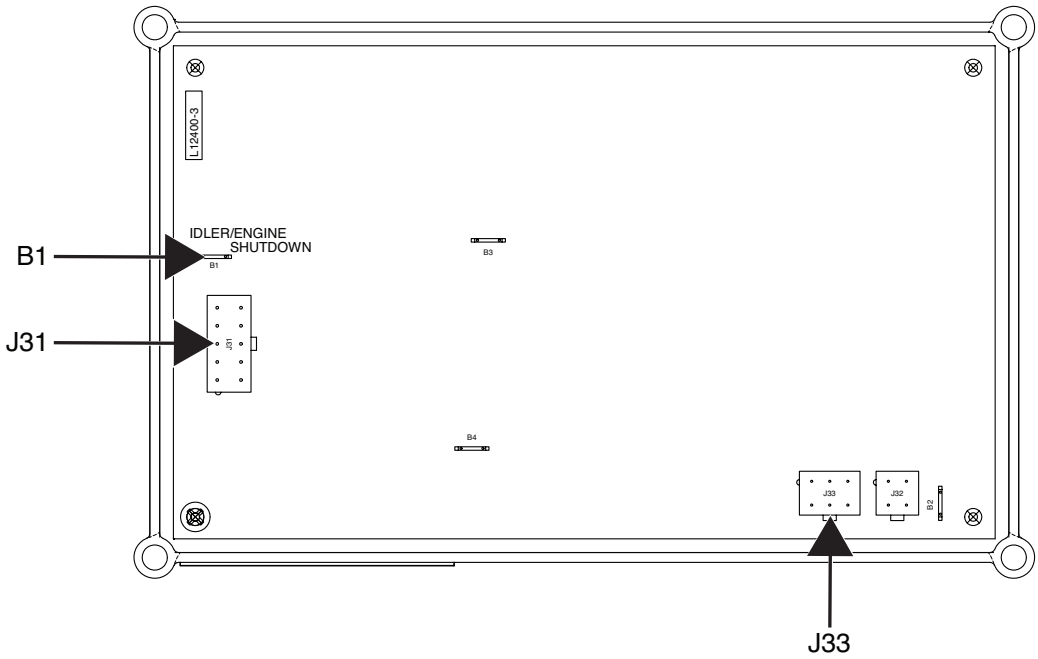
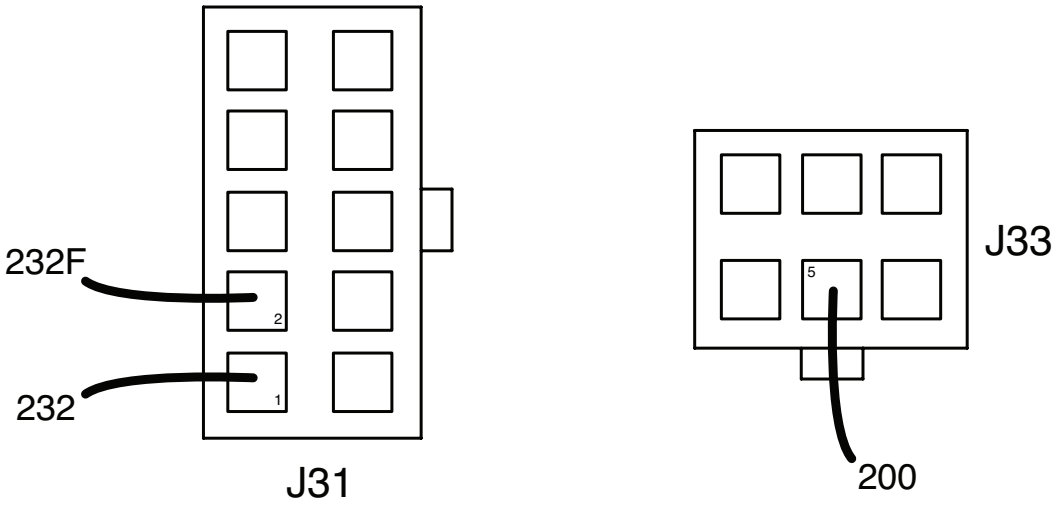


Figure F.39 – Engine protection/idle PC board lead locations



ROTOR RESISTANCE AND GROUND TEST PROCEDURE (STATIC)

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Rotor Winding is open, shorted or grounded.

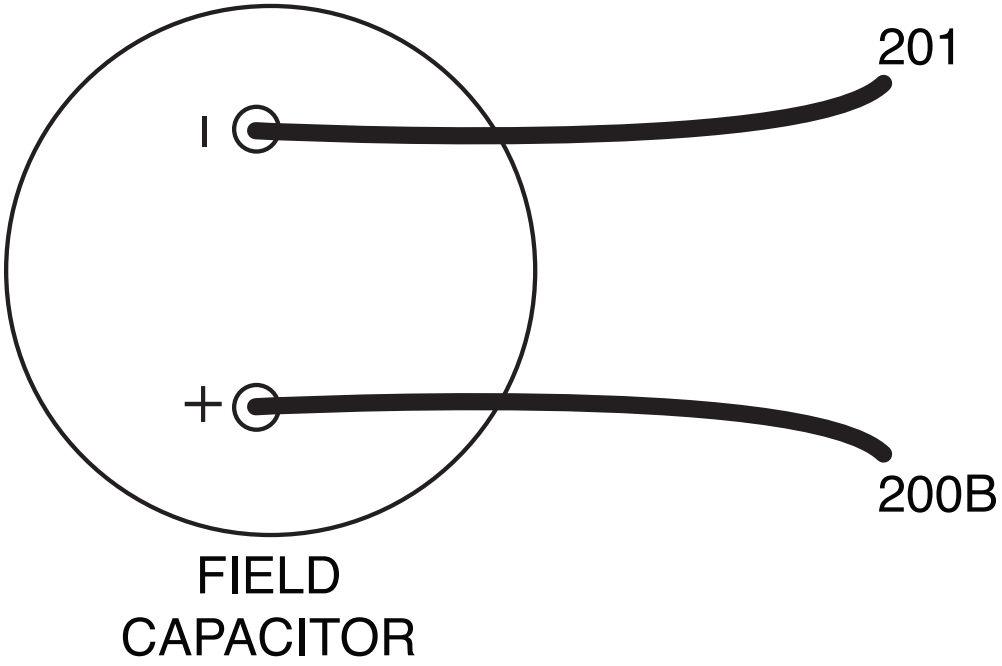
MATERIALS NEEDED

7/16” Nutdriver
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Using a 7/16” nutdriver, label and disconnect leads 201 and 200B from the field capacitor. See ***Figure F.40***. See Wiring Diagram. This will electrically isolate the rotor windings.
5. Using a volt/ohmmeter, measure the resistance from lead 201 to 200B. It should read approximately 25 ohms. See ***Figure F.40***. See Wiring Diagram.
6. If the reading is incorrect, remove the brush holder bracket and measure directly across the slip rings. If reading is correct, check the brushes and the leads. If reading is still incorrect, the rotor may be faulty.
7. Using a volt/ohmmeter, measure the resistance to ground from either of the slip rings to any good unpainted chassis ground. The resistance should be very high, at least 500,000 ohms (500K).
8. If the test does not meet the resistance specifications, then the rotor is grounded and should be cleaned and replaced.
9. If this test meets the resistance specifications, continue testing using the ***Rotor Resistance And Ground Test Procedure (Dynamic)***.
10. Using a 7/16” nutdriver, connect leads 201 and 200B from the field capacitor. See Wiring Diagram. Be sure to connect the leads to the same terminals they were removed from.
11. When testing is complete, reconnect all leads and perform the ***Case Cover Replacement Procedure***.

Figure F.40 – Field capacitor lead locations



ROTOR RESISTANCE AND GROUND TEST PROCEDURE (DYNAMIC)

(Also referred to as flying resistance test)

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 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 checks for faults in the Rotor Winding, while these windings are being stressed by the mechanical forces encountered during normal operation.

MATERIALS NEEDED

7/16” Nutdriver
Volt/Ohmmeter
Wiring Diagram

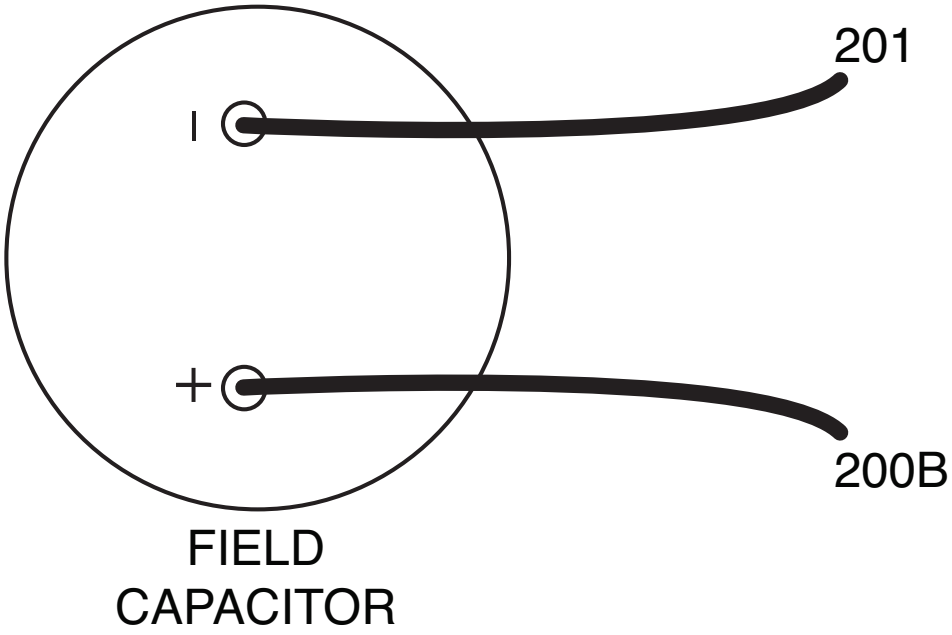
TEST PROCEDURE

NOTE: This test requires that the brushes and slip rings are clean, in good condition and are properly seated.

1. Perform the ***Brush And Slip Ring Service Procedure***.
2. Turn off the engine on the Cross Country 300 machine.
3. Perform the ***Case Cover Removal Procedure***.
4. Using a 7/16” nutdriver, label and disconnect leads 201 and 200B from the field capacitor. See ***Figure F.41***. See Wiring Diagram.
5. Using an ohmmeter, connect the ohmmeter to leads 201 and 200B and insulate the connections. See Wiring Diagram.
6. Start the engine and run at high idle speed (1860-1890 RPM). The resistance should read approximately 25 ohms.
7. Shut off engine and move one of the ohmmeter leads to a good clean chassis ground.
8. Start the engine and run at high idle speed (1860-1890 RPM). The resistance should read very high, at least 500,000 (550k) ohms.
9. If the resistance readings differ significantly from the values indicated, re-check the brushes and the brush spring tension. If the brushes and slip rings are good, the rotor may be faulty.
10. If faulty, perform the ***Stator, Rotor And Shaft Assembly Removal And Replacement Procedure***.
11. Using a 7/16” nutdriver, connect leads 201 and 200B to the field capacitor. See Wiring Diagram
12. Perform the ***Case Cover Replacement Procedure***.

***NOTE:** The resistance of the windings will change with temperature. Higher temperatures will produce higher resistances and lower temperatures will produce lower resistance.

Figure F.41 – Field capacitor lead locations



ROTOR VOLTAGE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Rotor Winding is operating at normal voltage.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Connect the voltmeter probes to the field capacitor terminals (201 & 200B). See ***Figure F.42***. See Wiring Diagram.
4. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch into the 'High Idle/Run' position. See ***Figure F.43***. Start the engine and allow the RPM to stabilize for about 15 to 30 seconds.
5. The meter should read 145-175 VDC.
6. Set the 'Stop / (Auto Idle/Run) / (High Idle/Run)' switch to the 'Stop' position. See ***Figure F.43***.
7. If the meter reading is normal, this test is complete.
8. If the voltage measures zero or very near zero, the rotor flashing circuit may be faulty, the leads may be open or the rotor may be shorted.
9. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***, the ***Rotor Resistance And Ground Test Procedure (Dynamic)*** and the ***Flashing Voltage Test Procedure***.
10. **If the voltage is lower than 145**, the engine RPM may be too low or there may be problems in the windings or other exciter circuit components or connections. Perform the testing described in step 12.
11. **If the meter reading indicates battery voltage, about 12 to 14 VDC**, the rotor may be open or the brushes may be faulty or not making proper contact with the slip rings. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***, the ***Rotor Resistance And Ground Test Procedure (Dynamic)*** and the ***Brush And Slip Ring Service Procedure***.
12. If the voltage measures about 3 to 5 VDC, the generator is not building-up to normal output even though the flashing circuit appears to be functioning normally. This condition could be caused by one of several failed components or connections. Continue with the following test.

13. Check the field bridge rectifier and capacitor, also check the wiring and terminals connecting them. See Wiring Diagram.
14. Perform the ***Rotor Resistance And Ground Test Procedure (Static)***, the ***Rotor Resistance And Ground Test Procedure (Dynamic)***.
15. Perform the ***Stator Short Circuit And Ground Test Procedure***.
16. When the stator short circuit and ground test has been completed, reconnect leads to the field bridge rectifier. All other stator leads should remain disconnected and isolated at this time.
17. Examine stator wiring for damage, pinched leads, chafed insulation, etc. If necessary, disconnect and isolate the stator output leads as close to the stator as possible. See Wiring Diagram.
18. All of these disconnected leads should be insulated and/or positioned so they cannot come in contact with any other wiring or chassis ground and cannot be damaged by moving parts when the engine is running.
19. Restart the machine and measure the rotor voltage.
20. If rotor voltage continues to read significantly lower than 160 VDC, the stator is probably defective and should be replaced.
    NOTE: The field bridge rectifier and field capacitor may appear to function normally when tested independently, but may malfunction when placed under the stress of normal operation. For this reason, it is recommended that the bridge rectifier and the capacitor be replaced with known good components before replacing the stator.
21. Perform the ***Case Cover Replacement Procedure***.

Figure F.42 – Field capacitor terminal locations

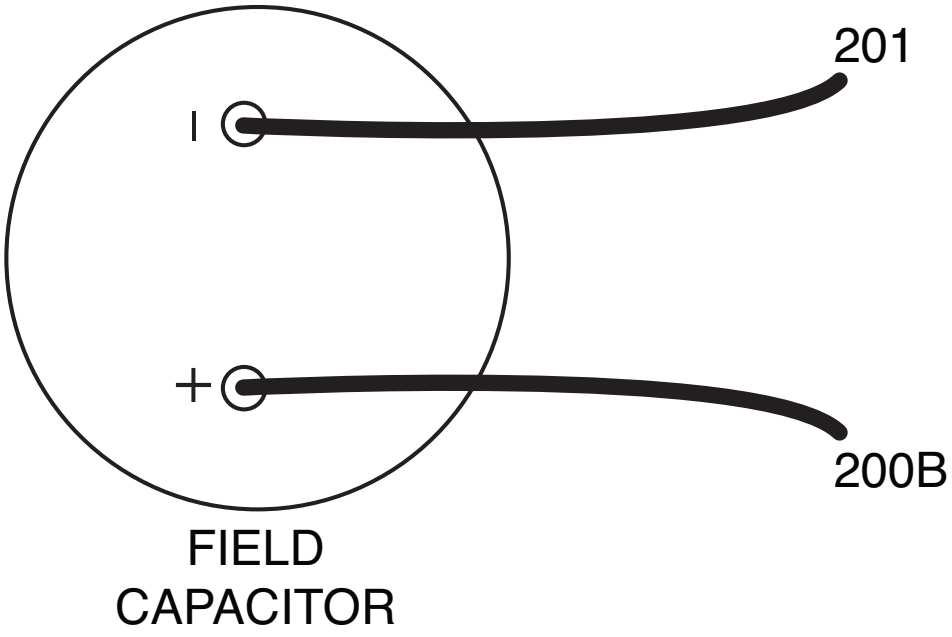
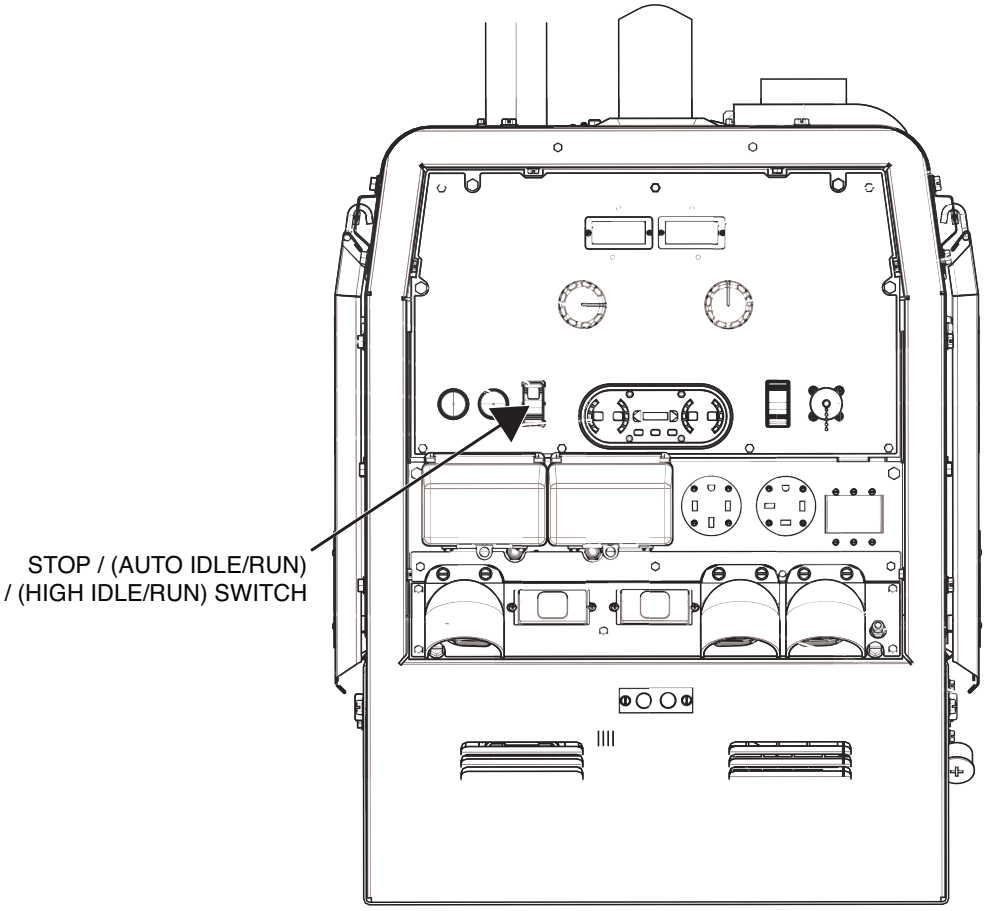


Figure F.43 – Stop / (auto idle/run) / (high idle/run) switch locations



STATOR SHORT CIRCUIT & GROUND TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if there are poor electrical connections, defective or grounded windings within the Stator. This test should be performed if flashing voltage is present at the Rotor Slip Rings, Rotor resistance, Field Bridge Rectifier, Field Capacitor and all associated wiring are proven to be good, but the Stator output voltage fails to build-up to normal levels or is too high in one or more (but not all) of the Windings.

MATERIALS NEEDED

Offset Phillips Screwdriver
7/16” Nutdriver
7/16” Open-End Wrench
Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Capacitor Discharge Procedure***.
3. Unplug anything that may be connected to auxiliary receptacles.
4. Label, disconnect and isolate the GND (lead 5A) from the neutral stud on the auxiliary receptacle panel. See ***Figure F.44***. See Wiring Diagram.
5. Label and disconnect leads 5H and 6A from the field bridge rectifier. See ***Figure F.45***. See Wiring Diagram.
6. Using an offset Phillips screwdriver, label and disconnect leads 3, 4 and 6 from circuit breaker (CB1). See ***Figure F.44***. See Wiring Diagram.
7. Using a 7/16” nutdriver and a 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing lead W1 to the output rectifier. See ***Figure F.46***. See Wiring Diagram. Repeat this step for leads W2, W3, W4, W5 and W6.
8. Using a volt/ohmmeter, measure the resistance between chassis ground and each of the following: Lead W1, W2, W3, W4, W5, W6, 3, 4 and 6. See Wiring Diagram. Resistance should be very high 500,000 (550k) ohms minimum.
9. Using a volt/ohmmeter, measure the resistance from lead 5 to leads W1, W2 or W3. See Wiring Diagram. This checks for a connection between the auxiliary winding and the weld winding. Resistance should be very high 500,000 (550k) ohms minimum.

10. If any of the readings are less than 500,000 (500k) ohms, check for damaged, contaminated or shorted wiring or components between the test points and the stator winding. If necessary, disconnect and isolate the stator leads as close to the stator winding as possible. See Wiring Diagram. If the low resistance is determined to be between the windings within the stator, the stator is defective and should be replaced*.
    NOTE: *The field bridge rectifier and field capacitor may appear to function normally when tested independently, but may malfunction when placed under the stress of normal operation. For this reason, it is recommended that the bridge rectifier and capacitor be replaced with known good components before replacing the stator.
11. When testing is complete, attach all previously disconnected leads.
12. Perform the ***Case Cover Replacement Procedure***.

Figure F.44 – Neutral stud and circuit breaker (CB1) locations

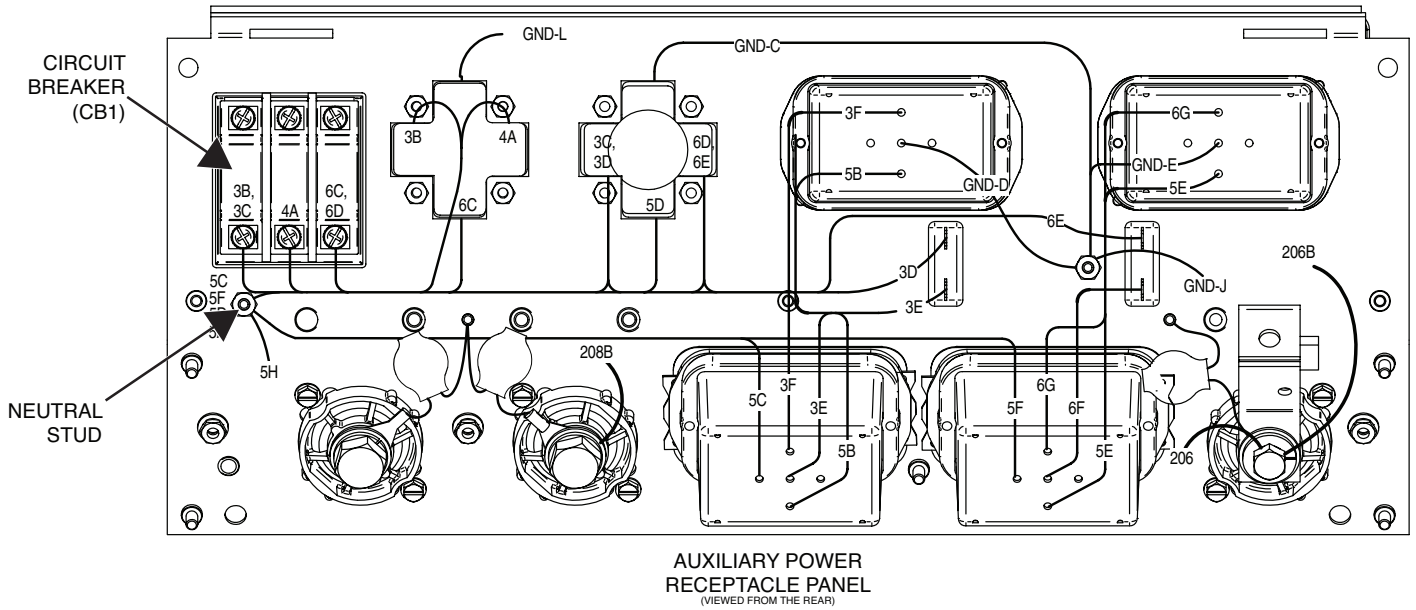


Figure F.45 – Field bridge rectifier location

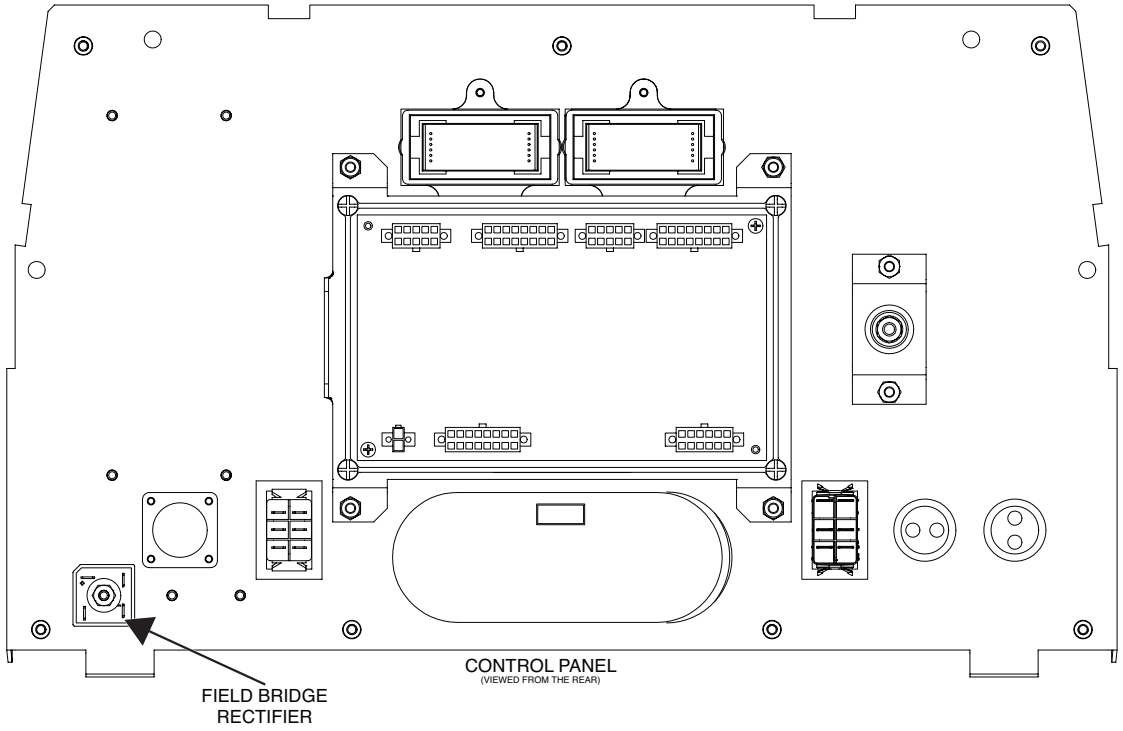
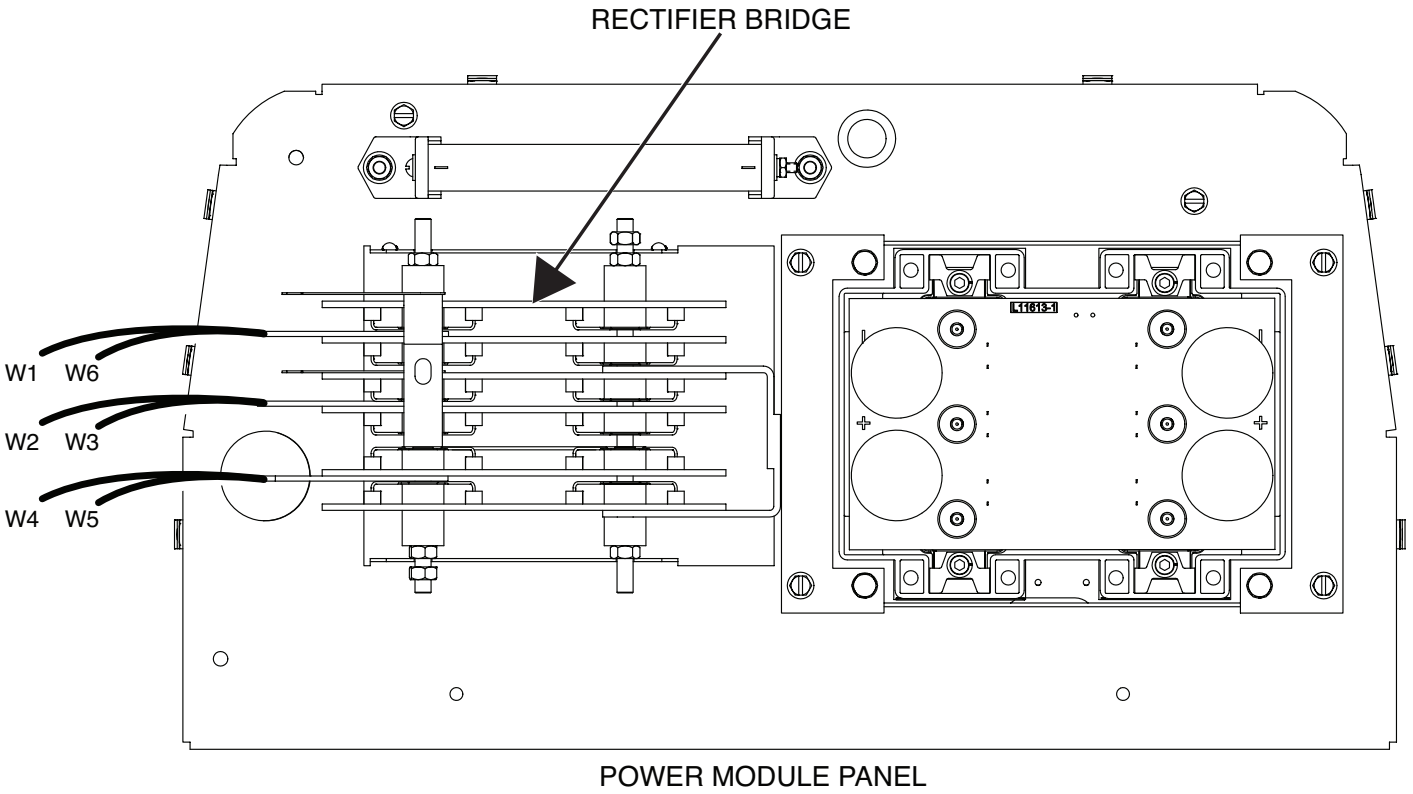


Figure F.46 – Rectifier bridge lead locations



STATOR VOLTAGE TEST PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the Stator is able to produce correct voltage from its winding. It will only yield meaningful data if the Engine high idle speed is correct (1860 to 1890 RPM), and approximately 160 VDC is present across the Rotor Slip Rings.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram

TEST PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
   NOTE: Voltage tests of the 120 and 120/240 VAC receptacles can be performed by placing the meter probes directly into the appropriate connection slots in the front of the receptacles rather than testing at the lead connections. If the meter probes are not long enough to make contact with the conductors inside the receptacles, test pins may be used.
   To test the 120 VAC auxiliary winding:
3. Connect the volt/ohmmeter probes to either of the 120 VAC receptacles. See ***Figure F.47***. See Wiring Diagram.
4. Start the engine and run at high idle (1860 – 1890 RPM).
5. Check the AC voltage reading. It should read between 115 and 132 VAC.
   To test 240 VAC auxiliary winding:
6. Connect the volt/ohmmeter probes to either of the 240 VAC receptacles. See ***Figure F.47***. See Wiring Diagram.
7. Start the engine and run at high idle (1860 – 1890 RPM).
8. Check the AC voltage reading. It should read between 230 and 264 VAC.
9. If these voltage readings are not within the specified limits, check for tripped or defective circuit breakers, loose connections or broken wires between the test points and the stator windings. If there are no wiring problems and the circuit breakers are not tripped or defective, the stator is defective and should be replaced.

To test the three-phase weld winding:

10. Locate weld winding leads W1, W2 and W3 where they connect to the three-phase rectifier bridge. See ***Figure F.48***. See Wiring Diagram.
11. Start the engine and run at high idle (1860 – 1890 RPM).
12. Using a volt/ohmmeter, measure the voltage from leads W1 to W2, W2 to W3 and W1 to W3. See ***Figure F.48***. See Wiring Diagram. Normal reading is about 60 to 65 VAC.
13. If these voltage readings are not within the specified limits, check for loose connections or broken wires between the test points and the stator windings. If there are no wiring problems, the stator may be faulty.
14. If faulty, perform the ***Stator, Rotor And Shaft Assembly Removal And Replacement Procedure***.
15. Perform the ***Case Cover Replacement Procedure***.

Figure F.47 – 120 / 240 VAC receptacle locations

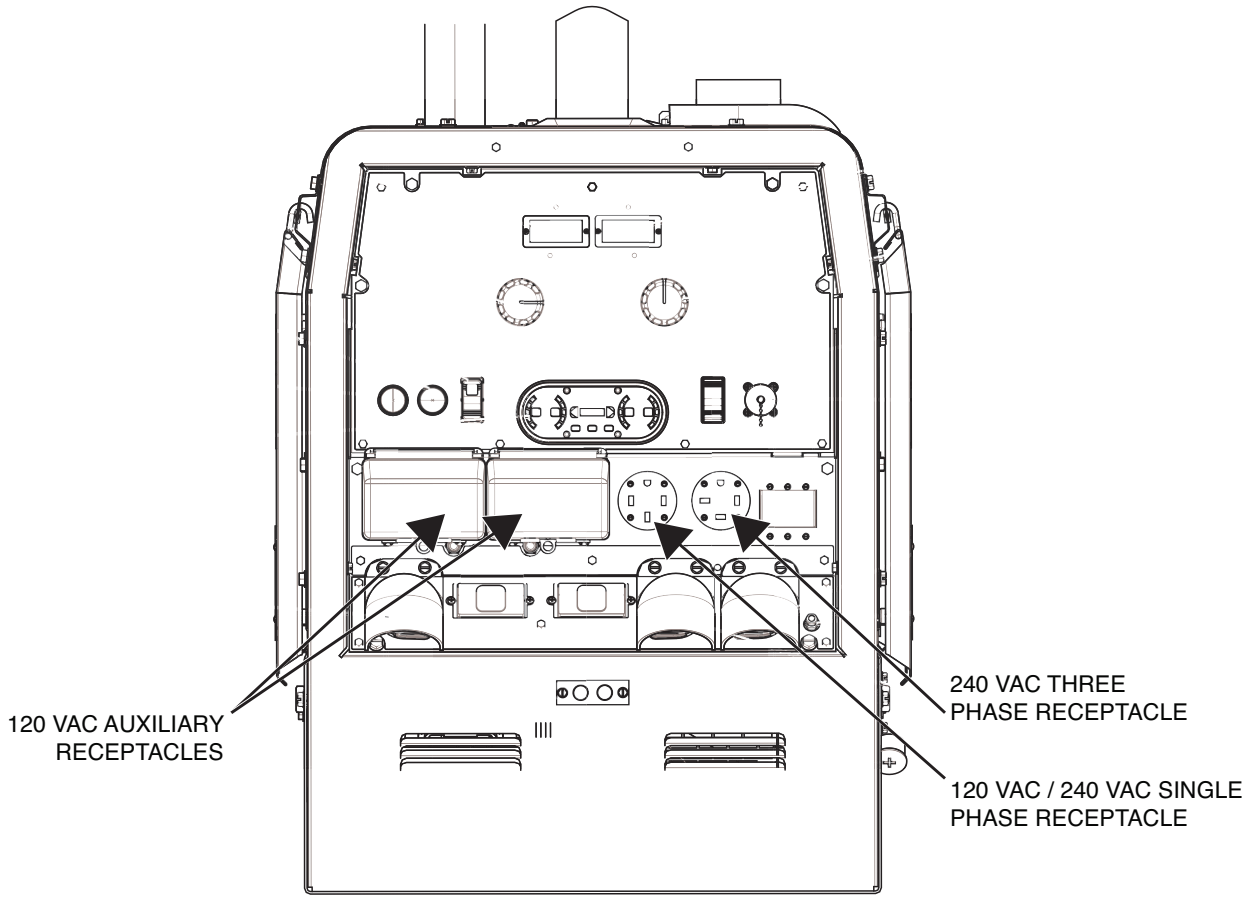
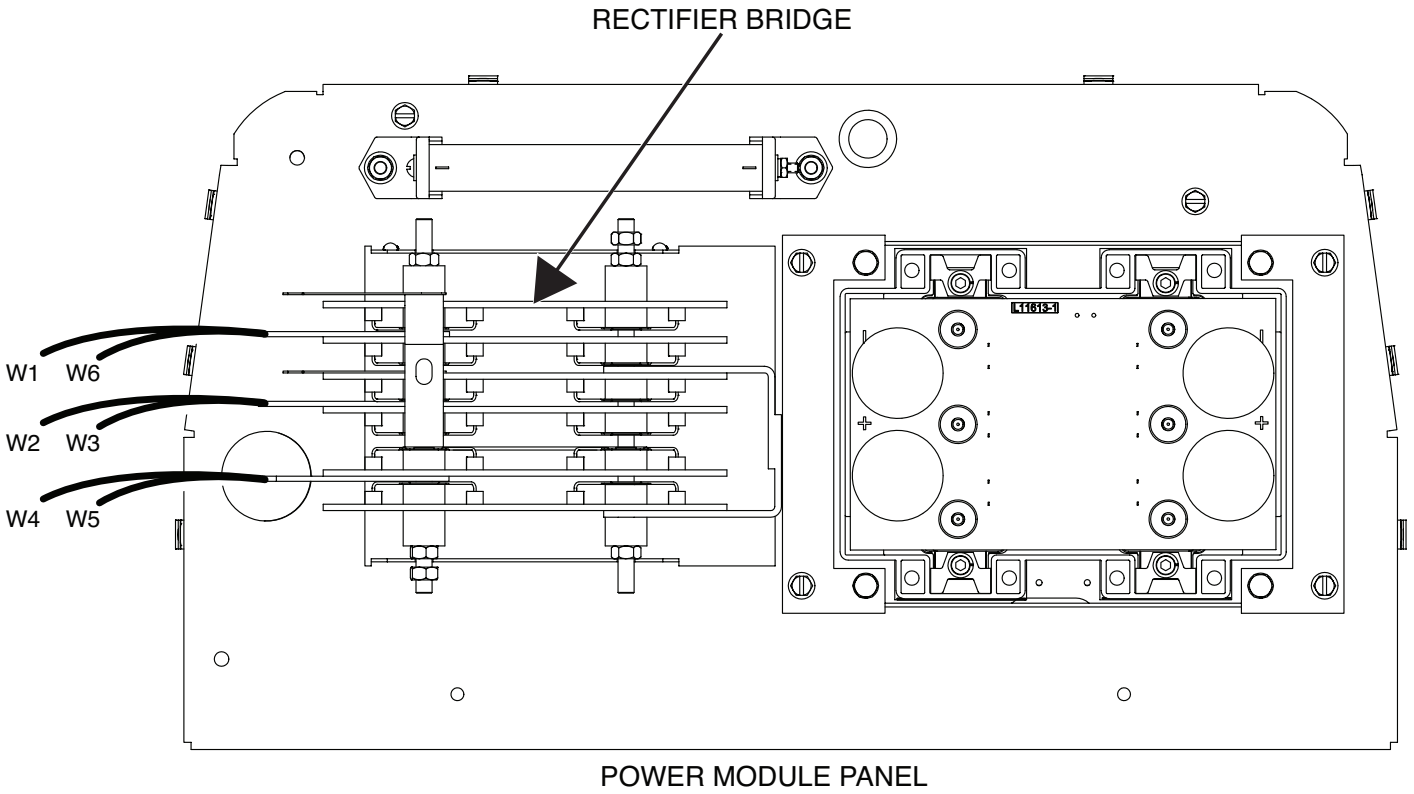


Figure F.48 – Rectifier bridge lead locations



Removal And Replacement Procedures

STOP / (AUTO IDLE/RUN) / (HIGH IDLE/RUN) SWITCH REMOVAL AND REPLACEMENT PROCEDURE

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TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Stop / (Auto Idle/Run) / (High Idle/Run) Switch.

MATERIALS NEEDED

Wiring Diagram

REMOVAL PROCEDURE

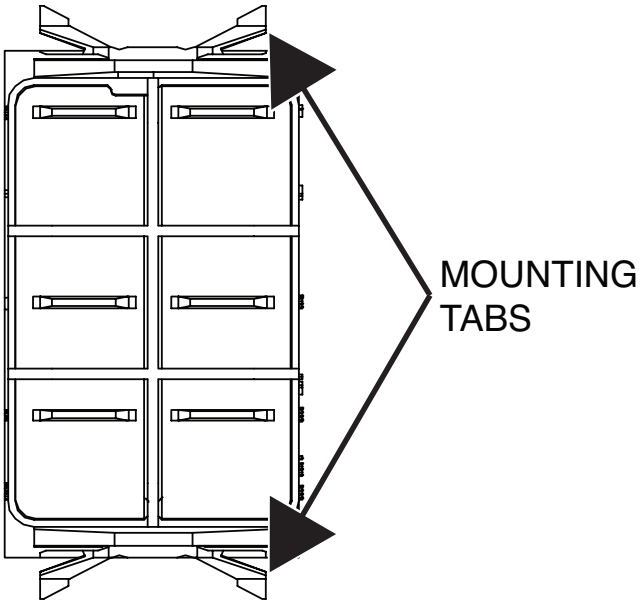
1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Disconnect the lead from the negative battery terminal. See Wiring Diagram.
5. Carefully depress the tabs at the top and bottom of the of the rear side of the switch. See ***Figure F.49***.
6. Carefully maneuver the switch thru the front of the control panel.
7. Label and disconnect leads 232A, 5R, 236A, 256 and 257 from terminals 8, 7, 2, 5, 3 and 6 of the switch. See ***Figure F.50***. See Wiring Diagram.
8. Route wires back thru the control panel and remove the switch backing plate.
9. The switch can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position switch backing plate over the wiring for the switch and route the leads thru the front panel of the machine.
2. Connect leads 232A, 5R, 236A, 256 and 257 to terminals 8, 7, 2, 5, 3 and 6 of the switch. See Wiring Diagram.
3. Carefully press the switch into position on the control panel. The tabs on the switch should lock the switch in place on the switch backing plate.

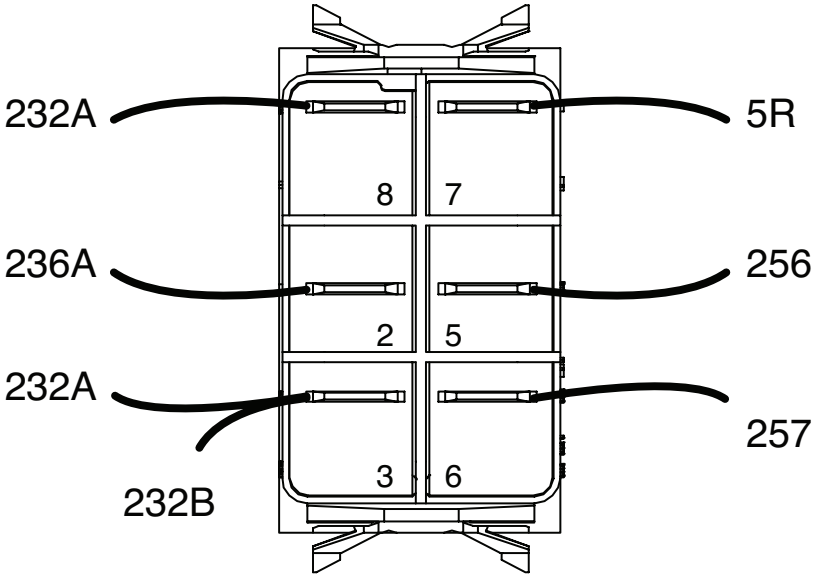
4. Connect the lead to the negative battery terminal.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform the ***Retest After Repair Procedure***.

Figure F.49 – Start / (auto idle/run) / (high idle/run) switch tab locations



START / (AUTO IDLE/RUN)
/ (HIGH IDLE/RUN) SWITCH
(VIEWED FROM THE REAR)

Figure F.50 – Start / (auto idle/run) / (high idle/run) switch lead and terminal locations



START / (AUTO IDLE/RUN)
/ (HIGH IDLE/RUN) SWITCH
(VIEWED FROM THE REAR)

WELD MODE SELECTOR SWITCH REMOVAL AND REPLACEMENT PROCEDURE

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 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 Weld Mode Selector Switch.

MATERIALS NEEDED

Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Disconnect the lead from the negative battery terminal. See Wiring Diagram.
5. Carefully depress the tabs at the top and bottom of the of the rear side of the switch. See ***Figure F.51***.
6. Carefully maneuver the switch thru the front of the control panel.
7. Label and disconnect leads 214, 217, 222A, 220 and 218 from terminals 1, 4, 2, 3, 6 and 5 of the switch. See ***Figure F.52***. See Wiring Diagram.
8. Route wires back thru the control panel and remove the switch backing plate.
9. The switch can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position new engine control unit into the machine.
2. Carefully position switch backing plate over the wiring for the switch and route the leads thru the front panel of the machine.
3. Connect leads 214, 217, 222A, 220 and 218 to terminals 1, 4, 2, 3, 6 and 5 of the switch. See Wiring Diagram.
4. Carefully press the switch into position on the control panel. The tabs on the switch should lock the switch in place on the switch backing plate.
5. Connect the lead to the negative battery terminal.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.

Figure F.51 – Weld mode selector switch tab locations

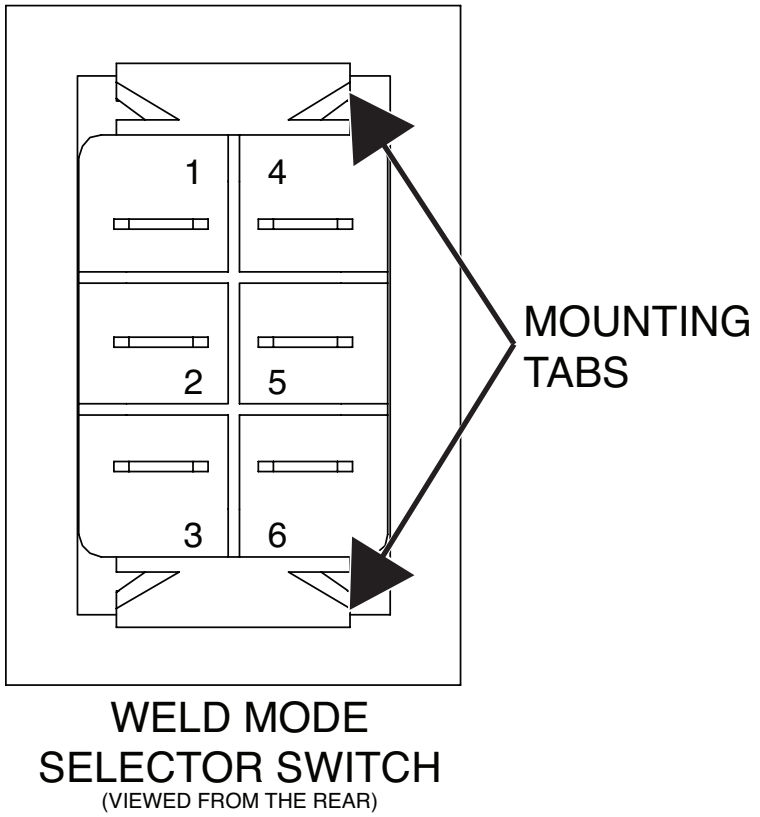
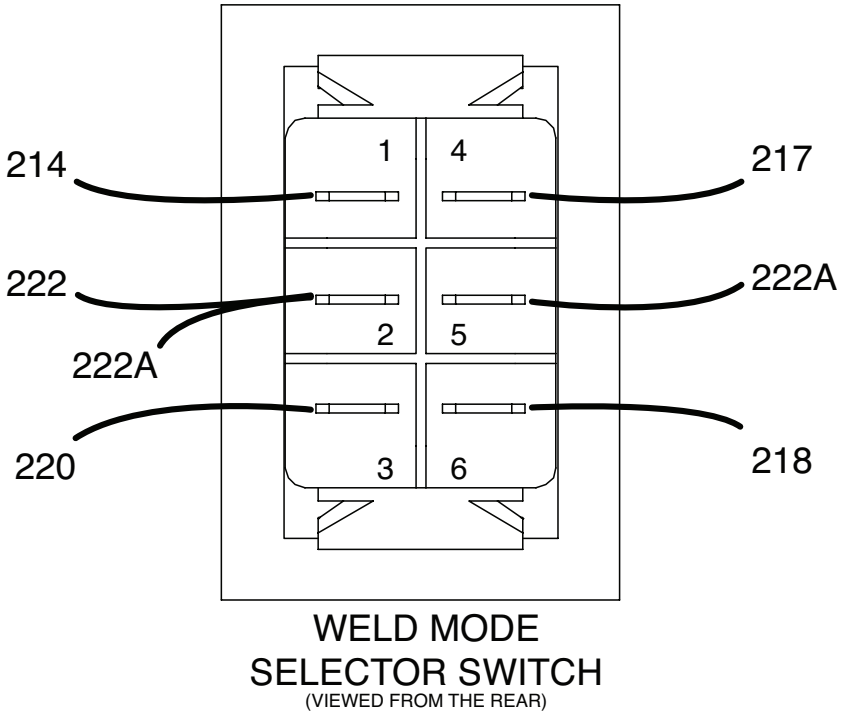


Figure F.52 – Weld mode selector switch lead and terminal locations



FIELD BRIDGE RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

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 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 Field Bridge Rectifier.

MATERIALS NEEDED

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

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Label and disconnect leads 200A, 200, 5H, 201A and 6A from the field bridge rectifier. See ***Figure F.53***. See Wiring Diagram.
5. Using a 3/8” nutdriver, remove the nut, lock washer, flat washer and insulating washer securing the field bridge rectifier to the mounting post. See ***Figure F.54***.
6. The field bridge rectifier can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Clean the mating surfaces of the control panel and the field bridge rectifier.
2. Apply a coating of Dow Corning 340 heat sink compound to the mating surface of the field bridge rectifier.
3. Carefully position the field bridge rectifier onto the mounting post.
4. Using a 3/8” nutdriver, attach the nut, lock washer, flat washer and insulating washer securing the field bridge rectifier to the mounting post.
5. Connect leads 200A, 200, 5H, 201A and 6A to the field bridge rectifier. See Wiring Diagram.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.

Figure F.53 – Field bridge rectifier lead locations

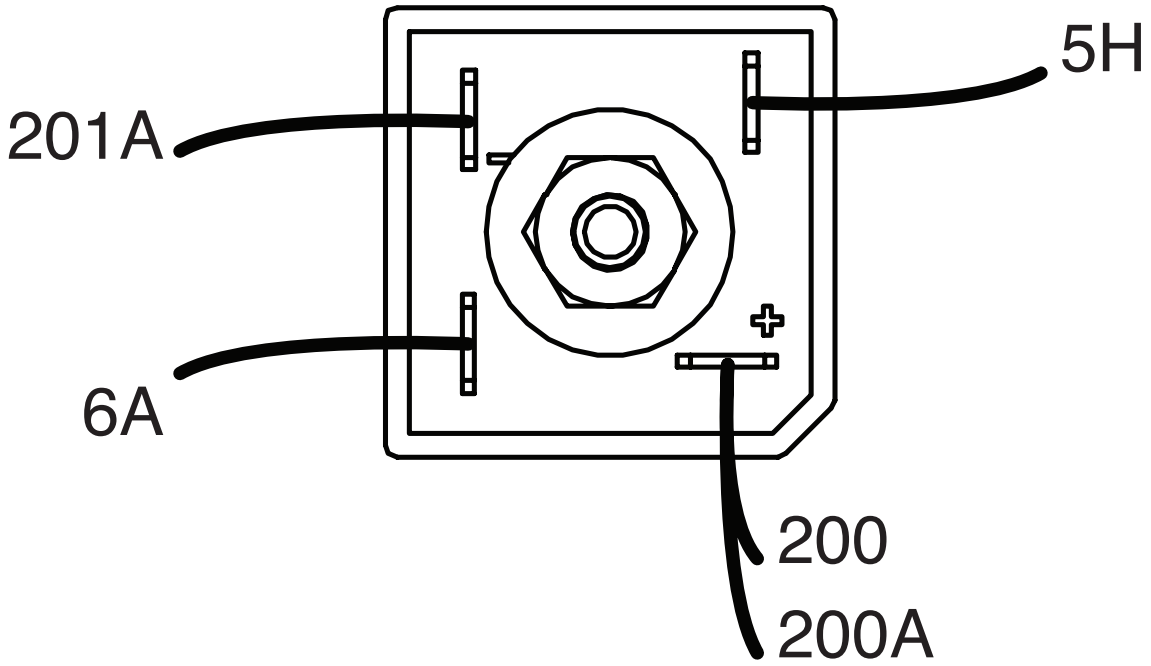
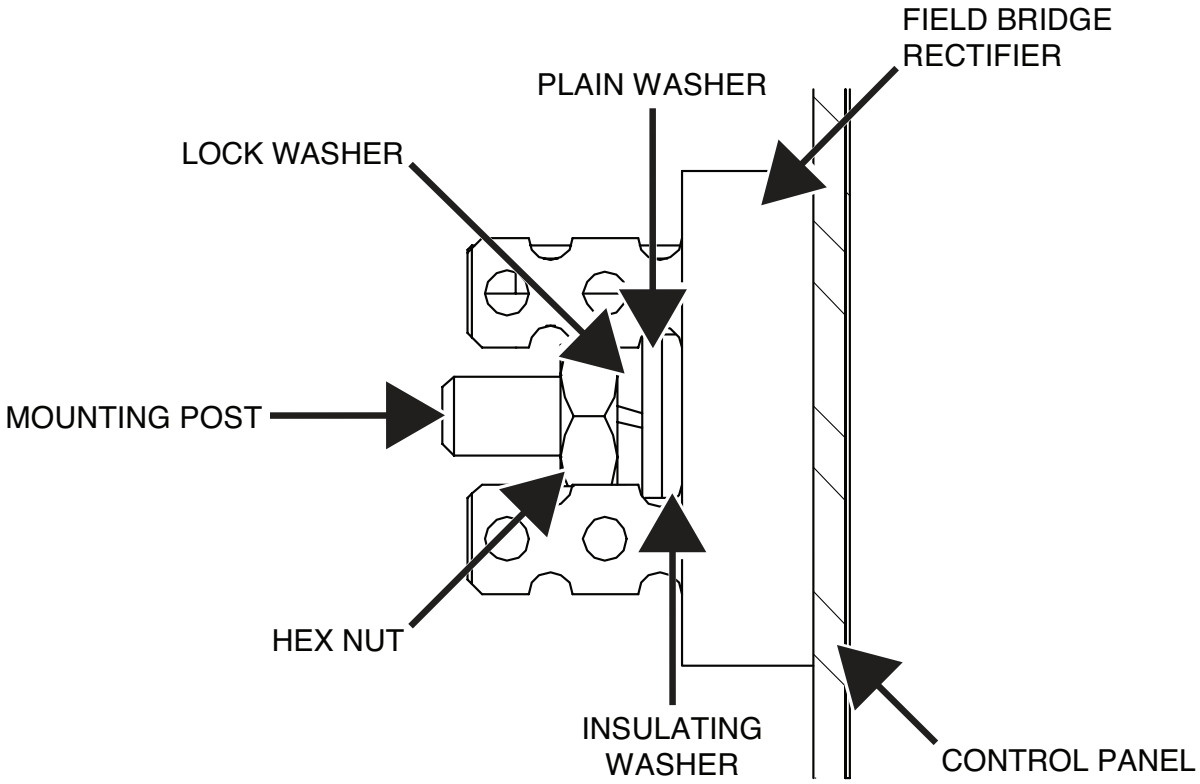


Figure F.54 – Field bridge rectifier mounting hardware locations



CHOPPER MODULE PC BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

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

MATERIALS NEEDED

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

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Label and disconnect the quick-connects attaching leads 23 and 25 to terminals B7 and B8 of the chopper module board. See ***Figure F.55***. See Wiring Diagram.
5. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing the NEG lead and lead 14 to terminal B1 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
6. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing the POS lead and leads 13 and 13A to terminal B2 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
7. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing leads W9 and 15 to terminal B3 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
8. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing the NEG lead to terminal B4 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
9. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing the POS lead to terminal B5 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
10. Using a 7/16” nutdriver, remove the bolt, lock washer and flat washer securing the W10 lead to terminal B6 of the chopper module PC board. See ***Figure F.55***. See Wiring Diagram.
11. Using a 3/8” nutdriver, remove the four screws securing the chopper module PC board to the power module panel. See ***Figure F.56***.
12. The chopper module PC board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position new chopper module PC board onto the power module panel.
2. Using a 3/8” Nutdriver, attach the four screws securing the chopper module PC board to the power module panel.
3. Apply a thin coating of Penetrox heat sink compound to terminals B1, B2, B3, B4, B5 and B6 of the chopper module PC board.
4. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing the W10 lead to terminal B6 of the chopper module PC board. See Wiring Diagram.
5. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing the POS lead to terminal B5 of the chopper module PC board. See Wiring Diagram.
6. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing the NEG lead to terminal B4 of the chopper module PC board. See Wiring Diagram.
7. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing leads W9 and 15 to terminal B3 of the chopper module PC board. See Wiring Diagram.
8. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing the POS lead and leads 13 and 13A to terminal B2 of the chopper module PC board. See Wiring Diagram.
9. Using a 7/16” nutdriver, attach the bolt, lock washer and flat washer securing the NEG lead and lead 14 to terminal B1 of the chopper module PC board. See Wiring Diagram.
10. Connect the quick-connects attaching leads 23 and 25 to terminals B7 and B8 of the chopper module board. See Wiring Diagram.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform the ***Retest After Repair Procedure***.

Figure F.55 – Chopper module board terminal locations

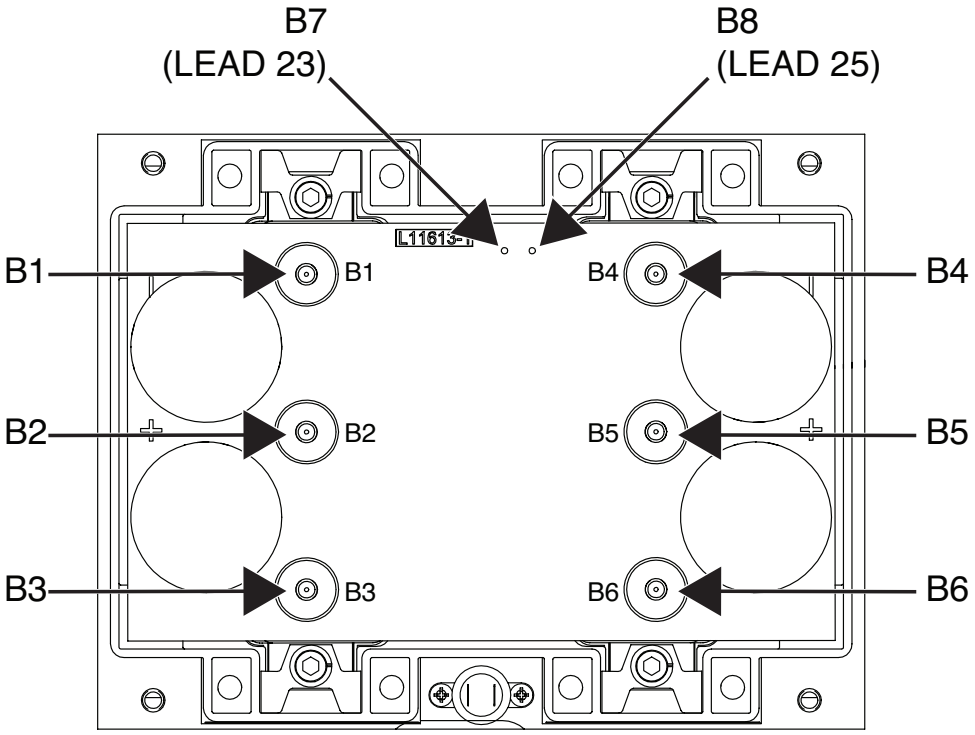
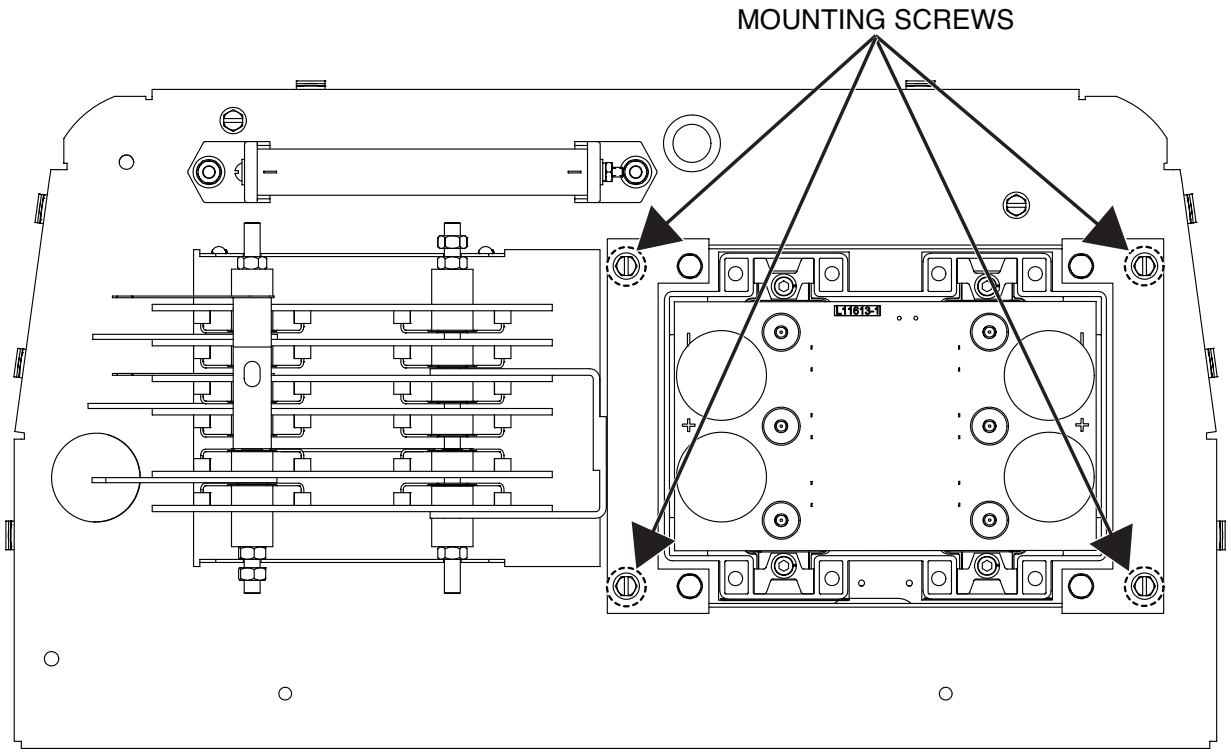


Figure F.56 – Chopper module board mounting screw locations



CHOKE REMOVAL AND REPLACEMENT PROCEDURE

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 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 Choke Assembly.

MATERIALS NEEDED

3/4” Nutdriver
1/2” Nutdriver
1/2” Open-End Wrench
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Perform the ***Field Capacitor Removal Procedure***.
5. Carefully slide the front panel away from the machine to gain access to the choke lead mounting screws.
   NOTE: To avoid damage to the wiring of the front panel, do not slide the front panel any more than necessary to gain access to the mounting screws.
6. Using a 3/4” nutdriver, remove the bolt, lock washer and flat washer securing the choke lead to the rear side of the negative CC output terminal. See ***Figure F.57***. See Wiring Diagram.
7. Using a 3/4” nutdriver, remove the bolt, lock washer and flat washer securing the choke lead to the rear side of the negative CV output terminal. See ***Figure F.57***. See Wiring Diagram.
8. Using a 1/2” nutdriver and a 1/2” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing the choke assembly to the choke bracket. See ***Figure F.58***.
9. Cut any cable ties securing the choke leads to the fan guard and route choke leads to allow for the removal of the choke assembly.
10. The choke assembly can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new choke assembly onto the choke bracket.
2. Replace any previously cut cable ties securing the choke leads to fan guard.

3. Using a 1/2” nutdriver and a 1/2” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing the choke assembly to the choke bracket.
4. Using a 3/4” nutdriver, attach the bolt, lock washer and flat washer securing the choke lead to the rear side of the negative CV output terminal. See Wiring Diagram.
5. Using a 3/4” nutdriver, attach the bolt, lock washer and flat washer securing the choke lead to the rear side of the negative CC output terminal. See Wiring Diagram.
6. Replace any previously removed cable ties.
7. Perform the ***Field Capacitor Replacement Procedure***.
8. Perform the ***Case Cover Replacement Procedure***.
9. Perform the ***Retest After Repair Procedure***.

Figure F.57 – Choke lead connection points

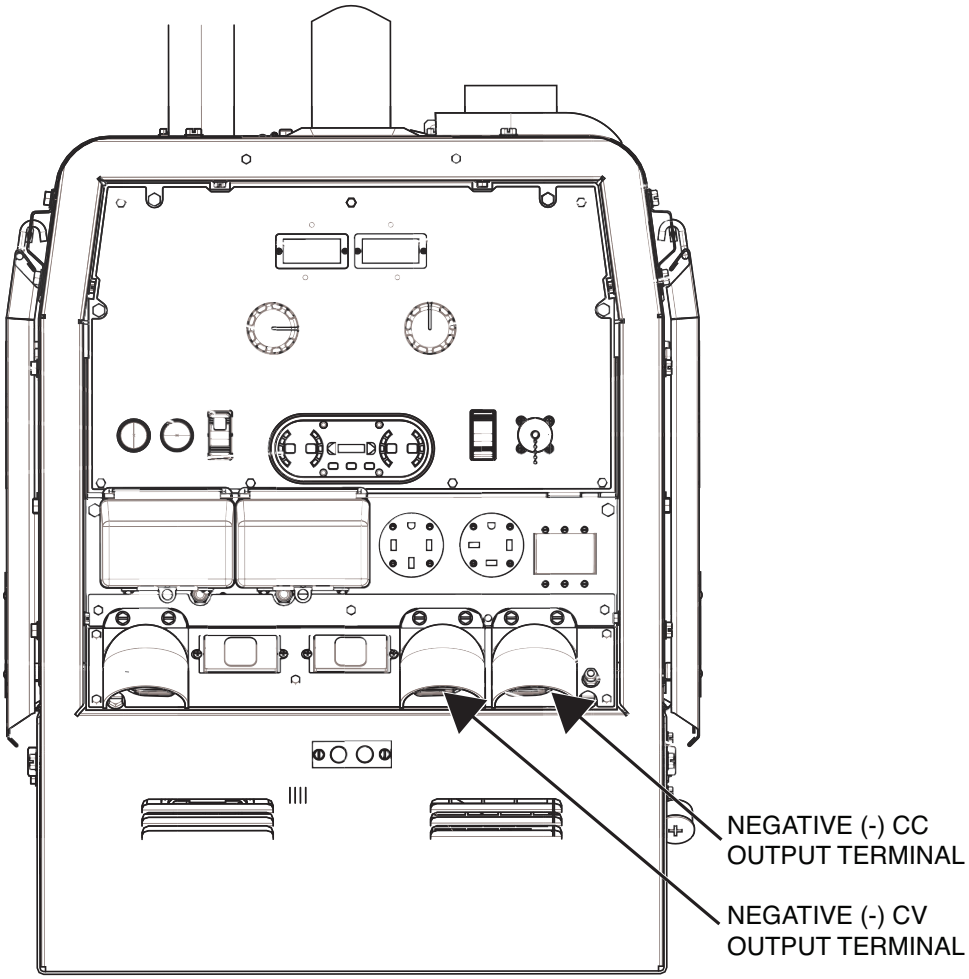
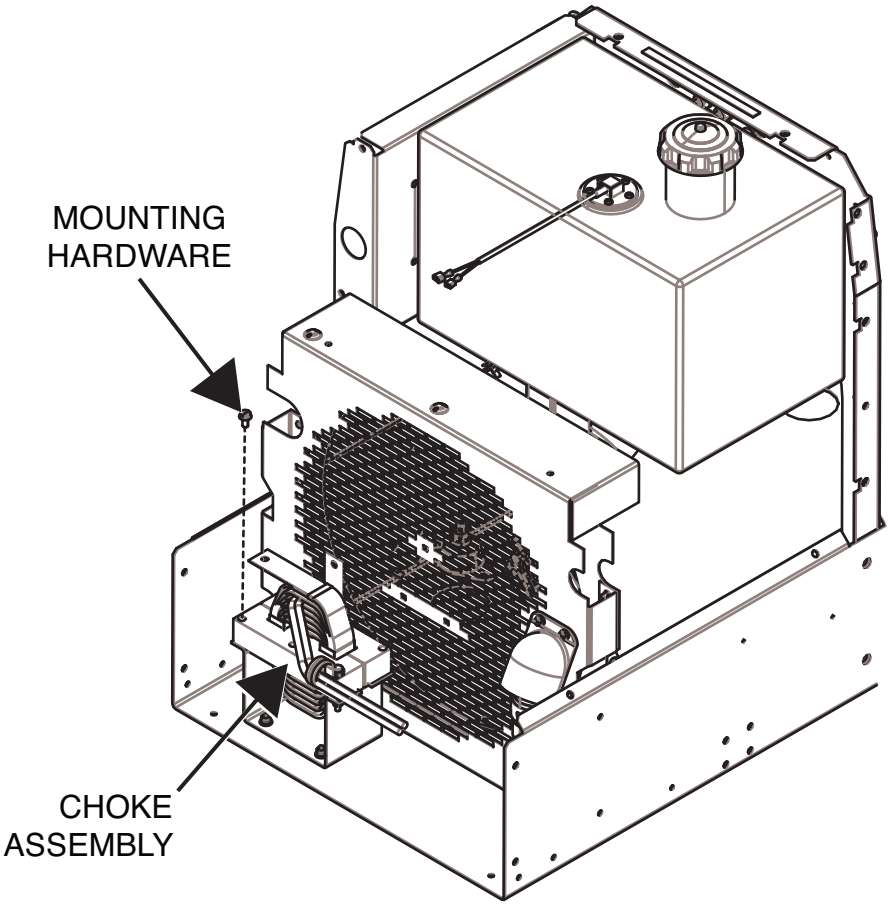


Figure F.58 – Choke assembly mounting hardware location



WELD CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 Weld Control Board.

MATERIALS NEEDED

3/8” Nutdriver
Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Label and disconnect plugs J1, J2, J3, J4, J5, J6 and J7 from the weld control board. See ***Figure F.59***. See Wiring Diagram.
5. Using a 3/8” nutdriver, remove the four nuts securing the PC board mounting bracket to the control panel. See ***Figure F.60***.
6. Carefully remove the weld control board and bracket assembly out of the machine.
7. Using a Phillips screwdriver, remove the four screws securing the weld control board to the PC board mounting bracket. See ***Figure F.61***.
8. The weld control board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new weld control board onto the PC board mounting bracket.
2. Using a Phillips screwdriver, attach the four screws securing the weld control board to the PC board mounting bracket.
3. Carefully position the weld control board and bracket assembly onto the rear of the control panel.
4. Using a 3/8” nutdriver, attach the four nuts securing the PC board mounting bracket to the control panel.
5. Connect plugs J1, J2, J3, J4, J5, J6 and J7 to the weld control board. See Wiring Diagram.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.

Figure F.59 – Weld control board plug locations

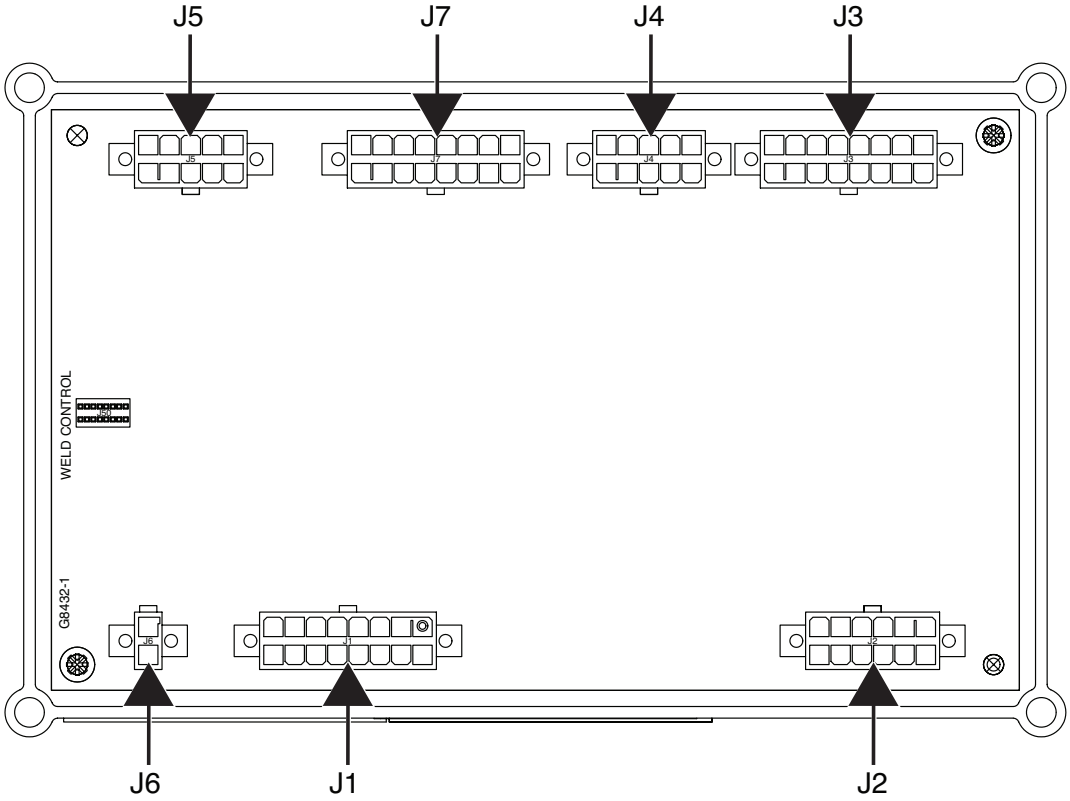


Figure F.60 – PC board bracket mounting screw location

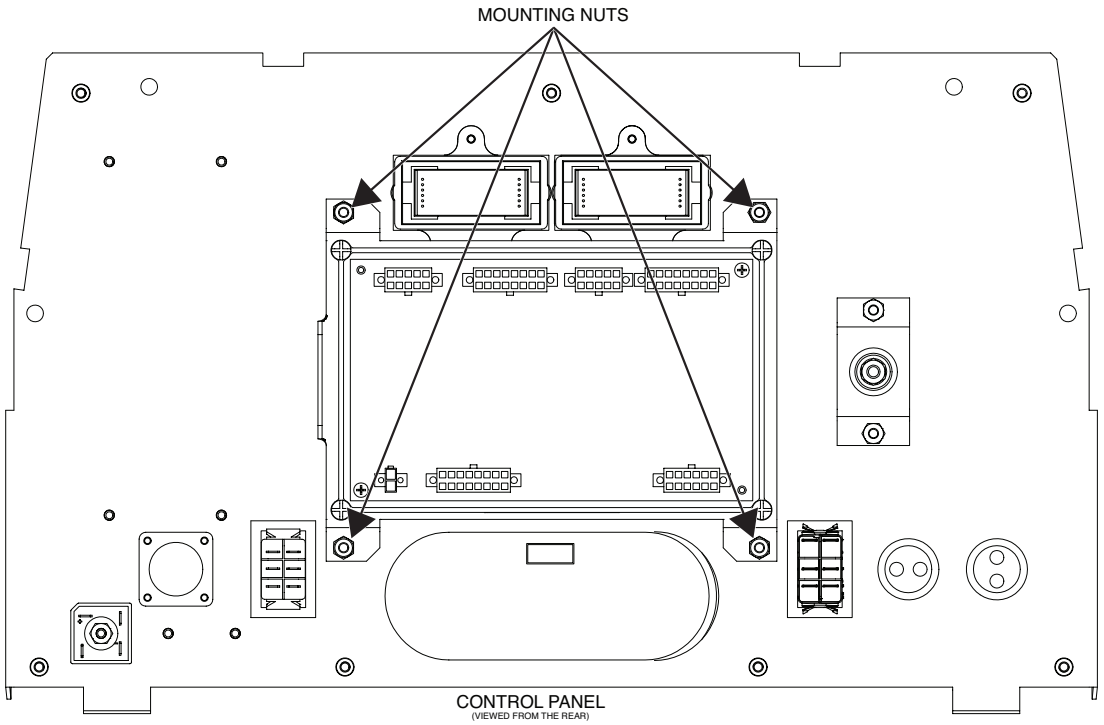
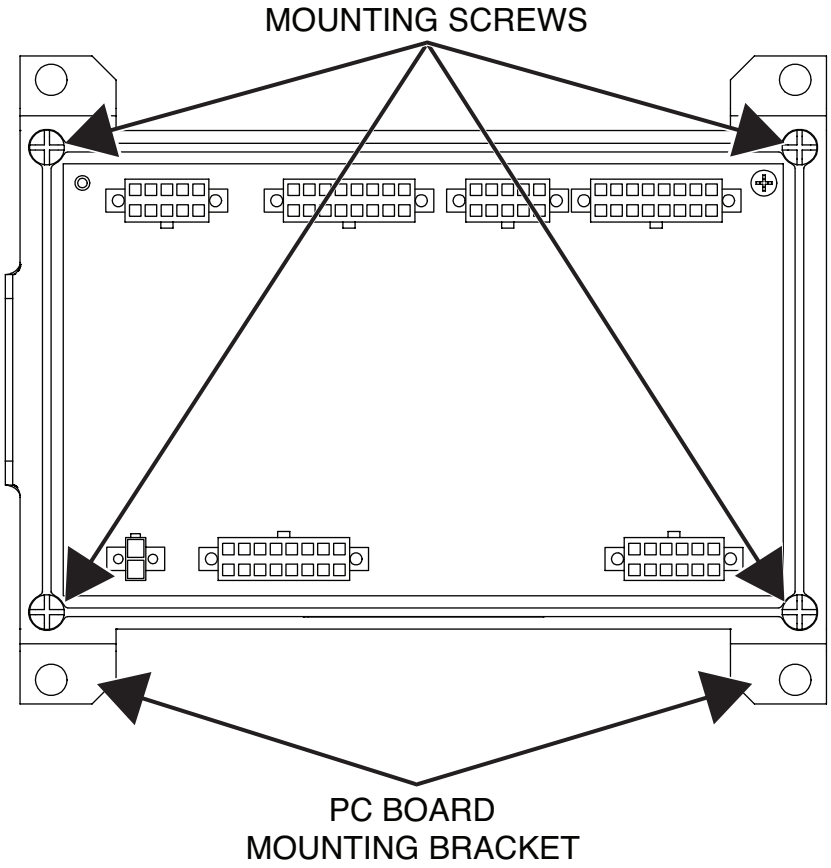


Figure F.61 – Weld control board mounting screw location



OUTPUT RECTIFIER BRIDGE REMOVAL AND REPLACEMENT PROCEDURE

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 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 Output Rectifier Bridge.

MATERIALS NEEDED

1/2” Nutdriver
1/2” Open-End Wrench
7/16” Nutdriver
7/16” Open-End Wrench
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Using a 1/2” nutdriver and a 1/2” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads B1-NEG and B4-NEG to the negative terminal of the rectifier bridge. See ***Figure F.62***. See Wiring Diagram.
5. Using a 1/2” nutdriver and a 1/2” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads B2-POS, B5-POS and POS-shunt to the positive terminal of the rectifier bridge. See ***Figure F.62***. See Wiring Diagram.
6. Using a 7/16” nutdriver and a 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W1 and W6 to the top terminal of the rectifier bridge. See ***Figure F.62***. See Wiring Diagram.
7. Using a 7/16” nutdriver and a 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W2 and W3 to the middle terminal of the rectifier bridge. See ***Figure F.62***. See Wiring Diagram.
8. Using a 7/16” nutdriver and a 7/16” open-end wrench, remove the bolt, nut, lock washer and two flat washers securing leads W4 and W5 to the bottom terminal of the rectifier bridge. See ***Figure F.62***. See Wiring Diagram.
9. Using a 1/2” nutdriver, loosen the nut securing the top of the rectifier bridge to the power module panel. See ***Figure F.63***.

10. Using a 1/2” nutdriver, loosen the nut securing the bottom of the rectifier bridge to the power module panel. See ***Figure F.63***.
11. The output rectifier bridge can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position new output rectifier bridge into the machine.
2. Using a 1/2” nutdriver, tighten the nut securing the bottom of the rectifier bridge to the power module panel.
3. Using a 1/2” nutdriver, tighten the nut securing the top of the rectifier bridge to the power module panel.
4. Using a 7/16” nutdriver and a 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W4 and W5 to the bottom terminal of the rectifier bridge. See Wiring Diagram.
5. Using a 7/16” nutdriver and a 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W2 and W3 to the middle terminal of the rectifier bridge. See Wiring Diagram.
6. Using a 7/16” nutdriver and a 7/16” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads W1 and W6 to the top terminal of the rectifier bridge. See Wiring Diagram.
7. Using a 1/2” nutdriver and a 1/2” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads B2-POS, B5-POS and POS-shunt to the positive terminal of the rectifier bridge. See Wiring Diagram.
8. Using a 1/2” nutdriver and a 1/2” open-end wrench, attach the bolt, nut, lock washer and two flat washers securing leads B1-NEG and B4-NEG to the negative terminal of the rectifier bridge. See Wiring Diagram.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

Figure F.62 – Rectifier bridge terminal and lead locations

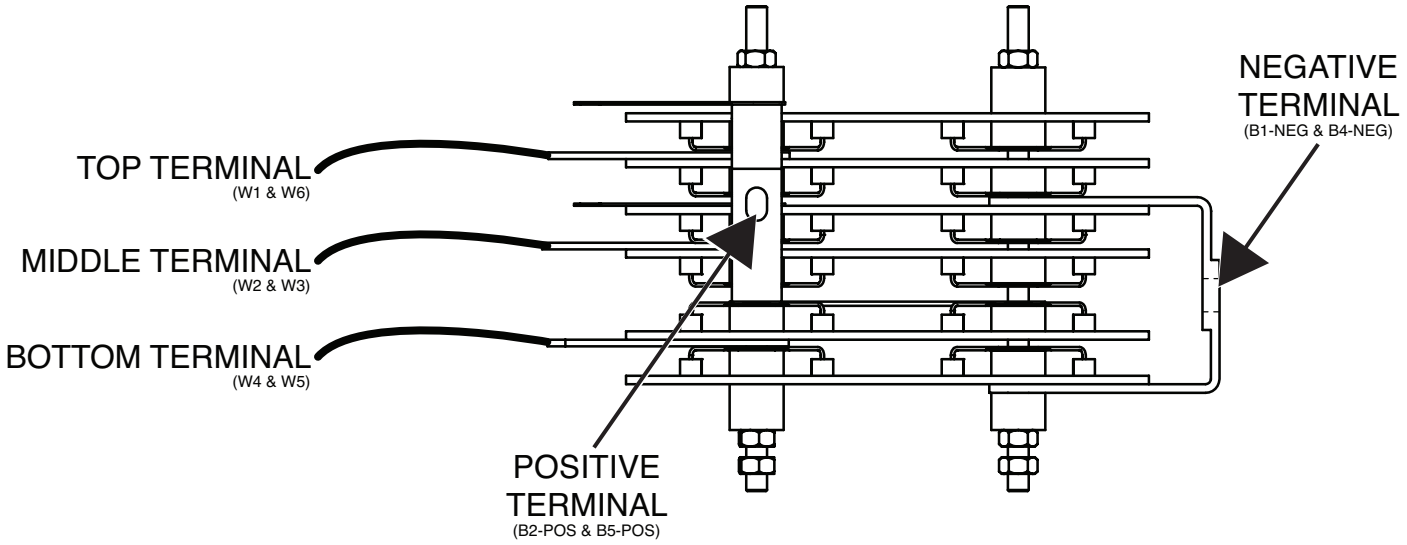
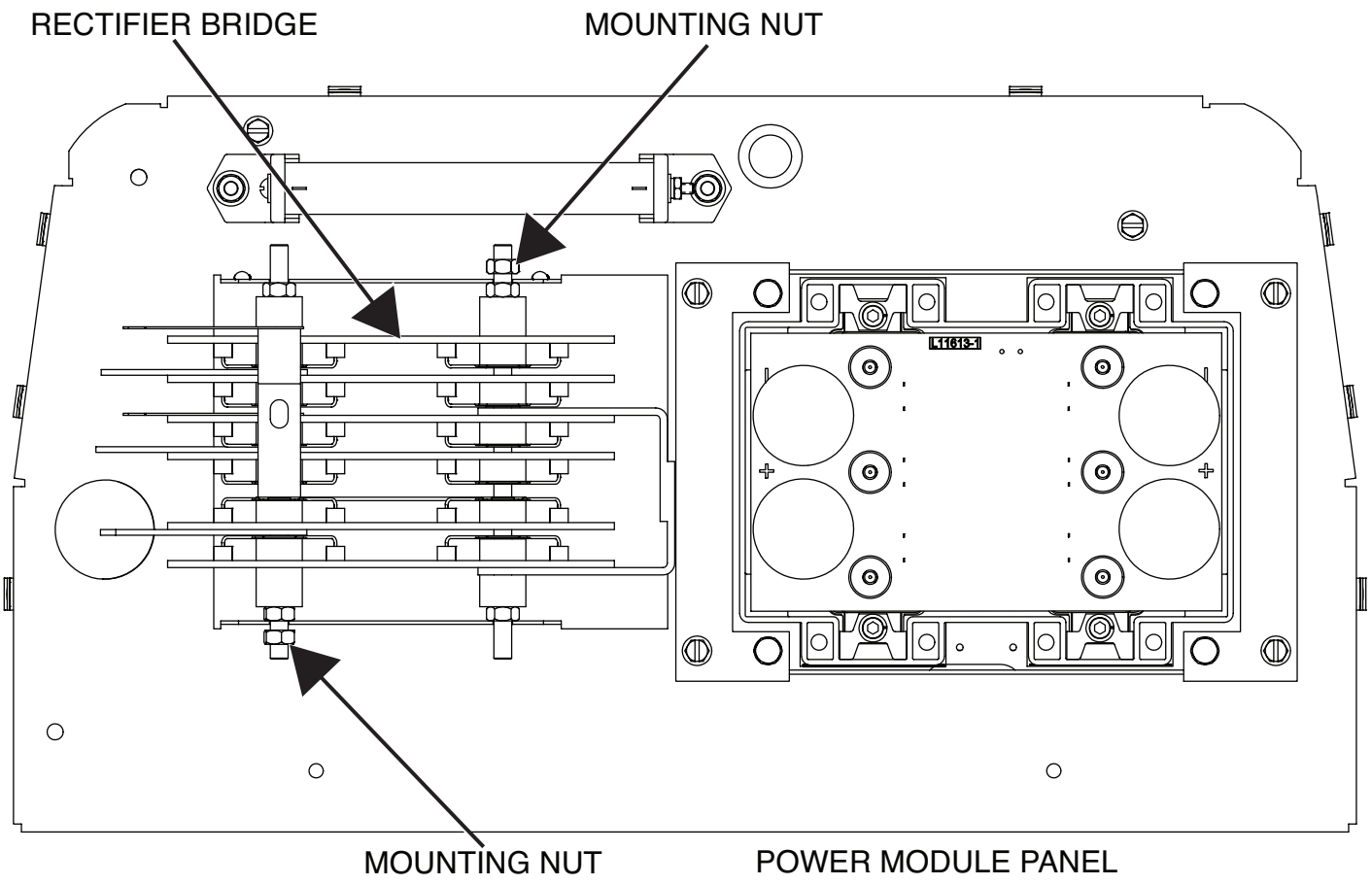


Figure F.63 – Rectifier bridge mounting nut locations



FIELD CAPACITOR REMOVAL AND REPLACEMENT PROCEDURE

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 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 Field Capacitor.

MATERIALS NEEDED

3/8” Nutdriver
7/16” Nutdriver
1/2” Nutdriver
3/8” Socket With An Extension
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Perform the ***Fuel Tank Removal Procedure***.
5. Using a 3/8” nutdriver, remove the two screws securing the output stud cover above the field capacitor. See ***Figure F.64***.
6. Using a 7/16” nutdriver, remove the nut, lock washer and flat washer securing leads 201 and 201A to the negative terminal of the field capacitor. See ***Figure F.65***. See Wiring Diagram. Label leads for reassembly.
7. Using a 7/16” nutdriver, remove the nut, lock washer and flat washer securing leads 200B and 200A to the positive terminal of the field capacitor. See ***Figure F.65***. See Wiring Diagram. Label leads for reassembly.
8. Using a 1/2” nutdriver, remove the six screws securing the front panel assembly to the machine. See ***Figure F.66***.
9. Carefully slide the front panel to gain access to the capacitor bracket mounting screw.
   NOTE: Do not slide the front panel more than an inch or two away from the machine to prevent damage to any wiring.
10. Using a 3/8” socket with an extension, loosen the screw securing the capacitor bracket to the fan guard.
11. Carefully slide the field capacitor out of the bracket. Note the polarity and orientation of the field capacitor for reassembly.

12. The field capacitor can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new field capacitor into the capacitor bracket.
2. Using a 3/8” socket with an extension, tighten the screw securing the capacitor bracket to the fan guard.
3. Carefully position the front panel onto the machine.
4. Using a 1/2” nutdriver, attach the six screws securing the front panel assembly to the machine.
5. Using a 7/16” nutdriver, attach the nut, lock washer and flat washer securing leads 200B and 200A to the positive terminal of the field capacitor. See Wiring Diagram.
6. Using a 7/16” nutdriver, remove the nut, lock washer and flat washer securing leads 201 and 201A to the negative terminal of the field capacitor. See Wiring Diagram.
7. Using a 3/8” nutdriver, attach the two screws securing the output stud cover above the field capacitor.
8. Perform the ***Fuel Tank Replacement Procedure***.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

Figure F.64 – Output stud cover location

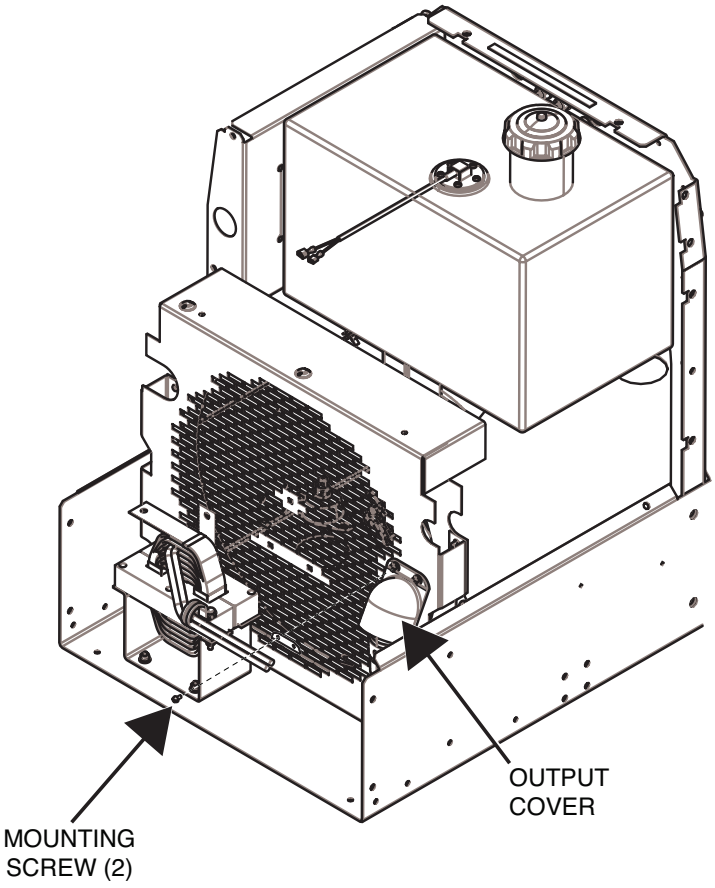


Figure F.65 – Field capacitor lead locations

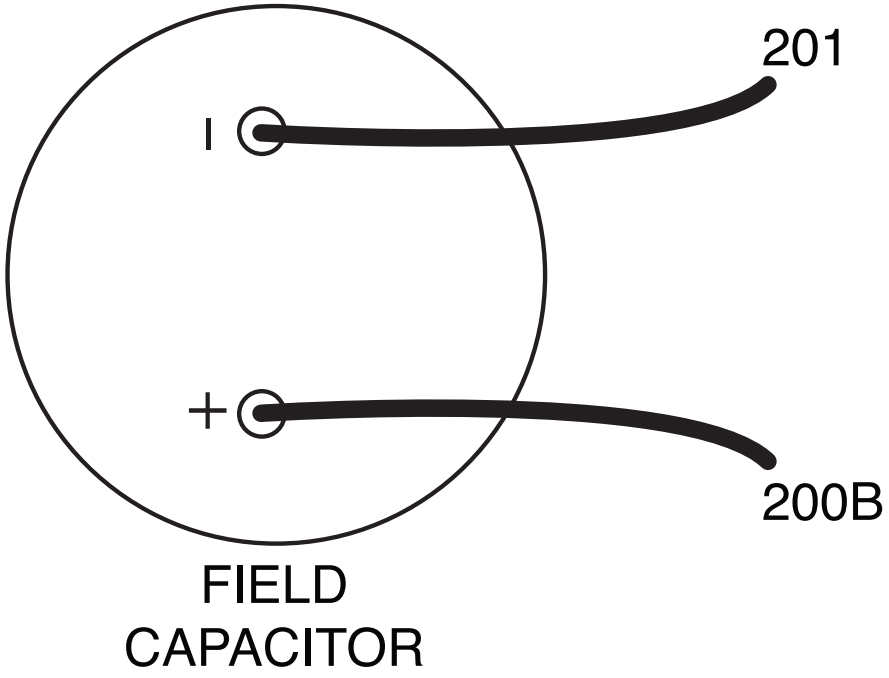
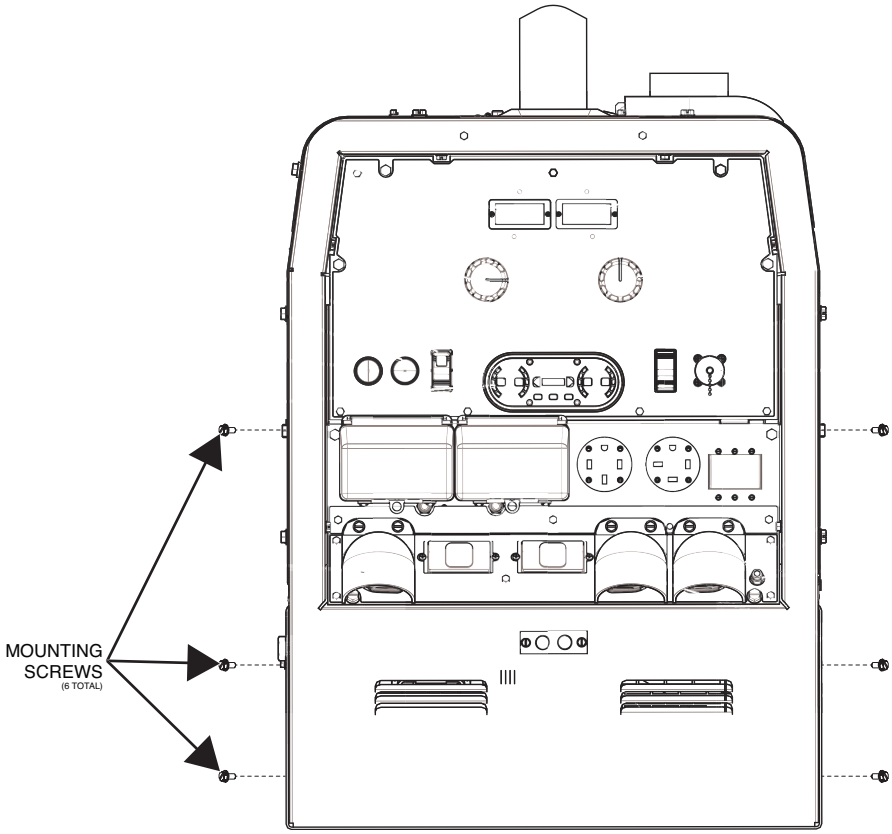


Figure F.66 – Front panel mounting screw locations



BRUSH AND BRUSH HOLDER ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

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 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 Brush And Brush Holder Assembly.

MATERIALS NEEDED

3/8” Nutdriver
5/8” Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Using a 3/8” nutdriver, remove the two screws securing the brush holder bracket to the machine base. See ***Figure F.67***.
5. Carefully maneuver the brush holder bracket to gain access to the leads.
6. Label and disconnect leads 200B and 201 from the brush terminals. See ***Figure F.68***. See Wiring Diagram.
7. Carefully remove the bracket assembly from the machine.
8. Using a 5/8” nutdriver, remove the two screws securing the brush holder to the brush holder bracket. See ***Figure F.69***.
9. Carefully slide the brush holder assembly out of the bracket.
10. The brush holder assembly can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully slide new brush holder assembly into the brush holder bracket.
2. Using a 5/8” nutdriver, attach the two screws securing the brush holder to the brush holder bracket.
3. Carefully position the brush holder and bracket assembly into the machine.
4. Connect leads 200B and 201 to the brush terminals. See Wiring Diagram.

5. Using a 3/8” nutdriver, attach the two screws securing the brush holder bracket to the machine base.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Retest After Repair Procedure***.

Figure F.67 – Brush holder bracket mounting screw locations

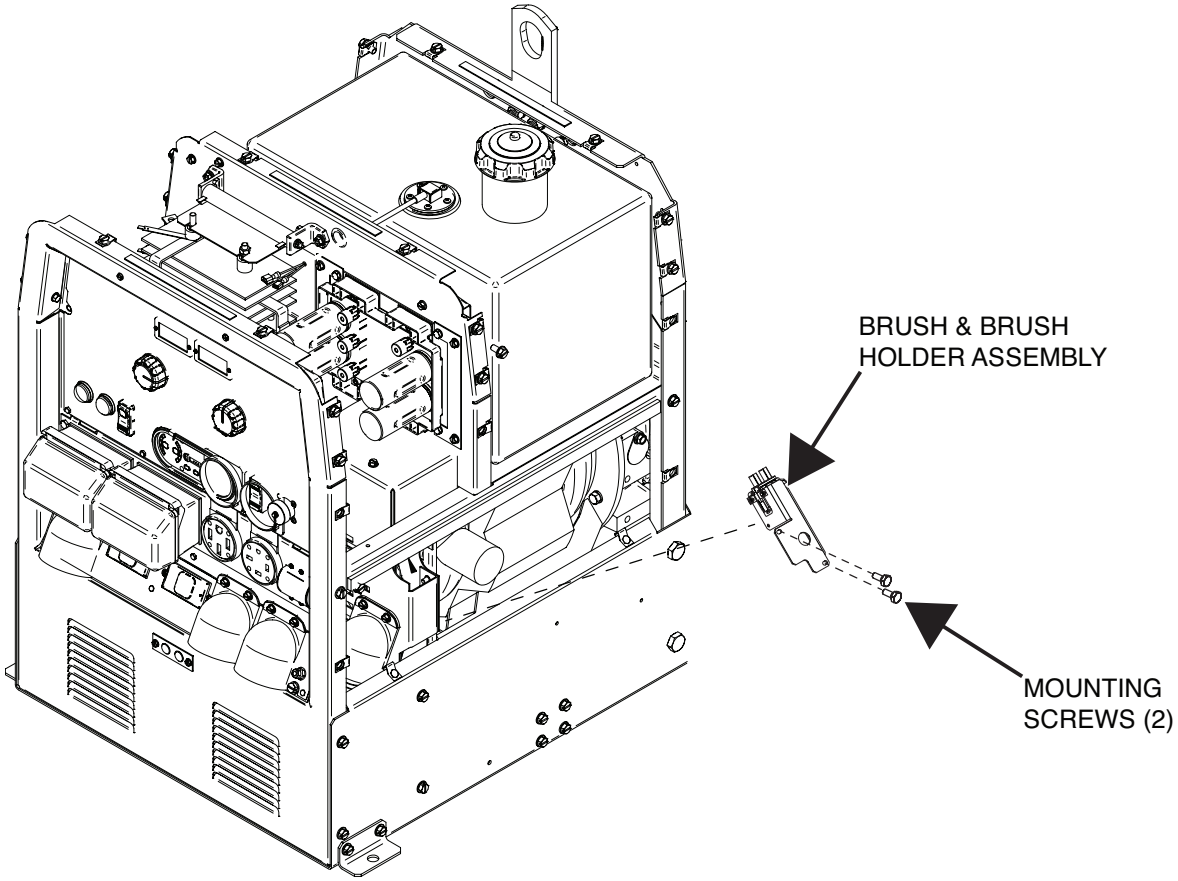


Figure F.68 – Brush holder lead locations

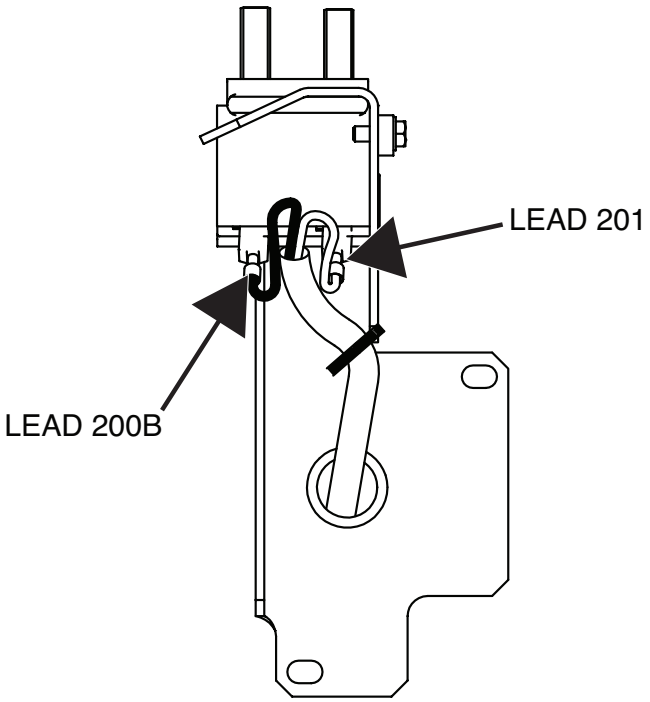
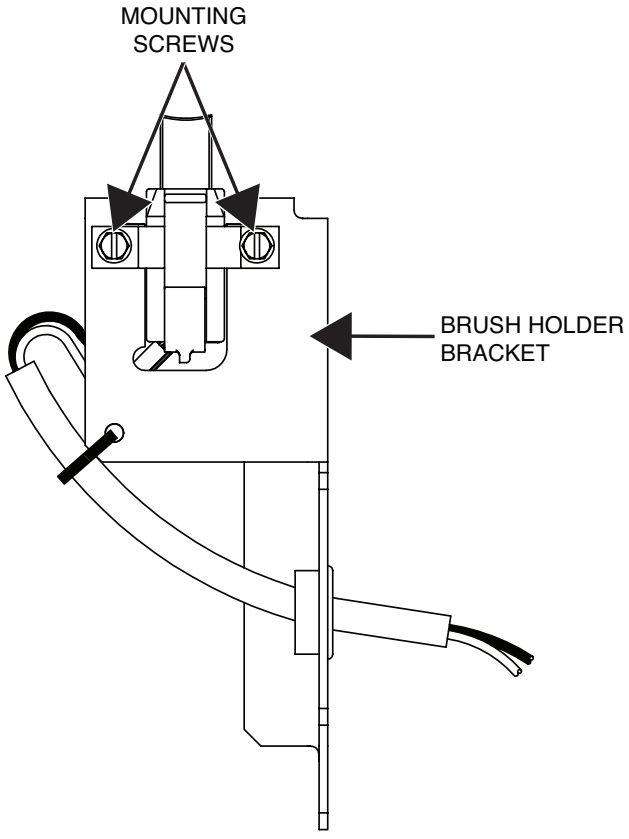


Figure F.69 – Brush holder mounting screw locations



ENGINE PROTECTION / IDLE CONTROL PC BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 Engine Protection / Idle Control PC Board.

MATERIALS NEEDED

3/8” Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Label and disconnect leads 55, 271 and 227 from terminals B1, B2 and B3 of the engine protection / idle control PC board. See ***Figure F.70***. See Wiring Diagram.
5. Label and disconnect plugs J31, J32 and J33 from the engine protection / idle control PC board. See ***Figure F.70***. See Wiring Diagram.
6. Using a 3/8” nutdriver, remove the four nuts securing the engine protection / idle control PC board to the mounting posts. See ***Figure F.71***.
7. The engine protection / idle control PC board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position new engine protection / idle control PC board onto the mounting posts.
2. Using a 3/8” nutdriver, attach the four nuts securing the engine protection / idle control PC board to the mounting posts.
3. Connect plugs J31, J32 and J33 to the engine protection / idle control PC board. See Wiring Diagram.
4. Connect leads 55, 271 and 227 to terminals B1, B2 and B3 of the engine protection / idle control PC board. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.

6. Perform the ***Retest After Repair Procedure***.

Figure F.70 – Engine protection / idle control PC board lead and plug locations

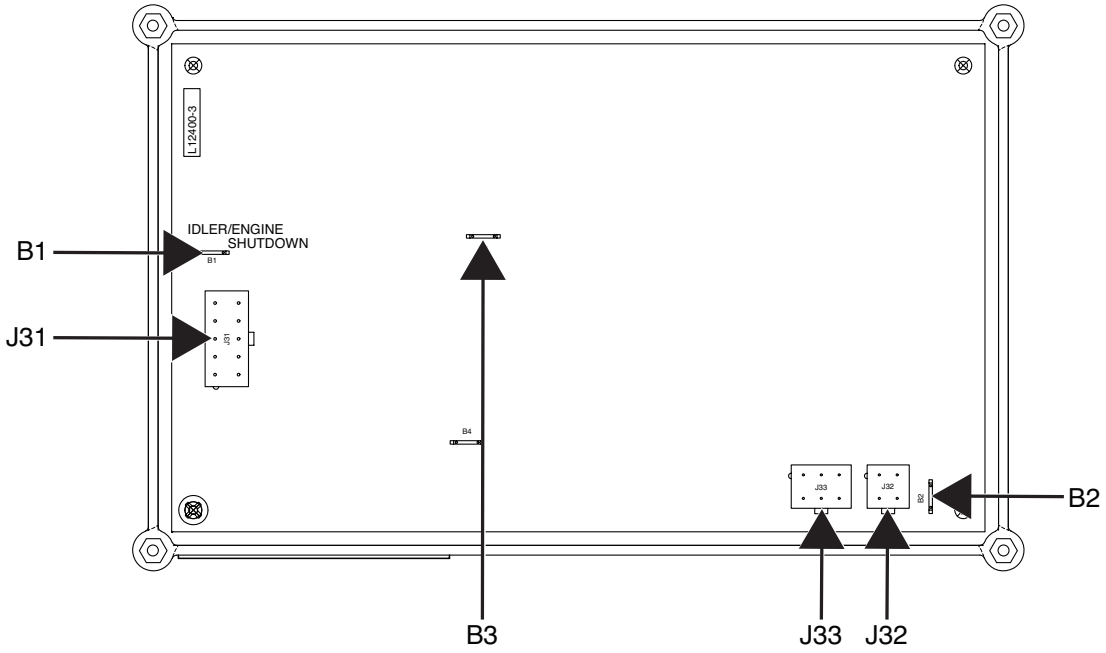
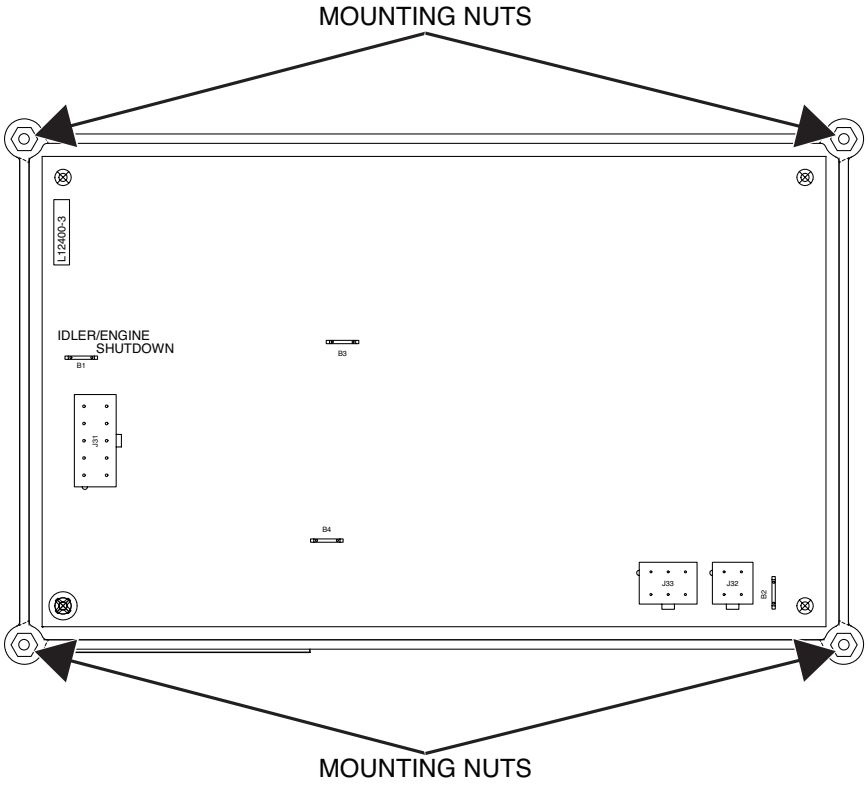


Figure F.71 – Engine protection / idle control PC board mounting nut locations



FUEL TANK REMOVAL AND REPLACEMENT PROCEDURE

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 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 Fuel Tank Assembly.

MATERIALS NEEDED

Fuel Siphon
Container For Fuel Storage
Slotted Screwdriver
3/8” Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Perform the ***Chopper Module PC Board Removal Procedure***.
5. Perform the ***Output Rectifier Bridge Removal Procedure***.
6. Perform the ***Engine Protection / Idle Control PC Board Removal Procedure***.
7. Label and disconnect the quick-connect terminals from leads 229 and 5J to the fuel level sensor. See ***Figure F.72***. See Wiring Diagram.
8. Using a fuel siphon and appropriate container, drain the fuel from the fuel tank.
9. Using a slotted screwdriver, loosen the hose clamp securing the fuel line to the bottom of the fuel tank. See ***Figure F.73***. Use caution when disconnecting fuel lines as they may contain small amounts of fuel. To avoid fuel spills wrap fuel line with a rag or paper towel.
10. Using a slotted screwdriver, loosen the hose clamp securing the fuel line to the top of the fuel tank. See ***Figure F.73***. Use caution when disconnecting fuel lines as they may contain small amounts of fuel. To avoid fuel spills wrap fuel line with a rag or paper towel.
11. Using a 3/8” nutdriver, remove the two screws securing the breaker and relay panel to the lift bale frame. See ***Figure F.74***.
12. Using a 3/8” nutdriver, remove the two screws securing the breaker and relay panel to the support rail. See ***Figure F.74***.
13. Using a 3/8” nutdriver, remove the two screws securing the power panel to the support rail. See ***Figure F.74***.

14. Using a 3/8” nutdriver, remove the two screws securing the power panel to the breaker and relay panel. See ***Figure F.74***.
15. Label and disconnect leads 13A and 15 from the resistor (R4). See ***Figure F.75***. See Wiring Diagram.
16. Carefully remove the breaker and relay panel from the machine.
17. Carefully remove the power panel from the machine.
18. The fuel tank can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position new fuel tank into the machine.
2. Carefully position the power panel into the machine.
3. Carefully position the breaker and relay panel onto the support rail.
4. Connect leads 13A and 15 to resistor (R4). See Wiring Diagram.
5. Using a 3/8” nutdriver, attach the two screws securing the power panel to the breaker and relay panel.
6. Using a 3/8” nutdriver, attach the two screws securing the power panel to the support rail.
7. Using a 3/8” nutdriver, attach the two screws securing the breaker and relay panel to the support rail.
8. Using a 3/8” nutdriver, attach the two screws securing the breaker and relay panel to the lift bale frame.
9. Using a slotted screwdriver, tighten the hose clamp securing the fuel line to the top of the fuel tank.
10. Using a slotted screwdriver, tighten the hose clamp securing the fuel line to the bottom of the fuel tank.
11. Connect the quick-connect terminals to leads 229 and 5J to the fuel level sensor. See Wiring Diagram.
12. Perform the ***Engine Protection / Idle Control PC Board Replacement Procedure***.
13. Perform the ***Output Rectifier Bridge Replacement Procedure***.
14. Perform the ***Chopper Module PC Board Replacement Procedure***.
15. Perform the ***Case Cover Replacement Procedure***.
16. Perform the ***Retest After Repair Procedure***.

Figure F.72 – Fuel level sensor lead locations

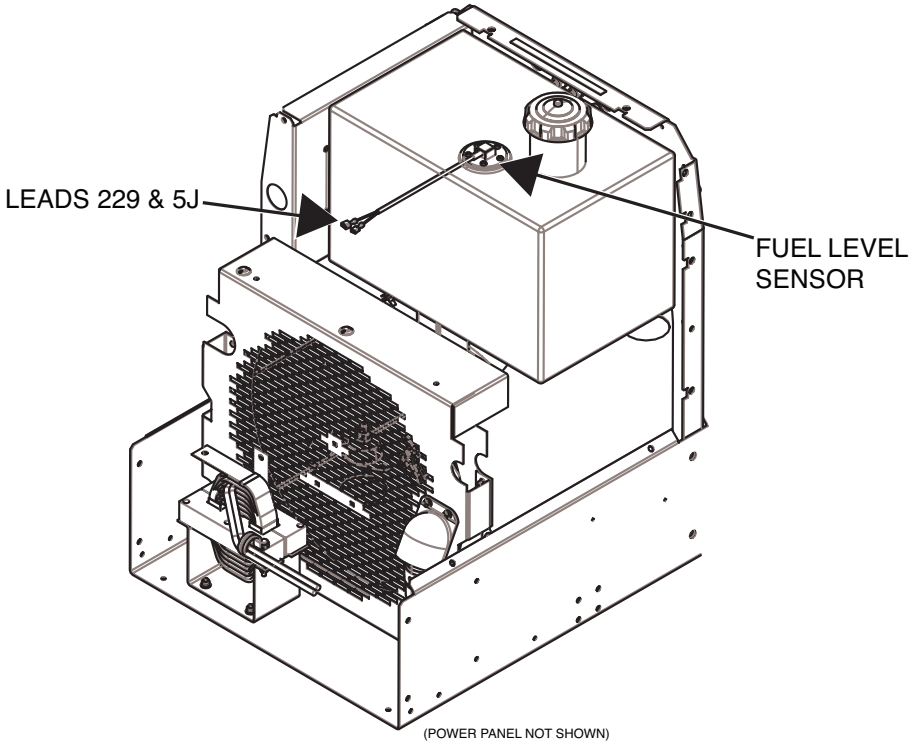


Figure F.73 – Fuel tank fuel line connection locations

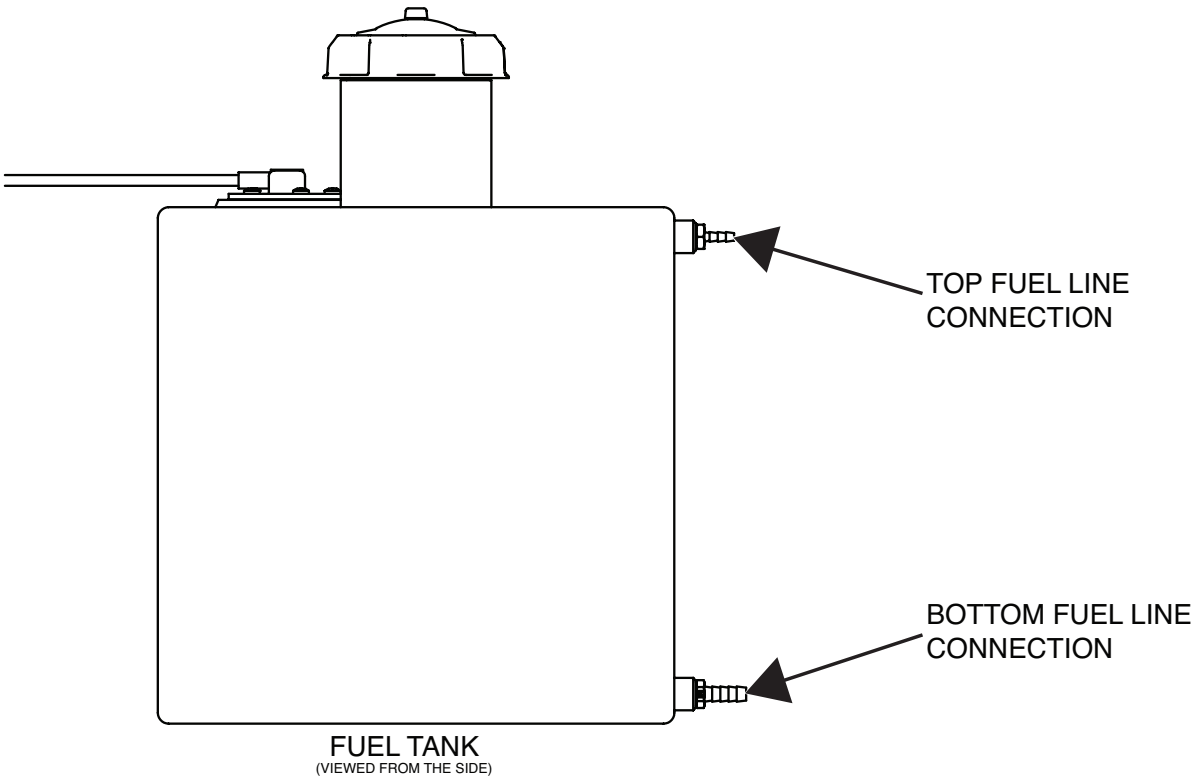


Figure F.74 – Power panel and breaker and relay panel mounting hardware location

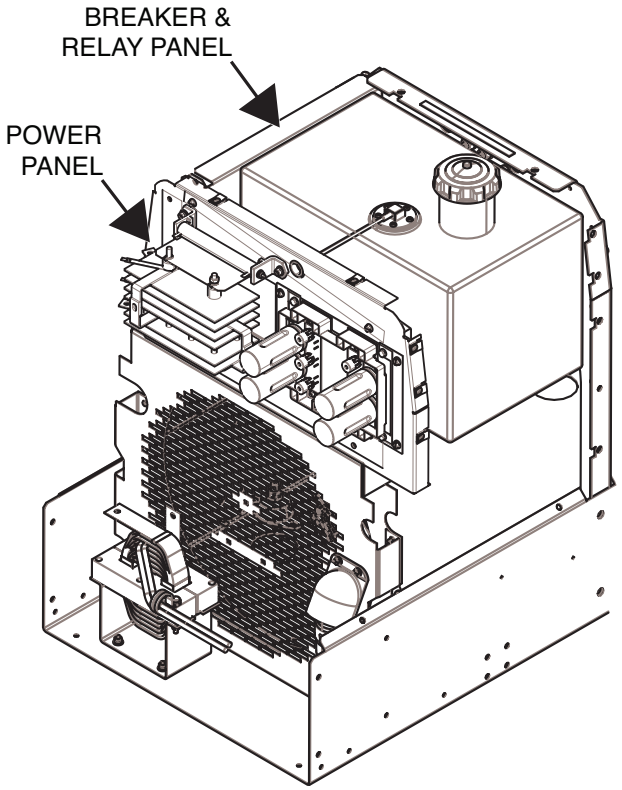
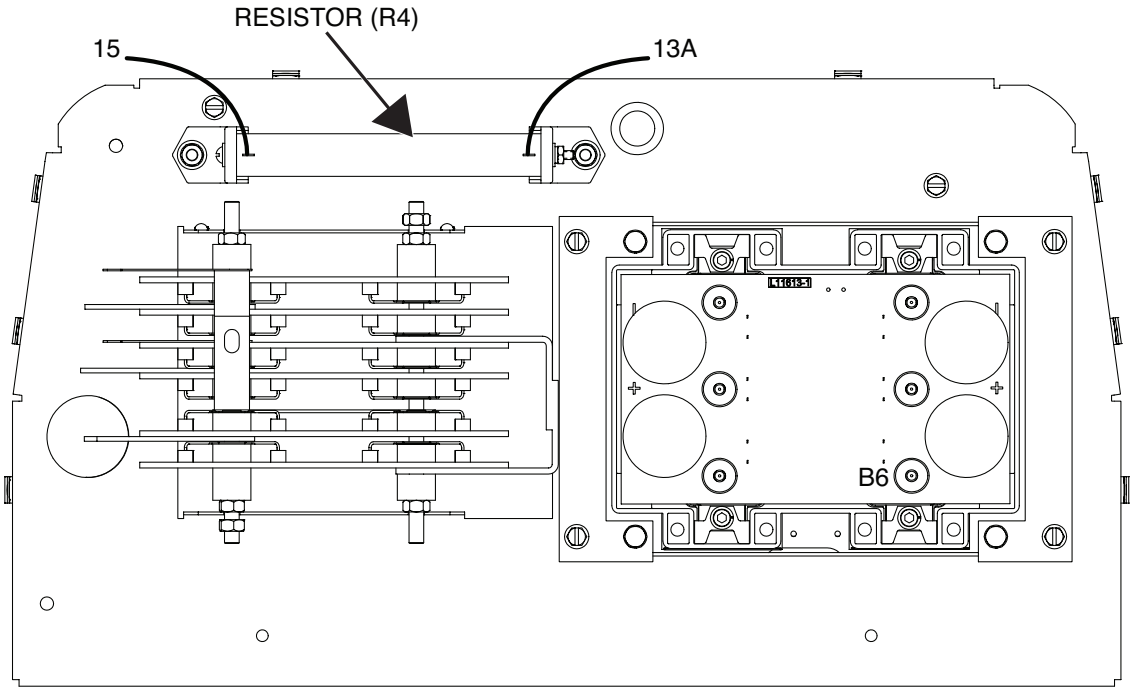


Figure F.75 – Resistor (R4) location



STATOR, ROTOR AND SHAFT ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURE

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 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 Stator, Rotor and Shaft Assembly.

MATERIALS NEEDED

3/8” Nutdriver
1/2” Nutdriver
3/4” Nutdriver
Slotted Screwdriver
7/16” Nutdriver
Wood Or Steel Blocking
Large Adjustable Wrench
Two 3/4” Deep Well Sockets
Hoist And Appropriate Rigging
9/16” Nutdriver
Gear Puller
Wiring Diagram

REMOVAL PROCEDURE

1. Turn off the engine on the Cross Country 300 machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Capacitor Discharge Procedure***.
4. Perform the ***Fuel Tank Removal Procedure***.
5. Using a 3/8” nutdriver, remove the two screws securing the fuel tank tray to the lift bail frame. See ***Figure F.76***.
6. Carefully route wiring thru the fuel tank tray, cutting cable ties as necessary. Remove the fuel tank tray.
7. Label and disconnect leads 236A and 238C from the circuit breaker (CB5) on the left support rail. See Wiring Diagram.

8. Using a 1/2” nutdriver, remove the screws securing the support rails to the lift bail frame. See ***Figure F.76***.
9. Using a 3/4” nutdriver, remove the bolt, lock washer and flat washer securing leads to the positive output stud. See Wiring Diagram.
10. Using a slotted screwdriver, loosen the screw securing leads 3, 4 and 6 to circuit breaker (CB1). See ***Figure F.77***. See Wiring Diagram. Take note of the direction and number of turns around the toroid by leads 3 and 6 for reassembly.
11. Label and disconnect lead 6A from the field bridge rectifier. See ***Figure F.78***. See Wiring Diagram.
12. Using a 3/8” nutdriver, remove the nut, lock washer and flat washer securing lead 5A to the neutral stud on the auxiliary power receptacle panel. See ***Figure F.78***. See Wiring Diagram. Label and disconnect lead 5A.
13. Using a 3/8” nutdriver, remove the nut, lock washer and flat washer securing lead 5 to the right ground stud on the upper control panel. See ***Figure F.78***. See Wiring Diagram. Label and disconnect lead 5.
14. Label and disconnect any leads necessary for the front panel to be moved to the side of the machine.
15. Carefully position the front panel off to the side of the machine to allow for the removal of the stator frame assembly and components.
16. Perform the ***Choke Removal Procedure***.
17. Using a 7/16” nutdriver, remove the four nuts, lock washers and flat washers securing the choke bracket to the base of the machine. See ***Figure F.79***.
18. Using a 3/8” nutdriver, remove the four screws securing the fan guard to the base. See ***Figure F.79***.
19. Carefully slide the fan guard out of the machine.
20. Place a piece of wood blocking between the fan blades to prevent the fan blades from rotating.
21. Using a large adjustable wrench, remove the bolt and lock washer securing the fan to the rotor shaft. See ***Figure F.80***.
22. Carefully slide the fan off of the rotor shaft.
23. Using two 3/4” deep well sockets, remove the two bolts, nuts, flat washers and spacers securing the stator frame to the base. See ***Figure F.80***.
24. Using a hoist and appropriate rigging, lift the stator frame up off of its mounting point.
25. Carefully place wood or steel blocking under the engine for support.
26. Using a 9/16” nutdriver, remove the eight screws and lock washers securing the stator frame to the engine.
27. Using a gear puller, pull the stator frame clear of the bearing on the rotor shaft.
28. Using a hoist and appropriate rigging, pull the stator frame assembly off the rotor shaft and out of the machine.
29. The stator frame can now be removed and replaced.
30. Using a hoist and appropriate rigging, support the rotor and shaft assembly. See ***Figure F.80***.
31. Using a 1/2” nutdriver, remove the six bolts, lock washers and flat washers securing the six disc clamping bars to the engine assembly. See ***Figure F.80***.
    NOTE: The rotor and shaft assembly will be free to fall after these bolts are removed.
32. The rotor and shaft assembly can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Using a hoist and appropriate rigging, mate the rotor and shaft assembly with the engine.
2. Using a 1/2” nutdriver, attach the six bolts, lock washers and flat washers securing the six disc clamping bars to the engine assembly.
3. Using a hoist and appropriate rigging, position the stator frame assembly into the machine and mate it with the engine.
4. Using a 9/16” nutdriver, attach the eight screws and lock washers securing the stator frame to the engine.
5. Using a hoist and appropriate rigging, position the stator frame onto its mounting point.
6. Using two 3/4” deep well sockets, attach the two bolts, nuts, flat washers and spacers securing the stator frame to the base.
7. Carefully slide the fan onto the rotor shaft.
8. Place a piece of wood blocking between the fan blades to prevent the fan blades from rotating.
9. Using a large adjustable wrench, attach the bolt and lock washer securing the fan to the rotor shaft.
10. Carefully slide the fan guard into the machine.
11. Using a 3/8” nutdriver, attach the four screws securing the fan guard to the base.
12. Using a 7/16” nutdriver, attach the four nuts, lock washers and flat washers securing the choke bracket to the base of the machine.
13. Perform the ***Choke Replacement Procedure***.
14. Carefully position the front panel in front of the machine.
15. Using a 3/8” nutdriver, attach the nut, lock washer and flat washer securing lead 5 to the right ground stud on the upper control panel. See Wiring Diagram.
16. Using a 3/8” nutdriver, attach the nut, lock washer and flat washer securing lead 5A to the neutral stud on the auxiliary power receptacle panel. See Wiring Diagram.
17. Connect lead 6A to the field bridge rectifier. See Wiring Diagram.
18. Carefully route leads 3 and 6 thru and around the toroid in the same manner as they removed. See Wiring Diagram.
19. Using a slotted screwdriver, tighten the screw securing leads 3, 4 and 6 to circuit breaker (CB1). See Wiring Diagram.
20. Connect any other previously disconnected leads to the front panel. See Wiring Diagram.
21. Using a 3/4” nutdriver, attach the bolt, lock washer and flat washer securing leads to the positive output stud. See Wiring Diagram.
22. Using a 1/2” nutdriver, attach the screws securing the support rails to the lift bail frame.
23. Connect leads 236A and 238C to the circuit breaker (CB5) on the left support rail. See Wiring Diagram.
24. Position the fuel tank tray onto the support rails.
25. Carefully route wiring thru the fuel tank tray, attaching cable ties as necessary.
26. Using a 3/8” nutdriver, attach the two screws securing the fuel tank tray to the lift bail frame.
27. Perform the ***Fuel Tank Replacement Procedure***.
28. Perform the ***Case Cover Replacement Procedure***.
29. Perform the ***Retest After Repair Procedure***.

Figure F.76 – Support rail and lit bail frame locations

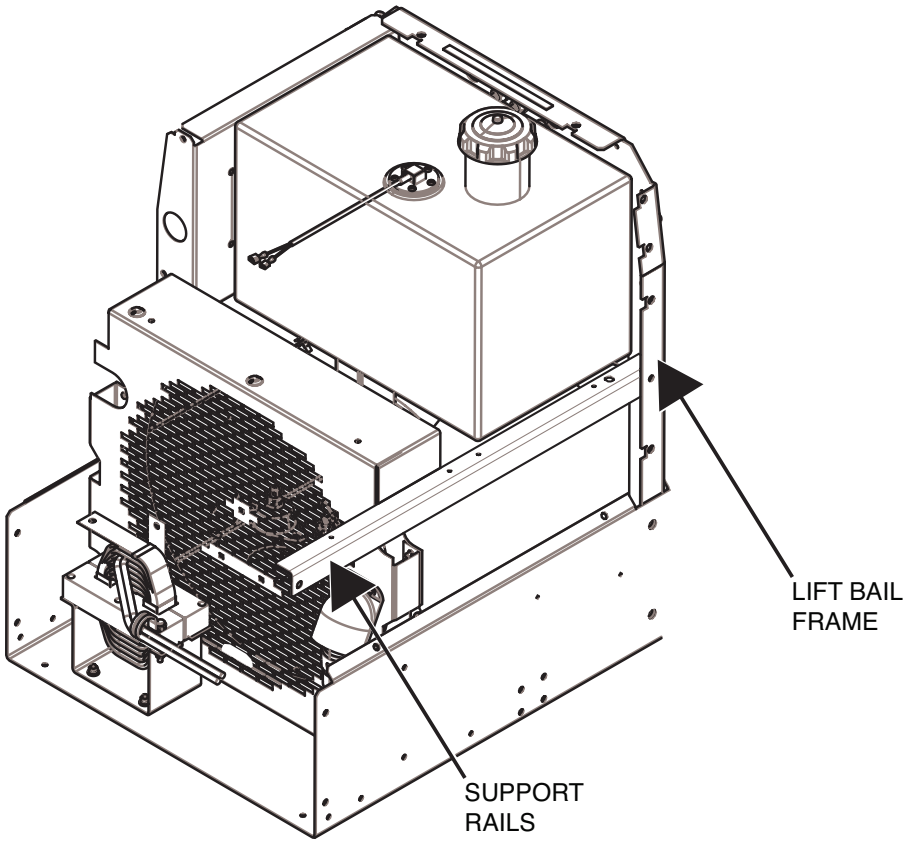


Figure F.77 – Circuit breaker (CB1) and neutral stud lead locations

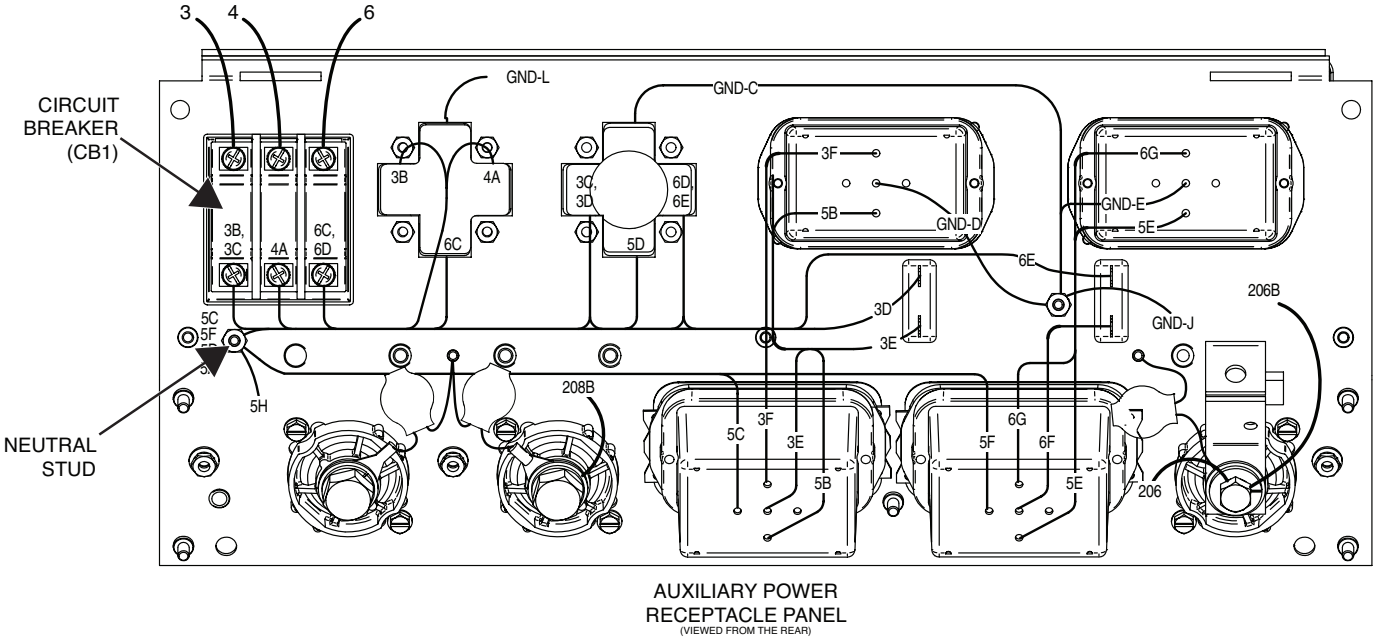


Figure F.78 – Field bridge rectifier and ground stud lead locations

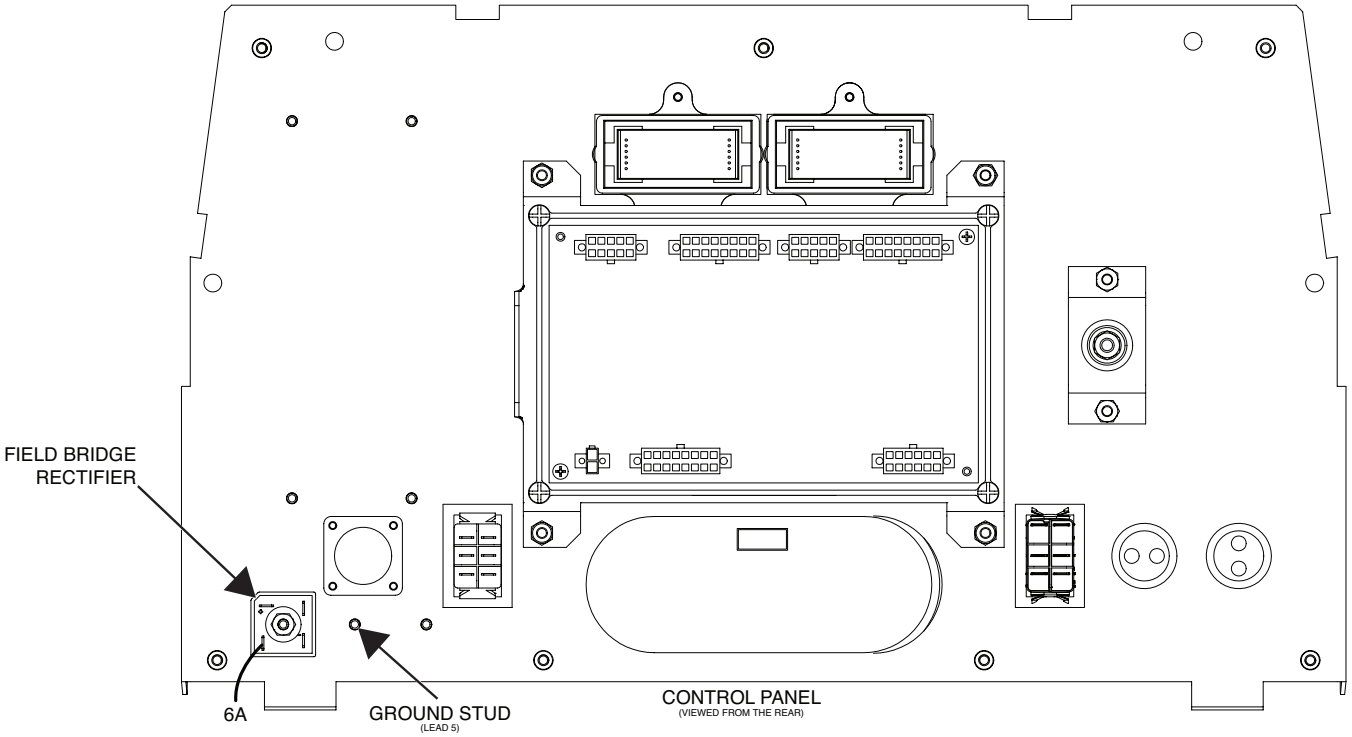


Figure F.79 – Fan guard and choke bracket locations

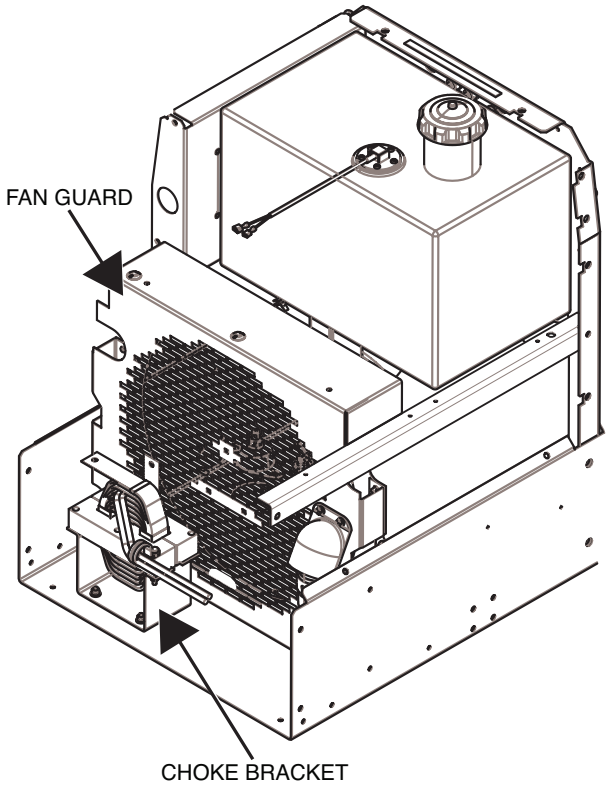
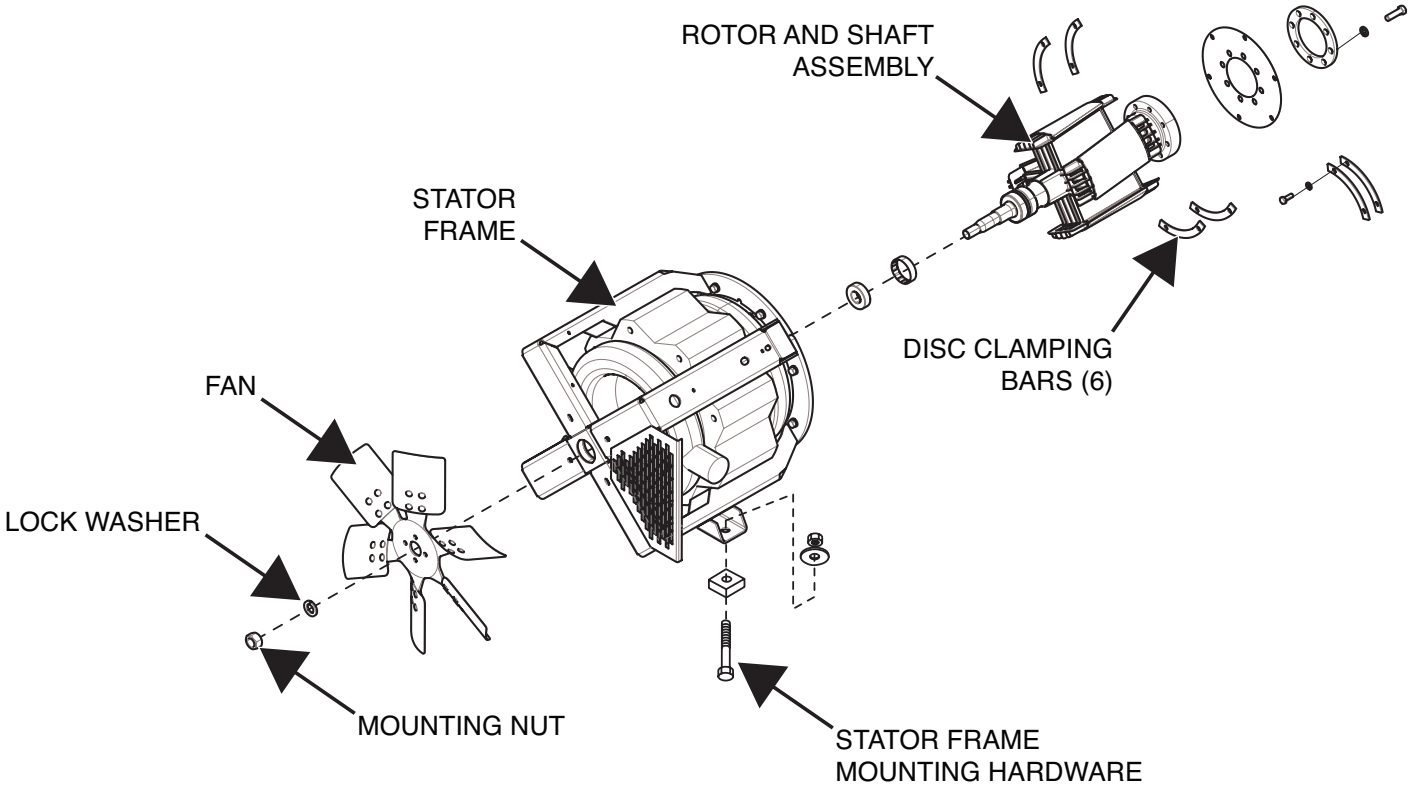


Figure F.80 – Stator frame and rotor mounting hardware locations



RETEST AFTER REPAIR

Retest a machine:

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

OR

• If you repair or replace any electrical components.

ENGINE OUTPUT

MODE	NO LOAD RPM	LOAD RPM
LOW IDLE	1300 - 1400	NA
HIGH IDLE	1850 - 1890	1800

WELDER DC OUTPUT

FINE CURRENT CONTROL	COARSE CURRENT CONTROL	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
MAXIMUM	MAXIMUM	55 – 60	32	300