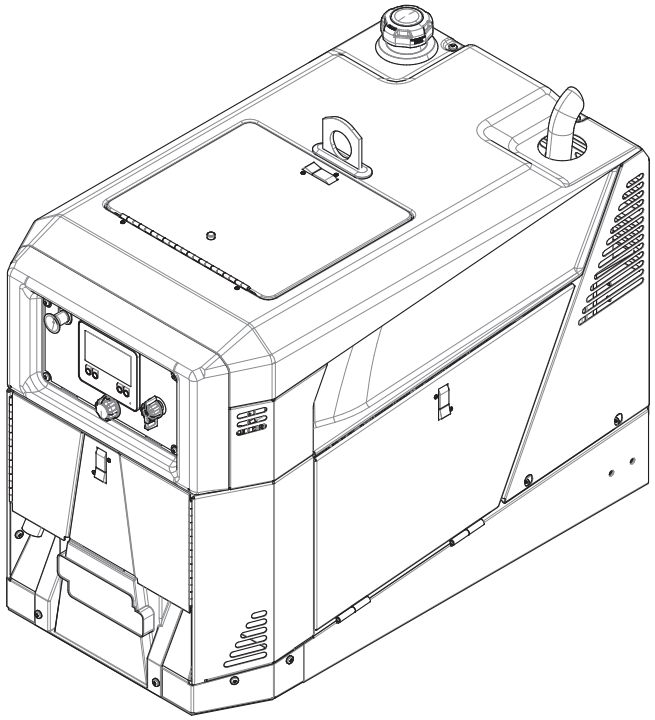
Ranger® 330 MPX

For use with machines having Code Numbers:

Ranger® 330 MPX: 12649, 13011

SERVICE MANUAL



SVM300 | Issue Date Apr - 19

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. 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.

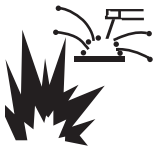
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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

- Torx Nutdriver (Size T30)
- 9/16" Open-End Wrench
- 1/2" Open-End Wrench
- 5/64" Allen Wrench
- 7/16" Open-End Wrench
- 3/8" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Slide the left and right side door assemblies off of the machine. See **Figure F.1** . See Wiring Diagram.
3. Using a Torx nutdriver (size T30), remove the two screws securing the roof welded assembly to the rear of the machine. See **Figure F.1** .
4. Open the engine door, to gain access to the mounting screws. See **Figure F.1** .
5. Using a Torx nutdriver (size T30), remove the four screws securing the roof welded assembly to the machine.
6. Using a Torx nutdriver (size T30), remove the two screws (four total) from each side securing the roof welded assembly to the machine.
7. Remove the lift bail cover, fuel cap and fuel trough from the machine. See **Figure F.1** .
8. Using a Torx nutdriver (size T30), remove the one screw securing the roof welded assembly to the output panel. See **Figure F.1** .
9. Using a Torx nutdriver (size T30), remove the four screws securing the control panel assembly to the machine. See **Figure F.1** . Do not completely remove the control panel at this time.
10. Label and disconnect the plug and ground lead from the rear of the engine control switch. See Wiring Diagram.
11. Label and disconnect plug from the rear of the LCD display. See Wiring Diagram.
12. Using a 5/64" Allen wrench, loosen the set screw securing the encoder knob to the encoder shaft. See **Figure F.1** .

13. Using a 7/16" open-end wrench, remove the nut and washer securing the encoder shaft to the control panel.
14. The control panel assembly can now be removed.
15. Using a 9/16" open-end wrench and a 1/2" open-end wrench, loosen the two nuts securing the choke control to the roof welded assembly. See **Figure F.1** . Carefully maneuver the choke control off of the roof welded assembly.
16. The roof welded assembly can now be removed.
17. Attach the fuel cap.
18. Using a Torx nutdriver (size T30), remove the six screws securing the case back to the machine.
19. Using a Torx nutdriver (size T30), remove the five screws (three on the output panel and two on the outside) securing the sail panel to the machine. See **Figure F.1** . Repeat this step for the other sail panel.
20. Using a 3/8" nutdriver, remove the two screws securing the sail panel to the output panel. See **Figure F.1** . Repeat this step for the other sail panel.
21. Perform any necessary replacement procedure.
22. To perform any testing reconnect the control panel by following the next steps.
23. Carefully position the encoder shaft through the control panel.
24. Using a 7/16" open-end wrench, attach the nut and washer securing the encoder shaft to the control panel.
25. Using a 5/64" Allen wrench, tighten the set screw securing the encoder knob to the encoder shaft.
26. Connect the plug to the rear of the LCD display. See Wiring Diagram.
27. Connect the plug and ground lead to the rear of the engine control switch. See Wiring Diagram.
28. Perform any test procedures.

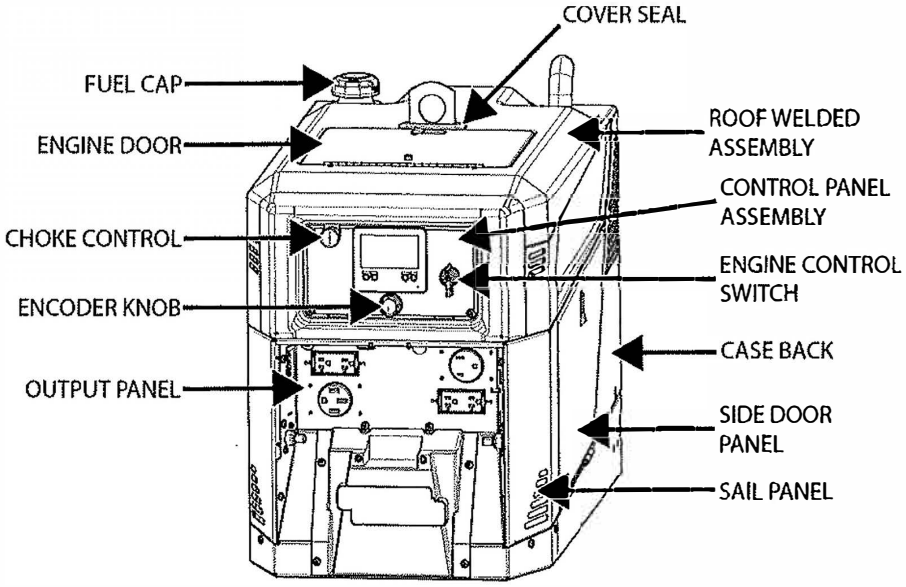
REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the sail panels onto the machine.
2. Using a 3/8" nutdriver, attach the two screws securing the sail panel to the output panel. Repeat this step for the other sail panel.
3. Using a Torx nutdriver (size T30), attach the five screws (three on the output panel and two on the outside) securing the sail panel to the machine. Repeat this step for the other sail panel.
4. Remove the fuel cap.
5. Carefully position the case back onto the machine.
6. Using a Torx nutdriver (size T30), attach the six screws securing the case back to the machine.
7. Carefully position the roof welded assembly onto the machine.
8. Carefully position the choke control into the roof welded assembly.
9. Using a 9/16" open-end wrench and a 1/2" open-end wrench, tighten the two nuts securing the choke control to the roof welded assembly.
10. Carefully position the encoder shaft through the control panel.
11. Using a 7/16" open-end wrench, attach the nut and washer securing the encoder shaft to the control panel.
12. Using a 5/64" Allen wrench, tighten the set screw securing the encoder knob to the encoder shaft.
13. Connect the plug to the rear of the LCD display. See Wiring Diagram.
14. Connect the plug and ground lead to the rear of the engine control switch. See Wiring Diagram.
15. Using a Torx nutdriver (size T30), attach the four screws securing the control panel assembly to the machine.
16. Using a Torx nutdriver (size T30), attach the one screw securing the roof welded assembly to the output panel.
17. Attach the lift bail cover, fuel cap and fuel trough from the machine.
18. Using a Torx nutdriver (size T30), attach the two screws (four total) to each side securing the roof welded assembly to the machine.
19. Using a Torx nutdriver (size T30), open the engine door and attach the four screws securing the roof welded assembly to the machine.
20. Using a Torx nutdriver (size T30), attach the two screws securing the roof welded assembly to the rear of the machine.
21. Slide the left and right side door assemblies onto the machine.

Figure 1. Case cover component locations

Case cover component locations



ROTOR RESISTANCE AND GROUND TEST PROCEDURE (STATIC)

WARNING:

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

- Needle Nose Pliers
- Volt/Ohmmeter
- Wiring Diagram

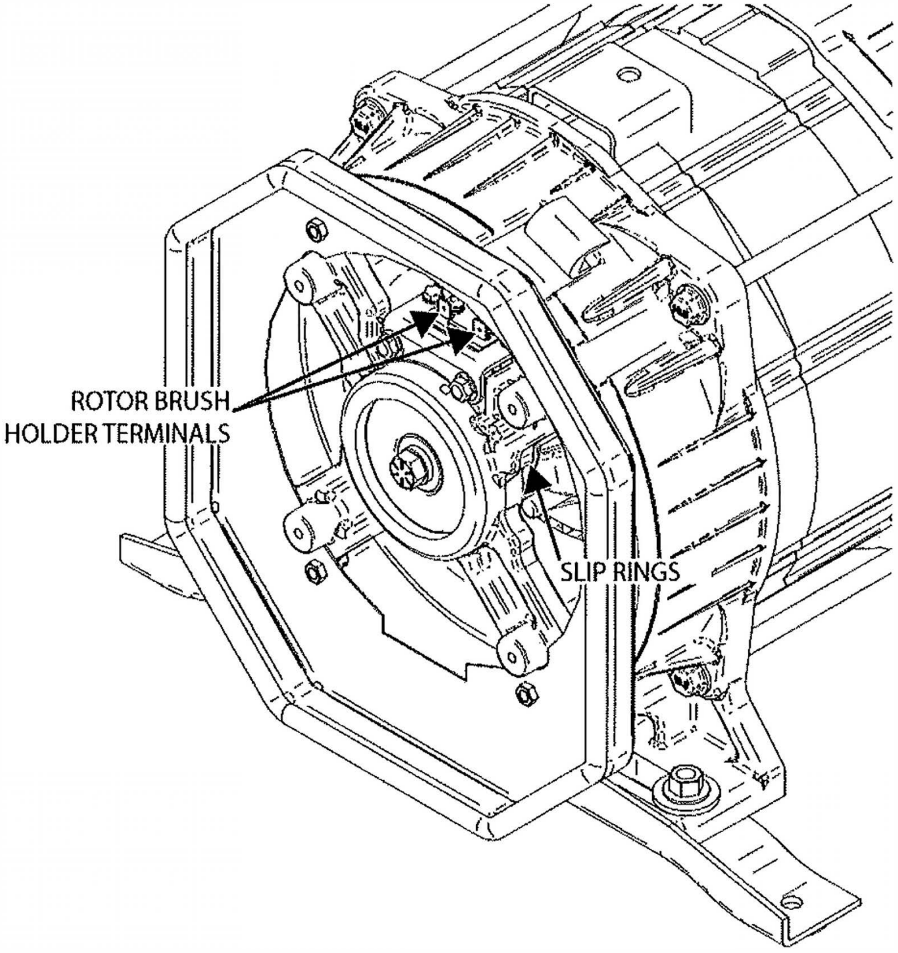
TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Using needle nose pliers, label and disconnect leads 200 and 219 from the rotor brush holder assembly. See **Figure F.2** . See Wiring Diagram. This will electrically isolate the rotor windings.
4. Using a volt/ohmmeter, check the rotor winding resistance across the slip rings. See Wiring Diagram. Normal resistance is approximately 25 ohms.
5. Using a volt/ohmmeter, measure the resistance to ground. Place one meter probe on either of the slip rings. Place the other probe on any good unpainted chassis ground. The resistance should be very high, at least 500,000 (500k) ohms.
6. If the test does not meet the resistance specifications, then the rotor may be faulty and should be replaced.
7. If this test meets the resistance specifications, continue testing using the **Rotor Resistance And Ground Test Procedure (Dynamic)** .
8. Perform the **Case Cover Replacement Procedure** .

Figure 1. Rotor brush holder terminals and slip ring locations

Rotor brush holder terminals and slip ring locations



ROTOR RESISTANCE AND GROUND TEST PROCEDURE (DYNAMIC) (ALSO REFERRED TO AS FL YING RESISTANCE TEST)

WARNING:

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

How to avoid:
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

- Analog Volt/Ohmmeter
- Wiring Diagram

Note: This test is best performed with a good quality analog type ohmmeter. Many digital meters will not provide stable or accurate resistance readings while the rotor is spinning.

TEST PROCEDURE

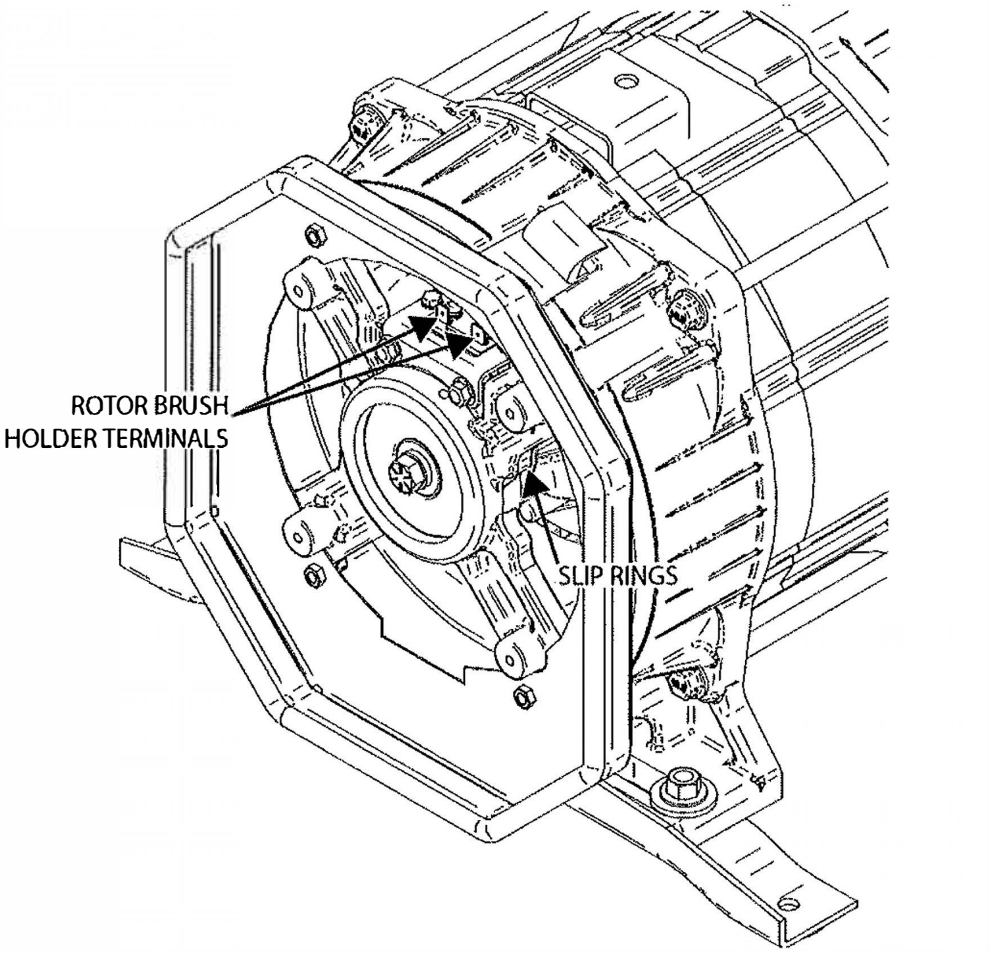
Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. This test requires that the brushes and slip rings are clean, in good condition and are properly seated.
4. Insulate the lead wires that had been disconnected from the brushes during the **Rotor Resistance And Ground Test Procedure (Static)** . Position and secure the leads so they cannot become damaged by the spinning rotor.
5. Securely attach the ohmmeter leads to the brush terminals. See **Figure F.3** . See Wiring Diagram. Use clips or terminals to attach the leads BEFORE starting the engine.
6. Start the engine and run it at high idle speed (3600 RPM). The resistance should read approximately 25* ohms at 77° F. (25° C.).
7. Shut off engine and move one of the ohmmeter leads to a good clean chassis ground.
8. Restart the engine and run it at high idle speed (3600 RPM). The resistance should be very high at least 500,000 (500k) 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, replace the rotor.
10. When testing is complete, connect the previously removed leads to the brush terminals.
11. Perform the **Case Cover Replacement Procedure** .

Note:

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

Figure 1. Rotor brush holder terminals and slip ring locations



OUTPUT RECTIFIER TEST PROCEDURE

WARNING:

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

How to avoid:
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 Output Rectifier is grounded or if there are any failed diode groups.

Note: This test will not be able to detect individual open diodes within a group.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the output rectifier. See **Figure F.4** . See Wiring Diagram.

Electrically isolate the three-phase input terminals of the output rectifier as follows:

4. Label, disconnect and electrically isolate leads W1, W2 and W3 from AC input terminals of the output rectifier. See **Figure F.4** . See Wiring Diagram.

Electrically isolate the DC output terminals of the rectifier:

5. Label, disconnect and electrically isolate the DC positive and DC negative terminals of the output rectifier from the chopper / control board bus bars. See **Figure F.4** . See Wiring Diagram.
6. Check for grounds by placing one of the ohmmeter probes on a clean, unpainted metal surface of the machine. Touch the other probe to each of the five rectifier terminals. See Wiring Diagram. The resistance to chassis ground from each terminal should be very high, 500,000 (500K) ohms minimum. If the resistance reading is less than specified, the rectifier is grounded and should be replaced.
7. If using diode checker or a multimeter with diode check functionality, read and understand the instructions that accompany your test equipment.
8. 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.
9. Perform the diode tests outlined in **Table F.1** . See **Figures F.4** and **F.5** . See Wiring Diagram.
10. When testing is complete connect all of the previously disconnected leads.
11. Perform the **Case Cover Replacement Procedure** .

Table 1.

Output rectifier diode drop tests

TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
AC TERMINAL 1	DC POSITIVE TERMINAL	0.3 VDC - 0.7 VDC
AC TERMINAL 2	DC POSITIVE TERMINAL	0.3 VDC - 0.7 VDC
AC TERMINAL 3	DC POSITIVE TERMINAL	0.3 VDC - 0.7 VDC
DC NEGATIVE TERMINAL	AC TERMINAL 1	0.3 VDC - 0.7 VDC
DC NEGATIVE TERMINAL	AC TERMINAL 2	0.3 VDC - 0.7 VDC
DC NEGATIVE TERMINAL	AC TERMINAL 3	0.3 VDC - 0.7 VDC
AC TERMINAL 1	DC NEGATIVE TERMINAL	OL
AC TERMINAL 2	DC NEGATIVE TERMINAL	OL
AC TERMINAL 3	DC NEGATIVE TERMINAL	OL
DC POSITIVE TERMINAL	AC TERMINAL 1	OL
DC POSITIVE TERMINAL	AC TERMINAL 2	OL
DC POSITIVE TERMINAL	AC TERMINAL 3	OL

Figure 1. Output rectifier AC input terminals location

Output rectifier AC input terminals location

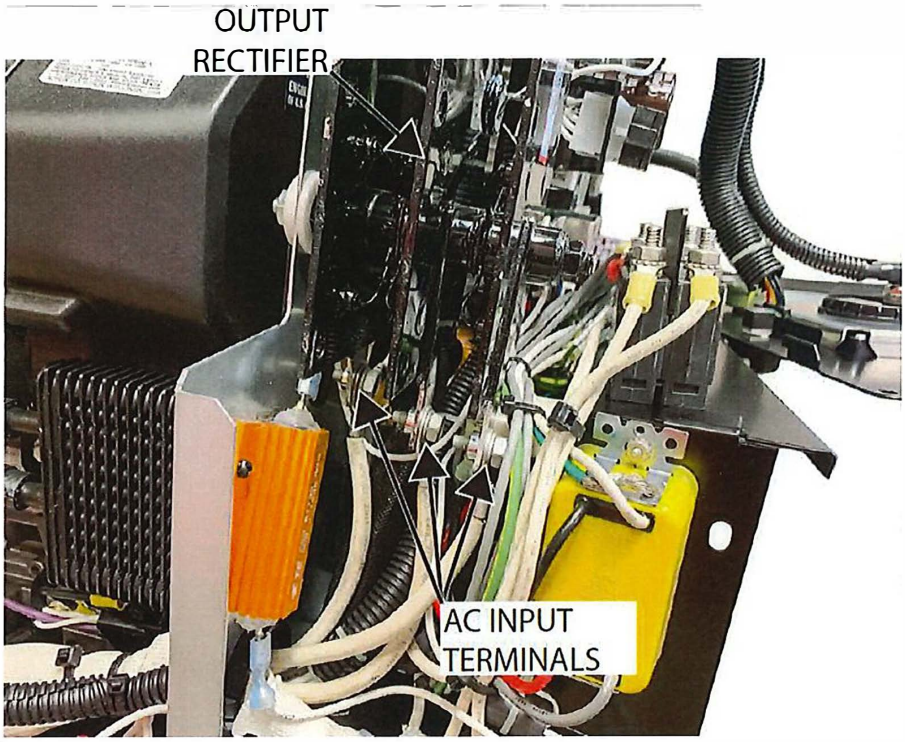
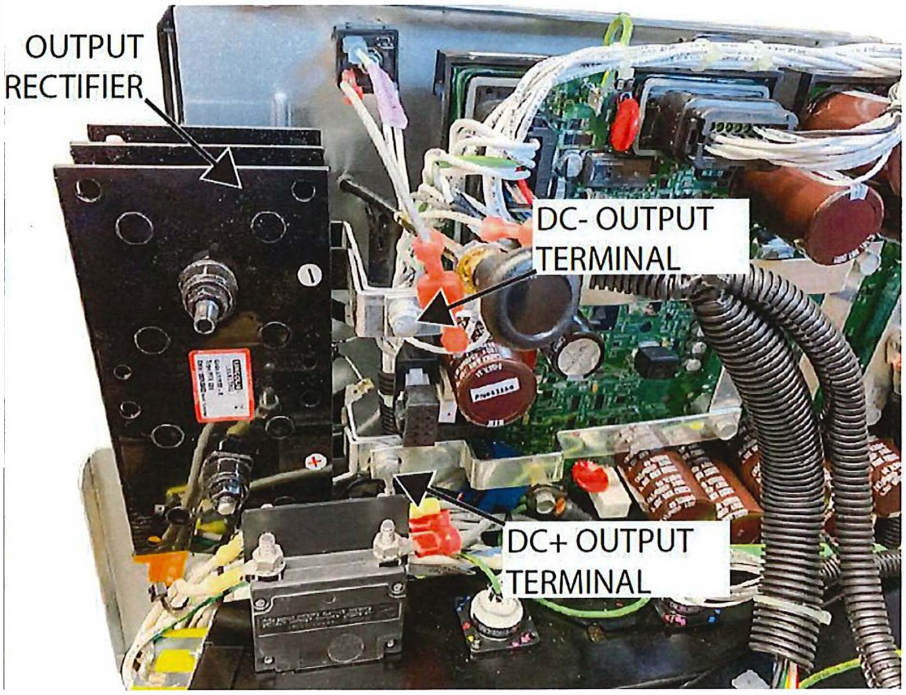


Figure 2. Output rectifier DC output terminals location

Output rectifier DC output terminals location



IDLER SOLENOID TEST PROCEDURE

WARNING:

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

How to avoid:
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 is functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- 12 - 14 VDC Power Supply
- Wiring Diagram

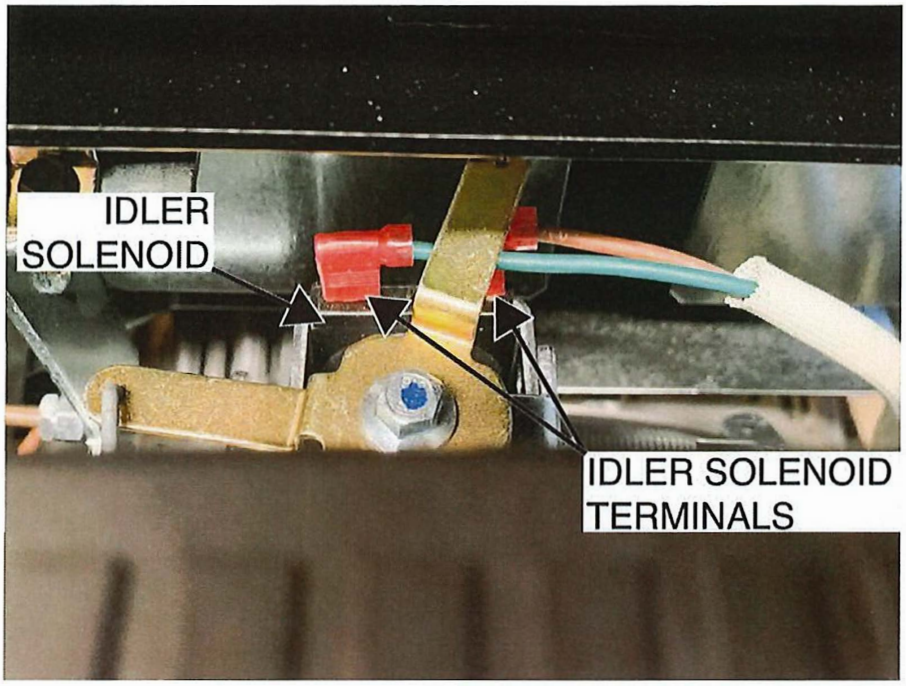
TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the idler solenoid, top middle of the welder beneath the lift frame. See **Figure F.6** . See Wiring Diagram.
4. Label and disconnect the brown and green leads from the idler solenoid. See **Figure F.6** . See Wiring Diagram.
5. Using a volt/ohmmeter, measure the resistance of the idler solenoid coil. See **Figure F.6** . See Wiring Diagram. Normal resistance is approximately 25 ohms.
6. Using a 12 - 14 VDC power supply, apply 12 - 14 VDC to the terminals of the idler solenoid. The solenoid should activate. Remove the voltage immediately.
7. If any of the tests fail, the idler solenoid may be faulty.
8. Connect the previously disconnected brown and green leads to the idler solenoid terminals. See Wiring Diagram.
9. Perform the **Case Cover Replacement Procedure** .

Figure 1. Idler solenoid terminals location

Idler solenoid terminals location



D3 AND D4 RECTIFIER TEST PROCEDURE

WARNING:

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

How to avoid:
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 D3 and D4 Rectifiers are functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the D3 and D4 rectifiers. The D3 rectifier is located on the upper left electronics compartment. The D4 rectifier is located behind the right sail panel. See **Figures F.7** and **F.8** . See Wiring Diagram.
4. Label and disconnect leads 7A, 9A, and 201A from the D3 rectifier. See **Figure F.9** .
5. Using a volt/ohmmeter, perform the forward diode drop tests outlined in **Table F.2** . See **Figure F.9** . See Wiring Diagram.
6. If any of the tests fail, the D3 rectifier may be faulty.
7. If faulty, perform the **D3 Rectifier Removal And Replacement Procedure** .
8. Connect leads 7A, 9A, and 201A to the D3 rectifier. See Wiring Diagram.
9. Label and disconnect leads 239 and 213 from the D4 rectifier. See **Figure F.9** . See Wiring Diagram.
10. Using a volt/ohmmeter, perform the forward diode drop tests outlined in **Table F.2** . See **Figure F.9** . See Wiring Diagram.
11. If any of the tests fail, the D4 rectifier may be faulty.
12. If faulty, perform the **D4 Rectifier Removal And Replacement Procedure** .
13. Connect leads 239 and 213 to the D2 rectifier. See Wiring Diagram.
14. Perform the **Case Cover Replacement Procedure** .

Table 1.

D3 and D4 rectifier forward diode drop tests

TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
TOP AC TERMINAL	POSITIVE TERMINAL	0.3 VDC - 0.7 VDC
BOTTOM AC TERMINAL	POSITIVE TERMINAL	0.3 VDC - 0.7 VDC
NEGATIVE TERMINAL	TOP AC TERMINAL	0.3 VDC - 0.7 VDC
NEGATIVE TERMINAL	BOTTOM AC TERMINAL	0.3 VDC - 0.7 VDC

Figure 1. D3 rectifier location

D3 rectifier location

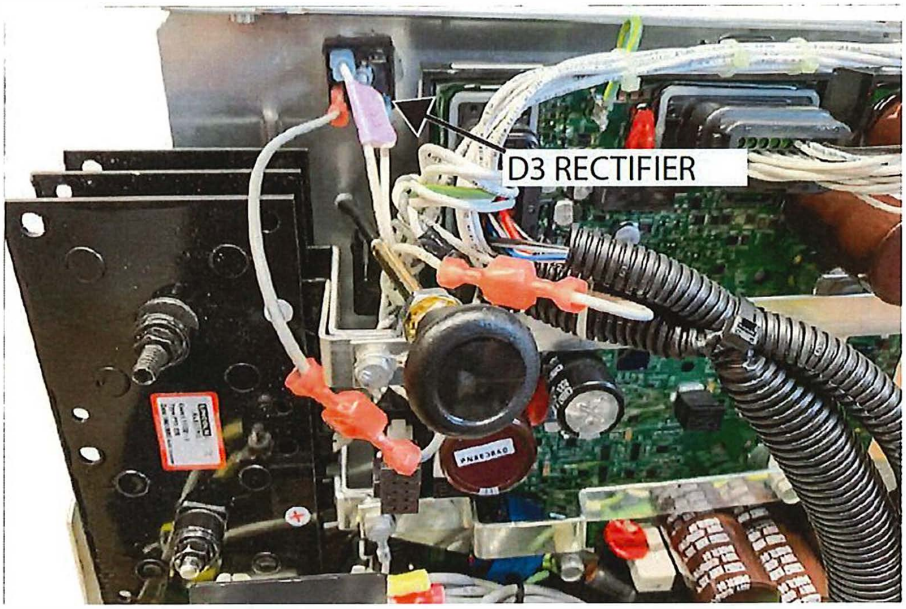


Figure 2. D4 rectifier location

D4 rectifier location

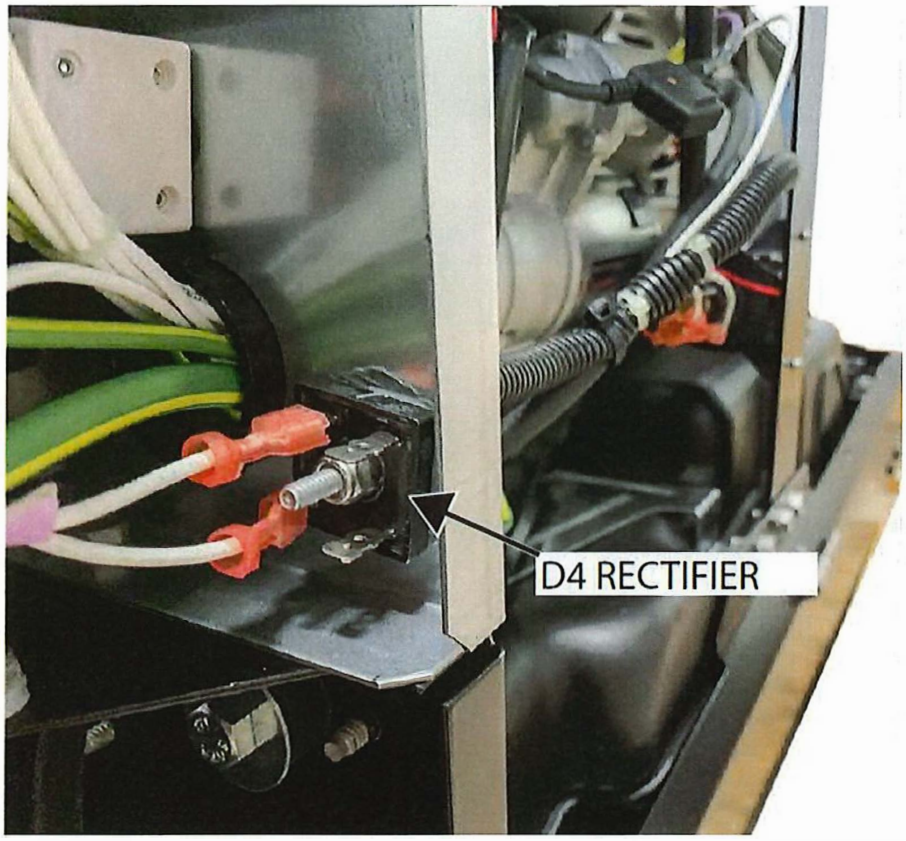
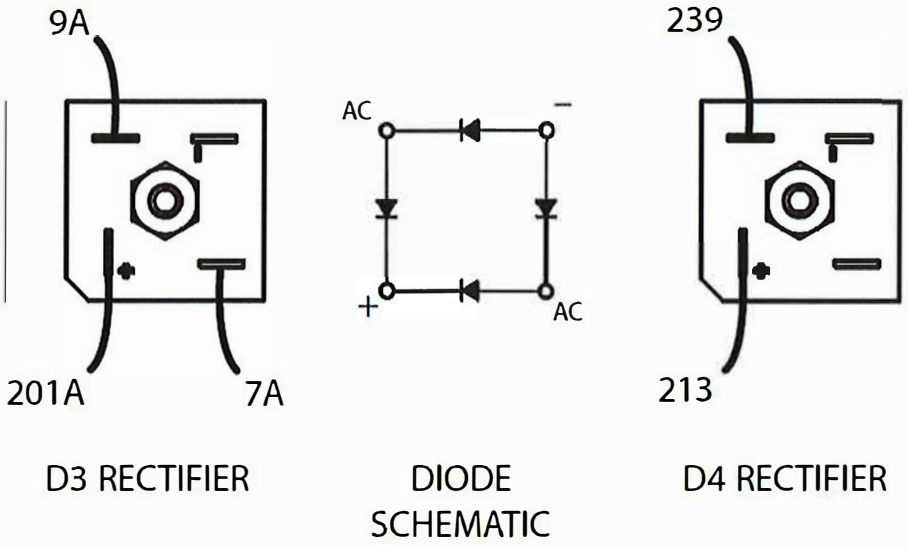


Figure 3. D3 and D4 rectifier schematic and lead locations

D3 and D4 rectifier schematic and lead locations



OUTPUT CHOKE TEST PROCEDURE

WARNING:

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

How to avoid:
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 Output Choke is open, shorted (turn to turn) or grounded.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the output choke assembly. The output choke is located on the firewall below the chopper / control board. See Wiring Diagram.
4. **Open:** No weld output. Using a volt/ohmmeter, test the resistance from the B3 / B6 choke lead to the negative output stud. See **Figures F.10** and **F.11** . See Wiring Diagram. Typical resistance is less than one ohm (B3 / B6 choke lead should be disconnected from the chopper / control board for testing).
5. **Turn To Turn Short:** Reduced inductance, arc instability, excessive heating of the choke. Check for any physical signs of arcing within the choke assembly. See Wiring Diagram.
6. **Choke Coil Grounded:** Reduced inductance, alternate weld current path. Electrically isolate the choke coil by disconnecting the lead from chopper board terminals B3 and B6 and the heavy choke leads from the negative output stud. Using a volt/ohmmeter, check the resistance from choke coil to chassis ground. Resistance should be at least 500,000 ohms. See Wiring Diagram.
7. If faulty, perform the **Output Choke Removal And Replacement Procedure** .
8. Perform the **Case Cover Replacement Procedure** .

Figure 1. B3 and B6 chopper / control board terminal locations

B3 and B6 chopper / control board terminal locations

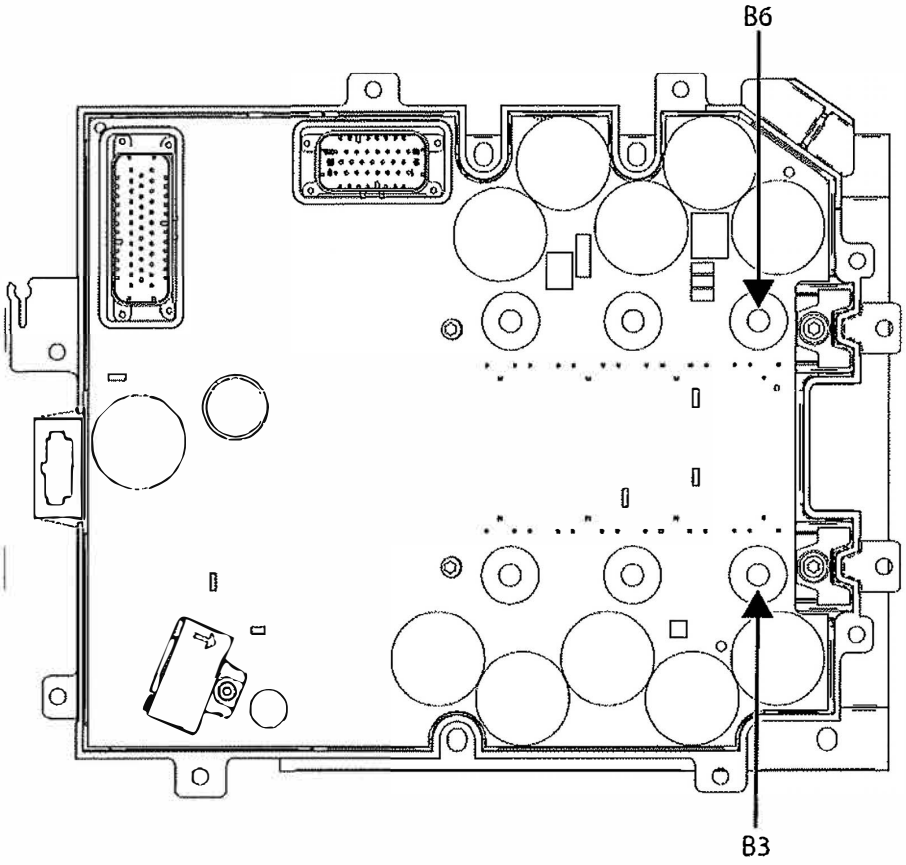
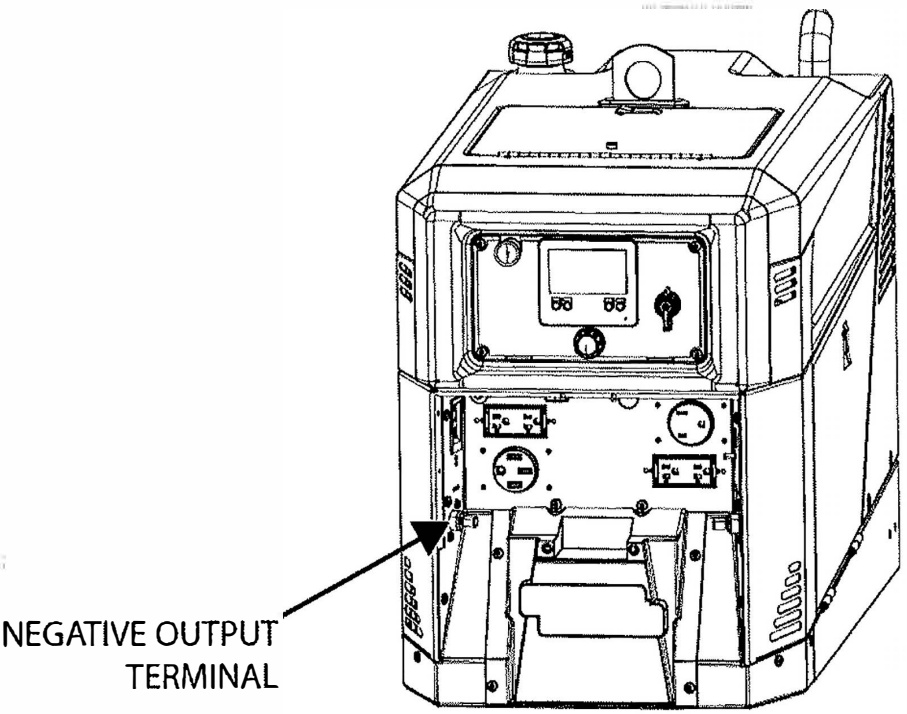


Figure 2. Negative output stud location

Negative output stud location



STATOR VOLTAGE TEST PROCEDURE

WARNING:

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

How to avoid:
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 Windings. It will only yield meaningful data if the engine high idle speed is correct (3600 RPM) and approximately 30 - 70 VDC is present across the Rotor slip rings.

Note: The slip ring voltage will most likely be correct if at least one of the AC output voltages is correct.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .

   Note: Voltage tests of the 120, 240 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 described below. 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 120 VAC receptacles as follow. Place the probes directly into either of the 120 VAC receptacles or connect to the red and green leads. See **Figure F.12** . See Wiring Diagram.
4. Start the engine and run it at high idle (3600 RPM).
5. Using a volt/ohmmeter, check the AC voltage reading. It should read between 120 and 135* VAC.

   Note: *These values are maximum for a cold machine.
6. If the 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 240 VAC auxiliary winding:
7. Connect the meter probes to leads 6A and 3A where they connect to the 240 VAC receptacle or insert the probes into the 240 VAC connection slots in the front of the 240 VAC receptacle. See **Figure F.12** . See Wiring Diagram.

8. Start the engine and run at high idle (3600 RPM).
9. Using a volt/ohmmeter, check the AC voltage reading. It should read between 236 and 252 VAC.
10. If the 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 120/240 VAC auxiliary winding:

11. Connect the meter probes to leads 6D and 3D where they connect to the 120/240 VAC receptacle or insert the probes into the 120/240 VAC connection slots in the front of the receptacle. See **Figure F.12** . See Wiring Diagram.
12. Start the engine and run at high idle (3600 RPM).
13. The AC voltage reading should be between 236 and 252 VAC.
14. If the voltage readings are not within specifications, check for tripped or defective circuit breaker, faulty connections or broken wires between the test points and the stator windings.

To test the 42 VAC wire feeding winding:

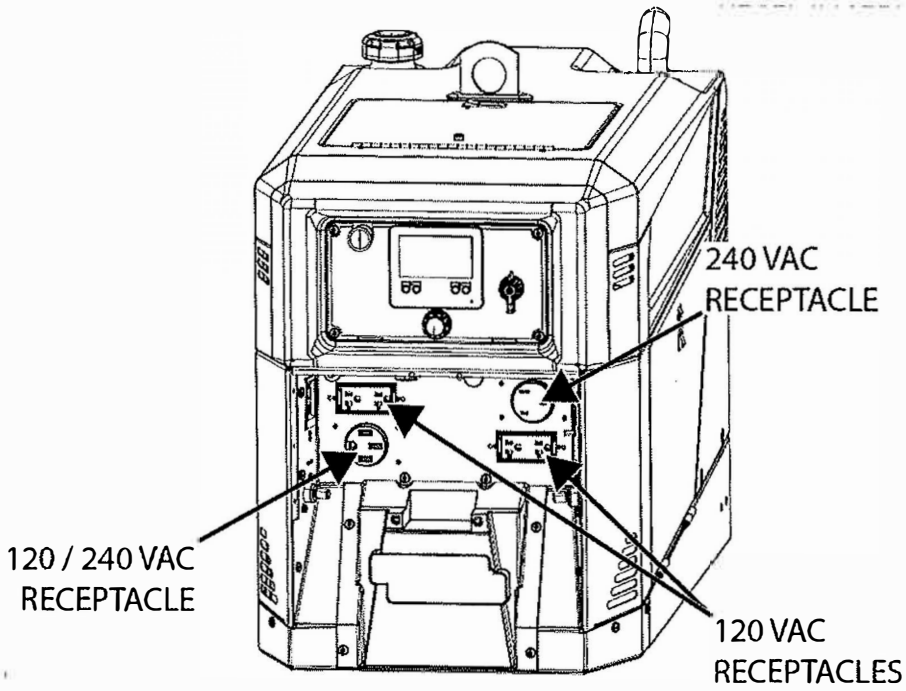
15. Connect the volt/ohmmeter probes to leads 5 and 8. See Wiring Diagram.
16. Start the engine and run at high idle (3600 RPM).
17. The AC voltage reading should be between 40 and 50 VAC.
18. If the voltage readings are not within the specified limits, check for tripped or defective circuit breakers, 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:

19. Locate weld winding leads W1, W2 and W3 where they connect to the three-phase output bridge rectifier. See Wiring Diagram.
20. Start the engine and run at high idle (3600 RPM).
21. Using a volt/ohmmeter, measure the voltage from leads W1 to W2, W2 to W3 and W1 to W3. See Wiring Diagram. Voltage should be about 55 - 75 VAC.
22. If the 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 is defective and should be replaced.
23. Perform the **Case Cover Replacement Procedure** .

Figure 1. 120 VAC, 240 VAC and 120 / 240 VAC receptacle locations

120 VAC, 240 VAC and 120 / 240 VAC receptacle locations



STATOR SHORT CIRCUIT AND GROUND TEST PROCEDURE

WARNING:

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

How to avoid:
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 undesirable electrical connections between the Stator Windings and Chassis Ground or between individual Windings within the Stator. This test should be performed if flashing voltage is present at the Rotor Slip Rings, Rotor Resistance, Bridge Rectifier, output rectifier 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

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

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Unplug anything that may be connected to the auxiliary receptacles.
4. Using a 7/16" nutdriver, remove the nut and washer securing lead 5 to the neutral stud. Label, disconnect and electrically isolate lead 5 from the neutral stud. See **Figure F.13** . See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the nut and washer securing leads 6 and 3 to circuit breaker (CB1). Label, disconnect and electrically isolate leads 6 and 3 from circuit breaker (CB1). See **Figure F.13** . See Wiring Diagram.
6. Label and disconnect leads 7A and 9A from the D3 rectifier. See **Figure F.13** . See Wiring Diagram.
7. Label and disconnect lead 8 from the quick connect terminal. See Wiring Diagram.
8. Using a volt/ohmmeter, check for continuity between the following points; resistance should be low.
    A. Leads 6 and 9, 9 and 8, 8 and 5, 5 and 7, 7 and 3. See Wiring Diagram. This will check the auxiliary winding.
    B. Leads W1 and W2, W2 and W3, W3 and W1. See Wiring Diagram. This will check the weld windings.
9. Using a volt/ohmmeter, check the resistance between each of the following points; resistance should read very high, 500,000 (500K) ohms minimum.
    A. Chassis ground and lead 6 (disconnected from circuit breaker CB1). This checks for a connection between chassis ground and the auxiliary winding. See Wiring Diagram.

B. Chassis ground and leads W1, W2 or W3 (at the AC input terminals of the output rectifier). This checks for a connection between the chassis ground and the weld winding. See **Figure F.13** . See Wiring Diagram.

C. Lead 5 and leads W1, W2 or W3 (at the AC input terminals of the output rectifier). This checks for a connection between the auxiliary winding and the weld winding. See **Figure F.13** . See Wiring Diagram.

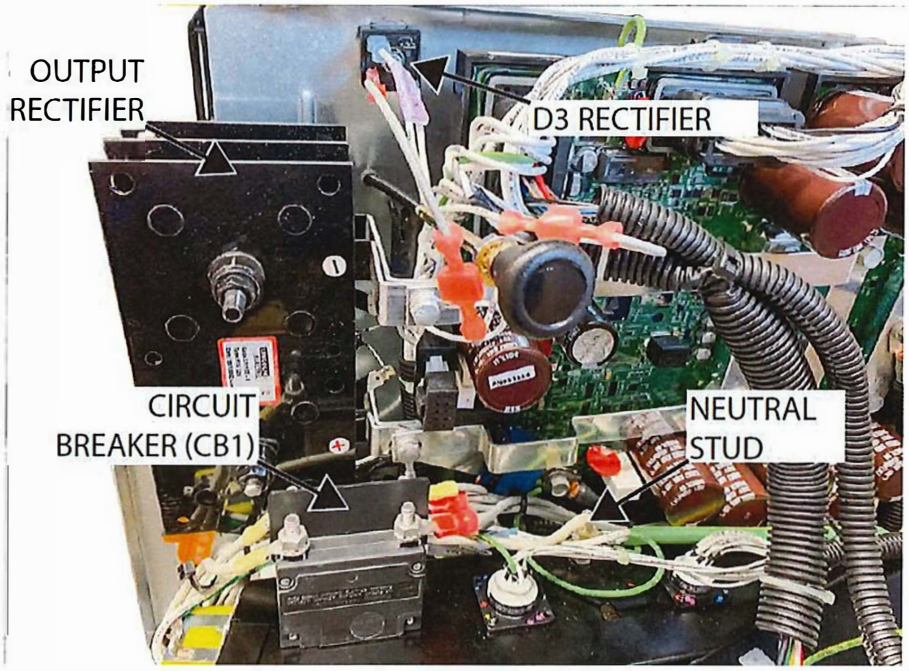
If any of the above readings is less than 500,000 (500K) ohms, check for damaged, contaminated or shorted wiring or components between the test points and the stator winding. If necessary, disconnect and isolate the stator leads as close to the stator winding as possible. See Wiring Diagram. If the low 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 output rectifier 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 output rectifier be replaced with known good components before replacing the stator.

10. When testing is complete connect all preciously disconnected leads and plugs.
11. Perform the **Case Cover Replacement Procedure** .

Figure 1. Neutral stud, circuit breaker (CB1), D3 rectifier and output rectifier locations

Neutral stud, circuit breaker (CB1), D3 rectifier and output rectifier locations



REMOTE CONTROL RECEPTACLE TEST PROCEDURE

WARNING:

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

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

TEST DESCRIPTION

This test will help determine if 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

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the remote receptacle, behind the output panel doors. See **Figure F.14** . See Wiring Diagram.
4. Make sure that there are no devices of any kind plugged into the remote receptacle.
5. Label and disconnect plug J1 from the chopper / control board. See **Figure F.15** . See Wiring Diagram. Examine the plug and the receptacle on the chopper / control board for dirt, corrosion, damaged or out-of-position pins. Repair or replace any damaged components. Position plug J1 so it cannot make electrical contact with any other conductor or chassis ground.
6. Using a volt/ohmmeter, perform the continuity tests outlined in **Table F.3** . See **Figures F.15** , **F.16** and **F.17** . See Wiring Diagram. Be very careful not to damage or spread any of the connection pins in the remote receptacle.
7. Using a volt/ohmmeter, perform the resistance tests outlined in **Table F.4** . See **Figures F.16** and **F.17** . See Wiring Diagram. Be very careful not to damage or spread any of the connection pins in the remote receptacle.
8. If the results do not meet the values specified, check for damage, dirt or moisture contamination in the remote receptacle and plug J1. Check for damaged or grounded wiring.
9. If the resistance values are found to be too low, due to contaminated electrical components in the remote receptacle harness assembly. Try removing the contamination and drying the components completely. If the resistance values are still too low, replace the remote receptacle harness assembly.
10. Perform the **Case Cover Replacement Procedure** .

Table 1.

Remote receptacle continuity tests

TEST POINT	TEST POINT	EXPECTED READING
PIN A	PLUG J1 PIN 1	LOW RESISTANCE
PIN B	PLUG J1 PIN 2	LOW RESISTANCE
PIN C	PLUG J1 PIN 3	LOW RESISTANCE
PIN D	PLUG J1 PIN 4	LOW RESISTANCE
PIN E	PLUG J1 PIN 12	LOW RESISTANCE
PIN F	GROUND	LOW RESISTANCE

Table 2.

Remote receptacle resistance tests

TEST POINT	TEST POINT	EXPECTED READING
PIN A	PIN B	500,000 (500K) OHMS OR HIGHER
PIN A	PIN C	500,000 (500K) OHMS OR HIGHER
PIN A	PIN D	500,000 (500K) OHMS OR HIGHER
PIN A	PIN E	500,000 (500K) OHMS OR HIGHER
PIN A	PIN F	500,000 (500K) OHMS OR HIGHER
PIN B	PIN C	500,000 (500K) OHMS OR HIGHER
PIN B	PIN D	500,000 (500K) OHMS OR HIGHER
PIN B	PIN E	500,000 (500K) OHMS OR HIGHER
PIN B	PIN F	500,000 (500K) OHMS OR HIGHER
PIN C	PIN D	500,000 (500K) OHMS OR HIGHER
PIN C	PIN E	500,000 (500K) OHMS OR HIGHER
PIN C	PIN F	500,000 (500K) OHMS OR HIGHER
PIN D	PIN E	500,000 (500K) OHMS OR HIGHER

PIN D	PIN F	500,000 (500K) OHMS OR HIGHER
PIN E	PIN F	500,000 (500K) OHMS OR HIGHER

Figure 1. Remote receptacle location

Remote receptacle location

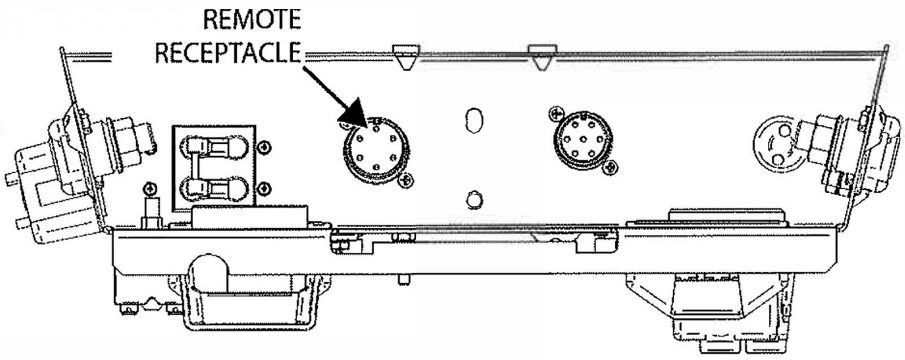


Figure 2. Chopper / control board plug J1 locations

Chopper / control board plug J1 locations

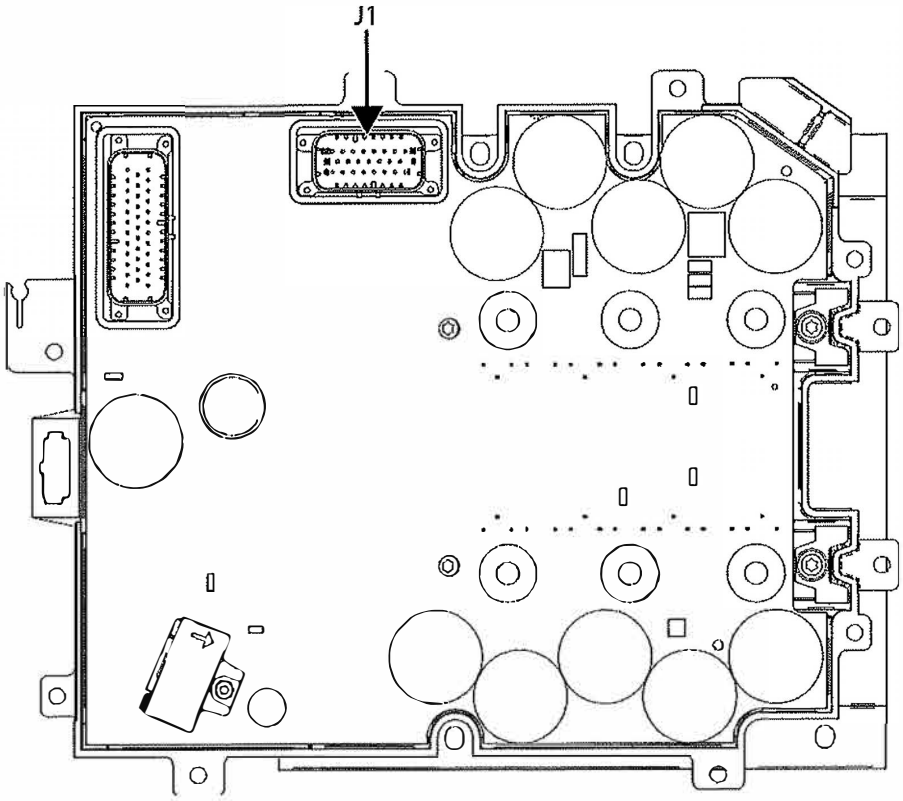


Figure 3. Remote receptacle pin locations

Remote receptacle pin locations

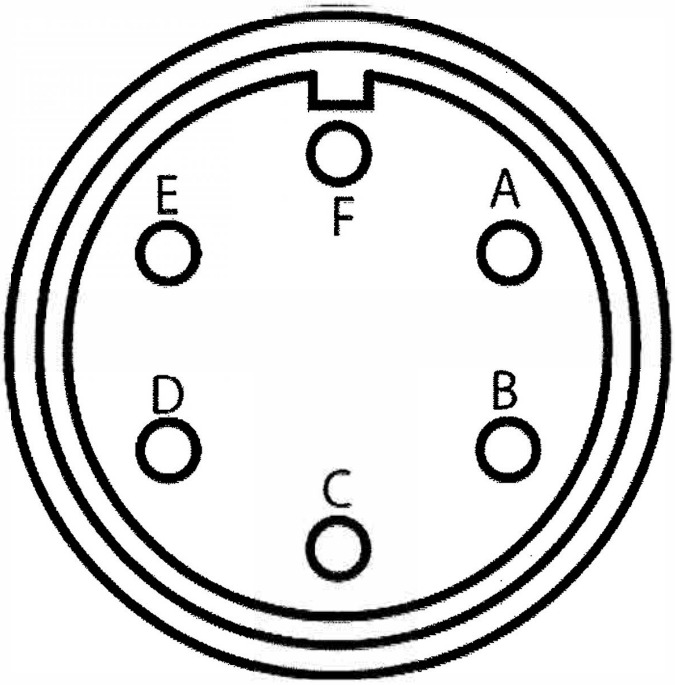
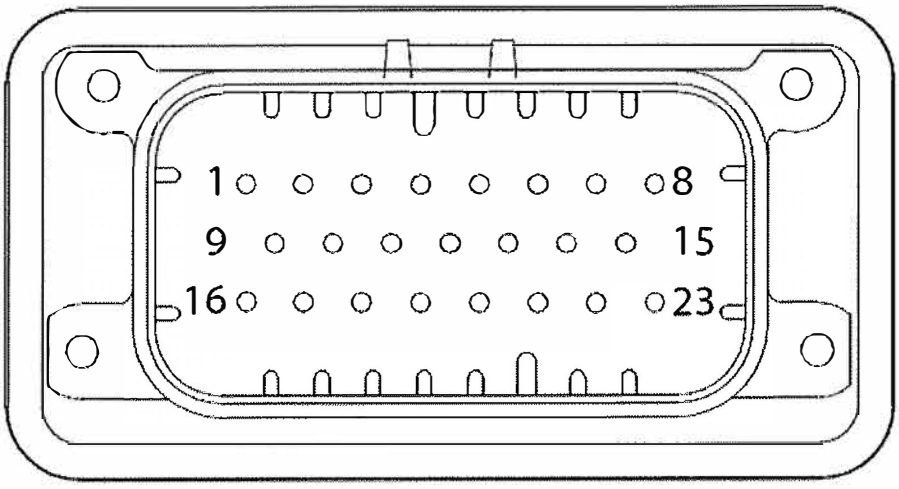


Figure 4. Plug J1 pinout

Plug J1 pinout



J1

SPOOL GUN RECEPTACLE TEST PROCEDURE

WARNING:

Type of Hazard:
Service and repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.
How to avoid:
If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if there is a problem with the Spool Gun Receptacle Control wiring, relating to electrical tracking between other Control Conductors, Power Conductors or ground.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the spool gun receptacle, behind the output panel doors. See **Figure F.18** . See Wiring Diagram.
4. Make sure that there is no device plugged into the spool gun receptacle.
5. Label and disconnect plug J1 from the chopper / control board. See **Figure F.19** . See Wiring Diagram. Examine the plug and the receptacle on the chopper / control board for dirt, corrosion, damaged or out-of-position pins. Repair or replace any damaged components. Position plug J1 so it cannot make electrical contact with any other conductor or chassis ground.
6. Using a volt/ohmmeter, perform the continuity tests outlined in **Table F.5** . See **Figures F.19** , **F.20** and **F.21** . See Wiring Diagram. Be very careful not to damage or spread any of the connection pins in the remote receptacle.
7. Using a volt/ohmmeter, perform the resistance tests outlined in **Table F.6** . See **Figures F.20** and **F.21** . See Wiring Diagram. Be very careful not to damage or spread any of the connection pins in the spool gun receptacle.
8. If the results do not meet the values specified, check for damage, dirt or moisture contamination in the spool gun receptacle and plug J1. Check for damaged or grounded wiring.
9. If the resistance values are found to be too low, due to contaminated electrical components in the spool gun receptacle harness assembly. Try removing the contamination and drying the components completely. If the resistance values are still too low, replace the spool gun receptacle harness assembly.
10. Perform the **Case Cover Replacement Procedure** .

Table 1.

Spool gun receptacle continuity tests

TEST POINT	TEST POINT	EXPECTED READING
PIN A	PLUG J1 PIN 6	LOW RESISTANCE
PIN B	PLUG J1 PIN 7	LOW RESISTANCE
PIN C	PLUG J1 PIN 8	LOW RESISTANCE
PIN D	PLUG J1 PIN 9	LOW RESISTANCE
PIN E	PLUG J1 PIN 11	LOW RESISTANCE
PIN F	PLUG J1 PIN 13	LOW RESISTANCE
PIN G	PLUG J1 PIN 10	LOW RESISTANCE

Table 2.

Spool gun receptacle resistance tests

TEST POINT	TEST POINT	EXPECTED READING
PIN A	PIN B	500,000 (500K) OHMS OR HIGHER
PIN A	PIN C	500,000 (500K) OHMS OR HIGHER
PIN A	PIN D	500,000 (500K) OHMS OR HIGHER
PIN A	PIN E	500,000 (500K) OHMS OR HIGHER
PIN A	PIN F	500,000 (500K) OHMS OR HIGHER
PIN A	PIN G	500,000 (500K) OHMS OR HIGHER
PIN B	PIN C	500,000 (500K) OHMS OR HIGHER
PIN B	PIN D	500,000 (500K) OHMS OR HIGHER
PIN B	PIN E	500,000 (500K) OHMS OR HIGHER
PIN B	PIN F	500,000 (500K) OHMS OR HIGHER
PIN B	PIN G	500,000 (500K) OHMS OR HIGHER
PIN C	PIN D	500,000 (500K) OHMS OR HIGHER

PIN C	PIN E	500,000 (500K) OHMS OR HIGHER
PIN C	PIN F	500,000 (500K) OHMS OR HIGHER
PIN C	PIN G	500,000 (500K) OHMS OR HIGHER
PIN D	PIN E	500,000 (500K) OHMS OR HIGHER
PIN D	PIN F	500,000 (500K) OHMS OR HIGHER
PIN D	PIN G	500,000 (500K) OHMS OR HIGHER
PIN E	PIN F	500,000 (500K) OHMS OR HIGHER
PIN E	PIN G	500,000 (500K) OHMS OR HIGHER
PIN F	PIN G	500,000 (500K) OHMS OR HIGHER

Figure 1. Spool gun receptacle location

Spool gun receptacle location

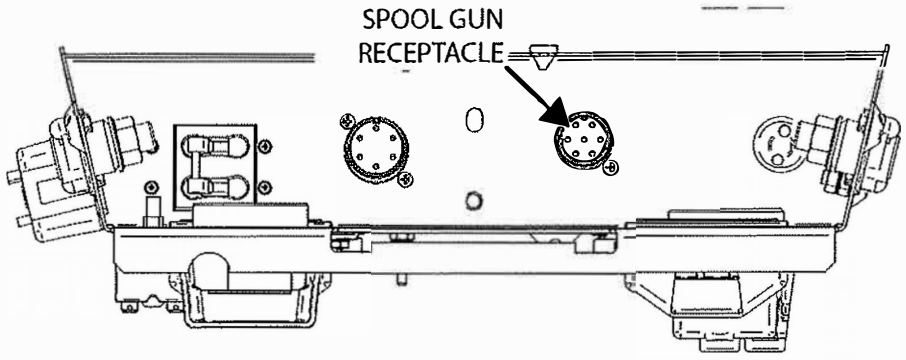


Figure 2. Chopper / control board plug J1 location

Chopper / control board plug J1 location

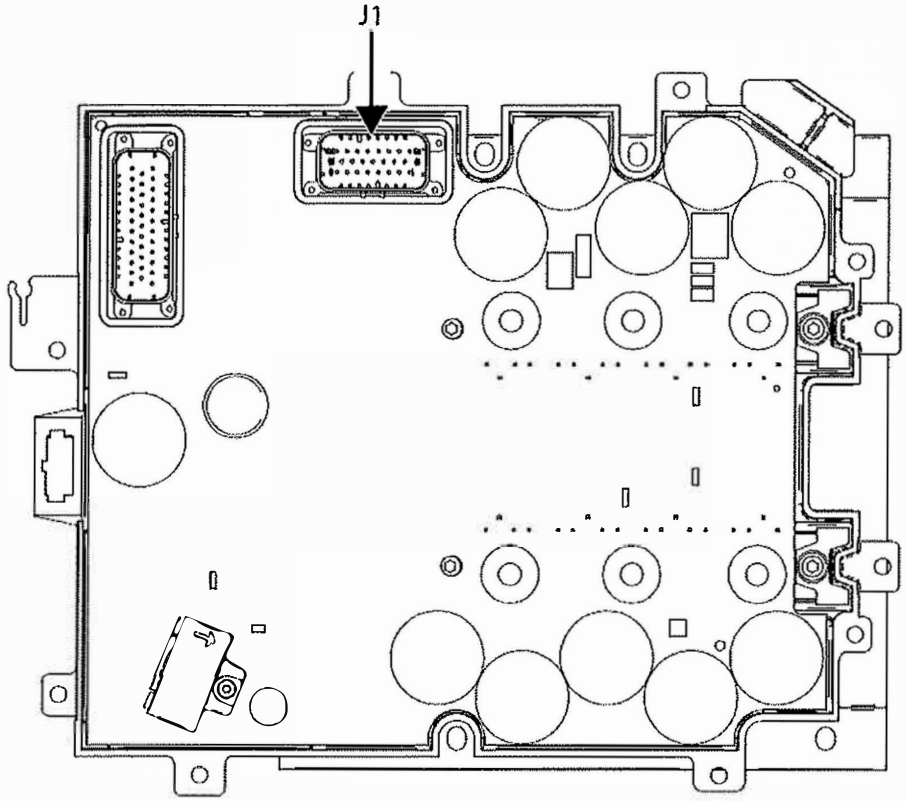


Figure 3. Spool gun pin locations

Spool gun pin locations

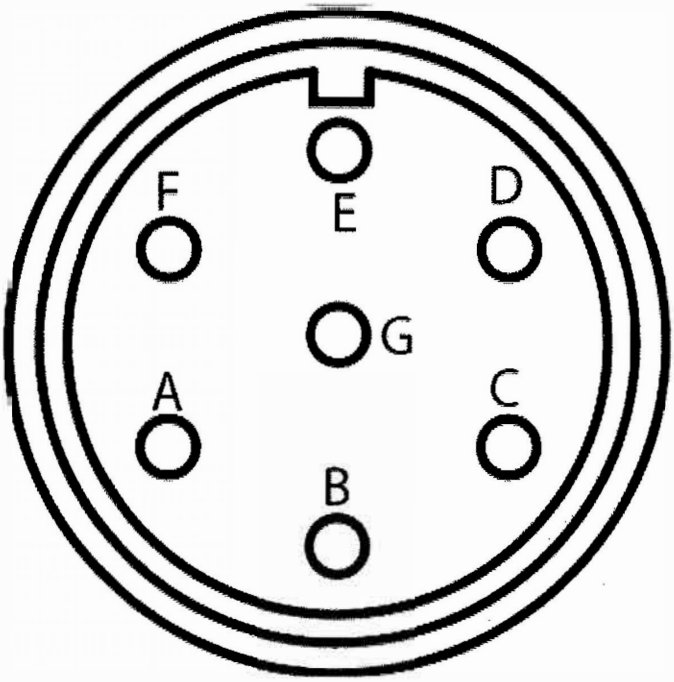
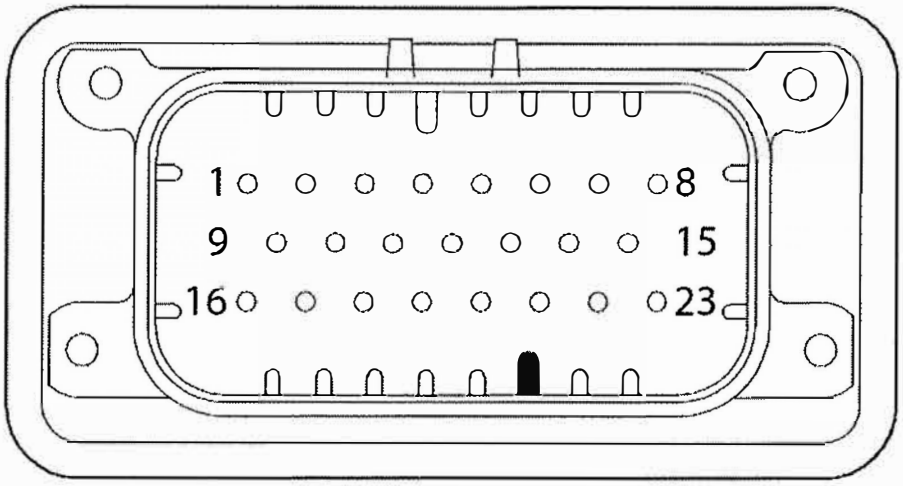


Figure 4. Plug J1 pinout

Plug J1 pinout



J1

OPEN CIRCUIT VOLTAGE (OCV) TEST PROCEDURE

WARNING:

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

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

TEST DESCRIPTION

This test will help determine if the unit is producing the correct OCV (Open Circuit Voltage).

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the positive and negative output terminals. See **Figure F.22** . See Wiring Diagram.
4. Start the engine and let it run and stabilize at high idle RPM.
5. Using a volt/ohmmeter, perform the tests outlined in **Table F.7** . See **Figure F.22** . See Wiring Diagram.
6. Turn off the engine on the Ranger 330MPX, when testing is complete.
7. If the correct voltage is being supplied to the chopper / control board (via the output rectifier) and one or more of the OCV values in incorrect, perform the **LCD Display Test Procedure** and the **Chopper / Control Board Test Procedure** .
8. Perform the **Case Cover Replacement Procedure** .

Table 1.

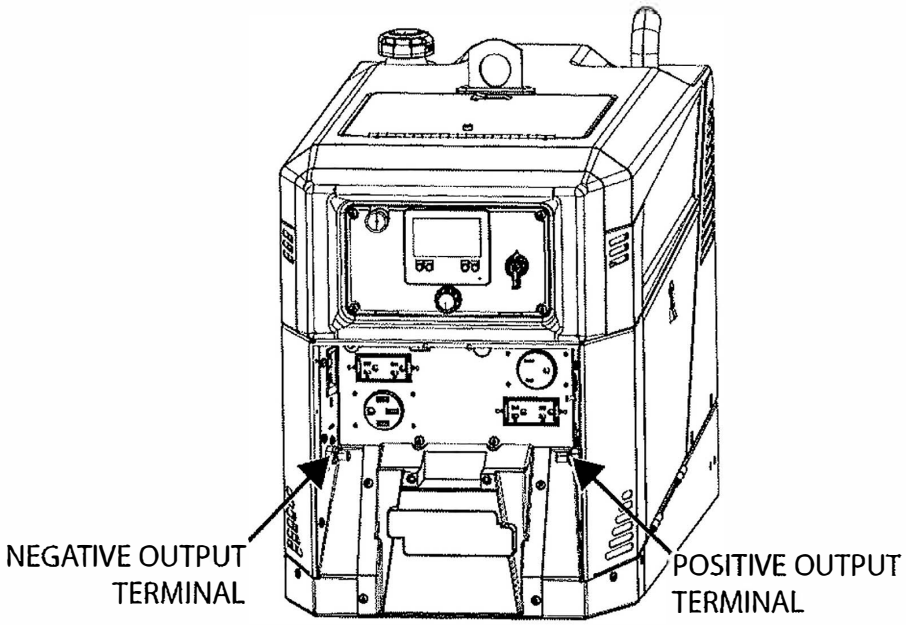
Open circuit voltage (OCV) tests

MODE	EXPECTED READING
GMAW	57.5 VDC
FCAW	57.5 VDC

STICK	57.5 VDC
TIG	14 VDC
PIPE	14 VDC
GOUGE	14 VDC

Figure 1. Output terminal locations

Output terminal locations



FLASHING VOLTAGE TEST PROCEDURE (ENGINE NOT RUNNING)

WARNING:

Type of Hazard:
Service and repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.
How to avoid:
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 not running.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

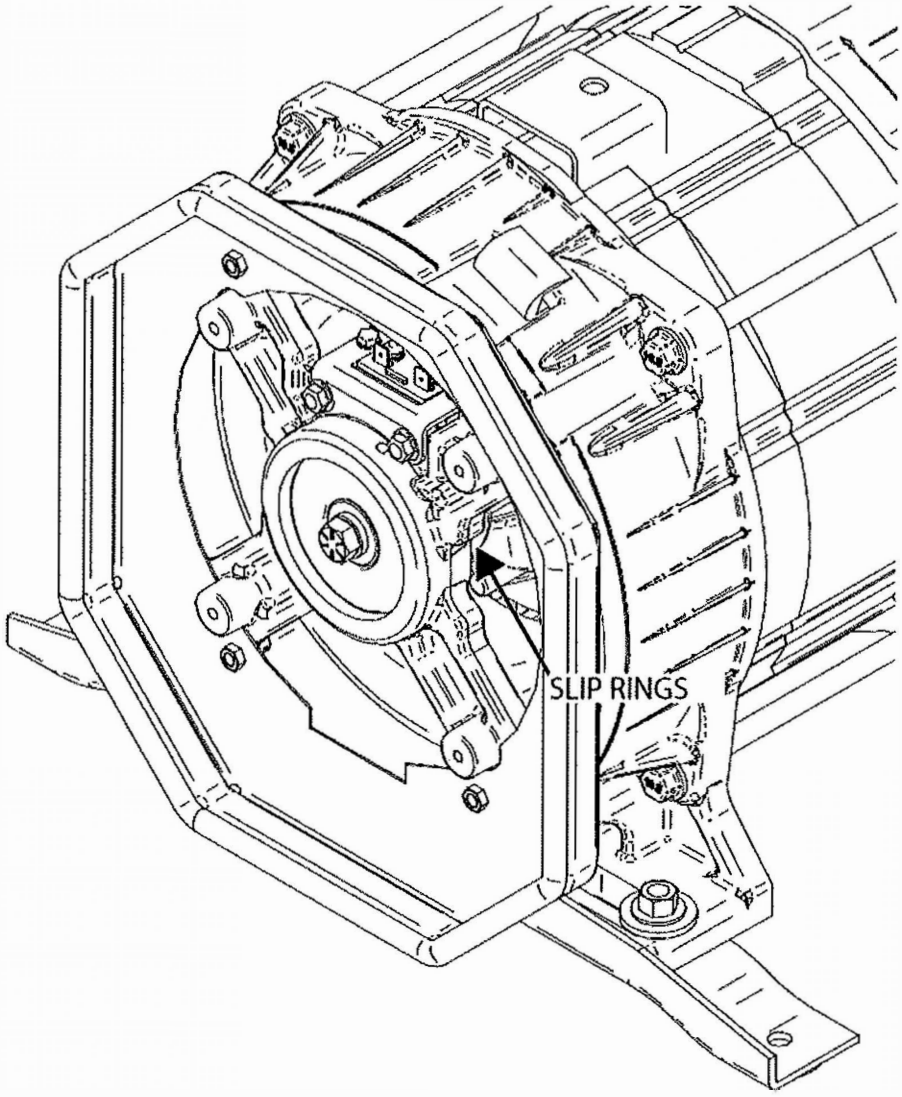
TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Make sure that the battery is fully charged and in good condition and the battery connections are clean and tight.
4. Place the engine control switch in the auto idle position. See Wiring Diagram.
5. Using a volt/ohmmeter, measure the voltage at the slip rings. See **Figure F.23** . See Wiring Diagram. Voltage should read approximately 6 VDC.
6. Set the engine control switch to the stop position.
7. If the meter reads normal voltage of 6 VDC, this test is complete.
8. If the meter reading indicates battery voltage of 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)** and **Rotor Resistance And Ground Test Procedure (Dynamic)** .
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 rotor winding.
11. Perform the **Rotor Resistance And Ground Test Procedure (Static)** and **Rotor Resistance And Ground Test Procedure (Dynamic)** .
12. Place the engine control switch into the stop position.
13. Perform the **Case Cover Replacement Procedure** .

Figure 1. Slip rings location

Slip rings location



BATTERY CHARGING CIRCUIT TEST PROCEDURE

WARNING:

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

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Using a volt/ohmmeter, measure the voltage at the battery terminals. See **Figure F.24** . See Wiring Diagram. The voltage should read approximately 12 VDC.
4. Locate the engine alternator terminals. See **Figure F.25** . See Wiring Diagram.
5. Using a volt/ohmmeter, measure the voltage from ground to the B+ terminal. See **Figure F.25** . See Wiring Diagram. Normal voltage is approximately 12.5 VDC (battery voltage).
6. Start the engine and let it run and stabilize at high idle RPM.
7. Using a volt/ohmmeter, measure the voltage from ground to the B+ terminal. See **Figure F.25** . See Wiring Diagram. Normal voltage is approximately 14 VDC.
8. Using a volt/ohmmeter, measure the voltage at the battery terminals. See **Figure F.24** . See Wiring Diagram. The voltage should read approximately 14 VDC.
9. Turn off the engine on the Ranger 330MPX.
10. If the battery voltage is not present at the alternator terminals, check the 30 amp fuse and all wiring and connections between the battery and the alternator. See Wiring Diagram.
11. If the battery is not producing at least 12 VDC, the battery may be faulty. If faulty charge or replace.
12. If the engine alternator is not properly charging the battery, the alternator may be faulty.
13. Perform the **Case Cover Replacement Procedure** .

Figure 1. Battery terminal location

Battery terminal location

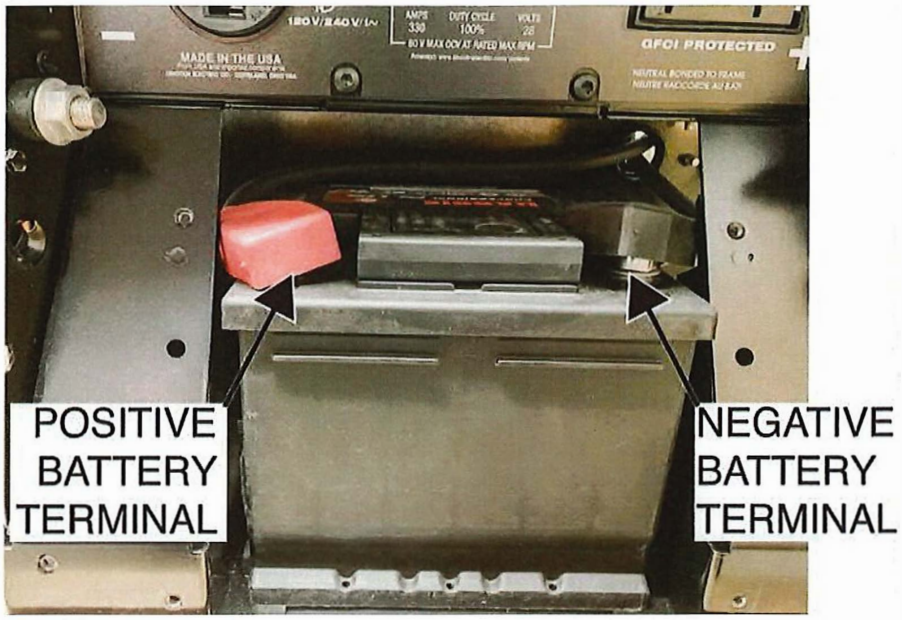
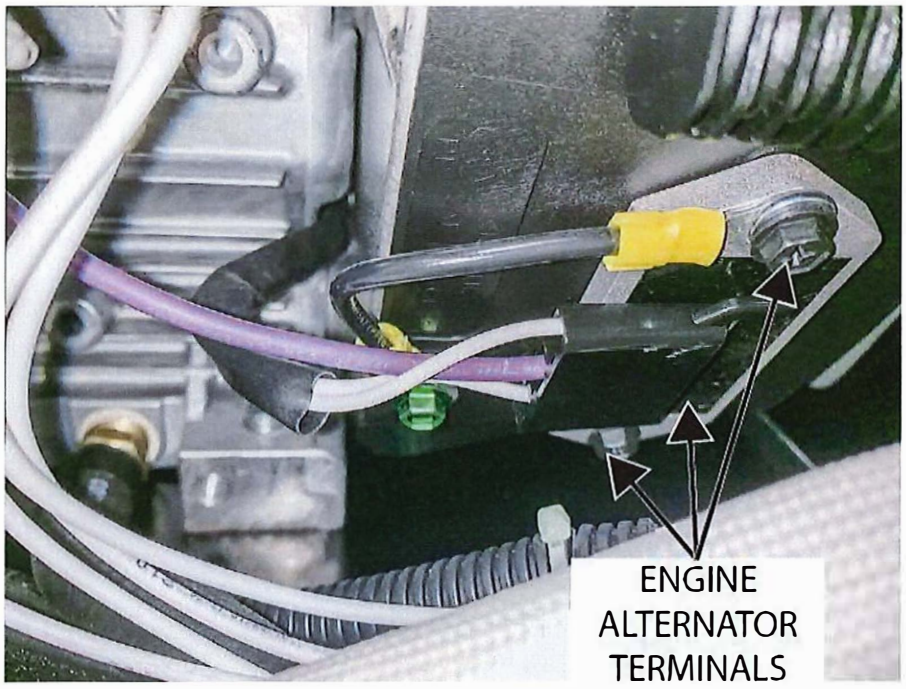


Figure 2. Engine alternator terminal locations

Engine alternator terminal locations



ELECTRIC FUEL PUMP TEST PROCEDURE

WARNING:

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

How to avoid:
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 Electric Fuel Pump is functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the electric fuel pump. See **Figure F.26** . See Wiring Diagram.
4. Label and disconnect the red and black leads from the quick connect terminals. See Wiring Diagram.
5. Using a volt/ohmmeter, measure the resistance from the red lead to the black lead. See Wiring Diagram. Normal resistance is approximately 4 - 7 ohms.
6. If the resistance is significantly higher or lower the electric fuel pump may be faulty.
7. Connect the red and black leads to the quick connect terminals. See Wiring Diagram.
8. Attach the meter probes to the red and black leads of the electric fuel pump. See Wiring Diagram.
9. Place the engine control switch in to the auto idle position. See **Figure F.27** .
10. Using a volt/ohmmeter, measure the voltage at the red and black leads connected to the electric fuel pump. See Wiring Diagram. Normal reading is approximately 12.5 VDC.
11. Start the engine and let it run and stabilize at high idle RPM.
12. Using a volt/ohmmeter, measure the voltage at the red and black leads connected to the electric fuel pump. See Wiring Diagram. Normal reading is approximately 12.5 VDC.
13. If the voltage is present and the electric fuel pump does not activate, it may be faulty.
14. If faulty, perform the **Electric Fuel Pump Removal And Replacement Procedure** .
15. Perform the **Case Cover Replacement Procedure** .

Figure 1. Electric fuel pump and quick connect terminals location

Electric fuel pump and quick connect terminals location

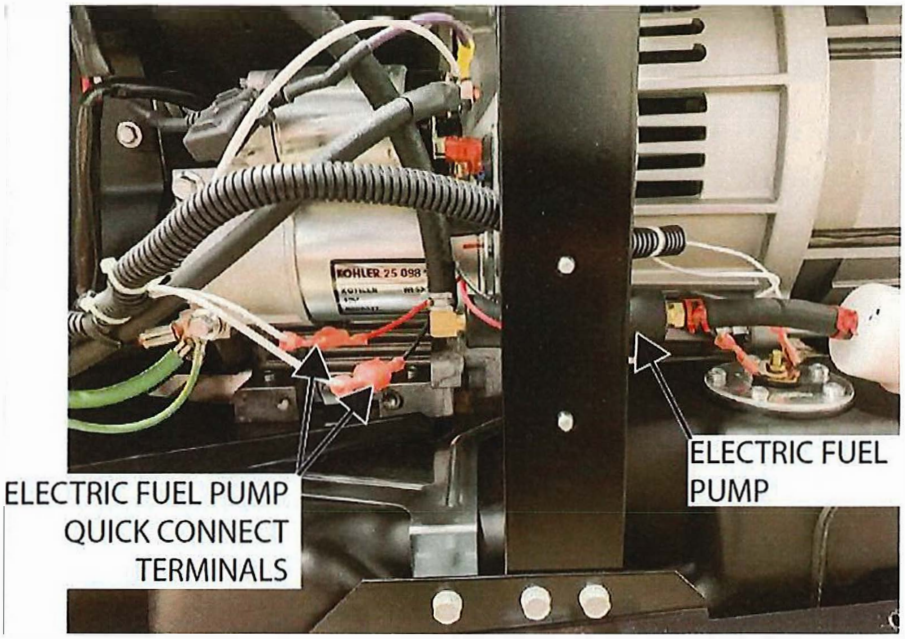
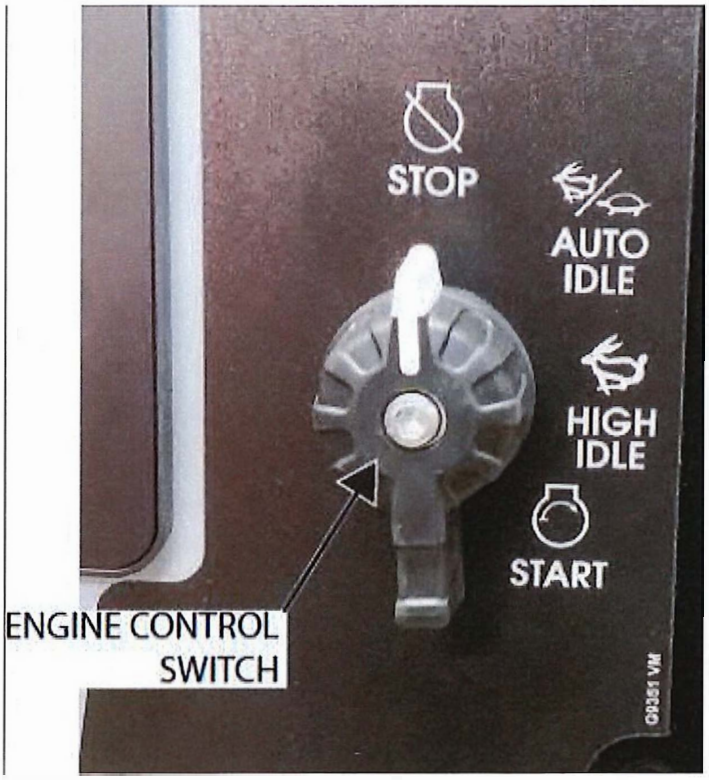


Figure 2. Engine control switch location

Engine control switch location



EVAP SOLENOID TEST PROCEDURE

WARNING:

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

How to avoid:
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

These tests will help determine if the EVAP Solenoid is functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the evap solenoid, on the fuel tank. See **Figure F.28** . See Wiring Diagram.
4. Label and disconnect leads 235 and 236 from the evap solenoid. See **Figure F.28** . See Wiring Diagram.
5. Using a volt/ohmmeter, measure the resistance of the terminals of the evap solenoid. See Wiring Diagram. Normal resistance is 14.1 ohms.
6. Connect leads 235 and 236 to the evap solenoid. See Wiring Diagram.
7. If the test fails, the evap solenoid may be faulty.
8. If faulty, perform the **EVAP Solenoid Removal And Replacement Procedure** .
9. Perform the **Case Cover Replacement Procedure** .

Figure 1. Evap solenoid location

Evap solenoid location

ENGINE CONTROL SWITCH TEST PROCEDURE

WARNING:

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

How to avoid:
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

These tests will help determine if the Engine Control Switch is functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the engine control switch. See **Figure F.29** . See Wiring Diagram.
4. Label and disconnect plug and ground lead from the rear of the engine control switch. See Wiring Diagram.
5. Using a volt/ohmmeter, perform the continuity tests outlined in **Table F.8** . See **Figure F.30** . See Wiring Diagram.
6. If any of the tests fails, the engine control switch may be faulty.
7. If faulty, perform the **Engine Control Switch Removal And Replacement Procedure** .
8. Perform the **Case Cover Replacement Procedure** .

Table 1.

Engine control switch continuity tests

TERMINAL	TERMINAL	CONTINUITY	ENGINE CONTROL SWITCH POSITION
3	4 AND 6	YES	STOP
2	4 AND 5	YES	AUTO IDLE

2	5	YES	HIGH IDLE
1	4 AND 5	YES	START

Figure 1. Engine control switch location

Engine control switch location

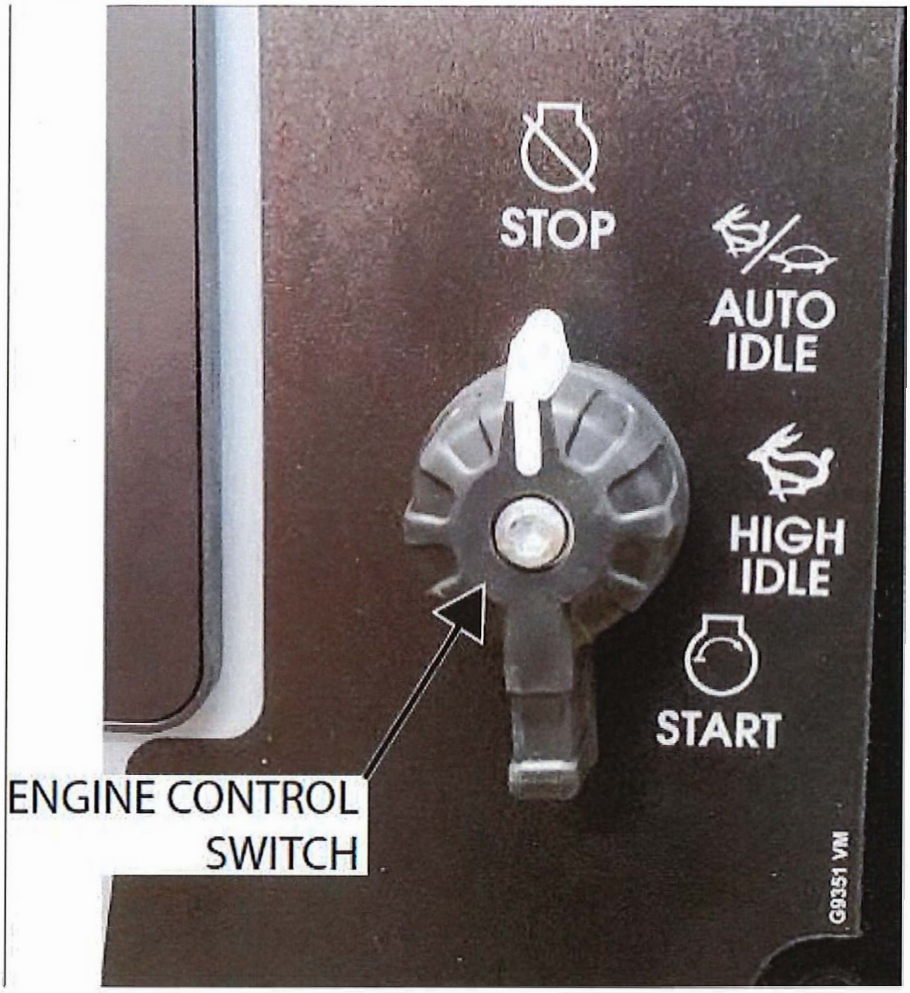
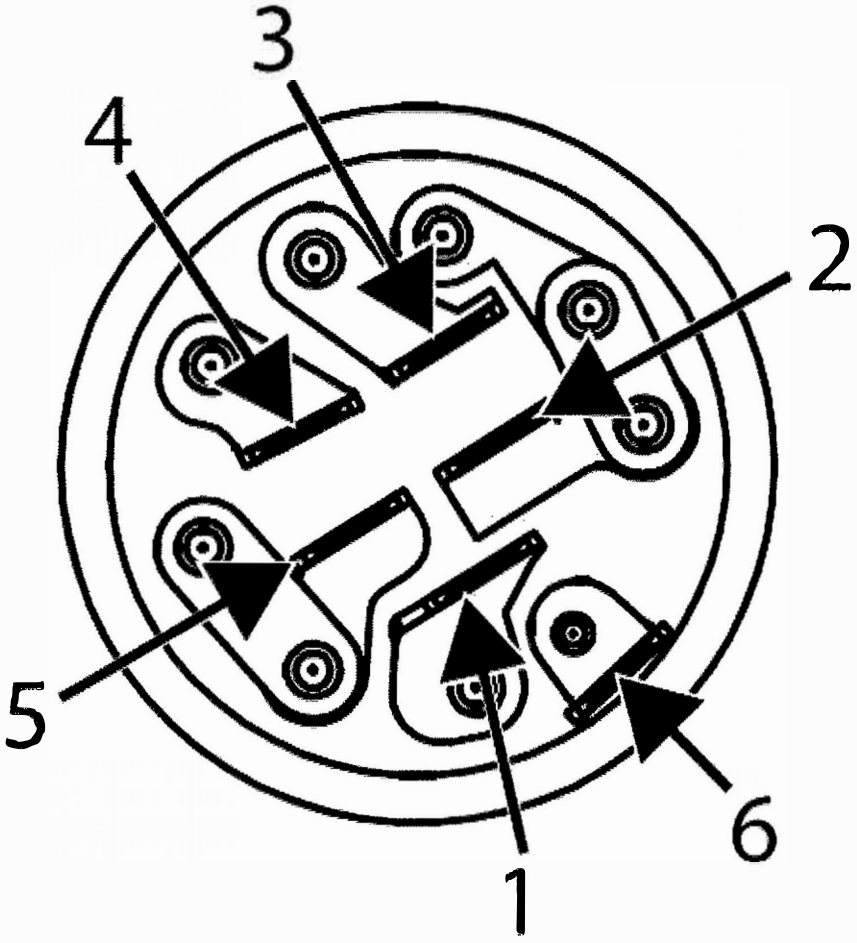


Figure 2. Engine control switch terminal locations

Engine control switch terminal locations



ROTOR VOLTAGE TEST PROCEDURE

WARNING:

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

How to avoid:
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 charge.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

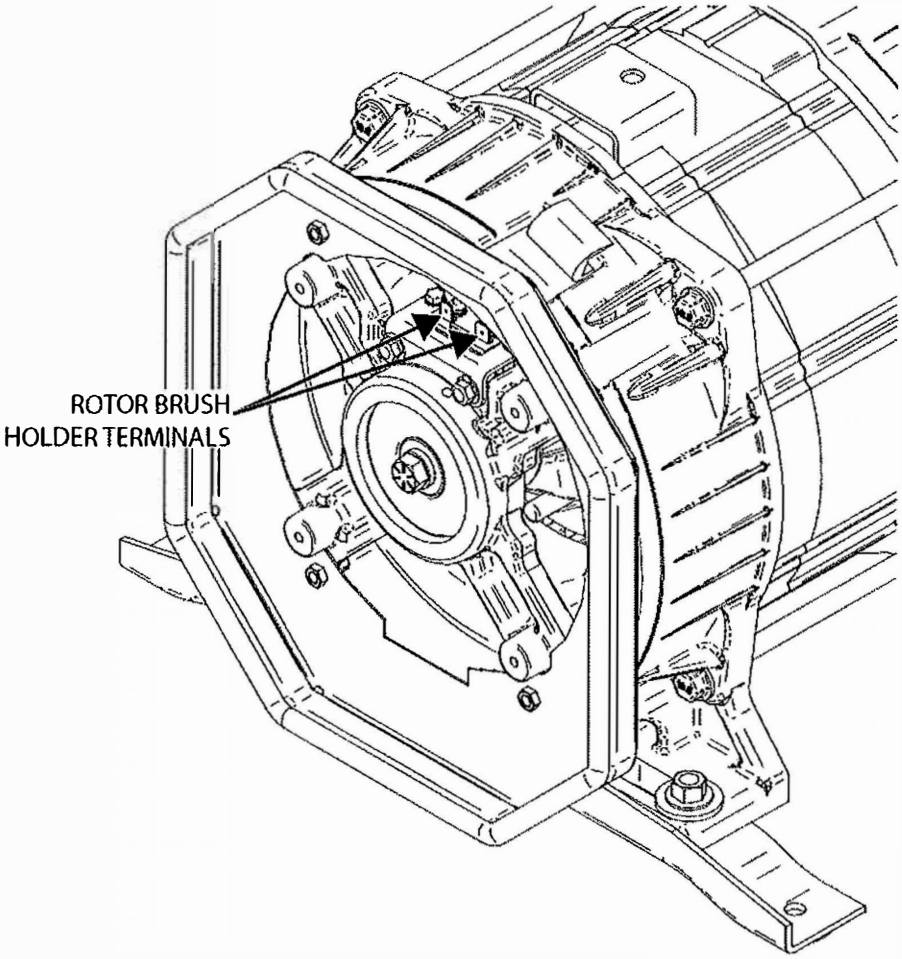
1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Connect the volt/ohmmeter probes to the brush terminals. See **Figure F.31** . See Wiring Diagram.
4. Start the engine and allow the RPM to stabilize for about 15 to 30 seconds. The meter should read 30 to 70 VDC.
5. Set the engine control switch to the stop position.
6. If the meter reading is normal, this test is complete.
7. If the voltage measures zero or very near zero, the rotor flashing circuit may be faulty or the rotor may be shorted.
8. Perform the **Rotor Resistance And Ground Test Procedure (Static)** , the **Rotor Resistance And Ground Test Procedure (Dynamic)** and the **Flashing Voltage Test Procedure** .
9. 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)** and the **Rotor Resistance And Ground Test Procedure (Dynamic)** .
10. If the voltage measures about 6 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.
11. If the flashing voltage (6 VDC) is not present, perform the **Chopper / Control Board Test Procedure** .
12. Check the D3 rectifier and also check all associated wiring and terminals connections. See Wiring Diagram.
13. Perform the **Rotor Resistance And Ground Test Procedure (Static)** and the **Rotor Resistance And Ground Test Procedure (Dynamic)** .
14. Perform the **Stator Short Circuit And Ground Test Procedure** .

15. When the stator short circuit and ground test has been completed, reconnect leads 7 and 9 to the D3 rectifier. All other stator leads should remain disconnected and isolated at this time.
16. Be sure that there are no leads of any kind across any of the stator windings, except the 7A – 9A winding. Examine stator wiring for damage, pinched leads, chafed insulation, etc. If necessary, disconnect and isolate the stator output leads as close to the starter as possible. See Wiring Diagram.
17. 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.
18. Re-start the machine and measure the rotor voltage.
19. If rotor voltage continues to read significantly lower than 30 - 70 VDC, the stator is probably defective and should be replaced.

    Note: The D3 rectifier may appear to function normally when tested independently, but may malfunction when placed under the stress or normal operation. For this reason, it is recommended that the D3 rectifier be replaced with known good component before replacing the stator.
20. Perform the **Case Cover Replacement Procedure** .

Figure 1. Rotor brush terminals location

Rotor brush terminals location



CHOPPER / CONTROL BOARD TEST PROCEDURE

WARNING:

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

How to avoid:
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 / Control Board is functioning properly. This test will not test all sections of the Chopper / Control Board.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the chopper / control board. See **Figure F.32** . See Wiring Diagram.
4. Start the engine and let it run and stabilize at high idle RPM.
5. Visually inspect the LEDs on the chopper / control board according to **Table F.9** . See **Figure F.33** . See Wiring Diagram.
6. Using a volt/ohmmeter, perform the voltage tests outlined in **Table F.10** . See **Figures F.33** and **F.34** . See Wiring Diagram.
7. Turn off the engine on the Ranger 330MPX.
8. Using a volt/ohmmeter, perform the voltage tests outlined in **Table F.11** (leads and bus bars should be terminals for testing). See **Figures F.33** and **F.34** . See Wiring Diagram.
9. If any of the tests fails, the chopper / control board may be faulty.
10. If faulty, perform the **Chopper / Control Board Removal And Replacement Procedure** .
11. Perform the **Case Cover Replacement Procedure** .

Table 1.

Chopper / control board LED indications

LED NUMBER	LED COLOR	LED INDICATION
1	GREEN	STATUS LED
2	GREEN	CHOPPER BUS VOLTAGE
3	GREEN	CHOPPER ACTIVE
4	GREEN	PWM SIGNAL
7	GREEN	FIELD FLASHING
8	GREEN	FIELD BUILD UP

Table 2.

Chopper / control board voltage tests

TEST POINT	TEST POINT	EXPECTED READING	MACHINE CONDITION
PLUG J2 PIN 10 (LEAD 227)	PLUG J2 PIN 23 (LEAD 228)	12.5 VDC	ENGINE OFF. ENGINE CONTROL SWITCH IN THE AUTO IDLE POSITION.
PLUG J2 PIN 10 (LEAD 227)	PLUG J2 PIN 23 (LEAD 228)	12.5 VDC	ENGINE RUNNING.
PLUG J2 PIN 34 (LEAD 201)	CHASSIS GROUND	124 VDC	ENGINE RUNNING. MACHINE AT HIGH IDLE.
PLUG J2 PIN 28 (WHITE LEAD)	PLUG J2 PIN 29 (BLUE LEAD)	12 VDC	ENGINE OFF. ENGINE CONTROL SWITCH IN THE AUTO IDLE POSITION.
PLUG J2 PIN 33 (LEAD 219)	PLUG J2 PIN 32 (LEAD 200)	6 VDC	ENGINE OFF. ENGINE CONTROL SWITCH IN THE AUTO IDLE POSITION.
PLUG J2 PIN 33 (LEAD 219)	PLUG J2 PIN 32 (LEAD 200)	30 - 70 VDC	ENGINE RUNNING. VOLTAGE DEPENDANT ON ENGINE SPEED.
PLUG J2 PIN 8 (LEAD 229)	PLUG J2 PIN 9 (LEAD 210A)	12 VDC	ENGINE OFF. ENGINE CONTROL SWITCH IN THE AUTO IDLE POSITION.
PLUG J1 PIN 5 (LEAD 208B)	LEAD W4 OR POSITIVE OUTPUT TERMINAL	OCV (OPEN CIRCUIT VOLTAGE)	ENGINE RUNNING. VOLTAGE DEPENDANT OF ENGINE SPEED AND MODE SETTING.
		2.5 VDC	ENGINE RUNNING.

PLUG J2 PIN 30 (BLACK LEAD)	PLUG J2 PIN 29 (BLUE LEAD)		
PLUG J2 PIN 31 (GREY LEAD)	PLUG J2 PIN 29 (BLUE LEAD)	2.5 VDC	ENGINE RUNNING.

Table 3.

Chopper / control board diode drop tests

TEST POINT (POS)	TEST POINT (NEG)	EXPECTED READING
TERMINAL B6	TERMINAL B5	0.3 VDC - 0.7 VDC
TERMINAL B4	TERMINAL B6	0.3 VDC - 0.7 VDC
TERMINAL B3	TERMINAL B2	0.3 VDC - 0.7 VDC
TERMINAL B1	TERMINAL B3	0.3 VDC - 0.7 VDC

Figure 1. Chopper / control board location

Chopper / control board location

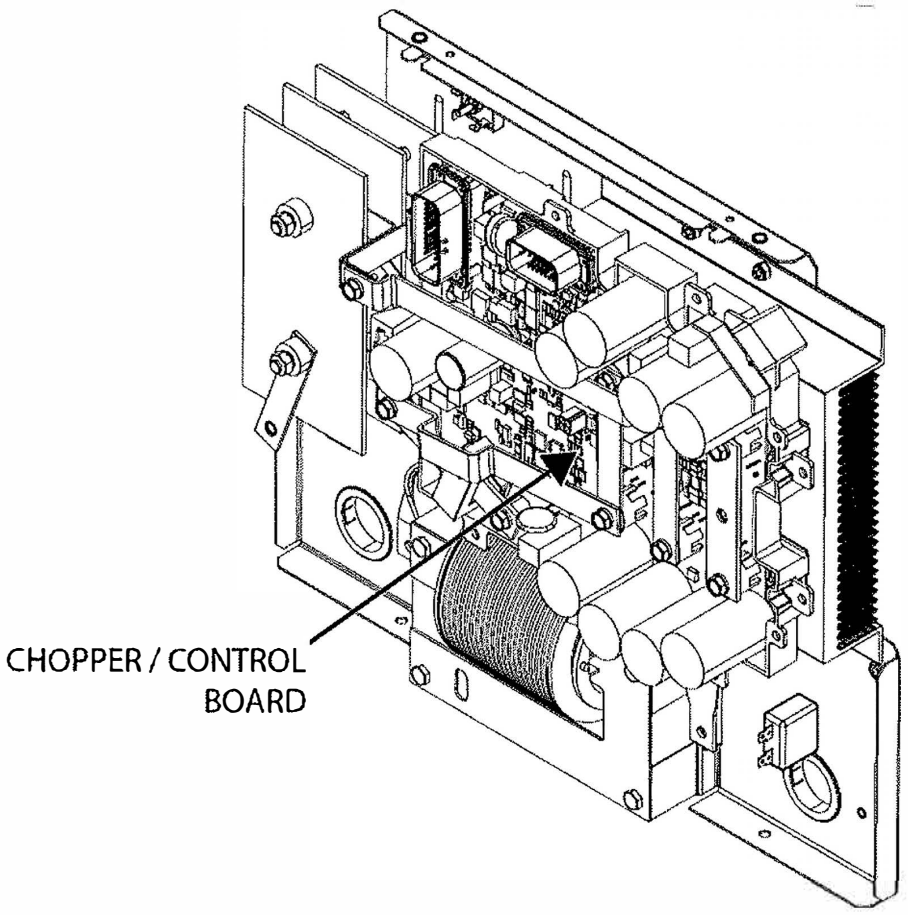


Figure 2. Chopper / control board plug and LED locations

Chopper / control board plug and LED locations

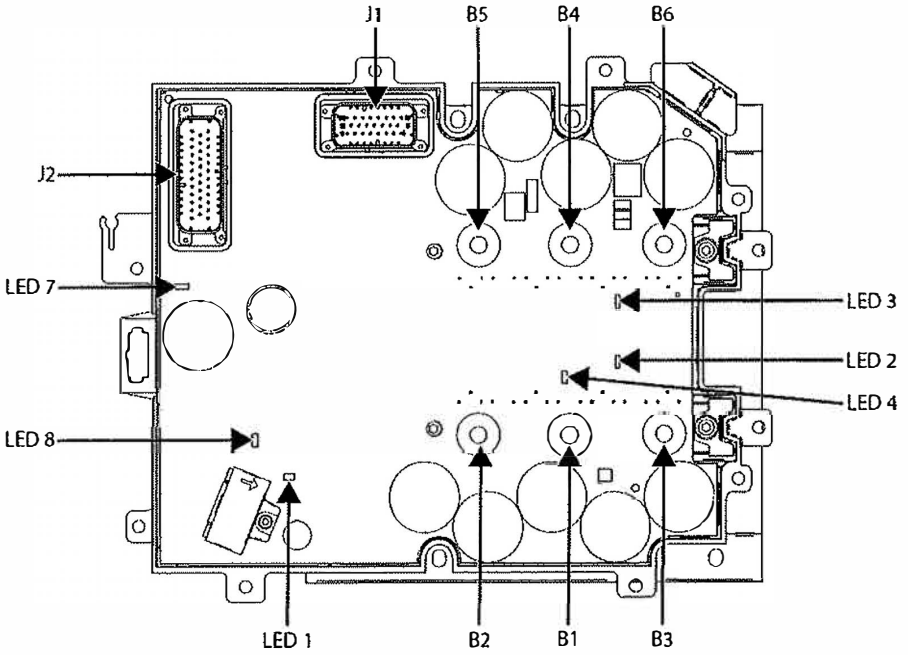
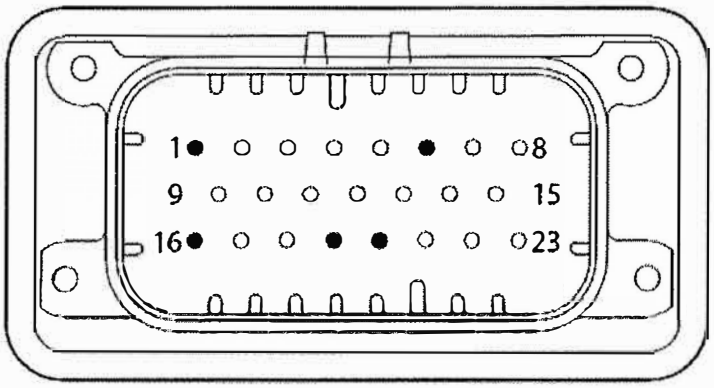
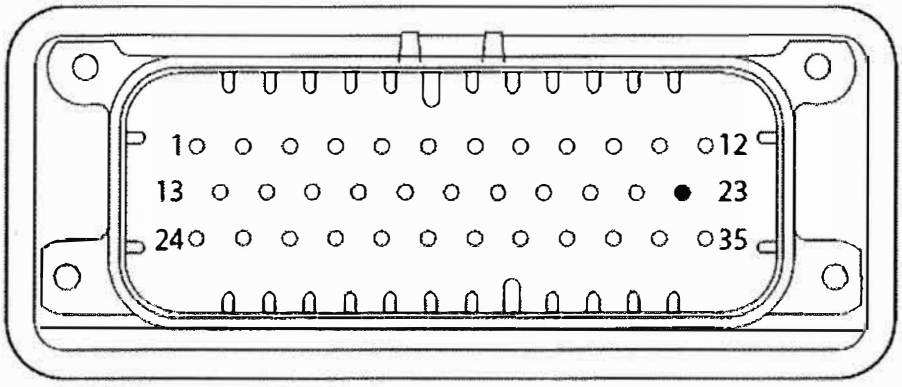


Figure 3. Chopper / control board plug J1 and J2 pinouts

Chopper / control board plug J1 and J2 pinouts



PLUG J1



PLUG J2

LCD DISPLAY TEST PROCEDURE

WARNING:

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

How to avoid:
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

These tests will help determine if the LCD Display is functioning properly.

MATERIALS NEEDED

- Volt/Ohmmeter
- Wiring Diagram

TEST PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Locate the LCD display, on the control panel. See **Figure F.35** . See Wiring Diagram.
4. Using a volt/ohmmeter, perform the tests outlined in **Table F.12** , at the chopper / control board. See **Figures F.36** and **F.37** . See Wiring Diagram.
5. If any of the voltages are present and the LCD display is not functioning, the LCD display may be faulty.
6. If faulty, perform the **LCD Display Removal And Replacement Procedure** .
7. Perform the **Case Cover Replacement Procedure** .

Table 1.

LCD Display voltage tests

TEST POINT	TEST POINT	EXPECTED READING	MACHINE CONDITION
PLUG J2 PIN 28 (WHITE LEAD)	PLUG J2 PIN 29 (BLUE LEAD)	12 VDC	ENGINE OFF. ENGINE CONTROL SWITCH IN AUTO IDLE POSITION.
		2.5 VDC	ENGINE RUNNING.

PLUG J2 PIN 30 (BLACK LEAD)	PLUG J2 PIN 29 (BLUE LEAD)		
PLUG J2 PIN 31 (GREY LEAD)	PLUG J2 PIN 29 (BLUE LEAD)	2.5 VDC	ENGINE RUNNING.

Figure 1. LCD display location

LCD display location

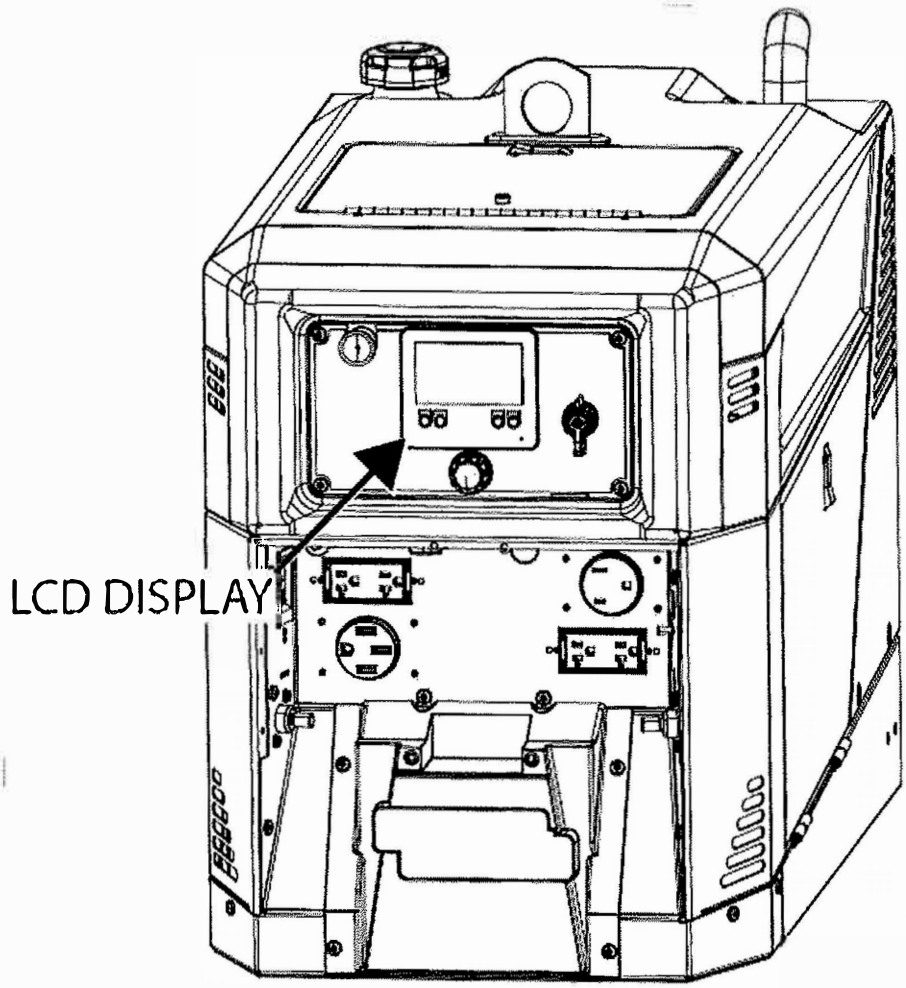


Figure 2. Chopper / control board plug locations

Chopper / control board plug locations

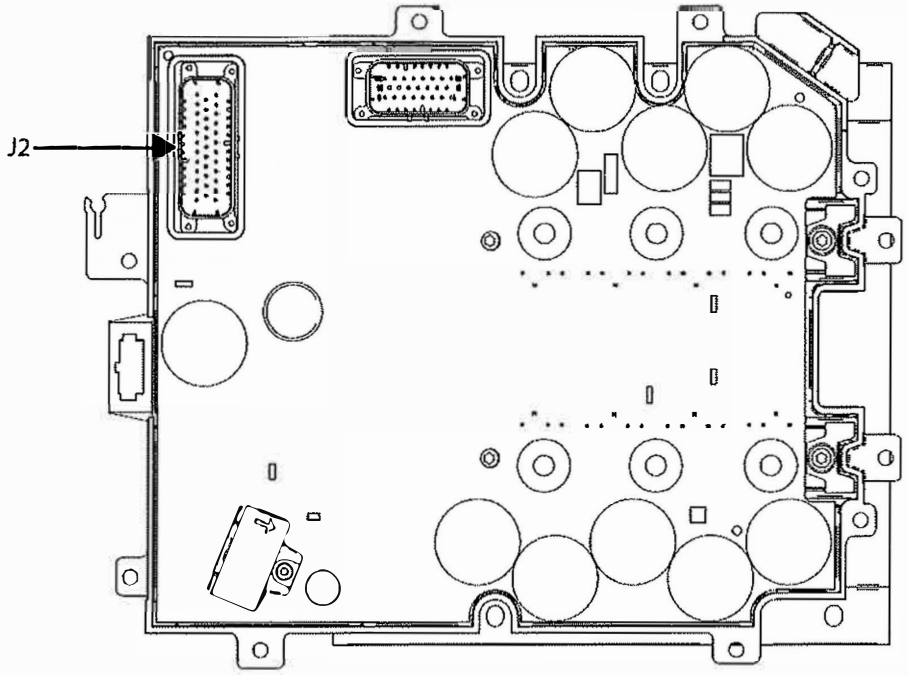
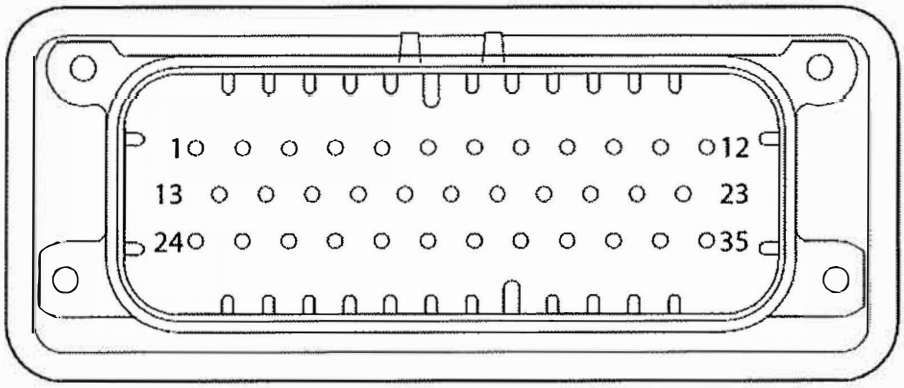


Figure 3. Chopper / control board plug J2 pinout

Chopper / control board plug J2 pinout



PLUG J2

OUTPUT PANEL REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 Panel.

MATERIALS NEEDED

- 7/16" Nutdriver
- 3/4" Socket
- 9/16" Socket
- Torx Nutdriver (Size T30)
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Using a 7/16" nutdriver, remove the two nuts securing leads 3 and 6 to the CB1 circuit breaker. See **Figure F.38** . See Wiring Diagram. Label and disconnect leads 3 and 6.
4. Using a 7/16" nutdriver, remove the nut and washers securing lead 5 to the neutral stud. See **Figure F.38** . See Wiring Diagram. Label and disconnect lead 5.
5. Label and disconnect any remaining leads to allow for the output panel to be moved to the side. See Wiring Diagram.
6. Cut any cable ties as necessary.
7. Using a 7/16" nutdriver, remove the four screws and washers securing the output panel to the machine. See **Figure F.39** . See Wiring Diagram.
8. Using a 3/4" socket and a 9/16" socket, remove the bolt, lock washer and flat washer securing the leads to the positive output terminal. See Wiring Diagram.
9. Using a 3/4" socket and a 9/16" socket, remove the bolt, lock washer and flat washer securing the leads to the negative output terminal. See **Figure F.40** . See Wiring Diagram.
10. Using a Torx nutdriver (size T20), remove the two screws securing the output panel to the machine. See **Figure F.40** . See Wiring Diagram.
11. Carefully maneuver the output panel to the side to gain access to components located behind the panel.

REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the output panel on the machine.
2. Using a Torx nutdriver (size T20), attach the two screws securing the output panel to the machine.
3. Using a 3/4" socket and a 9/16" socket, attach the bolt, lock washer and flat washer securing the leads to the negative output terminal. See Wiring Diagram.
4. Using a 3/4" socket and a 9/16" socket, attach the bolt, lock washer and flat washer securing the leads to the positive output terminal. See Wiring Diagram.
5. Using a 7/16" nutdriver, attach the four screws and washers securing the output panel to the machine.
6. Using a 7/16" nutdriver, attach the nut and washers securing lead 5 to the neutral stud. See Wiring Diagram.
7. Using a 7/16" nutdriver, attach the two nuts securing leads 3 and 6 to the CB1 circuit breaker. See Wiring Diagram.
8. Connect any remaining previously disconnected leads. See Wiring Diagram.
9. Replace cable ties as necessary.
10. Perform the **Case Cover Replacement Procedure** .
11. Perform the **Retest After Repair Procedure** .

Figure 1. CB1 circuit breaker and neutral stud locations

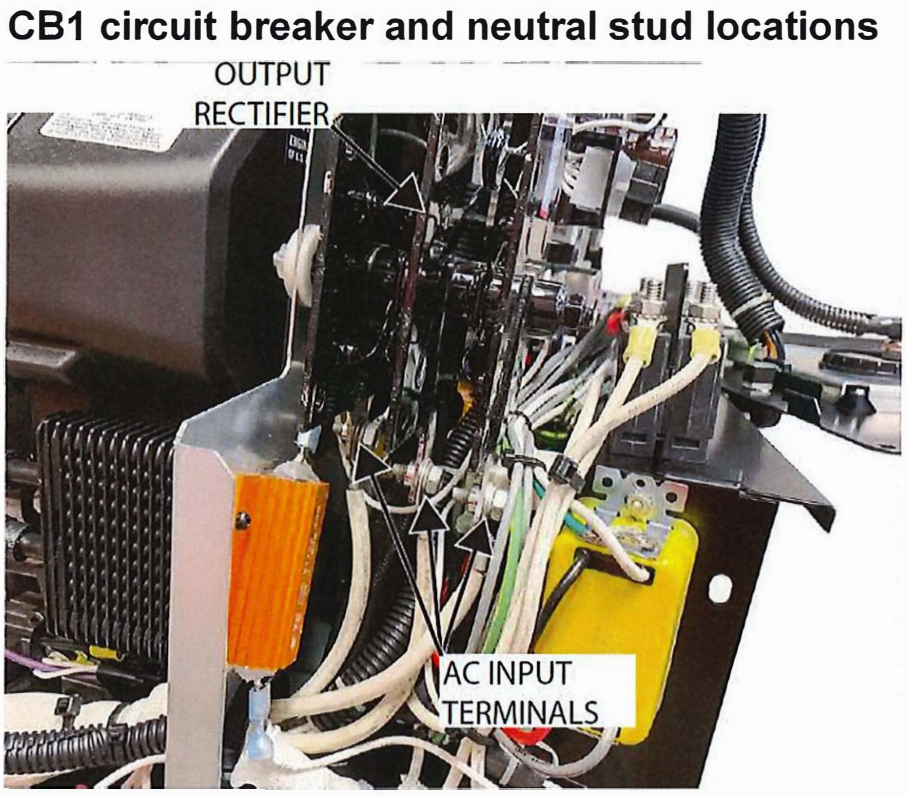


Figure 2. Output panel mounting screw and negative output terminal bolt locations

Output panel mounting screw and negative output terminal bolt locations

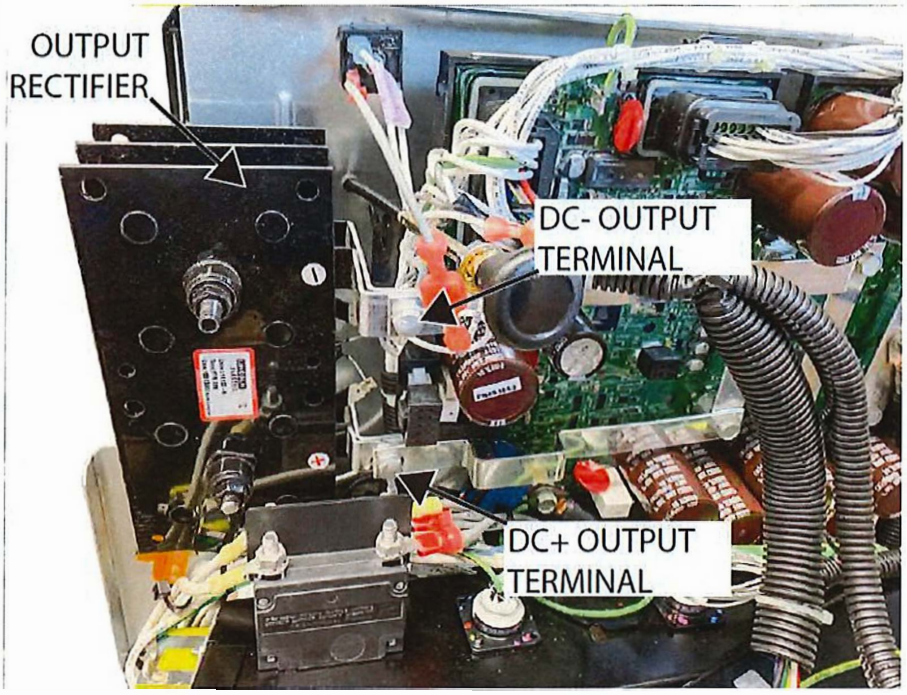
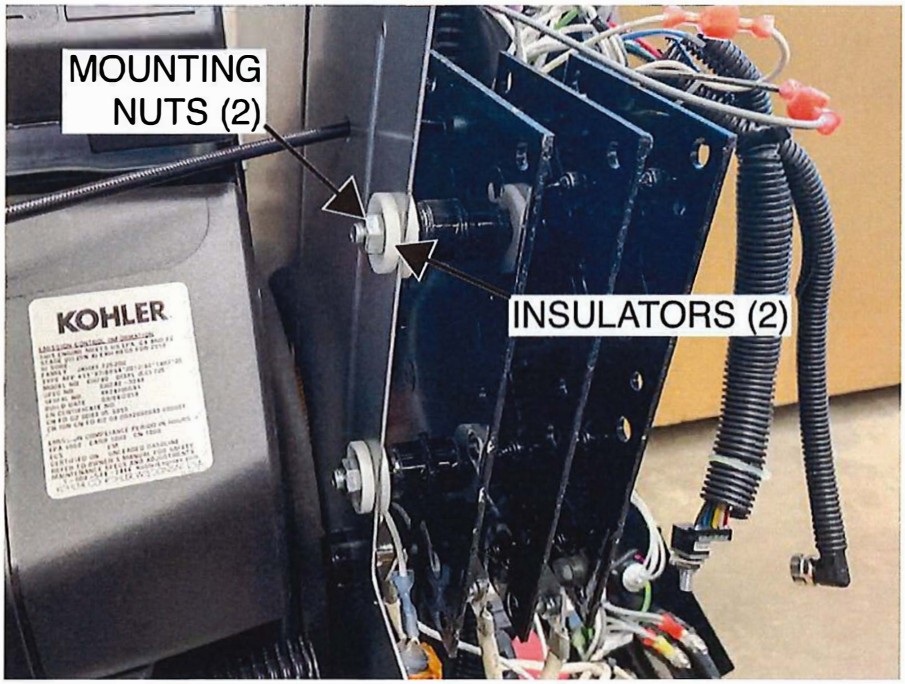


Figure 3. Output panel mounting screw locations

Output panel mounting screw locations



ENGINE CONTROL SWITCH REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

MATERIALS NEEDED

- Torx Nutdriver (Size T20)
- Crescent Wrench
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Label and disconnect plug and ground lead from the rear of the engine control switch. See Wiring Diagram.
4. Using a Torx nutdriver (size T20), remove the screw securing the knob to the shaft. See **Figure F.41** . See Wiring Diagram.
5. Using a crescent wrench, remove the nut securing the engine control switch to the control panel. See **Figure F.42** . See Wiring Diagram.
6. The engine control switch can now be removed and replaced.

REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new engine control switch onto the control panel.
2. Using a crescent wrench, attach the nut securing the engine control switch to the control panel.
3. Using a Torx nutdriver (size T20), attach the screw securing the knob to the shaft.
4. Connect plug and ground lead to the rear of the engine control switch. See Wiring Diagram.
5. Perform the **Case Cover Replacement Procedure** .
6. Perform the **Retest After Repair Procedure** .

Figure 1. Engine control switch knob mounting screw locations

Engine control switch knob mounting screw locations

Figure 2. Engine control switch mounting nut location

Engine control switch mounting nut location

LCD DISPLAY REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

MATERIALS NEEDED

- 5/54" Allen Wrench
- 7/16" Open-End Wrench
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Label and disconnect plug from the rear of the LCD display. See Wiring Diagram.
4. Using a 5/64" Allen wrench, loosen the set screw securing the encoder knob to the encoder shaft. See **Figure F.43** . See Wiring Diagram.
5. Using a 7/16" open-end wrench, remove the nut and washer securing the encoder shaft to the control panel.
6. The LCD display can now be removed and replaced.

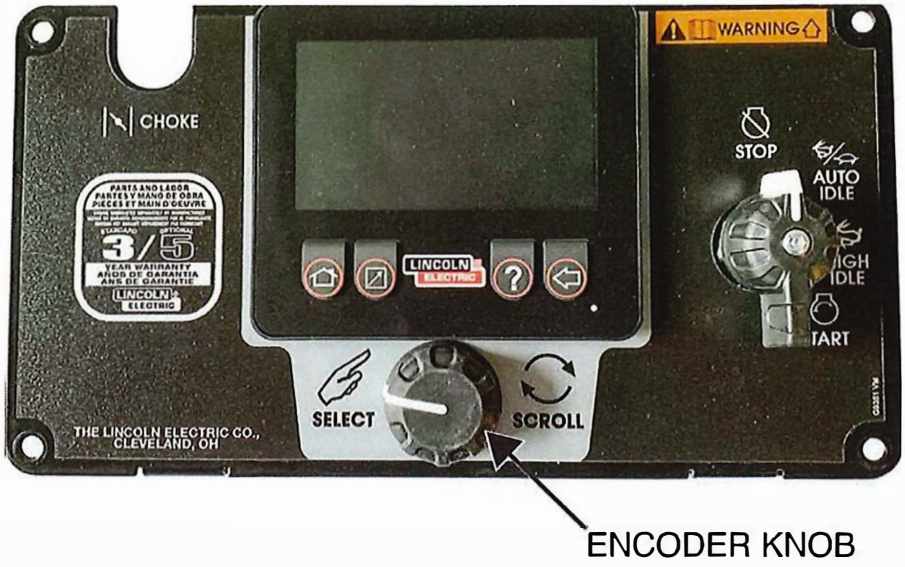
REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new LCD display into the machine.
2. Using a 7/16" open-end wrench, attach the nut and washer securing the encoder shaft to the control panel.
3. Using a 5/64" Allen wrench, tighten the set screw securing the encoder knob to the encoder shaft.
4. Connect plug to the rear of the LCD display. See Wiring Diagram.
5. Perform the **Case Cover Replacement Procedure** .
6. Perform the **Retest After Repair Procedure** .

Figure 1. Encoder knob set screw location

Encoder knob set screw location



OUTPUT RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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.

MATERIALS NEEDED

- 7/16" Nutdriver
- 1/2" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Perform the **Output Panel Removal Procedure** .
4. Using a 7/16" nutdriver, remove the three bolts and flat washers securing leads W1, W2, W3 and TW1 to the AC terminals of the output rectifier. See **Figure F.44** . See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the bolts and washers securing the leads and bus bars to the positive and negative terminals of the output rectifier. See **Figure F.45** . See Wiring Diagram.
6. Using a 1/2" nutdriver, remove the two nuts and insulators securing the output rectifier to the electronics panel. See **Figure F.46** . See Wiring Diagram.
7. The output rectifier can now be removed and replaced.

REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new output rectifier onto the electronics panel.
2. Using a 1/2" nutdriver, attach the two nuts and insulators securing the output rectifier to the electronics panel.
3. Using a 7/16" nutdriver, attach the bolts and washers securing the leads and bus bars to the positive and negative terminals of the output rectifier. See Wiring Diagram.

4. Using a 7/16" nutdriver, attach the three bolts and flat washers securing leads W1, W2, W3 and TW1 to the AC terminals of the output rectifier. See Wiring Diagram.
5. Perform the **Output Panel Replacement Procedure** .
6. Perform the **Case Cover Replacement Procedure** .
7. Perform the **Retest After Repair Procedure** .

Figure 1. Output rectifier AC terminal locations

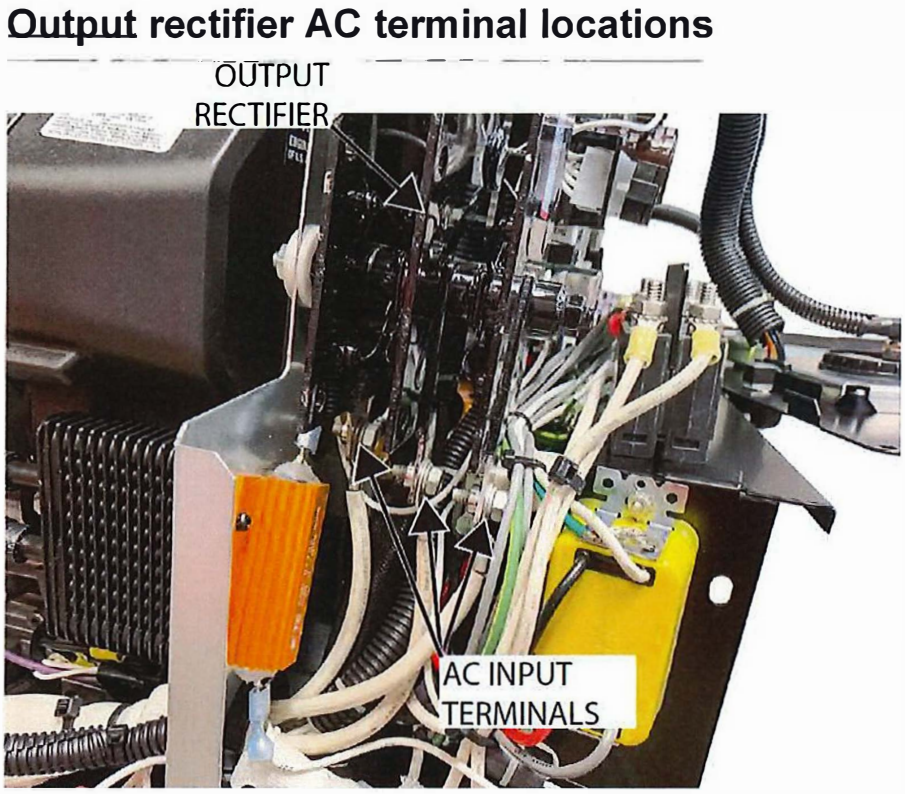


Figure 2. Output rectifier positive and negative terminal locations

Output rectifier positive and negative terminal locations

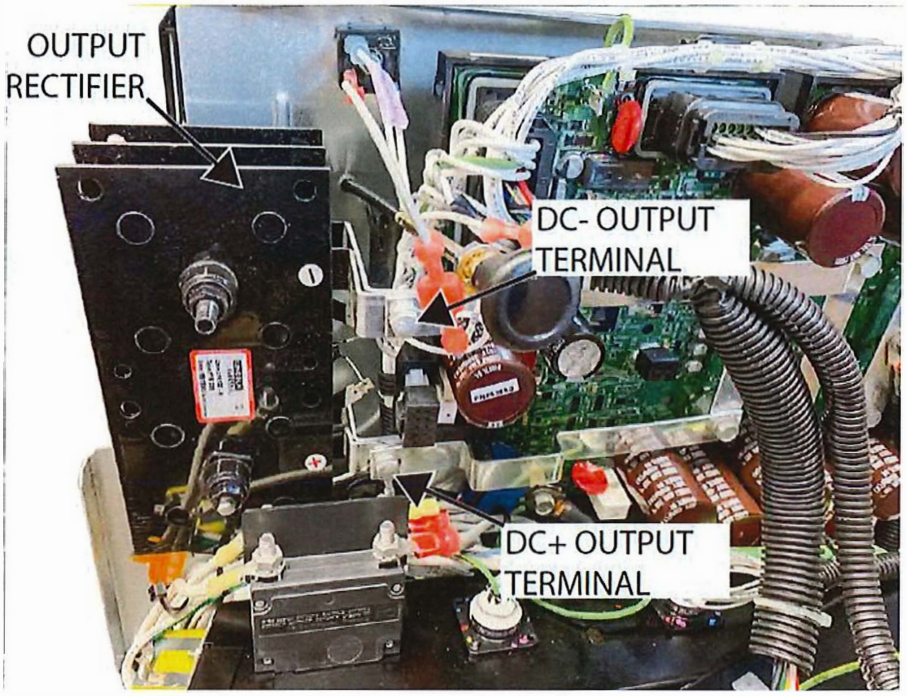
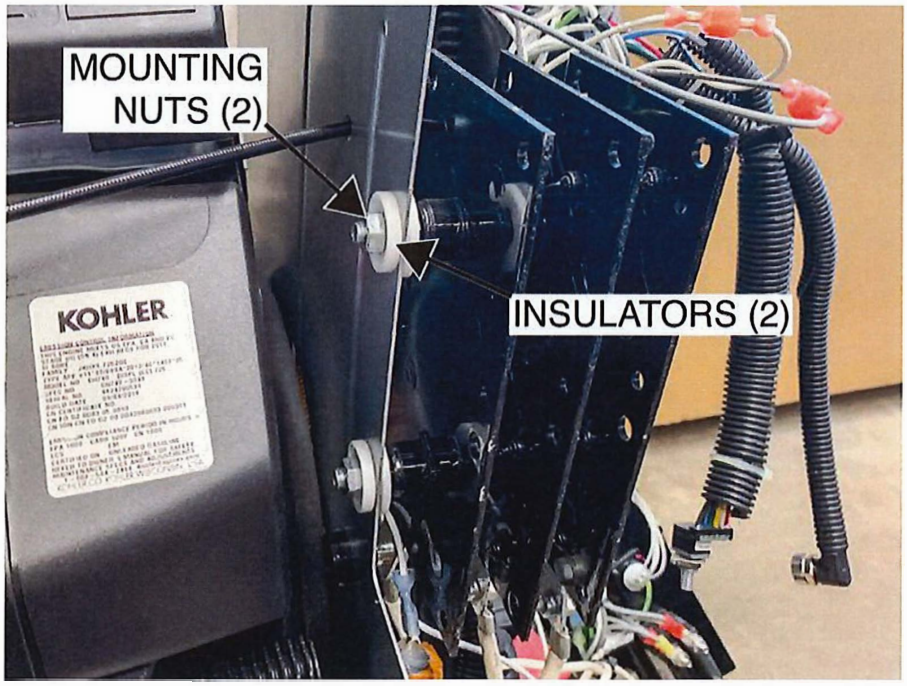


Figure 3. Output rectifier mounting nut and insulator locations

Output rectifier mounting nut and insulator locations



OUTPUT CHOKE REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 Choke.

MATERIALS NEEDED

- 7/16" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Perform the **Output Panel Removal Procedure** .
4. Label and disconnect leads W5 and W6 from the output choke terminals. See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the four bolts securing the output choke to the electric panel. See **Figure F.47** . See Wiring Diagram.
6. The output choke can now be removed and replaced.

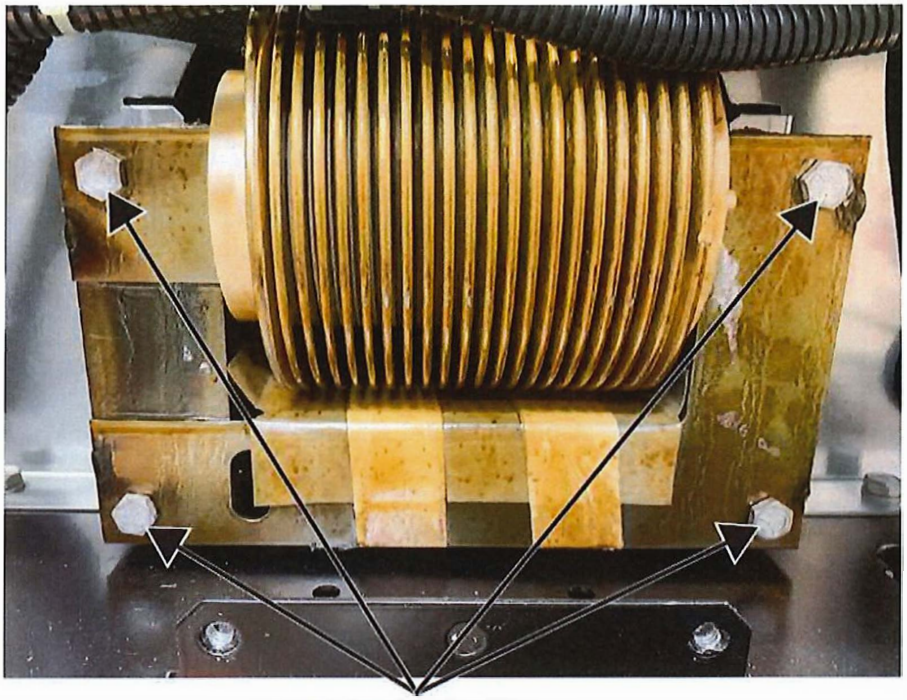
REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new output choke onto the electronics panel.
2. Using a 7/16" nutdriver, attach the four bolts securing the output choke to the electric panel. See Wiring Diagram.
3. Connect leads W5 and W6 to the output choke terminals. See Wiring Diagram.
4. Perform the **Output Panel Replacement Procedure** .
5. Perform the **Case Cover Replacement Procedure** .
6. Perform the **Retest After Repair Procedure** .

Figure 1. Output choke mounting bolt locations

Output choke mounting bolt locations



MOUNTING BOLTS (4)

CHOPPER / CONTROL BOARD REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 / Control Board.

MATERIALS NEEDED

- 7/16" Nutdriver
- 7/16" Open-End Wrench
- 3/8" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Perform the **Output Panel Removal Procedure** .
4. Label and disconnect plugs J1 and J2 from the chopper / control board. See **Figure F.48** . See Wiring Diagram.
5. Label and disconnect lead GNDM from terminal B8 of the chopper / control board. See **Figure F.48** . See Wiring Diagram.
6. Using a 7/16" nutdriver, remove the eight screws and washers securing the bus bars and associated leads to the chopper / control board. See **Figure F.48** . See Wiring Diagram.
7. Using a 7/16" open-end wrench, remove the screw and washer securing lead W4 to the bus bar. See **Figure F.48** . See Wiring Diagram.
8. Cut any cable ties and route remaining leads to allow for the removal of the chopper / control board. See Wiring Diagram.
9. Using a 3/8" nutdriver, remove the four screws securing the chopper / control board to the electronics panel.
10. The chopper / control board can now be removed and replaced.

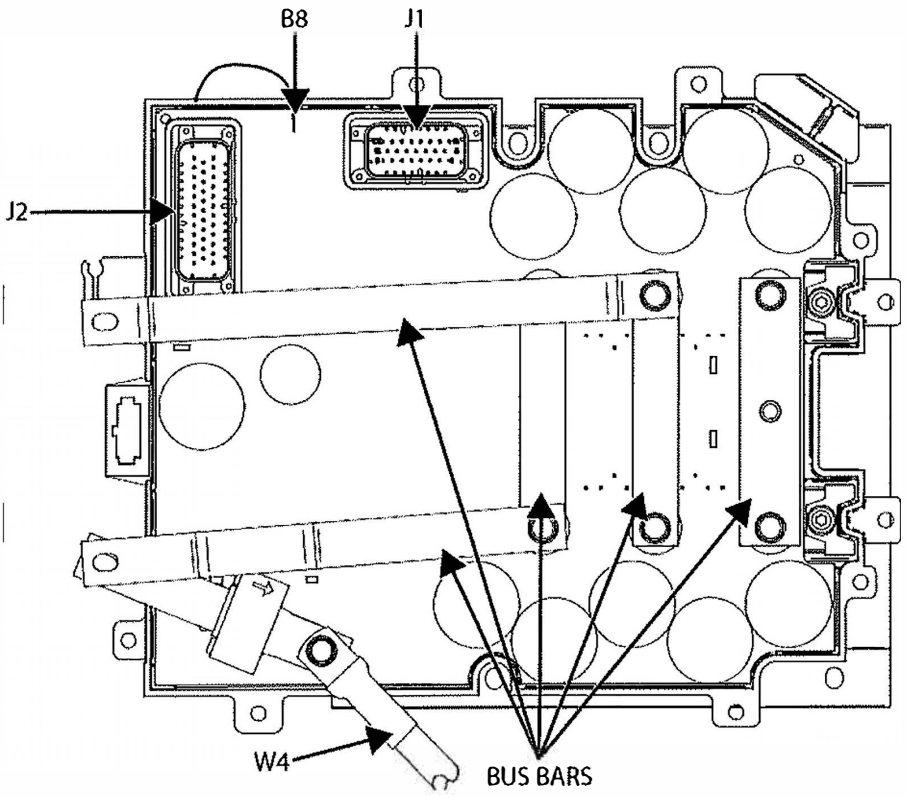
REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new chopper / control board onto the electronics panel.
2. Using a 3/8" nutdriver, attach the four screws securing the chopper / control board to the electronics panel.
3. Using a 7/16" open-end wrench, attach the screw and washer securing lead W4 to the bus bar. See Wiring Diagram.
4. Using a 7/16" nutdriver, attach the eight screws and washers securing the bus bars and associated leads to the chopper / control board. See Wiring Diagram.
5. Connect lead GNDM to terminal B8 of the chopper / control board. See Wiring Diagram.
6. Connect plugs J1 and J2 to the chopper / control board. See Wiring Diagram.
7. Replace cable ties as necessary.
8. Perform the **Output Panel Replacement Procedure** .
9. Perform the **Case Cover Replacement Procedure** .
10. Perform the **Retest After Repair Procedure** .

Figure 1. Chopper / control board terminal and bus bar locations

Chopper / control board terminal and bus bar locations



D3 AND D4 RECTIFIER REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 D3 and D4 Bridge Rectifiers.

MATERIALS NEEDED

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

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Label and disconnect leads 7A, 9A and 210A from the D3 bridge rectifier. See **Figure F.49** . See Wiring Diagram.
4. Using a 3/8" nutdriver, remove the nut securing the D3 bridge rectifier to the electronics panel. See **Figure F.50** .
5. The D3 bridge rectifier can now be removed and replaced.
6. Label and disconnect leads 239 and 213 from the D4 bridge rectifier. See **Figure F.49** . See Wiring Diagram.
7. Using a 3/8" nutdriver, remove the nut securing the D4 bridge rectifier to the machine. See **Figure F.50** . See Wiring Diagram.
8. The D4 bridge rectifier can now be removed and replaced.

REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully apply a thin coating of Dow Corning 340 heat sink compound to the rear of the D3 and D4 rectifiers.
2. Carefully position the new D4 bridge rectifier into the machine.
3. Using a 3/8" nutdriver, attach the nut securing the D4 bridge rectifier to the machine.
4. Connect leads 239 and 213 to the D4 bridge rectifier. See Wiring Diagram.

5. Carefully position the new D3 bridge rectifier into the machine.
6. Using a 3/8" nutdriver, attach the nut securing the D3 bridge rectifier to the machine.
7. Connect leads 7A, 9A and 210A to the D3 bridge rectifier. See Wiring Diagram.
8. Perform the **Case Cover Replacement Procedure** .
9. Perform the **Retest After Repair Procedure** .

Figure 1. D3 and D4 bridge rectifier lead locations

D3 and D4 bridge rectifier lead locations

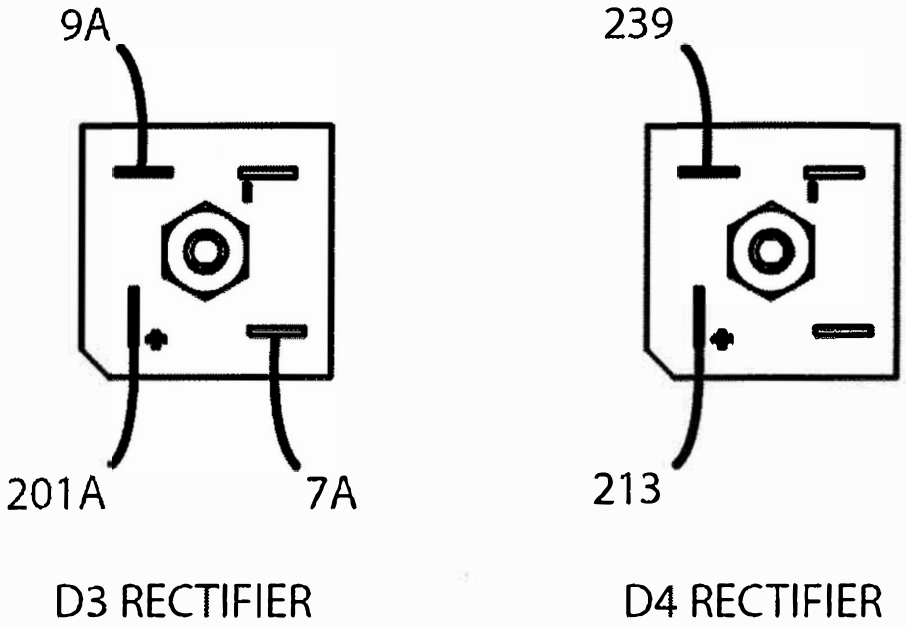
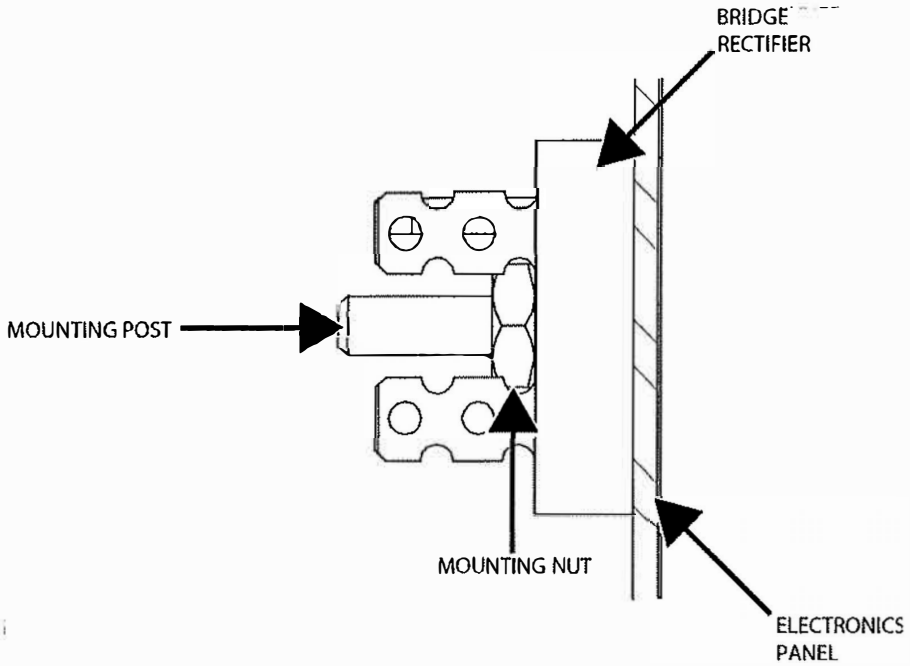


Figure 2. D3 and D4 bridge rectifier mounting nut locations

D3 and D4 bridge rectifier mounting nut locations



EVAP SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 Evap Solenoid.

MATERIALS NEEDED

- 3/8" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Label and disconnect leads 235 and 236 from the terminals of the evap solenoid. See **Figure F.51** . See Wiring Diagram.
4. Using a 3/8" nutdriver, remove the nut securing the evap solenoid to the fitting. See **Figure F.51** . See Wiring Diagram.
5. Carefully slide the evap solenoid off the fitting.
6. The EVAP solenoid can now be removed and replaced.

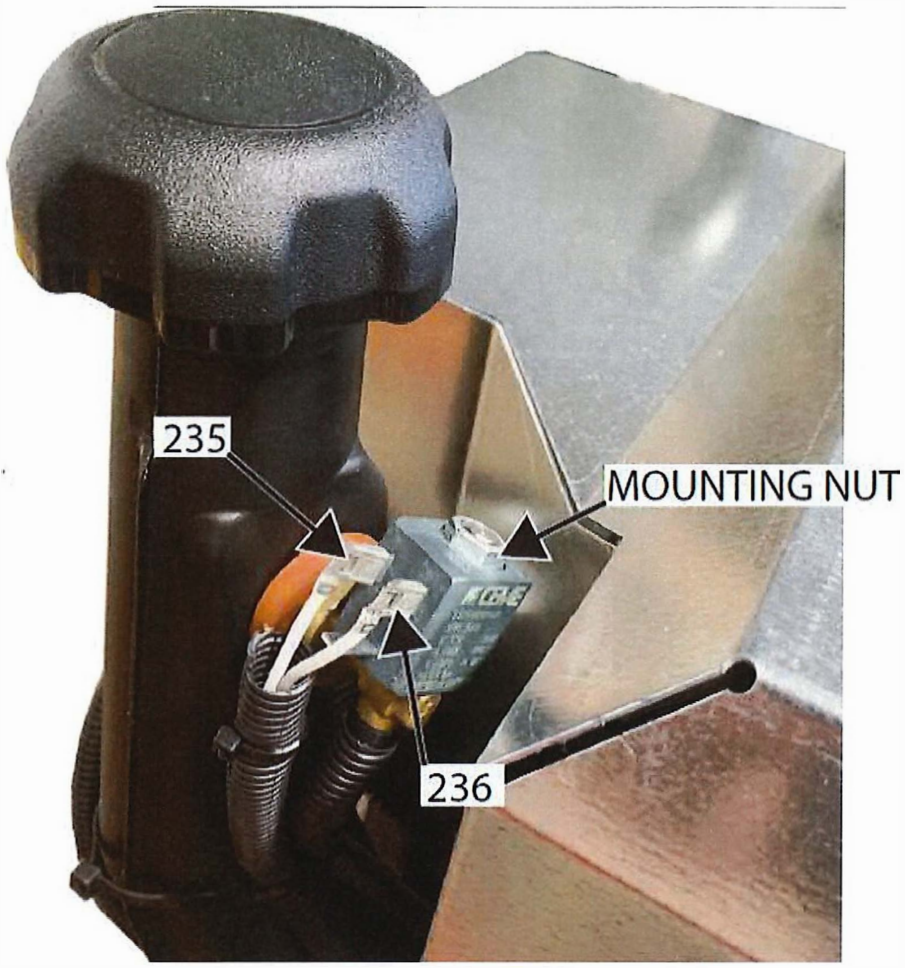
REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the new evap solenoid onto the fitting.
2. Using a 3/8" nutdriver, attach the nut securing the evap solenoid to the fitting.
3. Connect leads 235 and 236 to the terminals of the evap solenoid. See Wiring Diagram.
4. Perform the **Case Cover Replacement Procedure** .
5. Perform the **Retest After Repair Procedure** .

Figure 1. Evap solenoid lead and mounting nut locations

Evap solenoid lead and mounting nut locations


235
MOUNTING NUT
236

ELECTRIC FUEL PUMP REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

How to avoid:
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 Electric Fuel Pump.

MATERIALS NEEDED

- Needle Nose Pliers
- 7/16" Nutdriver
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Using needle nose pliers, loosen the clamps securing the two fuel lines to the electric fuel pump. See **Figure F.52** . Disconnect fuel lines. Use paper towels to prevent spills from fuel lines.
4. Label and disconnect the red and black leads from the quick connect terminals. See **Figure F.52** . See Wiring Diagram.
5. Using a 7/16" nutdriver, remove the two screws and washers securing the electric fuel pump to the lift bail support. See **Figure F.52** .
6. The electric fuel pump can now be removed and replaced.

REPLACEMENT PROCEDURE

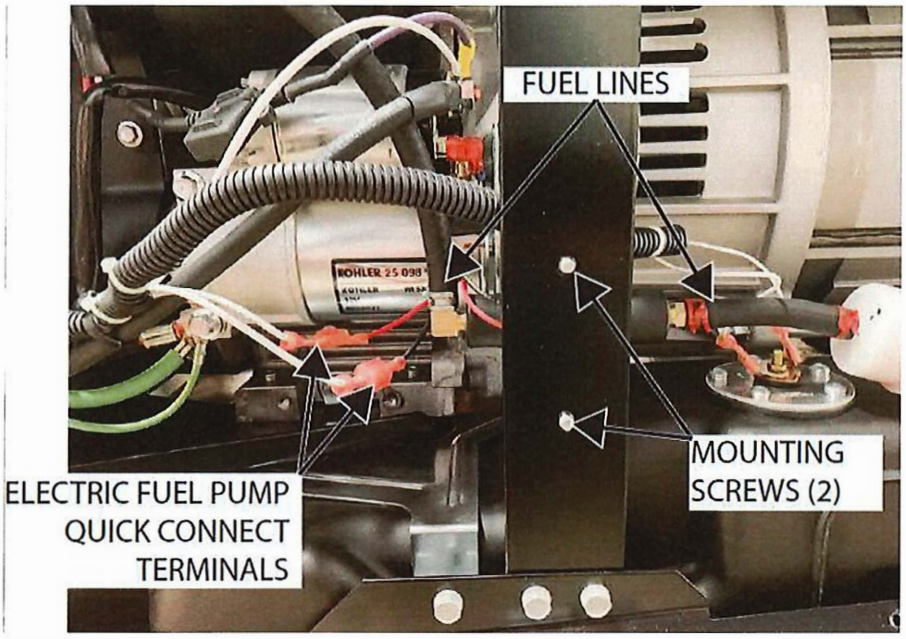
Procedure Steps:

1. Carefully position the new electric fuel pump into the machine.
2. Using a 7/16" nutdriver, attach the two screws and washers securing the electric fuel pump to the lift bail support.
3. Connect the red and black leads to the quick connect terminals. See Wiring Diagram.
4. Connect the two fuel lines to the electric fuel pump.
5. Using needle nose pliers, tighten the clamps securing the two fuel lines to the electric fuel pump.
6. Perform the **Case Cover Replacement Procedure** .

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

Figure 1. Electric fuel pump fuel lines, red and black leads and mounting screw locations

Electric fuel pump fuel lines, red and black leads and mounting screw locations



STATOR AND ROTOR REMOVAL AND REPLACEMENT PROCEDURE

WARNING:

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

MATERIALS NEEDED

- 7/16" Nutdriver
- Torx Nutdriver (Size T30)
- 9/16" Nutdriver
- 1/2" Nutdriver
- 10mm Nutdriver
- 17mm Open-End Wrench
- Hoist And Appropriate Rigging
- Gear Puller
- 5/8" Nutdriver
- Rotor Removal Tool
- Wiring Diagram

REMOVAL PROCEDURE

Procedure Steps:

1. Turn off the engine of the Ranger 330MPX machine.
2. Perform the **Case Cover Removal Procedure** .
3. Using a 7/16" nutdriver, remove the two nuts securing leads 3 and 6 to the CB1 circuit breaker. See **Figure F.53** . See Wiring Diagram. Label and disconnect leads 3 and 6.
4. Using a 7/16" nutdriver, remove the nut and washers securing lead 5 to the neutral stud. See **Figure F.53** . See Wiring Diagram. Label and disconnect lead 5.
5. Label and disconnect leads 7, 8 and 9 from their quick connect terminals. See Wiring Diagram.
6. Using a 7/16" nutdriver, remove the three bolts and flat washers securing leads W1, W2, W3 and to the AC terminals of the output rectifier. See **Figure F.53** . See Wiring Diagram.
7. Cut cable ties as necessary.
8. Carefully route leads thru the electronics panel. See Wiring Diagram.

9. Using a torx nutdriver (size T30), remove the two screws securing the upper muffler baffle to the machine. See **Figure F.54** . See Wiring Diagram.
10. Using a 7/16" nutdriver, remove the five screws and washers securing the upper muffler baffle to the machine. See **Figure F.54** .
11. The upper muffler baffle can now be removed.
12. Using a 9/16" nutdriver, remove the screw securing the muffler to the machine. See **Figure F.54** .
13. Using a 7/16" nutdriver, remove the four screws securing the lower muffler baffle to the machine. See **Figure F.54** .
14. Using a 1/2" nutdriver, remove the four nuts securing the muffler to the engine.
15. Carefully remove the muffler from the engine. Note gasket placement for reassembly.
16. The lower muffler baffle can now be removed.
17. Using a 10mm nutdriver, remove the four screws securing the generator inlet baffle to the end bracket. See **Figure F.55** .
18. Label and disconnect leads 200 and 219 from the brush holder. See **Figure F.55** . See Wiring Diagram.
19. Using a 10mm nutdriver, remove the two screws securing the brush holder to the machine. See **Figure F.55** .
20. Using a 9/16" nutdriver and a 17mm open-end wrench, remove the four long bolts and nuts securing the end bracket to the stator. See **Figure F.55** .
21. Using a 9/16" nutdriver, remove the two nuts and flat washers securing the end bracket to the base of the machine. See **Figure F.55** . See Wiring Diagram.
22. Using a hoist and appropriate rigging, lift the end bracket (closest to the engine) to allow for the removal of the end bracket and stator.
23. Using a gear puller, separate the end bracket from the stator and remove the end bracket.
24. Using a hoist and appropriate rigging, remove the stator from the end bracket.
25. Using a 5/8" nutdriver, remove the long bolt securing the rotor to the engine. See **Figure F.55** .
26. Use a rotor removal tool or tap the rotor to break it free from the engine.
27. Using a hoist and appropriate rigging, remove the rotor.
28. Remove the screws securing the end bracket to the engine.

REPLACEMENT PROCEDURE

Procedure Steps:

1. Carefully position the end bracket onto the engine.
2. Attach the previously removed screws securing the end bracket to the engine.
3. Using a hoist and appropriate rigging, position the rotor onto the engine.
4. Using a 5/8" nutdriver, attach the long bolt securing the rotor to the engine.
5. Using a hoist and appropriate rigging, position the stator over the rotor.
6. Using a gear puller, attach the end bracket to the stator.
7. Using a hoist and appropriate rigging, lift the end bracket (closest to the engine) and place the other end bracket onto the mounting posts.
8. Using a 9/16" nutdriver, attach the two nuts and flat washers securing the end bracket to the base of the machine.
9. Using a 9/16" nutdriver and a 17mm open-end wrench, attach the four long bolts and nuts securing the end bracket to the stator.
10. Using a 10mm nutdriver, attach the two screws securing the brush holder to the machine.
11. Connect leads 200 and 219 to the brush holder. See Wiring Diagram.
12. Using a 10mm nutdriver, attach the four screws securing the generator inlet baffle to the end bracket.
13. Carefully position the lower muffler baffle onto the machine.
14. Carefully position the muffler onto the machine. Ensure the gaskets are in the proper position.
15. Using a 1/2" nutdriver, attach the four nuts securing the muffler to the engine.
16. Using a 7/16" nutdriver, attach the four screws securing the lower muffler baffle to the machine.
17. Using a 9/16" nutdriver, attach the screw securing the muffler to the machine.
18. Carefully position the upper muffler baffle onto the machine.
19. Using a 7/16" nutdriver, attach the five screws and washers securing the upper muffler baffle to the machine.
20. Using a torx nutdriver (size T30), attach the two screws securing the upper muffler baffle to the machine.
21. Carefully route leads thru the electronics panel. See Wiring Diagram.

22. Replace cable ties as necessary.
23. Using a 7/16" nutdriver, attach the three bolts and flat washers securing leads W1, W2, W3 and to the AC terminals of the output rectifier. See Wiring Diagram.
24. Connect leads 7, 8 and 9 to their quick connect terminals. See Wiring Diagram.
25. Using a 7/16" nutdriver, attach the nut and washers securing lead 5 to the neutral stud. See Wiring Diagram.
26. Using a 7/16" nutdriver, attach the two nuts securing leads 3 and 6 to the CB1 circuit breaker. See Wiring Diagram.
27. Perform the **Case Cover Replacement Procedure** .
28. Perform the **Retest After Repair Procedure** .

Figure 1. CB1 circuit breaker, output rectifier and neutral stud locations

CB1 circuit breaker, output rectifier and neutral stud locations

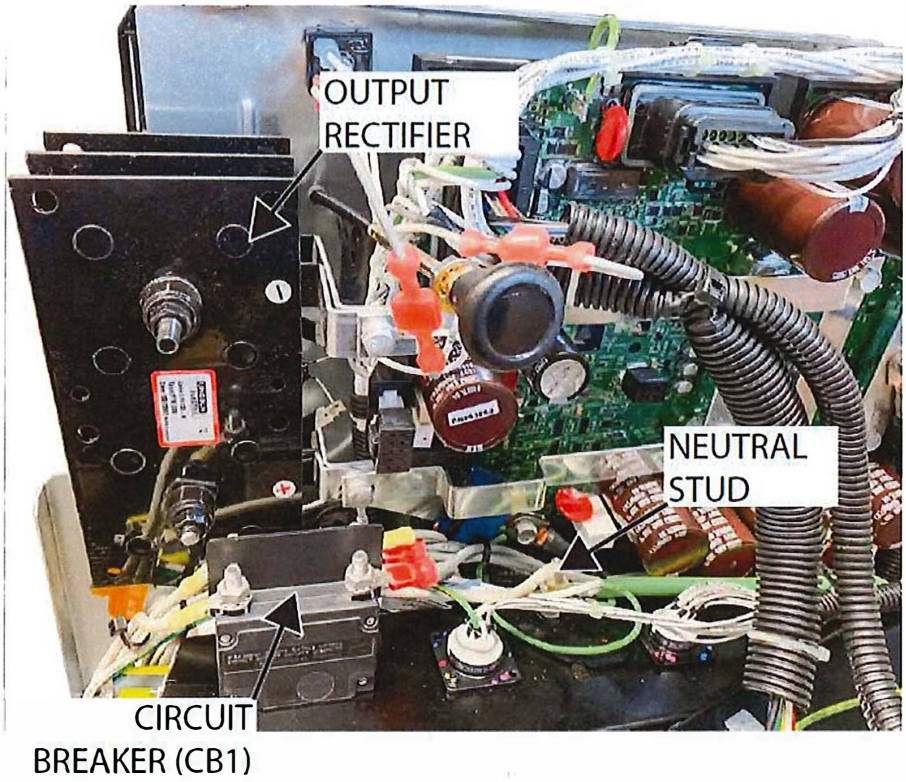


Figure 2. Upper muffler baffle, lower muffler baffle and muffler locations

Upper muffler baffle, lower muffler baffle and muffler locations

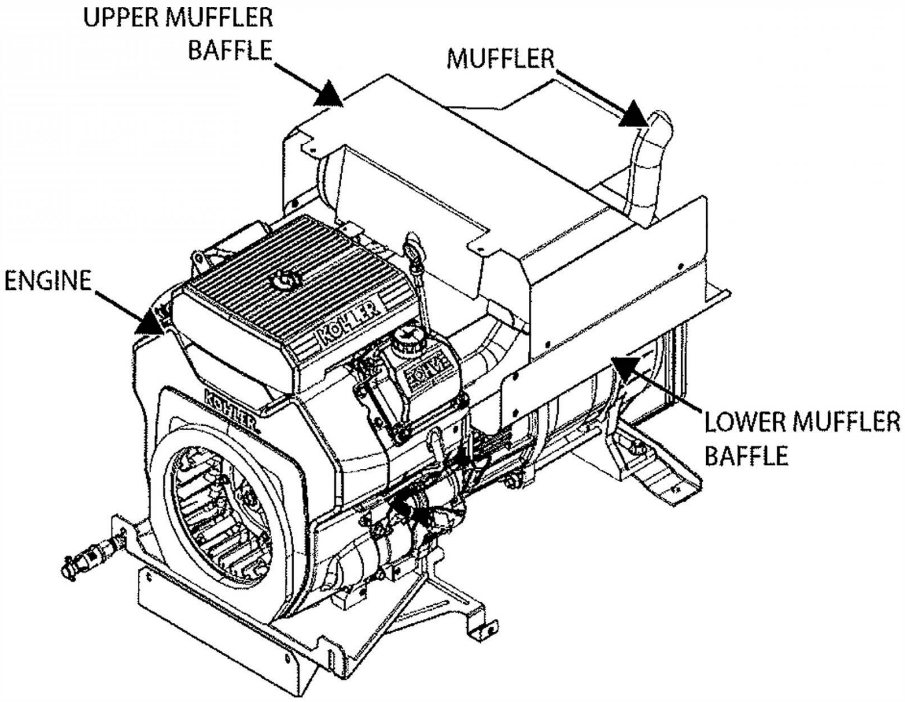
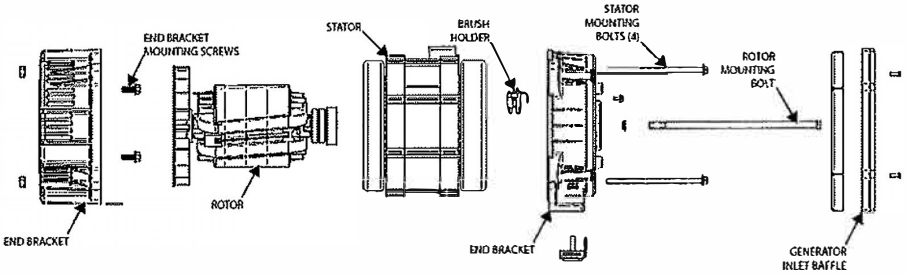


Figure 3. Stator and rotor component locations

Stator and rotor component 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.

Table 1.

MODE	NO LOAD RPM	LOAD RPM
LOW IDLE	2500	N/A
HIGH IDLE	3600	3600

Table 2.

WELDER DC (STICK) OUTPUT

MODE	OUTPUT CONTROL	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
STICK (CC)	MAXIMUM	57.5	28	330

Table 3.

WELDER CV MIG/FCAW OUTPUT

MODE	OUTPUT CONTROL	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
CV	MAXIMUM	57.5	28	330

Table 4.

WELDER TIG OUTPUT

MODE	OUTPUT CONTROL	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
TIG	MAXIMUM	14	28	330

Table 5.

WELDER DC PIPE OUTPUT

MODE	OUTPUT CONTROL	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
DC PIPE	MAXIMUM	14	28	330

Table 6.

AUXILIARY POWER OUTPUT

RECEPTACLE	OPEN CIRCUIT VOLTAGE	LOAD VOLTS	LOAD AMPS
120 VAC DUPLEX	120 - 135	115 - 130	20
120/240 VAC	120 - 270	115 - 240	50
240 VAC	240 - 270	216 - 240	50