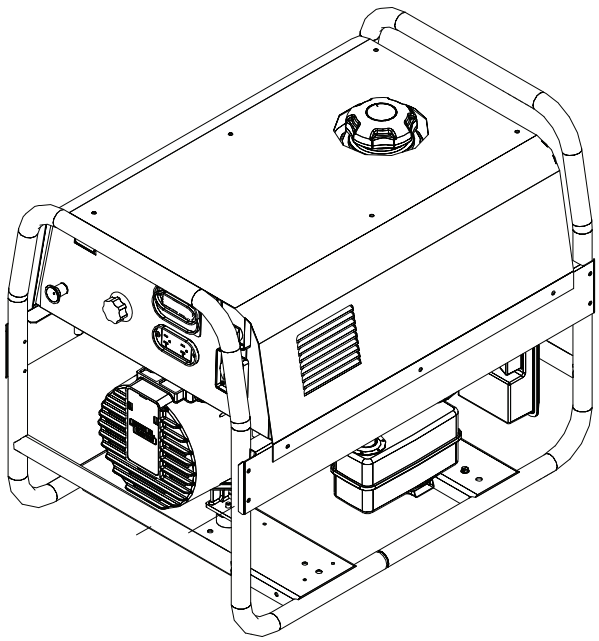
NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

OUTBACK® 145

For use with machines having Code Numbers:

11517 & 11732

SERVICE MANUAL



Need Help? Call 1.888.935.3877
to talk to a Service Representative

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

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

For Service outside the USA:
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SVM216-A | Issue Date 12-Jan

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

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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

FOR ENGINE powered equipment.

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

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

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

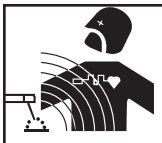
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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

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

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

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



ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

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

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

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

ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS can burn.

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

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

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

FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

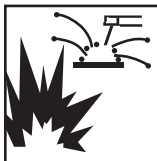
5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

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

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.



WELDING and CUTTING SPARKS can cause fire or explosion.

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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

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

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

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

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

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

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

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d.Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Electromagnetic Compatibility (EMC)

Conformance
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

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

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

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

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

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

Electromagnetic Compatibility (EMC)

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

Methods of Reducing Emissions

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

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

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

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

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

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

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

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FIGURE E.1 BLOCK LOGIC DIAGRAM

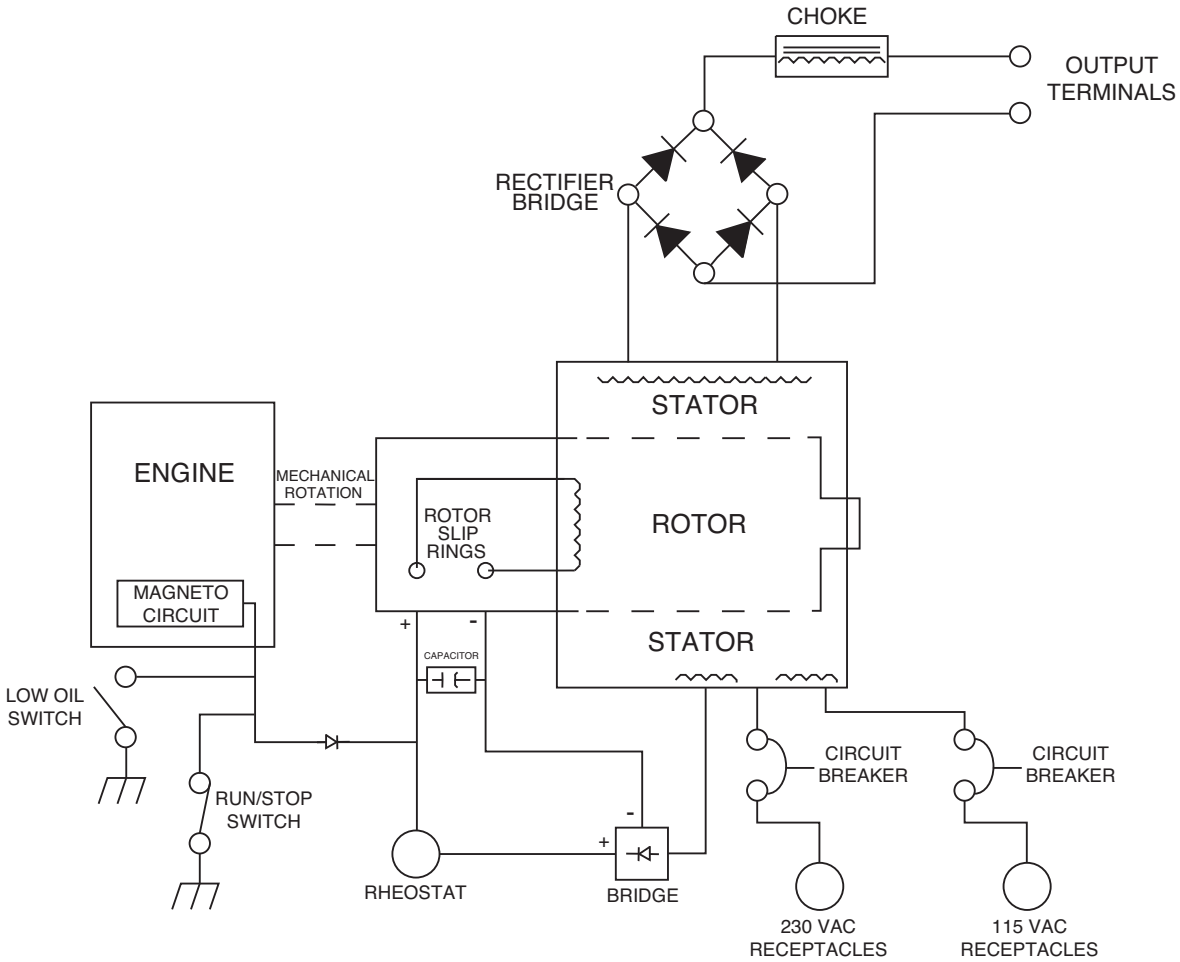
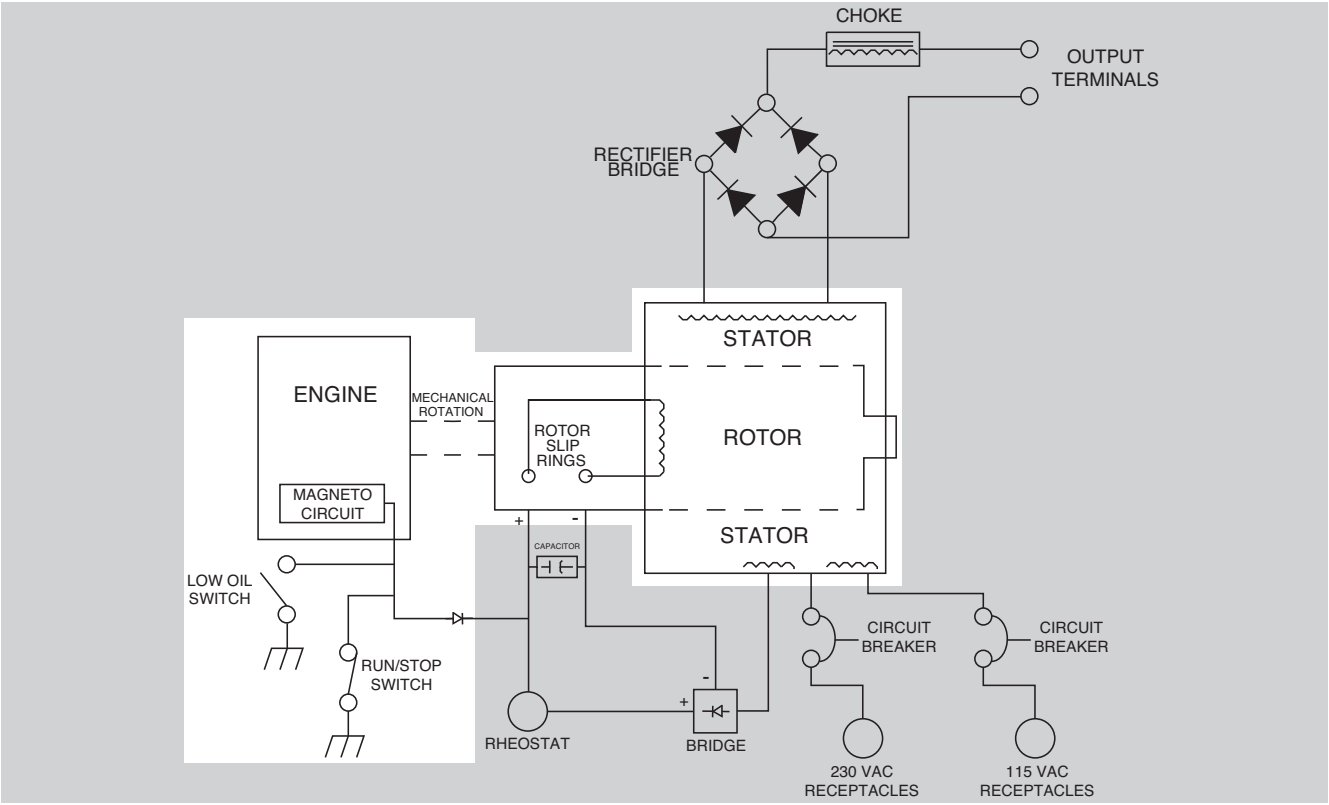


FIGURE E.2 - ENGINE CONTROL, IGNITION, ROTOR & STATOR



ENGINE CONTROL AND IGNITION

The engine ignition is created and controlled by a fly-wheel type magneto circuit. This circuit is shorted to ground when the ON/OFF switch is moved to the OFF position, thus disabling the ignition circuit and shutting down the engine. In the event of a low oil condition the Low Oil Level Switch will activate and short the ignition circuit to ground. This will disable the ignition circuit and shut down the engine. This is a protective function to prevent damage to the engine if the crankcase oil level is inadequate.

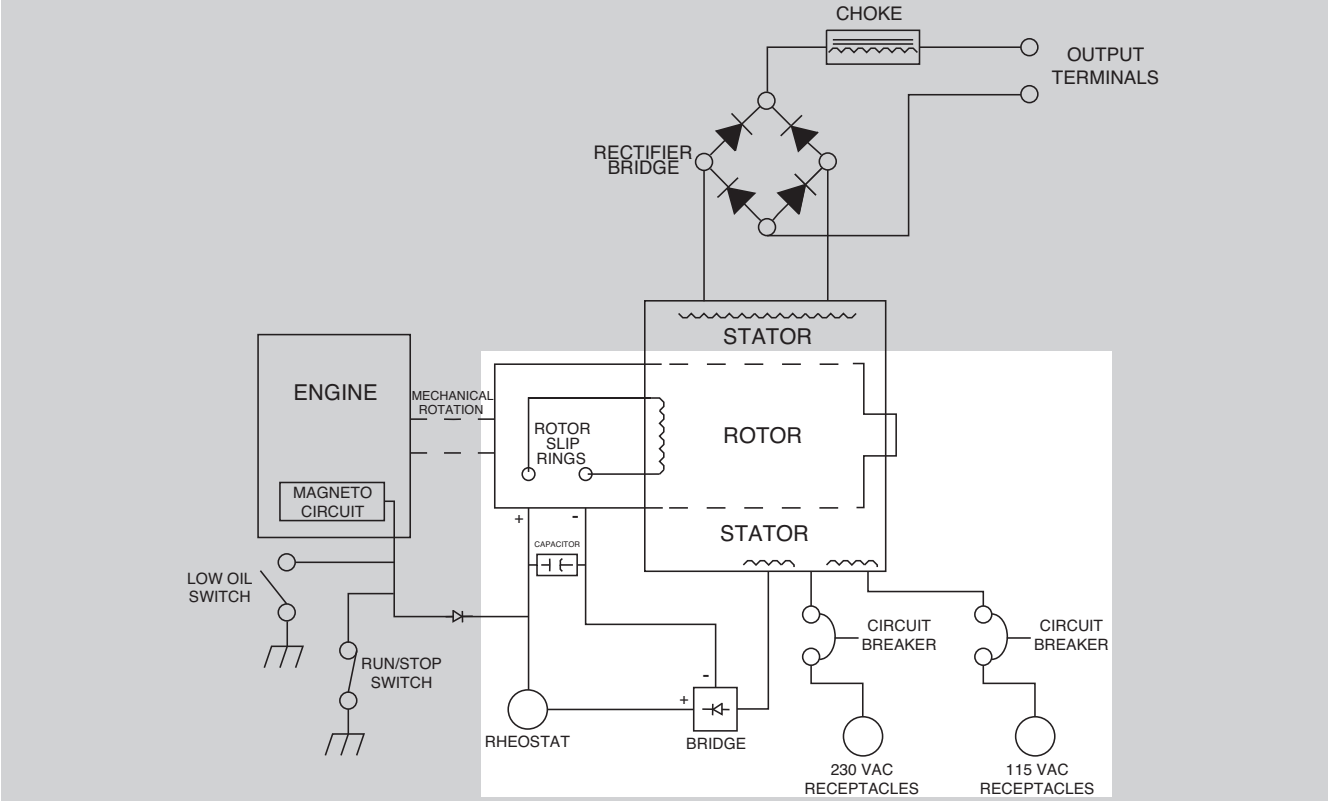
ENGINE, EXCITATION, ROTOR AND STATOR

A small voltage developed by the engine magneto is fed through a diode to the rotating field coil in the rotor via a brush and slip ring configuration. This excitation (“Flashing”) voltage magnetizes the rotor lamination. The rotor is mechanically coupled to the engine. The rotating magnet induces a voltage in the stationary windings of the main alternator (stator).

Three separate and isolated windings are incorporated in the stator lamination assembly. Each winding set has a different number of turns, producing different magnitudes of AC output voltages. The three windings are the weld winding, the auxiliary power winding and the field feedback winding. The field feedback winding provides rotor current during machine operation. The output of the Outback 145 is dependent on two criteria: the engine RPM and the amount of current in the rotor winding.

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

FIGURE E.3 - ROTOR FIELD FEEDBACK AND AUXILIARY POWER



ROTOR FIELD FEEDBACK AND AUXILIARY POWER

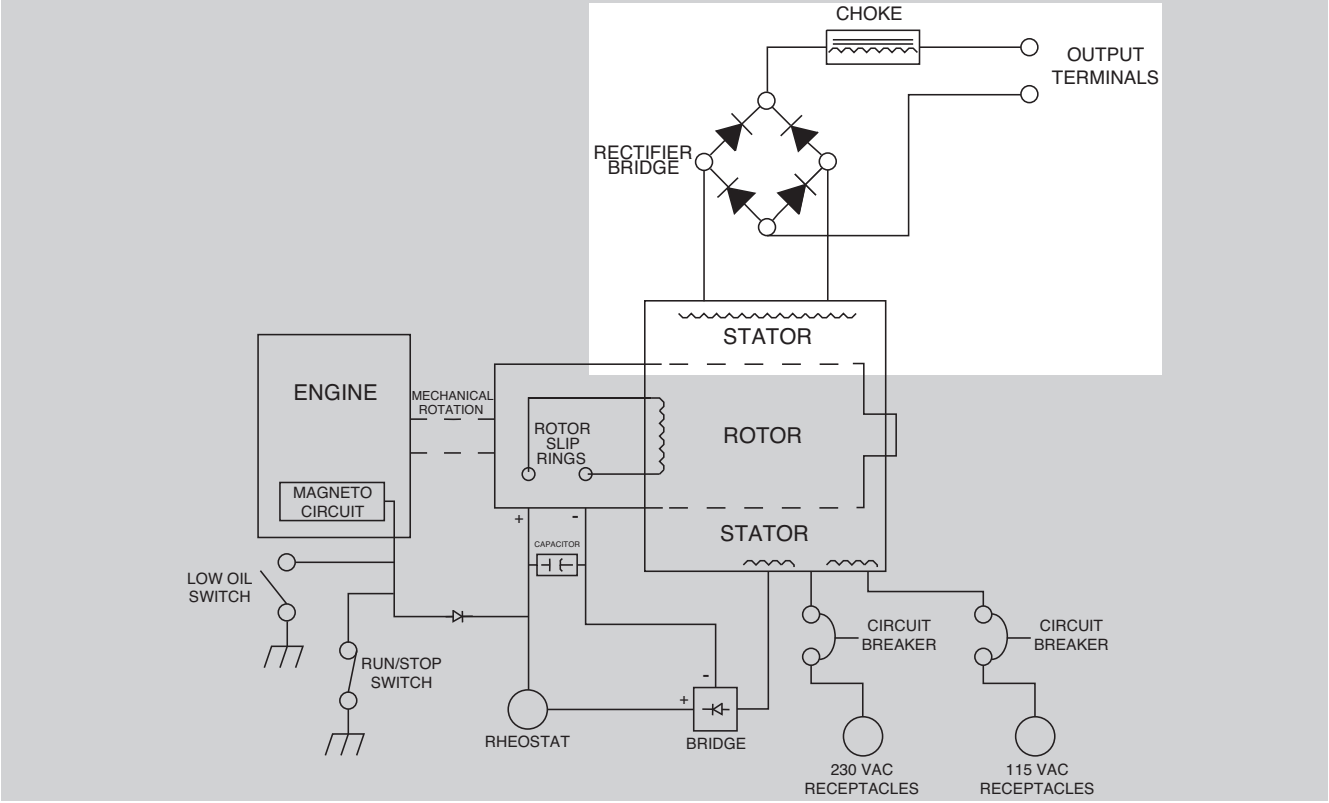
The AC voltage developed in the field winding is fed to the full wave bridge. The DC output of the bridge is filtered by the field capacitor and controlled by the output rheostat.

This filtered and controlled feedback voltage is fed to the rotor winding via the brush and slip ring configuration. As the feedback voltage is increased or decreased, the outputs of the weld and auxiliary windings are likewise increased or decreased.

When full field voltage is applied to the rotor and the engine is running at high speed (3750 RPM), a 230VAC voltage is developed in the stator auxiliary winding. This winding is tapped to provide 115 VAC. The two voltages (115VAC and 230VAC) are connected to the appropriate receptacles and offer 4250 watts (total) of AC power.

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

FIGURE E.4 - WELDING OUTPUT



WELD WINDING

The weld winding provides AC current to the full wave bridge and is rectified to DC which is then filtered through the choke coil to provide up to 145 amps of stick welding current.

AUXILIARY POWER OVERCURRENT PROTECTION

The Outback 145's 4250 watt auxiliary power winding and circuitry is protected from an overload condition by two 20 amp circuit breakers. They can be manually reset.

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

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: output problems and engine problems.

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

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

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

⚠ CAUTION

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

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

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

⚠ CAUTION

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

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

PC board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

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

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

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

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

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

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

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

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

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

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident.	1. Contact your local Lincoln Authorized Field Service Facility.	1. Contact The Lincoln Electric Service Dept. 888-935-3877.
No weld output and no auxiliary power. Engine operates normally.	1. Check brushes for wear. See the ***Maintenance*** section of this manual. 2. Check for loose or faulty connections at brush holders.	1. Perform the ***Rotor Voltage Test***. 2. If the rotor voltage is low or missing, check for the proper flashing current. Perform the ***Rotor Flashing Circuit Test***. 3. Perform the ***Rotor Resistance Test***. 4. The field capacitor (C1) or rectifier bridge (D1) may be faulty. Test or replace. 5. Test the rheostat (R1). Normal resistance is 3.3 ohms. 6. Perform the ***Field Diode Bridge Test***.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
Engine will not start.	1. Make sure the RUN/STOP Switch is in the “RUN” position. 2. Make sure the fuel shut off valve is in the open position. 3. Make sure the engine has adequate fuel and oil. 4. Adjust the choke to prevent carburetor flooding. 5. Check the spark plug wire for loose or faulty connections.	1. Check the fuel line for breaks or obstructions. 2. The spark plug may be faulty. Replace. 3. Service the engine as outlined in the ***Maintenance*** section of this manual. 4. The engine ignition module may be faulty. Consult Briggs & Stratton Service.
Engine runs erratic or stops running.	1. The oil level may be low, activating the engine oil level shutdown system. Check oil level. 2. Check the spark plug wire for loose or faulty connection. 3. The spark plug may be faulty. Replace. 4. The fuel and air mixture may be out of adjustment. Consult the Briggs & Stratton Owner’s Manual. 5. The fuel supply may be contaminated with water.	1. If the oil level is correct, the oil level shutdown switch may be faulty. Remove the lead running from the oil level switch to the ignition module. If the engine runs normally, the oil level switch is faulty. Replace. DO NOT OPERATE THE ENGINE WITHOUT OIL LEVEL PROTECTION. 2. The engine may require service to the head or carburetor.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No weld output, the auxiliary power (230-115VAC) operates normally. Engine runs normally.	1. Check the open circuit voltage (OCV) at the welder output terminals. Normal is 75 to 82VDC with engine at high idle (3750 RPM) and the output rheostat at maximum. If the correct OCV is present, go to Step 3, below. 2. If the open circuit voltage is NOT present at the welder output terminals, contact your local Lincoln Electric Authorized Field Service Facility. 3. Check the welding cables, clamps and electrode holder for loose or broken connections.	1. Check the continuity (low resistance) from the positive output terminal, through the choke (L1), to the positive side of the output rectifier bridge (D1). See Wiring Diagram. 2. Check the continuity (zero ohms) from the negative output terminal to the negative side of the output rectifier bridge (D1). See Wiring Diagram. 3. Perform the ***Output Rectifier Bridge Tes***t. 4. Check the stator for continuity of winding. See Wiring Diagram.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No auxiliary power – welding output is normal – engine runs normally.	1. Make sure that the control rheostat (R1) is set at maximum. 2. Check for a loose or faulty plug at the power receptacle. 3. If the machine is equipped with circuit breakers, check and reset if tripped.	1. Check the auxiliary power receptacles and associated wires for loose or faulty connections. 2. Check the continuity (zero ohms) of leads #3, #5, and #6 from the receptacles to the main stator windings. See Wiring Diagram. 3. Make sure lead #5 is grounded to the machine frame (zero ohms). 4. Check the stator for continuity of winding. See Wiring Diagram.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Low weld output and low auxiliary output.	1. The generator brushes may be worn. See the ***Maintenance*** section of this manual or contact your local Lincoln Electric Authorized Field Service Facility. 2. The engine RPM may be low.	1. Perform the ***Rotor Voltage Test.*** 2. If the rotor voltage is low, the field capacitor (C1) or the field rectifier bridge (D2) may be faulty. Test or replace. 3. Check the rheostat (R1). Normal resistance is 3.3 ohms. See Wiring Diagram. 4. The rotor may be faulty. Perform the ***Rotor Resistance Test.*** 5. The engine RPM may be low. Perform the ***Engine Throttle Adjustment Test.*** 6. If the engine idle RPM is okay, the engine may have lost horsepower and be in need of major repair.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
The welding arc is “cold.” The engine runs normally. The auxiliary power functions normally.	1. Check for loose or faulty connections at the weld output terminals and welding cable connections. 2. The welding cable may be too long or coiled, causing an excessive voltage drop.	1. With the output control at maximum, check for the correct open circuit voltage (OCV) at the welder output terminals (75 - 82 VDC). If the correct open circuit voltage is present at the output terminals, check for loose connections on the heavy current carrying leads inside the OUTBACK 145. See Wiring Diagram. 2. If the OCV is low at the welder output terminals, perform the ***Engine Throttle Adjustment Test.*** 3. Perform the ***Output Rectifier Bridge Test.*** 4. Check for shorted or grounded windings in the choke (L1).

⚠ CAUTION

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

NOTES

ROTOR VOLTAGE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

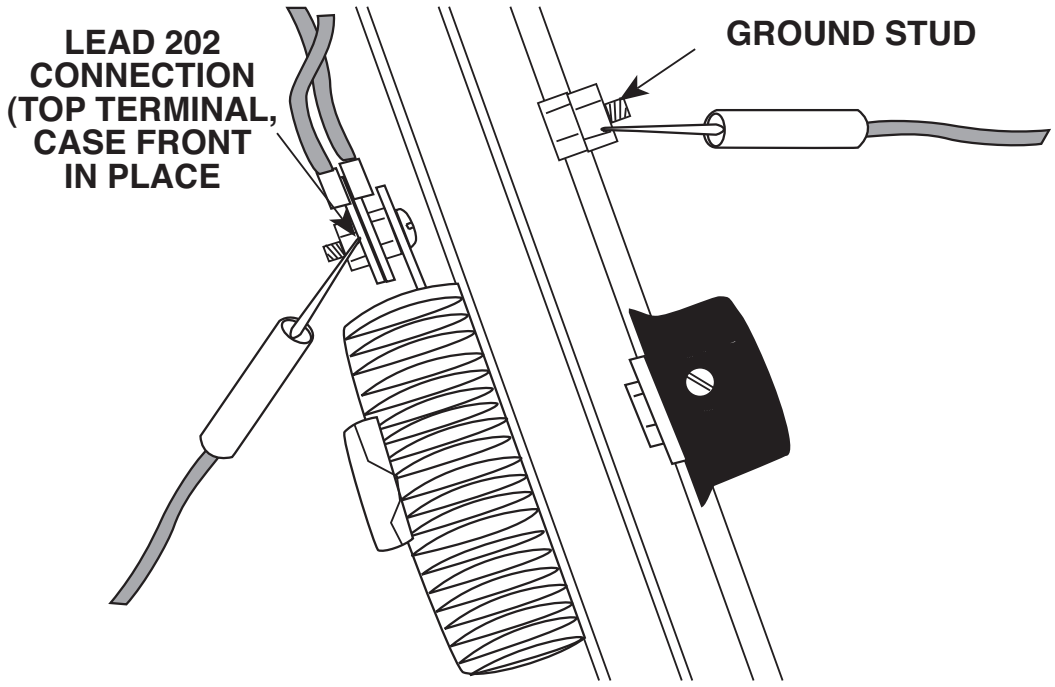
This test will determine if the correct DC voltage is being applied to the Rotor at maximum engine speed (3700 RPM). This information will aid the technician in determining if the Generator Field is operating properly.

MATERIALS NEEDED

Volt/Ohmmeter
3/8” Nutdriver
Wiring Diagram

ROTOR VOLTAGE TEST (continued)

FIGURE F.1 – LOCATION OF LEAD 202 FOR ROTOR VOLTAGE TEST



PROCEDURE

1. With the 3/8” nut driver, remove the 20 sheet metal screws that hold the top cover to the control box. Remove the top cover.
2. Start the machine and run it at high idle. Set the output control (rheostat) at the MAXIMUM setting.
3. Set the volt/ohmmeter at the DC position.
4. Place the positive probe on lead #202 (two red wires joined together) where it connects at the back of the rheostat. See Figure F.1 for location. Place the negative probe on the machine ground stud or any other good, unpainted ground.
5. Check the voltage reading on the volt/ohmmeter. It should read 37.5 - 42.5 VDC.
6. If the voltage is low or not present, the generator field circuit is not functioning correctly. Proceed with the Rotor Resistance Test. C1, R1, or D2 may also be faulty.
7. If rotor voltage is correct, the generator field is okay. Replace the top cover on the control box. Tighten the 20 sheet metal screws with the 3/8” nut driver.

ROTOR RESISTANCE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

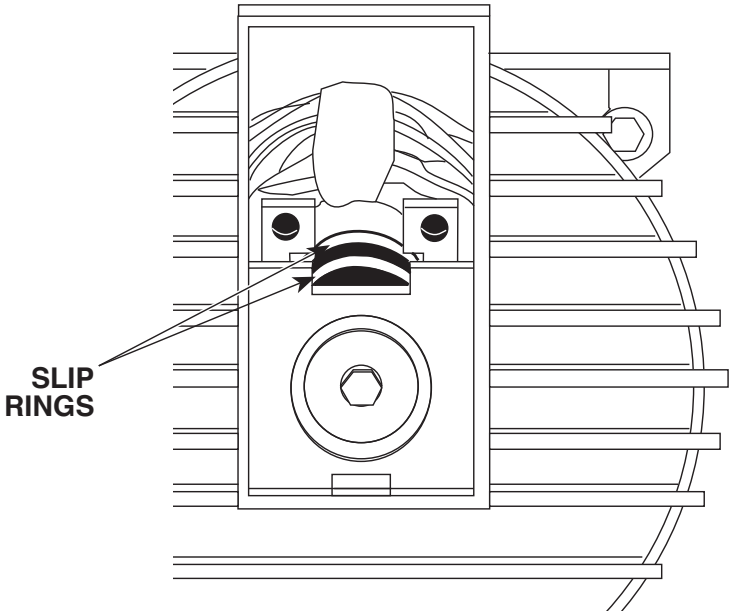
This test will determine if there is a shorted Winding in the Rotor or if the Rotor is grounded.

MATERIALS NEEDED

Volt/Ohmmeter
1/4” Nutdriver
Small Slot Head Screwdriver
Wiring Diagram

ROTOR RESISTANCE TEST (continued)

FIGURE F.2 – LOCATION OF ROTOR SLIP RINGS - BRUSH HOLDER ASSEMBLY REMOVED



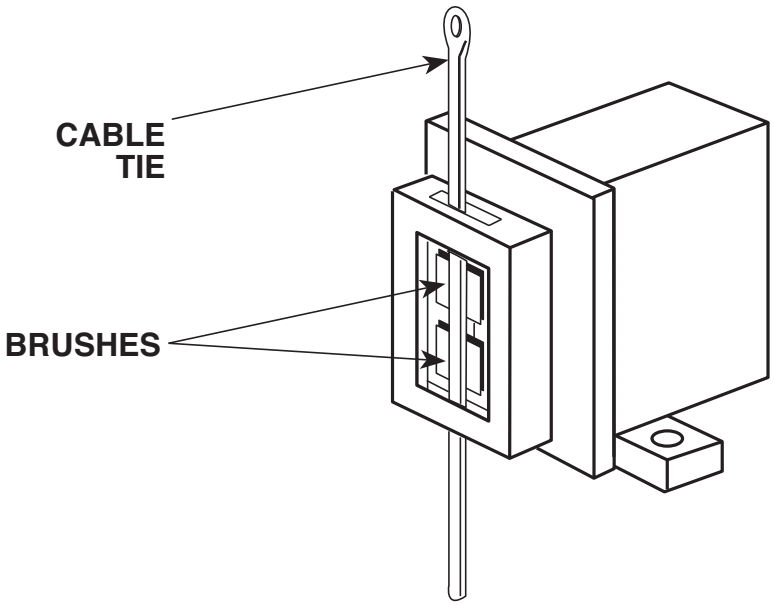
PROCEDURE

1. Conduct the test with the gasoline engine OFF.
2. Remove the spark plug wire to prevent accidental engine kickback or starting.
3. Isolate the rotor electrically by removing the generator brushes. Refer to Figure F.2 as you perform the remaining steps.
4. Open the brush holder assembly cover. Squeeze the 2 tabs and depress the cover at the top with a screw driver or your fingernail. The cover will drop open on its bottom hinge.
5. With the 1/4" nut driver, remove the 2 screws that hold the brush holder assembly in place.
6. Slide the brush holder assembly out and lay it aside, held by the 2 wires attached.
7. Measure the resistance across the rotor slip rings.
   A. Set the ohmmeter on the low scale (X1).
   B. Place one meter probe on one of the rotor slip rings. Place the other probe on the other slip ring.
   C. Check the resistance across the slip rings. It should read 7 - 8 ohms.
8. Measure the resistance to ground.
   A.. Set the ohmmeter on the high scale (X100,000).
   B. Place one probe on either of the slip rings. Place the other probe on any good, unpainted ground. Use the ground stud or the rotor thru-bolt.
   C. Check the resistance. It should read very high, at least .5 megohm (500,000 ohms).

If the resistance checks meet the specifications, then the rotor is okay.

ROTOR RESISTANCE TEST (continued)

FIGURE F.3 – BRUSHES RETAINED WITH CABLE TIE



9. Reinstall the brush holder assembly after the test. Depress the spring-loaded brushes into the holder and slip a suitable non-metallic, fairly stiff retainer through the slots at the top and bottom of the holder. A cable tie works well; see Figure F.3. This will hold the brushes up so that you can easily install the holder.
10. Slip the holder into position in the generator end bracket. Be careful not to loosen the 2 attached wires.
11. Reinstall and tighten the 2 screws with the 1/4" nut driver.
12. Slowly remove the non-metallic retainer from the brush holder and let the brushes snap back against the slip rings.
13. Snap the brush holder cover back into position.

NOTES

ROTOR "FLASHING" CIRCUIT TEST

⚠ WARNING

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

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

TEST DESCRIPTION

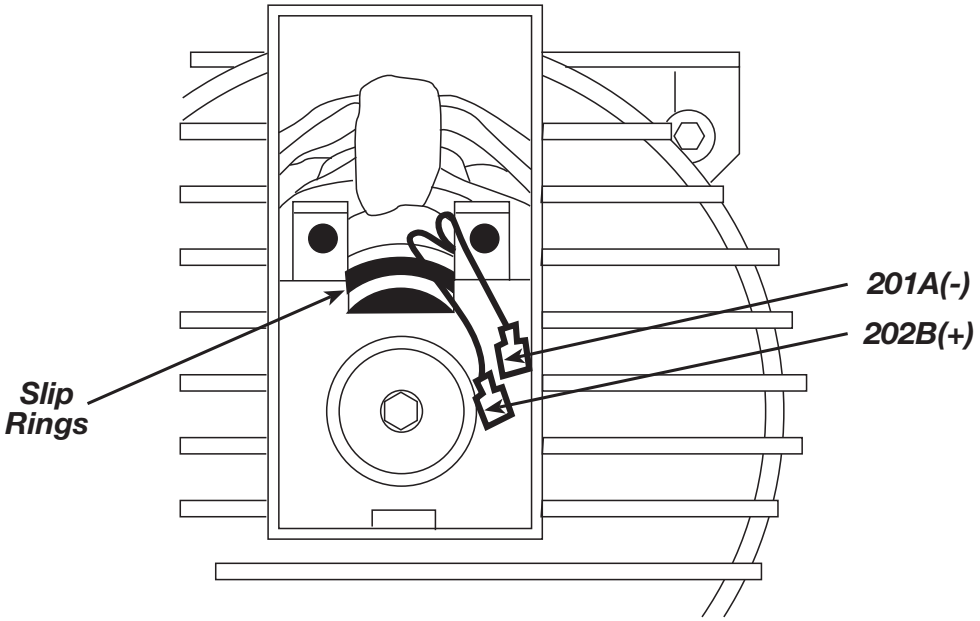
This test will determine if the Engine Magneto is supplying the proper "flashing" current to the Rotor.

MATERIALS NEEDED

Volt/Ohmmeter
3/8" Nutdriver
DC Ammeter
Wiring Diagram

ROTOR "FLASHING" CIRCUIT TEST (continued)

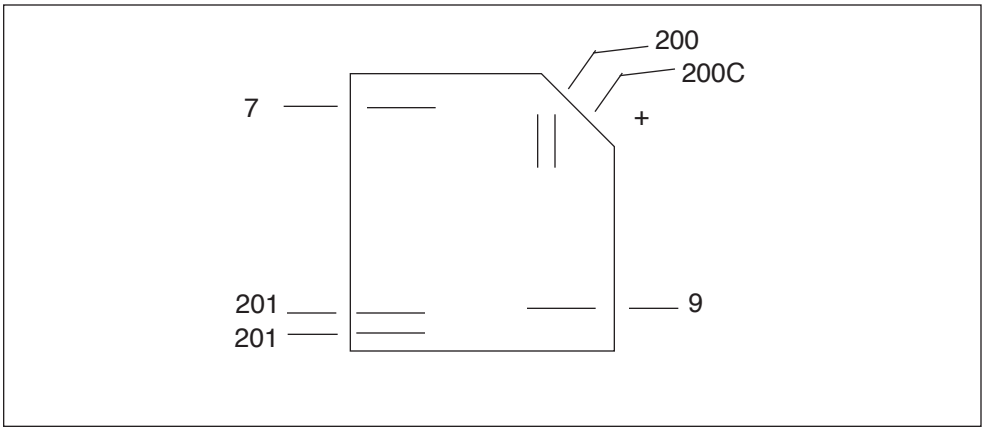
FIGURE F.4 – BRUSH HOLDER LEADS 201A(-) AND 202B(+)



PROCEDURE

1. With the 3/8" nutdriver, remove the 20 sheet metal screws that hold the top cover to the control box. Remove the top cover.
2. Locate and remove lead #201A from the brush holder. See Figure F.4 for location.
3. Connect the negative (-) lead of the DC ammeter to lead #201A and the positive (+) lead to the brush holder.
4. Remove lead #7A from field diode bridge rectifier D2. See Figure F.5. Electrically isolate the lead.

FIGURE F.5 – DIODE BRIDGE LEAD ASSIGNMENTS



ROTOR "FLASHING" CIRCUIT TEST (continued)

⚠ WARNING

MOVING PARTS can injure.

Keep away from moving parts.

ENGINE EXHAUST can kill.

Use in open, well ventilated areas or vent exhaust to the outside.

5. Start the engine and run it at High Idle (3700 - 3800 RPM).
6. The DC ammeter should read between 0.15 and 0.30 amps.
7. If the DC ammeter reads 0.0 amps, check for flashing voltage between lead #202 from the brush holder and case ground (lead #201). See ***Figure F.4*** and the Wiring Diagram. Normal flashing voltage is 2.05 VDC.
8. If normal flashing voltage is present, perform the Rotor Resistance Test. Also be sure that all #201 leads have continuity (zero ohms) to case ground.
9. If flashing voltage is not measured, check from lead 205 on the diode bridge D3 to case ground normal readings are around 3 VAC. If no flashing voltage is present, the engine magneto may be faulty. Check lead 205 back to magneto and measure for voltage there.
10. If there is AC volts at the diode bridge, the diode may be open. Check diode and move leads over if need be.

NOTES

OUTPUT RECTIFIER BRIDGE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

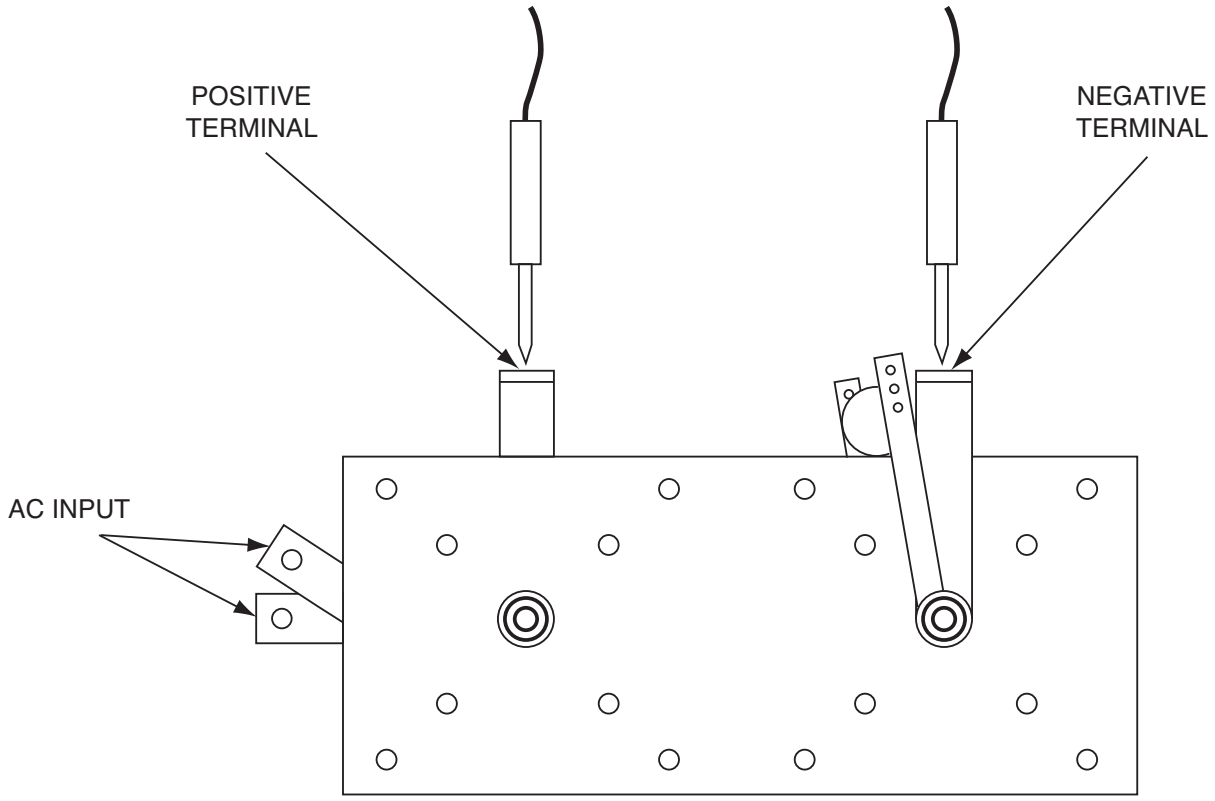
This test will determine if there are faulty diodes in the Output Rectifier Bridge.

MATERIALS NEEDED

Volt/Ohmmeter (Diode Tester)
7/16” Wrench
3/8” Nutdriver
Wiring Diagram

OUTPUT RECTIFIER BRIDGE TEST (continued)

FIGURE F.6 – OUTPUT RECTIFIER BRIDGE



PROCEDURE

1. Remove the 20 bolts holding down the control box cover by using a 3/8” nutdriver. Remove cover.
2. Remove the spark plug and then remove all of the current carrying leads using a 7/16” nutdriver and/or wrench from the output bridge.
3. Using a ohmmeter, measure resistance across the positive and negative studs. The resistance should be very low one way and very high or open the opposite.
4. If the bridge measures open or closed in both directions. The diode bridge rectifier will need replacement.

ENGINE THROTTLE ADJUSTMENT TEST
ROBIN / SUBARU ENGINE

⚠ WARNING

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

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

TEST DESCRIPTION

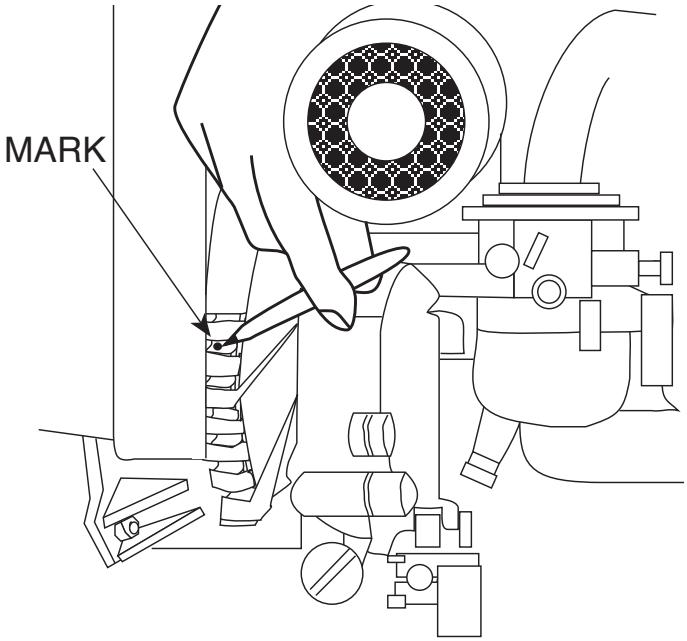
If the machine output is low, this test will determine whether the Gasoline Engine high idle speed is set for the correct maximum RPM.

MATERIALS NEEDED

Screwdriver
Frequency Counter or Strobe-Tach or Oscilloscope
Black or Red Marking Pencil
10mm Socket Wrench

ENGINE THROTTLE ADJUSTMENT TEST (continued)

FIGURE F.7 – MARK LOCATION



PROCEDURE

This test can be conducted by any of three methods.

Strobe-tach Method:

1. Remove the spark plug wire to prevent accidental kickback or starting.
2. With the black or red marking pencil, place a mark on one of the blower paddles, which can be reached through the vent slots in the end bracket. See Figure F.7.
3. Connect the strobe-tach according the manufacturer's instructions.
4. Reconnect the spark plug wire and start the engine. Direct the strobe-tach light on the blower paddle and synchronize it to the rotating mark. The tach should read 3700 RPM.
5. Using the 10mm socket wrench, slightly loosen the throttle locking nut.
6. Using the screwdriver adjust the high speed stop screw until the tach reads 3700 RPM.
5. Re-tighten the throttle locking nut.

Frequency Counter Method:

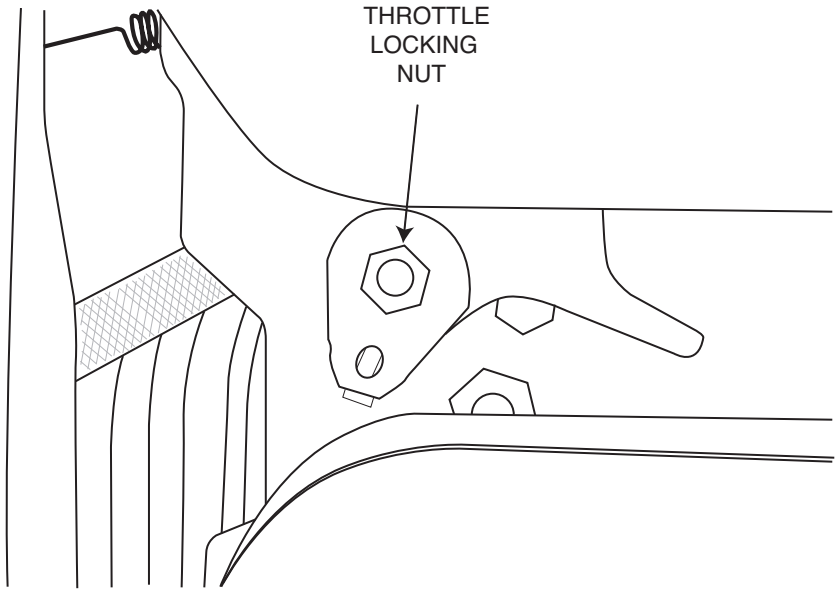
1. Plug the frequency counter into one of the 115 VAC auxiliary receptacle.
2. Start the engine and check the frequency counter. At the proper RPM (3700), the counter should read 62 Hz.
3. Using the 10mm socket wrench, slightly loosen the throttle locking nut.
4. Using the screwdriver, adjust the high speed stop screw until the frequency counter reads 3700 RPM.
5. Re-tighten the throttle locking nut.

Oscilloscope Method:

1. Connect the oscilloscope according to the manufacturer's instructions. At 3700 RPM, the waveform should exhibit a period of 16.2 milliseconds. Refer to the NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (115 VAC SUPPLY) HIGH IDLE - NO LOAD in this section of the manual.

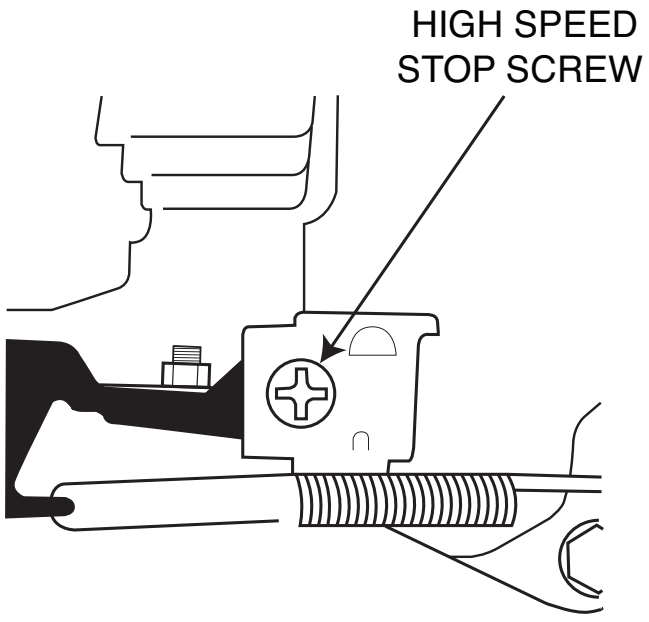
ENGINE THROTTLE ADJUSTMENT TEST (continued)

FIGURE F.8 – LOCKING NUT LOCATION



2. Using the 10mm socket wrench, slightly loosen the throttle locking nut. See Figure F.8.
3. Using the screwdriver, adjust the high speed stop screw until the waveform period is 16.2 milliseconds. See Figure F.8.
4. Re-tighten the throttle locking nut. See Figure F.8.

FIGURE F.9 – STOP SCREW LOCATION



NOTES

FIELD DIODE BRIDGE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

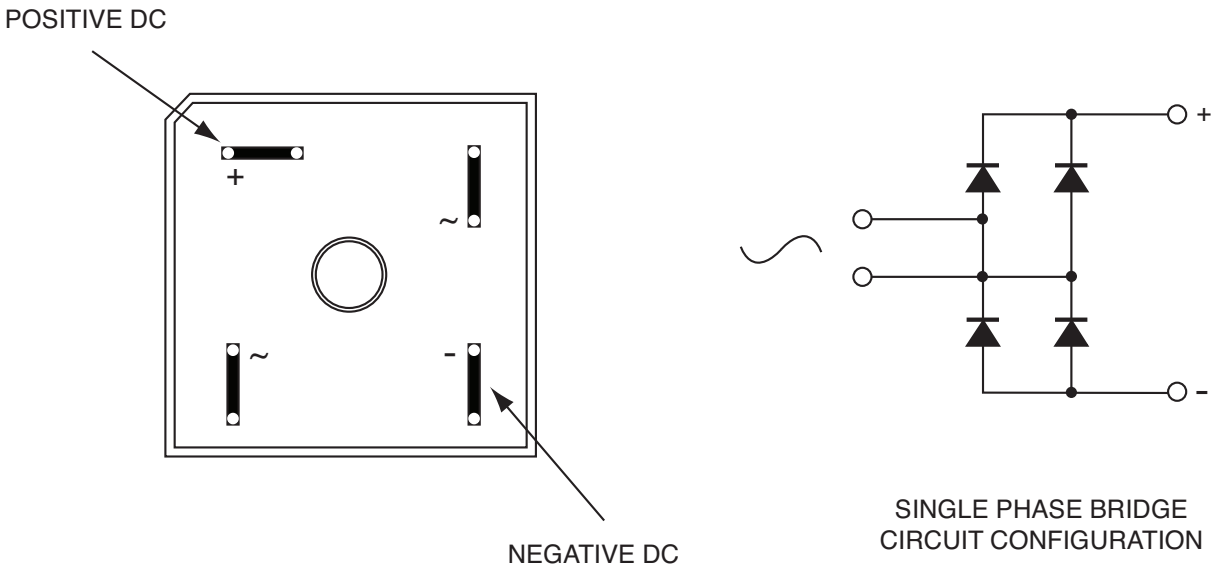
This procedure will test the Diode Bridge for any faulty Diodes and will help determine the configuration for the Bridge.

MATERIALS NEEDED

Ohmmeter or Diode Tester

FIELD DIODE BRIDGE TEST (continued)

FIGURE F.10 – DOOR REMOVAL

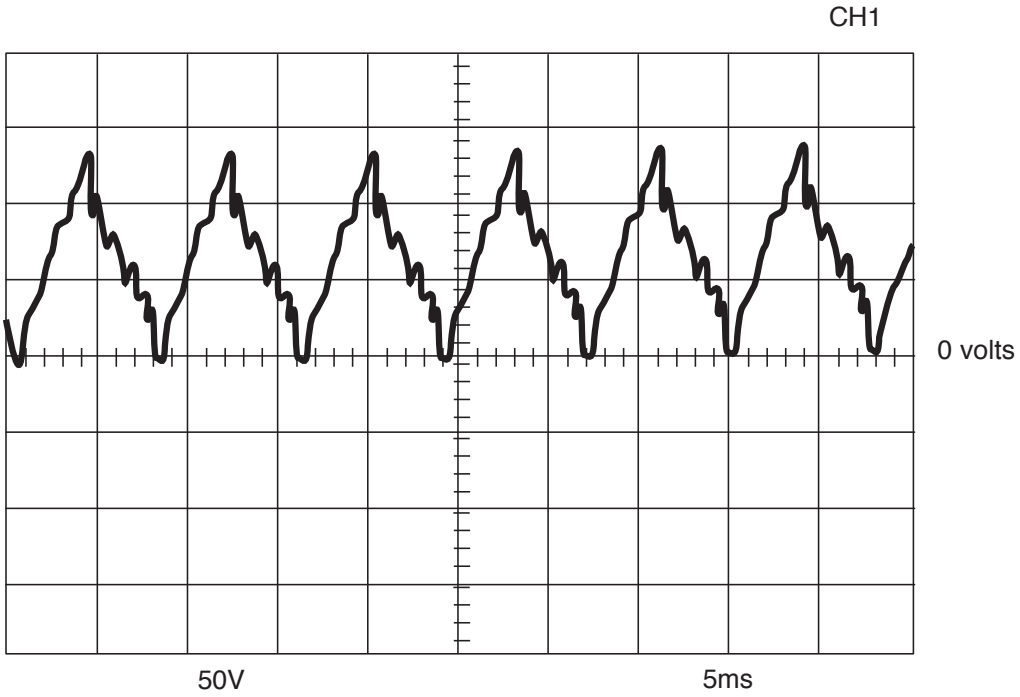


PROCEDURE

The diode bridge is configured as pictured above. The individual diodes can be tested using a diode tester or an ohmmeter. The diodes will read open one way and shorted the other way. If any o the diodes read shorted or open in both directions, the diode bridge will need to be replaced.

NORMAL OPEN CIRCUIT WELD VOLTAGE WAVEFORM

HIGH IDLE – NO LOAD – OUTPUT CONTROL AT MAXIMUM



This is the typical output voltage generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 5 milliseconds in time.

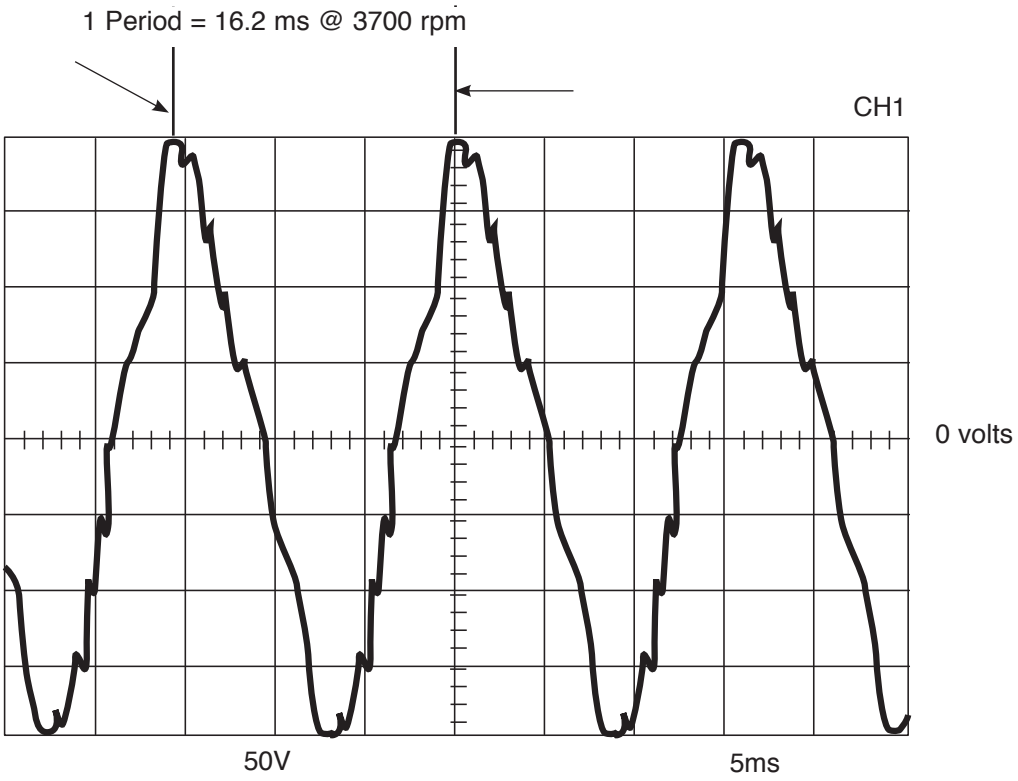
Note: Scope probes connected at machine output terminals.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (115VAC SUPPLY)

HIGH IDLE – NO LOAD



This is the typical auxiliary output voltage generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 5 milliseconds in time.

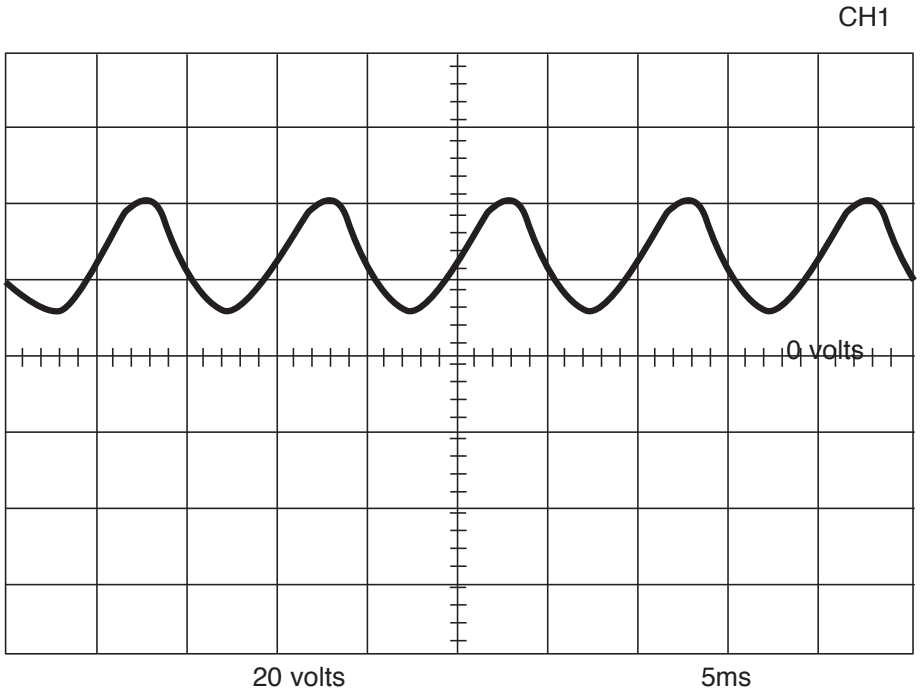
Note: Scope probes connected at machine 115VAC receptacle.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

TYPICAL WELD OUTPUT WAVEFORM

MACHINE LOADED



MACHINE LOADED TO 125 AMPS AT 25 VAC

This is the typical auxiliary output voltage generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 5 milliseconds in time.

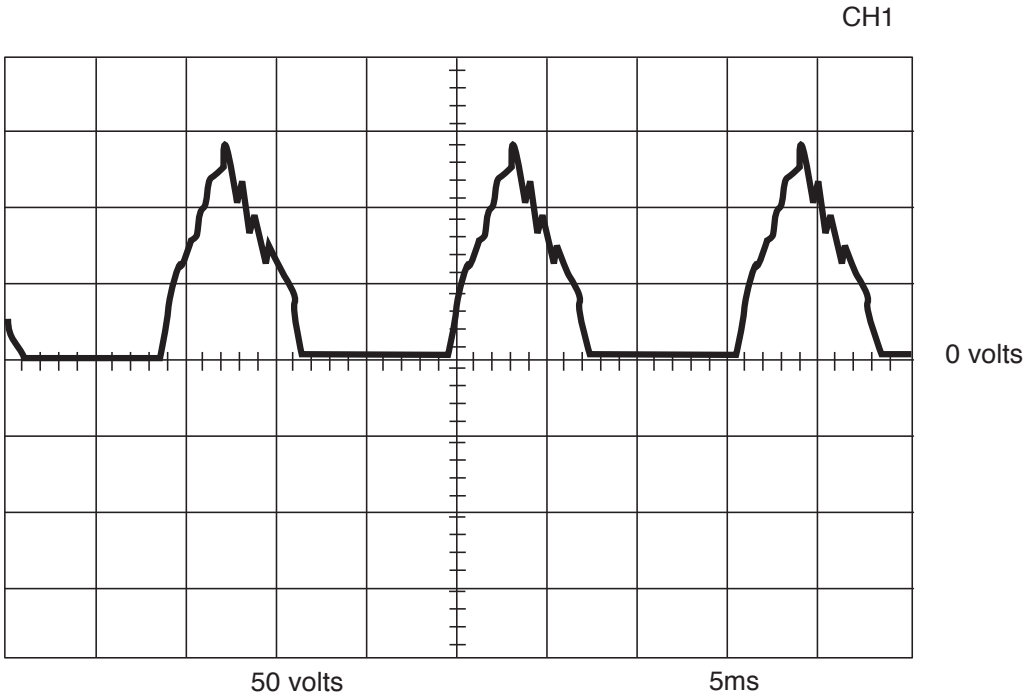
Note: Scope probes connected at machine 115VAC receptacle.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

ABNORMAL OPEN CIRCUIT WELD VOLTAGE WAVEFORM

HIGH IDLE – NO LOAD – OUTPUT CONTROL AT MAXIMUM



This is not the typical DC output voltage waveform. Note the “gap” in the waveform. One output diode was disconnected to simulate an “open” diode. Each vertical division represents 50 volts and that each horizontal division represents 5 milli-seconds in time.

Note: Scope probes connected at machine output terminals.

SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

BRUSH REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

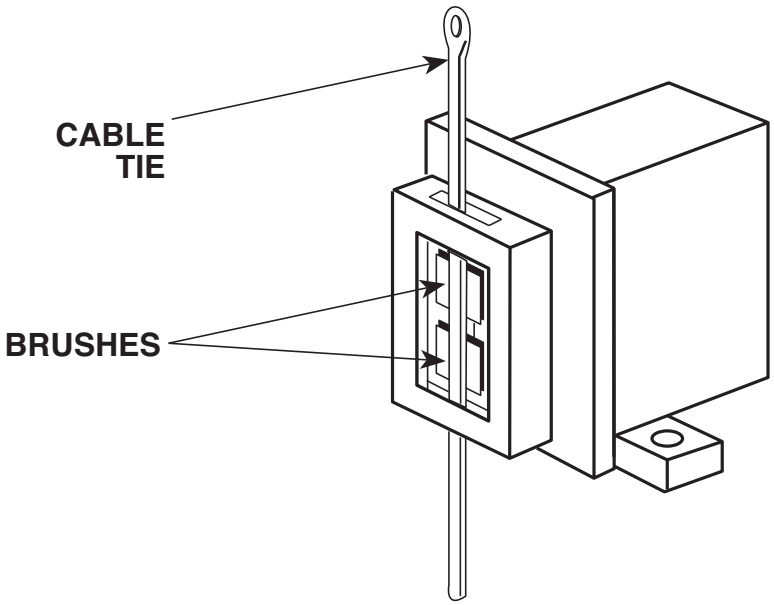
The following procedure will aid the technician in accessing the Generator Brushes for maintenance or replacement.

MATERIALS NEEDED

Small Slot Head Screwdriver
1/4” Nutdriver
Needlenose Pliers

BRUSH REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.11 – BRUSHES RETAINED WITH CABLE TIE



PROCEDURE

1. Remove the spark plug wire.
2. Open the brush holder assembly cover. Squeeze the 2 tabs and depress the cover at the top with a screw driver or your fingernail. The cover will drop open on its bottom hinge.
3. With the 1/4" nut driver, remove the 2 screws that hold the brush holder assembly in place.
4. With the needle nose pliers, gently remove the two white wires.

NOTE: Lead 202A is inboard. Lead 201A is outboard.

5. To change the brushes, use the slot head screwdriver to pop off the plastic retainer on the back of the brush holder assembly.
6. Remove the old brush assemblies and insert the new ones. One corner of the terminal clip is beveled so that the brush can go in only one way.
7. Snap the plastic retainer back onto the brush holder. The brushes may need some repositioning; wiggle them slightly to help them seat properly.

BRUSH REMOVAL AND REPLACEMENT PROCEDURE (continued)

8. To reinstall the brush holder assembly, depress the spring-loaded brushes into the holder and slip a suitable non-metallic, fairly stiff retainer through the slots at the top and bottom of the holder. A cable tie works well; see Figure F.11. This will hold the brushes up so that you can easily install the holder.
9. With the needlenose pliers, reinstall the two white wires to the appropriate terminals on the brushes. Lead 202A is inboard.
10. Slip the holder into position in the generator end bracket. Be careful not to loosen the 2 attached wires.
11. Reinstall and tighten the 2 screws with the 1/4" nut driver.
12. Slowly remove the non-metallic retainer from the brush holder and let the brushes snap back against the slip rings.
13. Check the wire connections or clearance and tightness.
14. Snap the brush holder cover back into position.

NOTES

RHEOSTAT REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

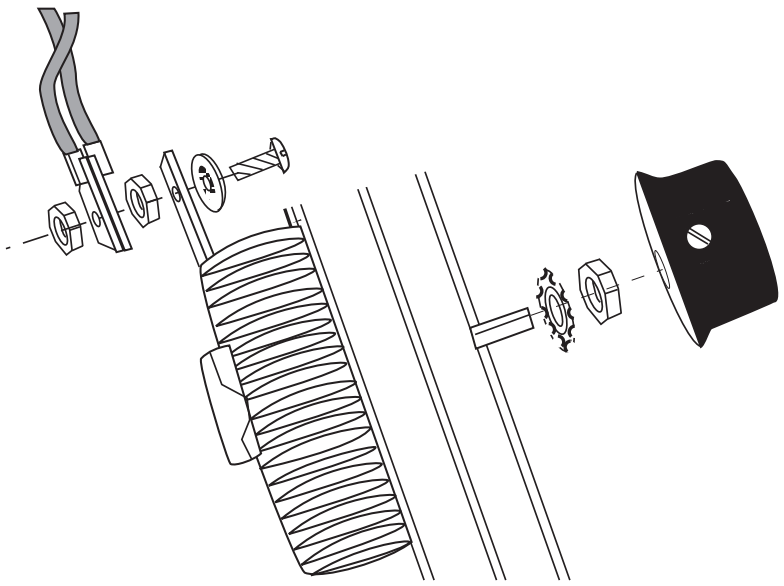
The following procedure will aid the technician in accessing and removing the Output Control Rheostat for maintenance or replacement.

MATERIALS NEEDED

3/8” Nutdriver
Small Slot Head Screwdriver
9/16” Open or Box End Wrench
5/16” Open or Box End Wrench
Needlenose Pliers
Wiring Diagram

RHEOSTAT REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.12 – RHEOSTAT REMOVAL



PROCEDURE

1. Remove the spark plug wire.
2. With the 3/8” nut driver, remove the 20 sheet metal screws that hold the top cover to the control box. Remove the top cover.
3. With the small slot head screw driver, loosen the screw that holds the knob to the rheostat shaft. The shaft has a flat for locating the knob at reassembly.
4. With a 9/16” open or box end wrench, remove the nut that holds the rheostat to the control panel. Support the rheostat with your hand as you turn the nut. There is a shake-proof washer under the nut.
5. Pull the rheostat back out of the control panel and lay it out on its wires to loosen the nuts that hold them.
6. With the 5/16” open or box end wrench, remove the brass nuts from the wire terminals. Support the terminals as you turn the wrench to avoid ripping the terminals from their foundations. Note the wire locations for reassembly.

NOTE: The brass screws are double-nutted with a shake-proof star washer under the screw head.

7. To reinstall the rheostat, replace each of the brass screws. Place a shake-proof star washer under the head, insert the screw into the rheostat and tighten down one nut. Replace the appropriate wires and tighten down the second nut. Again, support the terminals as you turn the wrench to avoid ripping the terminals from their foundations.
8. Reassemble the rheostat to the front of the control panel. Line up the locating tab on the rheostat with the slot on the control panel hole.
9. Reassemble the shake-proof star washer and nut and tighten securely with the 9/16” wrench.
10. Locate the flat spot on the shaft, line up the knob locking screw, push the knob onto the shaft and tighten the screw with the small slot head screw driver.
11. Check the rheostat knob for proper rotation, minimum to maximum.
12. Replace the control panel and tighten the 20 sheet metal screws with the 3/8” nut driver.

STATOR/ROTOR REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

The following procedure will aid the technician in removing the Stator and/or Rotor for maintenance or replacement of either component.

MATERIALS NEEDED

Lincoln Electric Rotor Removal Kit (S20925) - **FOR ROTOR REMOVAL ONLY**

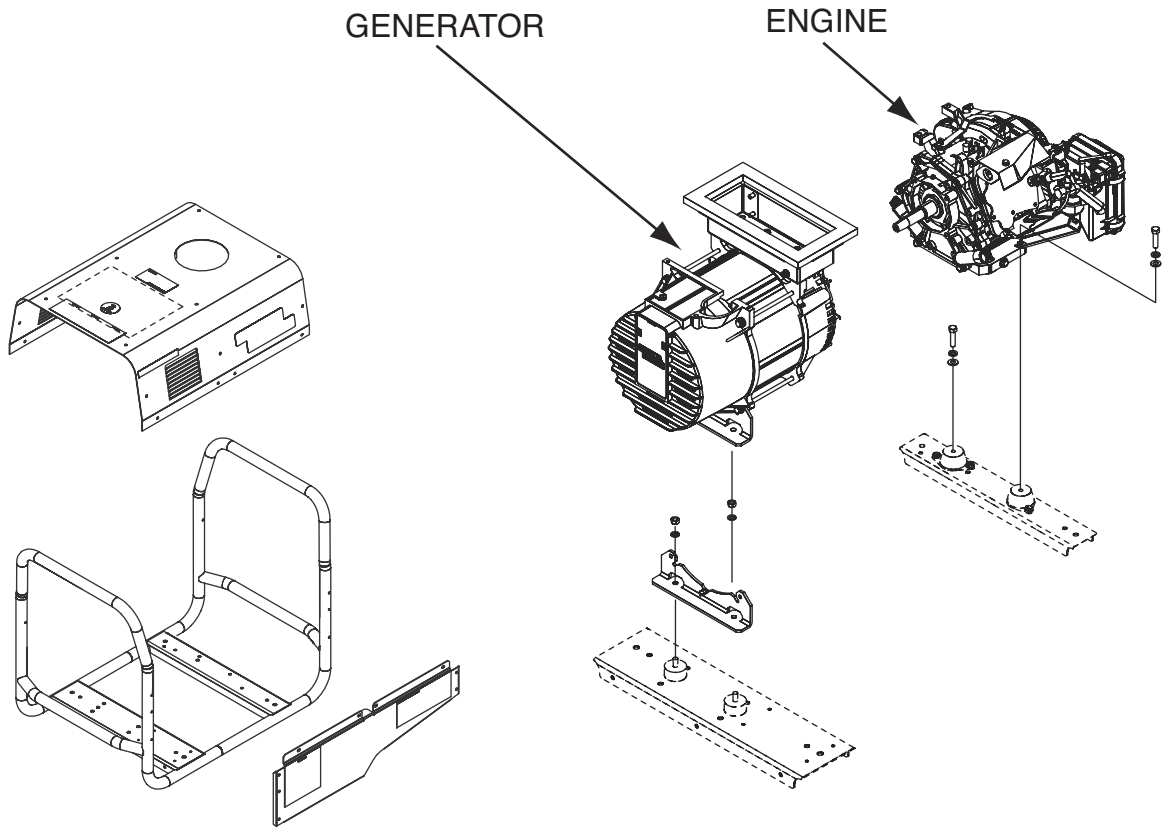
3/8” nut driver
1/2” Open or Box End Wrench
9/16” Open or Box End Wrench
Slot Head Screw Driver
1/2” Socket or Box End Wrench
Needlenose Pliers
Diagonal Cutters
Torque Wrench (ft lbs)
Babbitt, Leather, or Wooden Mallet
Volt/Ohmmeter
12” (long) Feeler Gauge (.010)

INSTRUCTIONS

For stator removal only, follow steps 1 -18 under STATOR REMOVAL PROCEDURE.
For rotor removal, follow the STATOR REMOVAL PROCEDURE, ROTOR REMOVAL PROCEDURE.

STATOR/ROTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.13 – GENERATOR AND ENGINE LOCATION

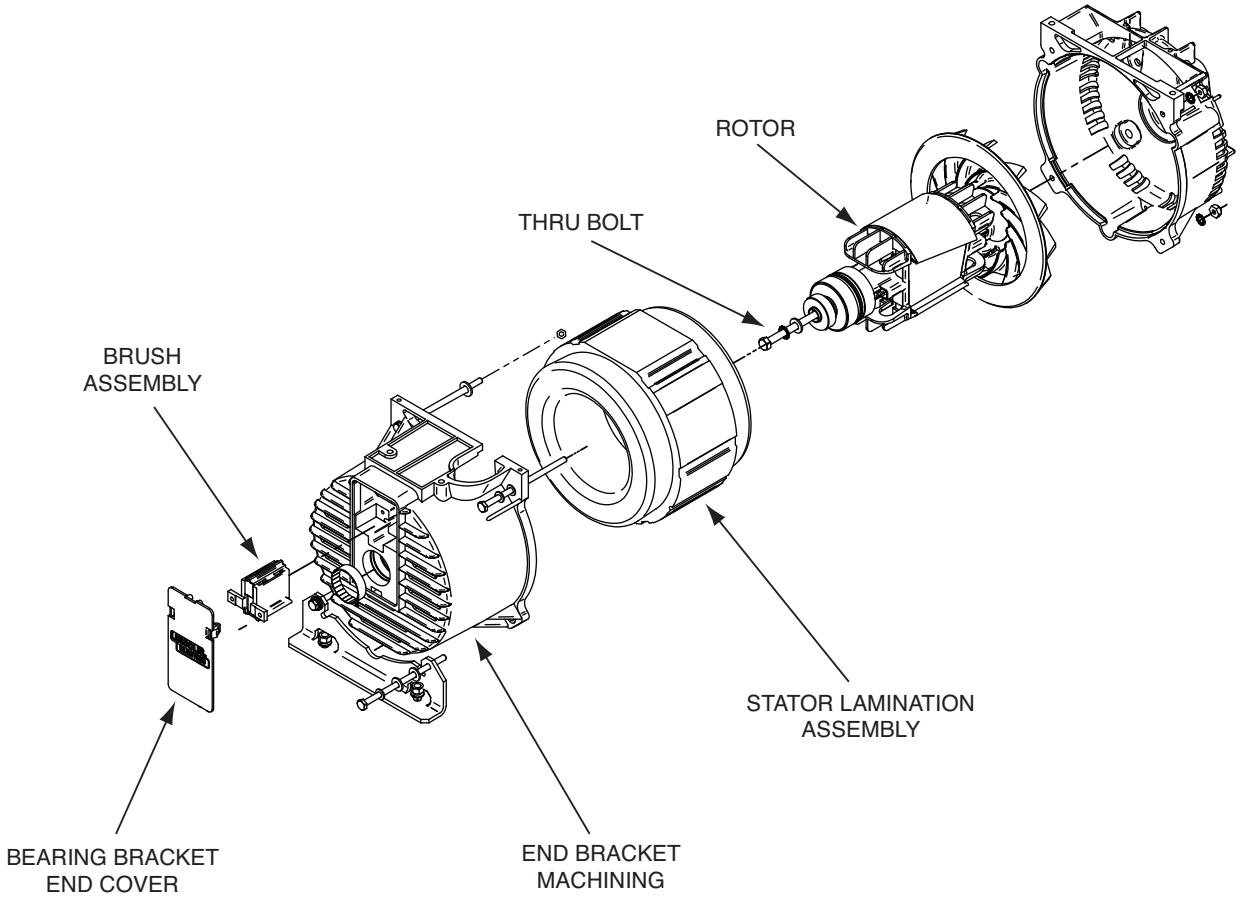


PROCEDURE

1. Remove control panel cover by removing the 20 screws with a 3/8” nutdriver.
2. Remove the right case side by removing the 5 screws using a 3/8” nutdriver.
3. Make sure the run/off switch on the rear of the engine is in the off position. Remove the gas line from the engine by closing the gas valve and pinching open the clip using a pair of needlenose pliers.
4. Unwire all of the leads that are coming up from the center hole in the control box from the stator.
5. The engine can be removed by unbolting the 2, 9/16” anchor bolts from the engine side and the 2, 1/2” bolts from the generator side. Pull the engine/generator from the right side of the welder.

STATOR/ROTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.14 – GENERATOR COMPONENTS



6. Remove the brush assembly from the slip ring end bracket.
7. Remove the (4) long HHCS and hardware along with the slip ring end bracket.
8. Carefully remove the stator from the engine end bracket and cradle. IMPROPER HANDLING OF THE STATOR CAN RESULT IN SHORTED WINDINGS AND/OR LOST OUTPUT.
9. Remove the rotor thru bolt located at the bearing end of the rotor.
10. Install the 7.70” long thru bolt supplied with the kit into the rotor. THREAD BOLT UNTIL TIGHT TO ENGINE CRANKSHAFT.
11. Install the supplied, left hand impact bolt, (counter-clockwise) into the rotor shaft. Continue to tighten impact bolt until interference with thru bolt is felt.

STATOR/ROTOR REMOVAL AND REPLACEMENT PROCEDURE (continued)

12. **If impact wrench is available**, rapidly torque impact bolt until rotor “pops” off of tapered engine crank.

    If impact wrench is unavailable, restrain rotor and tighten bolt with socket wrench until rotor “pops” off. A slight tap of the impact bolt with a babbitt hammer may be required.

13. Replace rotor onto shaft. Be certain to:
    - Tighten rotor bolt to 22 - 25 ft.-lbs.
    - Check air gap between stator and rotor. Gap must be .020”
    - Tighten (4) long bracket bolts to 4.5 - 5.5 ft.-lbs.
    - Rewire unit as detailed in diagram, pasted onto inside of roof.
    - Tighten all hardware and insulate all leads accordingly.

RETEST AFTER REPAIR

Retest a machine:

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

  OR

- If you repair or replace any electrical components.

ENGINE OUTPUT

	No Load RPM	Load RPM
Maximum Speed	3800	3250
Minimum Speed	3700	2800

WELDER/GENERATOR OUTPUT[1]

Output Control	Field Volts	Field Amps	Open Circuit Volts	Load Volts RMS	Load Amps
Maximum	32 - 38	4.0 - 6.4	68 - 80	20 - 25	135 - 160
Minimum	–	–	60 - 72	15 - 25	40 - 65

AUXILIARY POWER RECEPTACLE OUTPUT[1]

230 Volt Receptacle				115 Volt Receptacle[2]		
Output Control	Open Circuit Volts	Load Volts	Load Amps	Open Circuit Volts	Load Volts	Load Amps
Maximum	240 - 260	216 - 240	20.2 - 24	120 - 130	108 - 120	20.2 - 24

[1] Current Control Dial set at MAXIMUM.

[2] Output values of each receptacle can vary within the range shown but must be within 2 volts of each other.

NOTES

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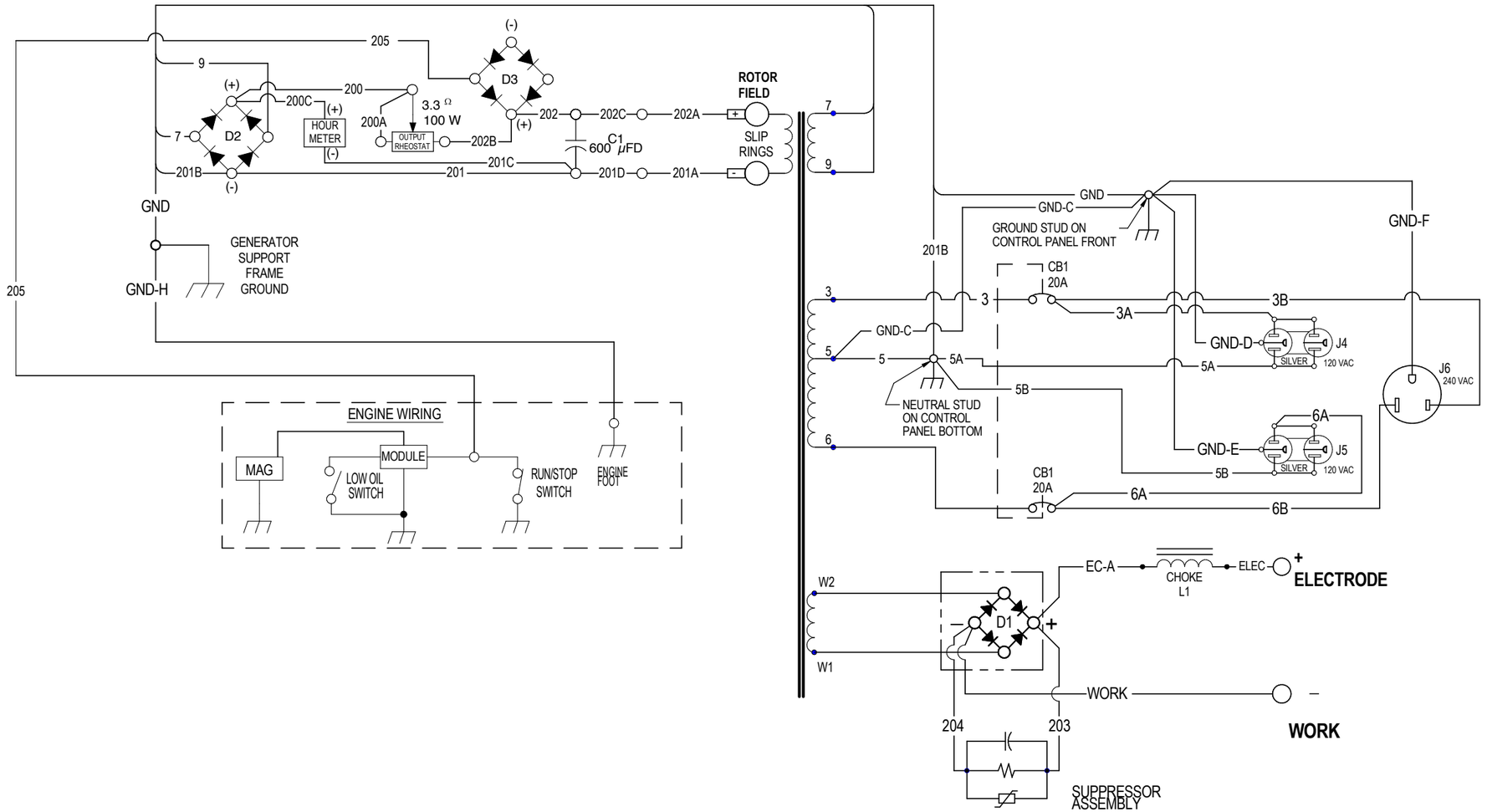
Schematic – Complete Machine (S28624) (Code 11732) G-5

WIRING DIAGRAM - (L13929)

WIRING DIAGRAM - OUTBACK 145



B
L13929

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

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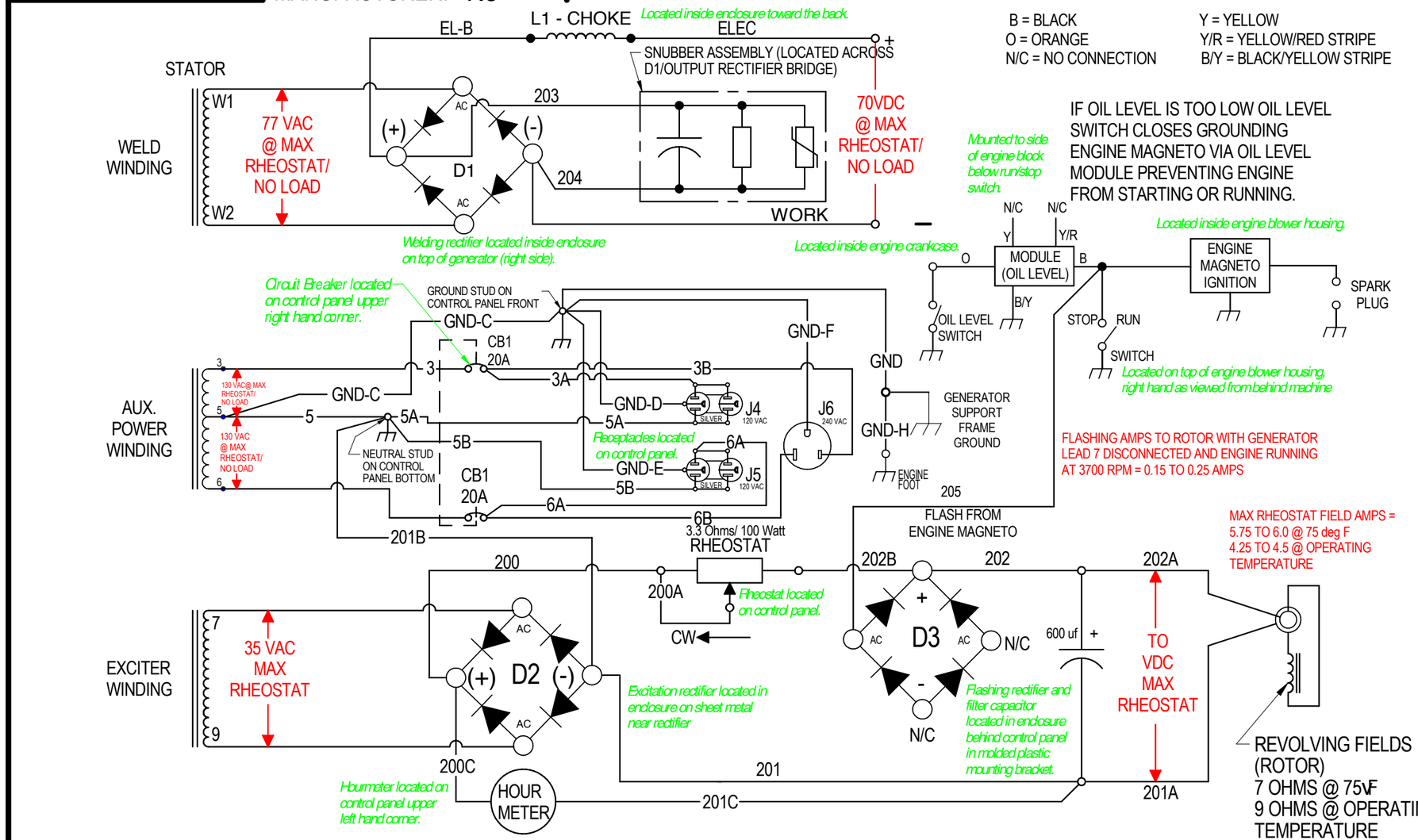
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE (S28100)

S28100

ENGINEERING CONTROLLED
MANUFACTURER: No

CHANGE DETAIL: RELEASED A.01 FROM X.



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MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE: ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (± 0.05 mm) ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.	CONTROL: CLEVELAND	SCALE: NONE IF PRINTED @ A4 SIZE	EQUIPMENT TYPE: OUTBACK 145				PAGE 1 OF 1
	DRAWN BY: mpatrzyk		SUBJECT: MACHINE SCHEMATIC				DOCUMENT NUMBER: S28100 / DOCUMENT REVISION: A
	ENGINEER: APM						
DO NOT SCALE THIS DRAWING	APPROVED: BS	UNITS: INCH	MATERIAL DISPOSITION: UF	APPROVAL DATE: 7/17/2009	PROJECT NUMBER: CRM40765	REFERENCE: S26009	

EN-164

SOLID EDGE Insight

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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