



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

POWER-ARC™ 4000

For use with machines having Code Numbers:

10200	10585	10673	10179
10202	10667	10792	10211
10243	10671	10793	10930
10244	10672	10866	

For Machines with code Number 10083 Refer to SVM103-A (on Service Navigator CD)

SERVICE MANUAL

Various engine configurations are available and machine appearance will vary accordingly.

⚠ 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.

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ELECTRIC SHOCK can kill.

- 3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- 3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:**
- Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
- 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
- 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
- 3.g. Never dip the electrode in water for cooling.
- 3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
- 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
- 3.j. Also see Items 6.c. and 8.



ARC RAYS can burn.

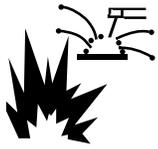
- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) 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. 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.c. 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.d. 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.e. Also see item 1.b.

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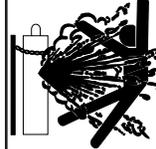


WELDING SPARKS can cause fire or explosion.

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.



CYLINDER may explode if damaged.

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

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



FOR ELECTRICALLY powered equipment.

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

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PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
 - a. Les circuits à l'électrode et à la pièce 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 vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
 - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, 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 de fonctionnement.
 - 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 précautions pour le porte-électrode s'appliquent 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 où on reçoit 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 soleil, 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 latéraux 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 un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistologie. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (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 châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce 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 faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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TECHNICAL SPECIFICATIONS - POWER-ARC 4000

INPUT - BRIGGS KOOL-BORE® GASOLINE ENGINE

<u>Manufacturer</u>	<u>Description</u>	<u>Speed</u>	<u>Displacement</u>	<u>Ignition</u>	<u>Capacities</u>
Briggs & Stratton Kool-Bore® Plus	1 cyl., 4 cycle air-cooled gasoline 8 HP @ 3750 RPM	3700 RPM ± 50 RPM at no load	19.4 cu. in. (319 cc)	Manual, Recoil start; Manual choke	Fuel: 1.0 gal. (3.8 l) Oil: 1.4 qt. (1.3 l)

INPUT - BRIGGS VANGUARD® GASOLINE ENGINE

Briggs & Stratton Vanguard® Model 185432	1 cyl., 4 cycle air-cooled OHV gasoline 9 HP @ 3750 RPM	3700 RPM ± 50 RPM at no load	18.06 cu. in. (296 cc)	Manual, Recoil start; Manual Choke	Fuel: 1.6 gal. (6.0 l) Oil 1.25 qt. (1.2 l)
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INPUT - BRIGGS INTEK® GASOLINE ENGINE

Briggs & Stratton Intek® Model	1 cyl., 4 cycle air-cooled OHV gasoline 8 HP @ 3750 RPM	3700 RPM ± 50 RPM at no load	18.64 cu. in. (305 cc)	Manual, Recoil start; Manual Choke	Fuel: 1.0 gal. (3.8 l) Oil 28 oz. (0.8 l)
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INPUT - HONDA GASOLINE ENGINE

Honda GX 270 VA2	1 cyl., 4 cycle air-cooled OHV gasoline 9 HP @ 3750 RPM	3700 RPM ± 50 RPM at no load	16.5 cu. in. (270 cc)	Manual, Recoil start; Manual Choke	Fuel: 1.59 gal. (3.8 l) Oil 1.16 qt. (1.11 l)
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RATED OUTPUT - WELDER

<u>Duty Cycle</u>	<u>Amps</u>	<u>Volts at Rated Amperes</u>
30% Duty Cycle	125	20 VAC
60% Duty Cycle	100	25 VAC

OUTPUT - WELDER AND GENERATOR

<u>Welding Ranges</u>	<u>Welder Open Circuit Voltage</u>	<u>AC Auxiliary Power</u>
70 - 125 Amps	62 VAC Max.	4000 Continuous Watts 4400 Surge Watts

PHYSICAL DIMENSIONS

<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Weight</u>
20.9 in. 530 mm	20 in. 508 mm	30 in. 762 mm	160 lb. 72.5 kg

POWER-ARC 4000



Read this entire installation section before you start installation.

SAFETY PRECAUTIONS



WARNING

Do not attempt to use this equipment until you have thoroughly read all the operation and maintenance manuals supplied with your machine. They include important safety precautions; detailed engine starting, operating, and maintenance instructions; and parts lists.

ELECTRIC SHOCK can kill.



- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.

- Always wear dry insulating gloves.

ENGINE EXHAUST can kill.



- Use in open, well ventilated areas or vent exhaust to the outside.
- Do not stack anything on or near the engine.

MOVING PARTS can injure.



- Do not operate this equipment with any of its doors open or guards off.
- Stop the engine before servicing it.

- Keep away from moving parts.

Only qualified personnel should install, use, or service this equipment.

LOCATION AND VENTILATION

Whenever you use the POWER-ARC 4000, be sure that clean cooling air can flow through the machine's gasoline engine and the generator. Avoid dusty, dirty areas. Also, keep the machine away from heat sources. Do not place the back end of the generator anywhere near hot engine exhaust from another machine. And of course, make sure that engine exhaust is ventilated to an open, outside area.

The POWER-ARC 4000 may be used outdoors. Do not set the machine in puddles or otherwise submerge it in water. Such practices pose safety hazards and cause improper operation and corrosion of parts.

Always operate the POWER-ARC 4000 with the case roof on and all machine components completely assembled. This will protect you from the dangers of moving parts, hot metal surfaces, and live electrical devices.

STORING

1. Store the machine in a cool, dry place when it's not in use. Protect it from dust and dirt. Keep it where it can't be accidentally damaged from construction activities, moving vehicles, and other hazards.
2. If you will be storing the machine for over 30 days, you should drain the fuel to protect fuel system and carburetor parts from gum deposits. Empty all fuel from the tank and run the engine until it stops from lack of fuel.
3. You can store the machine for up to 24 months if you use Briggs & Stratton Gasoline Additive, Part No. 5041 (available from any Authorized Briggs & Stratton Service Center), in the fuel system. Mix the additive with the fuel in the tank and run the engine for a short time to circulate the additive through the carburetor.
4. While the engine is still warm, drain the oil and refill with fresh oil per the engine manual.
5. Remove the spark plug and pour approximately 1/2 ounce (15 ml) of engine oil into the cylinder. Replace the spark plug and crank the engine slowly to distribute the oil.
6. Clean any dirt and debris from the cylinder and cylinder head fins and housing, rotating screen, and muffler areas.
7. Store in a clean, dry area.

STACKING

POWER-ARC 4000 machines CANNOT be stacked.

TILTING

Place the machine on a secure, level surface whenever you use it or store it. Any surfaces you place it on other than the ground must be firm, non-skid, and structurally sound.

The gasoline engine is designed to run in a level position for best performance. It can operate at an angle, but this should never be more than 15 degrees in any direction. If you do operate it at a slight angle, be sure to check the oil regularly and keep the oil level full. Also, fuel capacity will be a little less at an angle.

LIFTING

The POWER-ARC 4000 should be lifted by two people. (It weighs 160 lbs/72.5 kg.) Its welded tube roll cage is designed to make lifting easy.

ANGLE OF OPERATION

Internal combustion engines are designed to run in a level condition to achieve optimum performance. The maximum angle of operation for the engine 15 degrees from horizontal in any direction. Be certain to place the machine on a firm, non-skid, structural supporting surface. Anchor unit if necessary.

If you are operating the engine at a slight angle, be certain to check the oil regularly and maintain a level, full oil condition. The effective fuel capacity will also be slightly less than the specified 1.00 gallon (3.8 liters).

PRE-OPERATION ENGINE SERVICE

Read and understand the information about the gasoline engine in the **OPERATION** and **MAINTENANCE** sections of this manual before you operate the POWER-ARC 4000.



WARNING

- Keep hands away from the engine muffler or HOT engine parts.
- Stop the engine when fueling.
- Do not smoke when fueling.
- Remove the fuel cap slowly to release pressure.
- Do not overfill the fuel tank.
- Wipe up spilled fuel and allow the fumes to clear before starting the engine.
- Keep sparks and flame away from the fuel tank.

OIL

The Power-Arc 4000 with the Briggs and Stratton 8 HP engine and the Power-Arc 4000 with the Honda 9 HP engine are supplied with low oil protection. The Power-Arc 4000 with the Briggs and Stratton 8 HP engine is equipped with protection that will prevent the engine from starting if the oil level is low. The Power-Arc 4000 with the Honda 9 HP engine is equipped with protection that will shut down the engine in the event of a low oil condition. The engine cannot be restarted until sufficient oil is added.

The POWER-ARC 4000 is shipped with the engine filled with SAE 10W-30 oil. **CHECK THE OIL LEVEL BEFORE YOU START THE ENGINE.** This is an added precaution. When full, the oil level should be at the top of the fill plug hole. If it is not full, add enough oil to fill it. Be sure the fill plug is tight. Change oil after the first 5 hours of operation.

For more oil fill and service information, see the Briggs & Stratton Engine manual.

FUEL

Fill the fuel tank with clean, fresh, regular grade lead-free gasoline. **DO NOT MIX OIL WITH THE GASOLINE.**



The POWER-ARC 4000 has a plastic, 1.0 gallon (3.8L) fuel tank mounted on the engine. See the Briggs & Stratton Engine manual for more details about fuel.

MUFFLER DEFLECTOR

The POWER-ARC 4000 is shipped with an exhaust deflector. You can mount it yourself on the gasoline engine.

To install the deflector, do the following:

- Align the holes on the deflector plate with the holes on the muffler.
- Position the deflector so that the opening points either right, left, or downward, away from the operator.



CAUTION

Never position the deflector upward. Moisture or debris can enter the engine and damage it. As a general safety practice, position the deflector to direct exhaust gases away from the operator's face and eyes.

- Fasten the deflector onto the muffler with the screws provided.

NOTE: The deflector reduces generator output power up to 100 watts.

Power-Arc 4000 Typical Fuel Consumption

	B&S 8 HP Carb. Certified Intek	B&S 8 HP Carb. Cert. Kool Bore®	B&S 9 HP Vanguard®	Honda 9 HP Carb. Certified
No Load 3700 RPM ± 50 R.P.M.	.28 Gallons/Hour (1.06 Liters/Hour)	.36 Gallons/Hour (1.37 Liters/Hour)	.33 Gallons/Hour (1.25 Liters/Hour)	.30 Gallons/Hour (1.14 Liters/Hour)
AC CC Weld Output 125 Amps @ 18 Volts	.57 Gallons/Hour (2.16 Liters/Hour)	.69 Gallons/Hour (2.63 Liters/Hour)	.76 Gallons/Hour (2.9 Liters/Hour)	.58 Gallons/Hour (2.18 Liters/Hour)
AC CC Weld Output 100 Amps @25 Volts	.52 Gallons/Hour (1.97 Liters/Hour)	.64 Gallons/Hour (2.41 Liters/Hour)	.63 Gallons/Hour (2.4 Liters/Hour)	.55 Gallons/Hour (2.1 Liters/Hour)
Auxiliary Power 4000 Watts (120/240 Volts)	.59 Gallons/Hour (2.23 Liters/Hour)	.77 Gallons/Hour (2.92 Liters/Hour)	.76 Gallons/Hour (2.9 Liters/Hour)	.67 Gallons/Hour (2.54 Liters/Hour)

SPARK ARRESTER

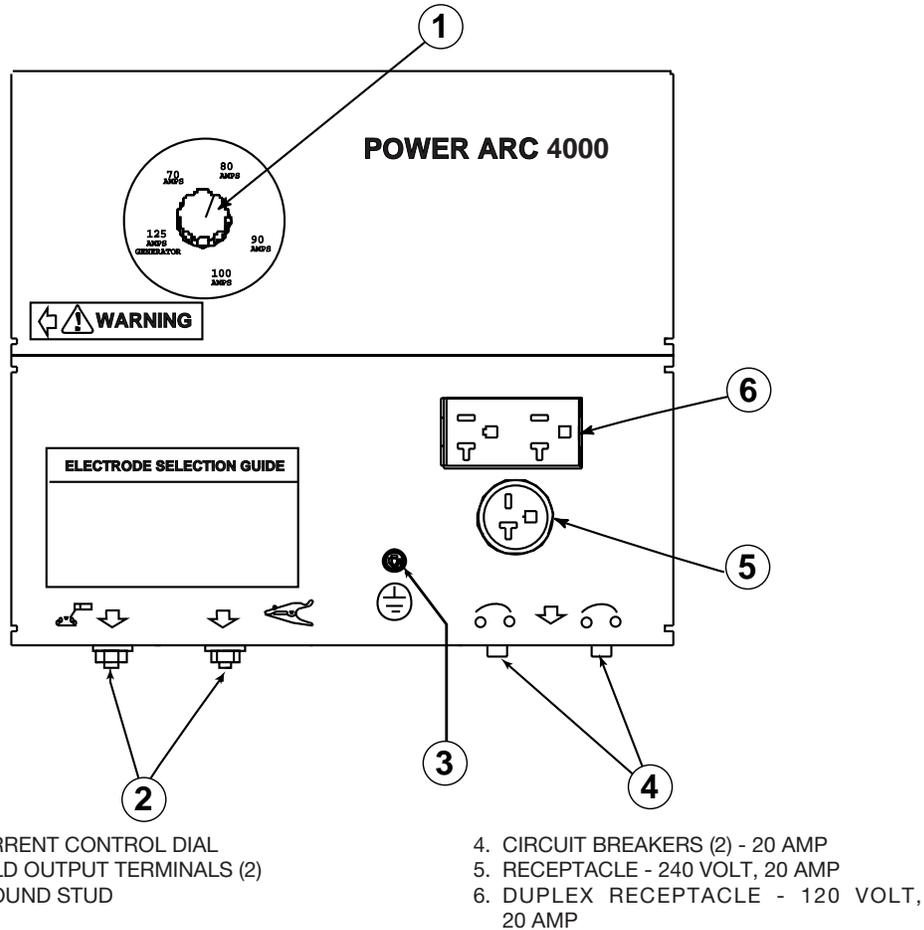
Gasoline engine mufflers may emit sparks when the engine is running. Some federal, state, or local laws require spark arresters in locations where unarrested sparks could present a fire hazard.

Standard mufflers and deflectors (like the ones included with the POWER-ARC 4000) do not act as spark arresters. When local laws require it, a spark arrester must be installed on the machine and properly maintained. An optional spark arrester kit is available for your POWER-ARC 4000. See the **ACCESSORIES** section of this manual for more information.

**CAUTION**

An incorrect spark arrester may lead to damage to the engine or reduce performance. A suitable spark arrester for the Briggs & Stratton 8 HP Cool Bore® engine is available as a Lincoln field-installed option.

FIGURE A.1 - POWER-ARC 4000 OUTPUT CONNECTIONS



ELECTRICAL OUTPUT CONNECTIONS

See Figure A.1 for the location of the current control dial, weld output terminals, ground stud, circuit breakers, 240 and 120 volt receptacles.

WELDING CABLE CONNECTIONS

Cable Size and Length

Be sure to use welding cables that are large enough. The correct size and length becomes especially important when you are welding at a distance from the welder.

Table A.1 lists recommended cable sizes and lengths for rated current and duty cycle. Length refers to the distance from the welder to the work and back to the welder. Cable diameters are increased for long cable lengths to reduce voltage drops.

TABLE A.1
 RECOMMENDED WELDING CABLE
 SIZE AND LENGTH

TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES

Cable Length	Cable Size for 125 amp/ 30% Duty Cycle
0-50 feet (0-15 meters)	6 AWG
50-100 feet (15-39 meters)	4 AWG
100-150 feet (30-46 meters)	3 AWG
150-200 feet (46-61 meters)	2 AWG
200-250 feet (61-76 meters)	1 AWG

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Cable Installation

Install the welding cables to your POWER-ARC 4000 as follows. See **Figure A.1** for the location of parts.

1. The gasoline engine must be OFF to install welding cables.
2. Remove the 1/2 - 13 flanged nuts from the output terminals.
3. Connect the electrode holder and work cables to the weld output terminals. You can connect either cable to either terminal, since the POWER-ARC 4000 provides AC weld current.
4. Tighten the flanged nuts securely.
5. Be certain that the metal piece you are welding (the “work”) is securely connected to the work clamp and cable.
6. Check and tighten the connections periodically.



CAUTION

- Loose connections will cause the output terminals to overheat. The terminals may eventually melt.
- Do not cross the welding cables at the output terminal connection. Keep the cables isolated and separate from one another.

Lincoln Electric offers a welding accessory kit with the properly specified welding cables. See the **ACCESSORIES** section of this manual for more information.

MACHINE GROUNDING



Because the POWER-ARC 4000 creates its own power from its gasoline-engine driven generator, you do not need to connect the machine frame to an earth ground. However, for best protection against electrical shock, connect a heavy gauge wire from the ground stud located on the bottom center of the output panel (see **Figure A.1**) to a suitable earth ground such as a metal pipe driven into the ground.



WARNING

Do not ground the machine to a pipe that carries explosive or combustible material.

When the POWER-ARC 4000 is mounted on a truck or a trailer, the machine generator ground stud **MUST** be securely connected to the metal frame of the vehicle. See **Figure A.1**. The ground stud is marked with the symbol.



PLUGS AND HAND-HELD EQUIPMENT

For further protection against electric shock, any electrical equipment connected to the generator receptacles must use a three-blade, grounded type plug or an Underwriter’s Laboratories (UL) approved double insulation system with a two-blade plug. Lincoln offers an accessory plug kit that has the right type of plugs. See the **ACCESSORIES** section of this manual for details.



WARNING

Never operate this machine with damaged or defective cords. All electrical equipment must be in safe condition.

AUXILIARY POWER RECEPTACLES

The control panel of the POWER-ARC 4000 features two auxiliary power receptacles:

- A 20 amp, 120 volt duplex (double outlet) receptacle
- A 20 amp 240 volt simplex (single outlet) receptacle.

See **Figure A.1**.

Through these receptacles the machine can supply up to 4,000 rated continuous watts and 4,400 surge watts of single-phase AC power.

PREMISES WIRING

The POWER-ARC 4000 three-wire, grounded neutral generator allows it to be connected to premises wiring. However, the wiring procedure needed to meet the National Electric Code (NEC) regulations as well as city ordinances can be confusing. The connections could vary from a “commonly grounded” to a “separately derived” system depending on whether you want the unit to be “hardwired” to the premises or only connected temporarily.



WARNING

Only a licensed, certified, trained electrician should install the machine to a premises or residential electrical system. Be certain that:

- **The premises is isolated and no feedbacking into the utility system can occur. Certain state and local laws require the premises to be isolated before the generator is linked to the premises. Check your state and local requirements.**
- **A double pole, double throw transfer switch in conjunction with the properly rated double throw circuit breaker is connected between the generator power and the utility meter.**

The POWER-ARC 4000 does not have a combined 120/240 volt twist-lock receptacle and cannot be connected to a premises as described in other Lincoln literature.

Remember that the POWER-ARC 4000 is intended only for backup, intermittent use. The gasoline engine has a rated life of 500 hours. It cannot withstand long-term use without proper maintenance. See the **MAINTENANCE** section of this manual and the engine owner’s manual for more information.

Certain electrical devices cannot be powered by the POWER-ARC 4000. Refer to **Table A.2** for these devices.

CIRCUIT BREAKERS

The POWER-ARC 4000 has its own 20 amp circuit breakers for overload protection. When the machine is operated in high temperature environments, the breakers may tend to trip at lower loads than normally.



CAUTION

Never bypass the circuit breakers. Without overload protection, the power-arc 4000 could overheat and/or cause damage to the equipment being used.

**CAUTION**

Certain Electrical devices cannot be powered by the POWER-ARC 4000. See Table A.2.

TABLE A.2
ELECTRICAL DEVICE USE WITH THE POWER-ARC 4000.

Type	Common Electrical Devices	Possible Concerns
Resistive	Heaters, toasters, incandescent light bulbs, electric range, hot pan, skillet, coffee maker.	NONE
Capacitive	TV sets, radios, microwaves, appliances with electrical control.	Voltage spikes or high voltage regulation can cause the capacitive elements to fail. Surge protection, transient protection, and additional loading is recommended for 100% fail-safe operation. DO NOT RUN THESE DEVICES WITHOUT ADDITIONAL RESISTIVE TYPE LOADS.
Inductive	Single-phase induction motors, drills, well pumps, grinders, small refrigerators, weed and hedge trimmers	These devices require large current inrush for starting. (See Table B.3, GENERATOR POWER APPLICATIONS, in the OPERATION section of this manual for required starting wattages.) Some synchronous motors may be frequency sensitive to attain maximum output torque, but they SHOULD BE SAFE from any frequency induced failures.
Capacitive/Inductive	Computers, high resolution TV sets, complicated electrical equipment.	An inductive type line conditioner along with transient and surge protection is required, and liabilities still exist. DO NOT USE THESE DEVICES WITH A POWER-ARC 4000.

The Lincoln Electric Company is not responsible for any damage to electrical components improperly connected to the POWER-ARC 4000.

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OPERATING INSTRUCTIONS

Read and understand this entire section before operating your POWER-ARC 4000.

SAFETY INSTRUCTIONS



WARNING

Do not attempt to use this equipment until you have thoroughly read all the operation and maintenance manuals supplied with your machine. They include important safety precautions; detailed engine starting, operating, and maintenance instructions; and parts lists.



ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.



FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



WELDING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not weld on containers that have held combustibles.



WARNING



ARC RAYS can burn.

- Wear eye, ear, and body protection.



ENGINE EXHAUST can kill.

- Use in open, well ventilated areas or vent exhaust to the outside.
- Do not stack anything on or near the engine.



MOVING PARTS can injure.

- Do not operate this equipment with any of its doors open or guards off.
- Stop the engine before servicing it.
- Keep away from moving parts.

Only qualified personnel should install, use, or service this equipment.

GENERAL DESCRIPTION

The POWER-ARC 4000 is a generator/ welder designed for home use and other non-commercial applications. As a generator it can supply up to 4,000 continuous watts (or 4,400 surge watts) of 120/240 volt, single-phase AC power. As a welder it provides 125 amps of AC constant current for welding with AC stick electrodes. A single dial provides continuous adjustment of welding output. The machine is lightweight, portable, and can be lifted by two people.

A Briggs & Stratton 8 HP Kool-Bore® Plus air-cooled, gasoline engine powers the generator/welder. The engine has an operating life of approximately 500 hours.

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The Lincoln warranty covers the Power Arc 4000 (excluding the engine) for 1 year from the date of purchase. The engine is covered by the Briggs & Stratton warranty policy for a period of 1 year for consumer use or 90 days for commercial use.

RECOMMENDED APPLICATIONS

GENERATOR

The POWER-ARC 4000 gives AC generator output for medium use, non-commercial demands. For more details on operating the generator, see **GENERATOR OPERATION** in the **OPERATION** section of this manual.

WELDER

The POWER-ARC 4000 provides excellent constant current AC welding output for stick (SMAW) welding. For more details on using the machine as a welder, see **WELDING OPERATION** in the **OPERATION** section of this manual.

OPERATIONAL FEATURES AND CONTROLS

The POWER-ARC 4000 was designed for simplicity. Therefore, it has very few operating controls. A single dial on the control panel lets you select either generator or welding use. For welding, the same dial selects continuous current output over the machine's 70 to 125 amp range.

The 8 HP Briggs & Stratton gasoline engine controls include a recoil starter, choke, and rotary stop switch. See **ENGINE OPERATION** in the **OPERATION** section of this manual for details about starting, running, stopping, and breaking in the gasoline engine.

DESIGN FEATURES AND ADVANTAGES

- Stick welding (SMAW) process capability with output range from 70 - 125 amps.
- Single-dial current output selection.
- Work and Electrode welding cable mounting terminals.

- Separate ground stud for safe connection of case to earth ground. Single 20 amp, 240 volt generator receptacle.
- Duplex 20 amp, 120 volt generator receptacle.
- Integrated generator output overload protection through two 20 amp circuit breakers.
- Welded-tube, full roll cage frame protects engine and generator/welder.
- Lightweight, portable design.
- Rubber mounting isolates engine and generator from frame to prevent machine "walking" during use.
- Lo-Tone® engine muffler for quieter operation. (A Super Lo-Tone® muffler is available from Briggs & Stratton.)
- Easy-starting, No Maintenance, Electronic Magnetron® ignition.
- Optional Oil Gard® low oil level engine shutdown kit is available from Briggs & Stratton.

WELDING CAPABILITY

The POWER-ARC 4000 is rated 125 amps, 20 volts at 30% duty cycle on a ten-minute basis. This means that you can load the welder to 125 amps for three minutes out of every ten-minute period. The machine is also capable of higher duty cycles at lower output currents. You can load the welder to 100 amps for six minutes out of ten for a 60% duty cycle.

The current is continuously variable from 70 to 125 amps AC. The POWER-ARC 4000 can weld with all 3/32 and most 1/8 inch diameter Lincoln AC electrodes.

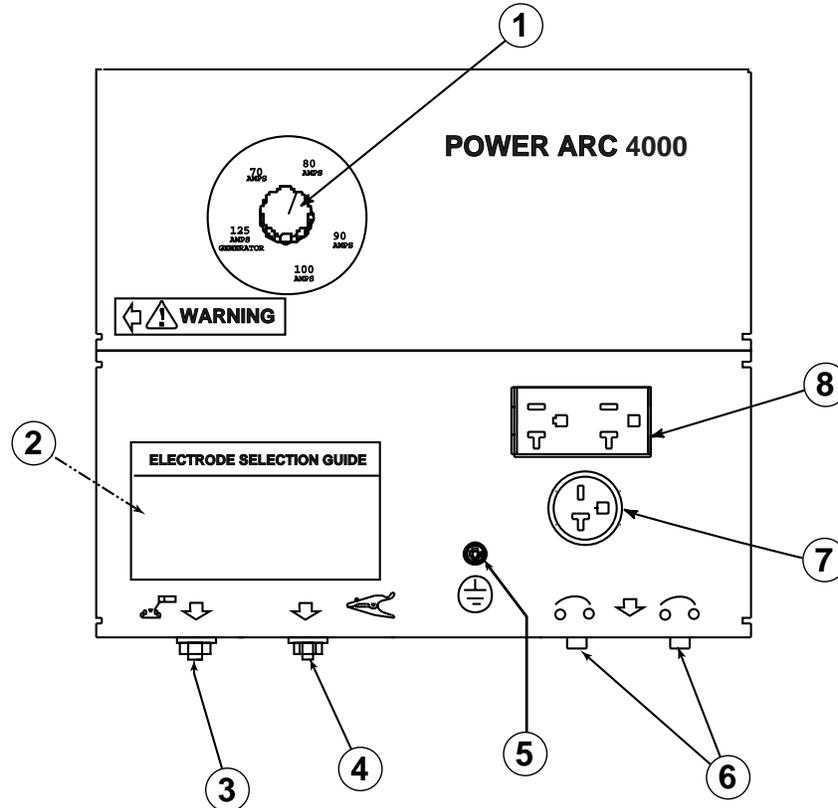
LIMITATIONS

- The POWER-ARC 4000 is not recommended for any processes besides those that are normally performed using stick welding (SMAW) procedures.
- The POWER-ARC 4000 is not recommended for pipe thawing.
- During welding, generator power is limited to 100 watts, and output voltages can drop from 120 to 80 volts and 240 to 160 volts. Therefore, DO NOT OPERATE ANY SENSITIVE ELECTRICAL EQUIPMENT WHILE YOU ARE WELDING.

CONTROLS AND SETTINGS

All generator/welder controls are located on the Output Control Panel. Gasoline engine controls are mounted on the engine. See Figures B.1 and **B.2** and the explanations that follow.

FIGURE B.1 – OUTPUT PANEL CONTROLS



1. CURRENT CONTROL DIAL
2. ELECTRODE SELECTION GUIDE
3. WELD OUTPUT TERMINAL (TO ELECTRODE HOLDER) WITH 1/2 - 13 FLANGE NUT
4. WELD OUTPUT TERMINAL (TO WORK) WITH 1/2 - 13 FLANGE NUT
5. GROUND STUD
6. 20 AMP CIRCUIT BREAKERS (2)
7. 20 AMP, 240 VOLT RECEPTACLE
8. 20 AMP, 120 VOLT DUPLEX RECEPTACLE

GENERATOR/WELDER CONTROLS

See Figure B.1 for the location of the following features:

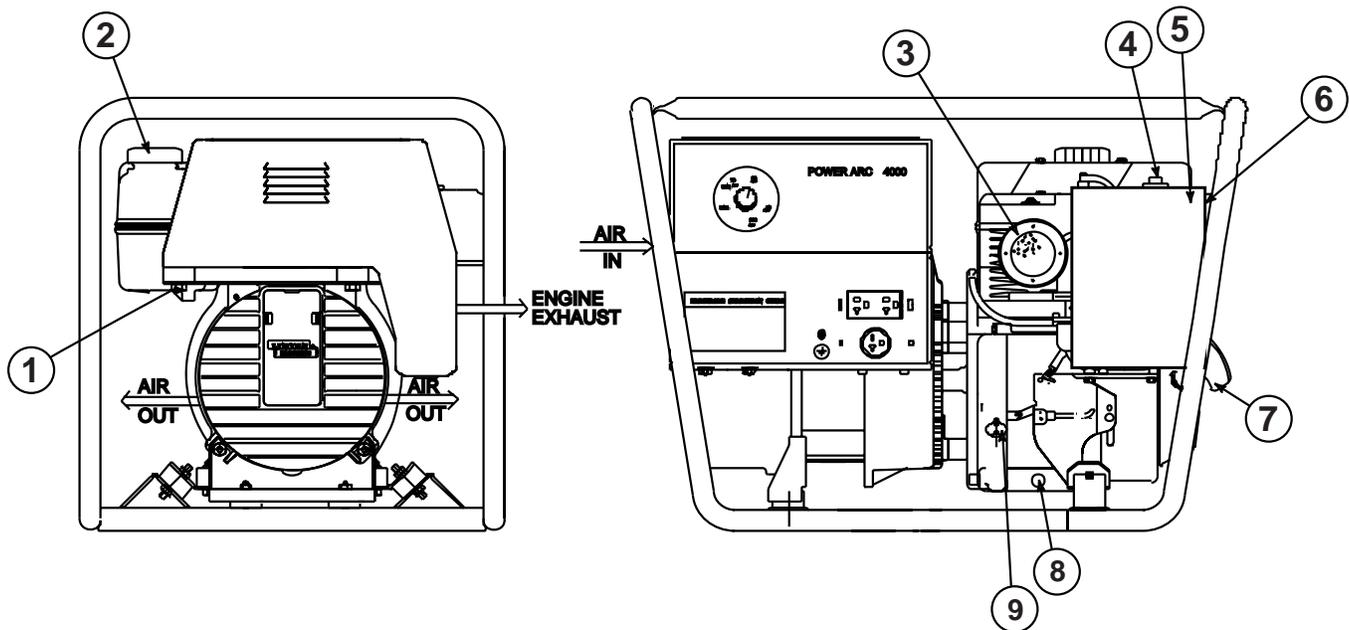
1. **CURRENT CONTROL DIAL:** Adjusts continuous current output. The amperages on the dial correspond to the average amperages needed for specific Lincoln welder rods.
2. **ELECTRODE SELECTION GUIDE:** Provides recommended electrode type, size, and welder output setting based on the thickness of the work.
3. **WELD OUTPUT TERMINAL (TO ELECTRODE HOLDER) WITH 1/2 - 13 FLANGE NUT:** Provides the connection point for either the electrode holder or the work cable. (Because the POWER-ARC 4000 is an AC output machine, either output terminal can be used for either cable.)
4. **WELD OUTPUT TERMINAL (TO WORK) WITH 1/2 - 13 FLANGE NUT:** Provides the connection point for either the electrode holder or the work cable. (Because the POWER-ARC 4000 is an AC output machine, either output terminal can be used for either cable.)

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5. GROUND STUD: Provides a connection point for connecting the machine case to earth ground for the safest grounding procedure.
6. 20 AMP, 240 VOLT RECEPTACLE: Connection point for supplying 240 volt power to operate one electrical device.
7. 20 AMP, 120 VOLT DUPLEX RECEPTACLE: Connection point for supplying 120 volt power to operate one or two electrical devices.

FIGURE B.2 – GASOLINE ENGINE CONTROLS



1. FUEL SHUTOFF VALVE
2. FUEL TANK AND CAP
3. MUFFLER
4. ROTARY STOP SWITCH
5. AIR CLEANER

6. CHOKE
7. RECOIL STARTER
8. OIL DRAIN PLUG
9. OIL FILL PLUG

GASOLINE ENGINE CONTROLS

See Figure B.2 for the location of the following features:

1. FUEL SHUTOFF VALVE: Stops the flow of gasoline from the fuel tank to the carburetor. Should be closed whenever you are finished using the POWER-ARC 4000. Must be opened before you start the engine.
2. FUEL TANK AND CAP: Holds 1.0 gallon (3.8 liters) of unleaded gasoline. Contains a 50 micron fuel filter molded at the outlet port.

NOTE: If you use any other alternate fuel tank or supply, be sure to use a recommended in-line fuel filter.

3. MUFFLER: Reduces engine noise output. Does not serve as a spark arrester. See **SPARK ARRESTER** in the **INSTALLATION** section of this manual.
4. ROTARY STOP SWITCH: Stops the engine by grounding the ignition circuit.
5. AIR CLEANER: Filters intake air to the carburetor. See **ENGINE MAINTENANCE** in the **MAINTENANCE** section of this manual for details about the specific type of air cleaner to use.
6. CHOKE: Provides a richer air/fuel mixture for cold engine starting conditions. See the topic **ENGINE OPERATION**, below, for details on setting the choke.



7. RECOIL STARTER: Manual, rope-type starter. The handle position allows easy starting from either ground level or pickup-truck level.
8. OIL DRAIN PLUG: Permits convenient draining of engine oil during maintenance. Both sides of the engine are equipped with an oil drain plug.
9. OIL FILL PLUG: Permits convenient filling of engine oil during maintenance. Both sides of the engine are equipped with an oil fill plug.

ENGINE OPERATION



WARNING

DO NOT RUN THE ENGINE AT EXCESSIVE SPEEDS. The maximum allowable high idle speed for the POWER-ARC 4000 is 3750 RPM, no load. **Do NOT adjust the governor screw on the engine. Severe personal injury and damage to the machine can result if it is operated at speeds above the maximum rated speed.**

Read and understand all safety instructions included in the Briggs & Stratton **Operating and Maintenance Instructions** manual that is shipped with the POWER-ARC 4000.

BEFORE STARTING THE ENGINE

CHECK AND FILL THE ENGINE OIL LEVEL:

1. Place the machine on a level surface. 
2. Open the oil fill plug.
3. Fill (if necessary) until oil flows out the top of the fill plug hole.
4. Replace the fill plug and tighten securely.

CHECK AND FILL THE ENGINE FUEL TANK:

1. Remove the fuel tank cap.
2. Fill the tank to allow approximately 1/4 inch (5 mm) of tank space for fuel expansion. **DO NOT FILL THE TANK TO THE POINT OF OVERFLOW.** 
3. Replace the fuel tank cap and tighten securely.

NOTE: The engine will operate satisfactorily on any gasoline meant for automotive use. A minimum of 87 octane is recommended. **DO NOT MIX OIL WITH THE GASOLINE.**

Use clean, fresh, lead-free gasoline. Leaded gasoline may be used if lead-free is not available. However, lead-free gasoline leaves fewer combustion deposits and gives longer valve life. For engine protection from fuel deposits, use Briggs & Stratton Gasoline Additive, part number 5041. Purchase gasoline in quantities that will be used within 30 days, to assure freshness.

NOTE: We DO NOT recommend using gasoline that contains alcohol, such as gasohol. However, if gasoline with alcohol is used, it MUST NOT contain more than 10% Ethanol and MUST be removed from the engine during storage. **DO NOT use gasoline containing Methanol.**

STARTING THE ENGINE

NOTE: Remove all loads connected to the AC power receptacles before starting the gasoline engine. Turn the Rotary Stop Switch to the "ON" position.

FOR A "COLD" ENGINE:

1. Open the fuel shutoff valve on the bottom of the fuel tank.
2. Place the choke lever in the "CHOKE" position.
3. Pull slightly on the recoil starter handle until resistance is felt. 

4. Pull the cord rapidly.
5. If the engine does not start, open the choke slightly (move lever upward) and pull the starter cord rapidly again.

When the engine starts, gradually open the choke to the "RUN" position. To open the choke fully, requires an engine warm-up period of several seconds to several minutes depending on the temperature. After starting the engine, first open the choke (toward RUN) until the engine just begins to run smoothly. Then open the choke in small steps, allowing the engine to accept small changes in speed and load, until the choke is fully open (in RUN). During engine warm-up the equipment can be operated.

FOR A "HOT" ENGINE:

1. Open the fuel shutoff valve on the bottom of the fuel tank.
2. Place the choke lever in the highest, upward position. Closing the choke of a hot engine will flood the carburetor and prevent starting.
3. Pull slightly on the recoil starter handle until resistance is felt.
4. Pull the cord rapidly.



FOR BEST ENGINE STARTING:

- Always use fresh gasoline and be sure the filter is clean and properly maintained.
- If you use an alternate fuel tank or supply, be sure to install an in-line fuel filter.
- Do not pull the recoil starter with the choke in the downward position more than one time. Repeated pulls on a choked engine will flood the carburetor.
- If the engine will not start, see the **TROUBLESHOOTING** section of this manual.



STOPPING THE ENGINE

1. Remove all welding and generator power loads and let the engine cool by running it for several minutes.
2. Stop the engine by turning the Rotary Stop Switch on top of the engine to the "OFF" position.
3. Hold the lever down firmly until the engine completely stops. Otherwise, the engine may restart or sputter as it stops.
4. Close the fuel shutoff valve at the bottom of the fuel tank.



WARNING

Close the fuel valve when the machine is transported to prevent fuel leakage from the carburetor. Drain the tank before transporting the machine in a vehicle.

For long periods of storage, turn off the fuel shut-off valve (lowest, downward position) and let the engine run until there is no more fuel in the line. Use a fuel additive such as Sta-Bil to minimize fuel gum deposits.

RUNNING THE ENGINE

The engine is set at the factory to run at high idle speed when not under load. You should not adjust this setting yourself.

BREAK-IN PERIOD

The engine will use a greater amount of oil during its "break-in" period. The break-in is about 12 running hours.

Check the oil frequently during break-in. Change the oil after the first 5 hours of operation. For more details, see the MAINTENANCE section of the engine owner's manual.



CAUTION

During break-in, subject the POWER-ARC 4000 to only moderate loads. Avoid long periods running at idle. Before stopping the engine, remove all loads and allow the engine to cool several minutes.

GENERATOR OPERATION



CAUTION

Be sure that any electrical equipment plugged into the generator's AC power receptacles can withstand a $\pm 10\%$ voltage and a $\pm 5\%$ frequency variation. Some electronic devices cannot be powered by the POWER-ARC 4000. Refer to *Table A.2, ELECTRICAL DEVICE USE WITH THE POWER-ARC 4000*, in the *INSTALLATION* section of this manual.

GENERAL INFORMATION

The POWER-ARC 4000 generator is rated at 4000 continuous watts (4400 surge watts). It provides both 120 volt and 240 volt power. You can draw up to 20 amps from either side of the 120 volt duplex receptacle, but no more than 37 amps from both sides at once. Up to 18 amps can be drawn from the single 240 volt receptacle.

Electrical loads in watts are calculated by multiplying the voltage rating of the load by the number of amps it draws. (This information is given on the load device nameplate.) For example, a device rated 115 volts, 2 amps will need 230 watts of power ($115 \times 2 = 230$).

You can use Table B.3, GENERATOR POWER APPLICATIONS, to determine the wattage requirements of the most common types of loads you can power with the POWER-ARC 4000. Be sure to read the notes at the bottom of the table.

TO USE THE GENERATOR AS AN AUXILIARY POWER SUPPLY:

1. Start the gasoline engine. See *ENGINE OPERATION* in this section of the manual.
2. Set the current control dial on the output control panel to "GENERATOR." See *Figure B.1*.
3. Plug the load(s) into the appropriate 120 volt or 240 volt power receptacle.

NOTE: During welding, the maximum generator output for auxiliary loads is 100 watts.

NOTE: You can supply multiple loads as long as the total load does not exceed 4,000 watts. Be sure to start the largest loads first.

**TABLE B.1
GENERATOR POWER APPLICATIONS**

Suggested Power Applications	Running Watts	*Start-up Watts
*Air Compressor - 3/4 HP	1,250	3,100 - 5,000
*Airless Sprayer - 1/3 HP	600	1,500 - 2,400
Chain Saw	1,200	
Circular Saw	1,200	
Coffee Maker	1,000	
*Deep Freezer	500	750 - 2,000
*Electric Motor - 1 HP	1,000	2,500 - 4,000
Electric Range (1 element)	1,500	
Electric Skillet	1,250	
*Furnace Fan - 1/3 HP	1,200	3,000 - 4,800
Portable Grinder (4 1/2")	600	
Portable Grinder (7")	2,000	
Halogen Work Light	500	
Hand Drill - 1/4"	500	
Hand Drill - 3/8"	700	
1500 Watt Heater	1,750	
Hedge Trimmer	450	
Light Bulb	100	
Reciprocating Saw	900	
Radial Arm Saw	2,600	
Radio	50	
*Refrigerator/Freezer (small)	600	1,500 - 2,400
Slow Cooker	200	
*Submersible Pump - 1 HP	1,000	2,500 - 4,000
*Sump Pump	600	1,500 - 2,400
Toaster	1,100	
Weed Trimmer	500	
Lincoln 100 or 125 Amp Wire Feeder/Welder	4,000	

NOTES:

Wattages listed are approximate. Check your equipment for actual wattage.

Equipment with unusually high *START-UP WATTS are listed. For start-up of other equipment listed in the table, multiply RUNNING WATTS by 2.

Multiple loads can be used as long as the total load does not exceed 4,000 watts. Be sure to start the largest loads first. For example, a 1 HP motor needs approximately 1,000 watts while running but may require 2,500 watts to start. Some inductive motors may require as much as 4 times running watts to start.

WELDING OPERATION

GENERAL INFORMATION

WARNING



Do not touch electrically live parts or electrodes with your skin or wet clothing.



Do not breathe welding fumes or gases.
Use ventilation or exhaust to remove welding fumes from the breathing area.



Keep flammable material away.
Wear eye, ear, and body protection.

The POWER-ARC 4000 generator/welder can deliver from 70 to 125 amps of continuous welding output current. Output can be adjusted by setting the current control dial on the output control panel.

You can get maximum welding output by setting the dial to 125 AMPS. At high current settings like this, some output may decrease as the machine is used. If you are welding for a long time, you may need to turn the dial slightly upward to maintain the same results.

The numbers on the dial correspond to the average amps needed to weld using specific Lincoln welding rods. **Table B.2, WELDING APPLICATIONS**, gives you the recommended dial settings based on the thickness of the work and the size and type of rod you're using.

TO USE THE POWER-ARC 4000 FOR WELDING:

1. Remove the flange nuts from the weld output terminals and place the work and electrode welding cables over the terminals. See **Figure B.1**. Replace and tighten the flange nuts securely. Be sure the connections are tight.
2. Select the appropriate electrode. See **Table B.2, WELDING APPLICATIONS**, or the ELECTRODE SELECTION GUIDE on the machine Output Control Panel.

3. Attach the work clamp securely to the work you are welding.
4. Insert the electrode into the electrode holder.
5. Set the current control dial to the desired output current.
6. Start the gasoline engine. See **ENGINE OPERATION** in this section of the manual.
7. Strike an arc and begin welding. For information on welding techniques, see **WELDING GUIDELINES** in this section of the manual.

AFTER YOU FINISH THE WELD:

1. Stop the gasoline engine. See **ENGINE OPERATION** in this section of the manual.
2. Allow the electrode and work to cool completely.
3. Remove the work clamp from the work.
4. Remove any remaining piece of electrode from the electrode holder.
5. If you are finished using the POWER-ARC 4000 for welding, disconnect the welding cables from the weld output terminals. Reattach the flange nuts and leave them on the terminals.

- NOTE:**
1. Welding current is continuously variable with 60% duty cycle applying to output currents 100 Amps and less and 30% duty cycle applying to currents above 100 Amps.
 2. Duty cycle is based on a ten minute period. The welder can be loaded to 125 Amps for three minutes out of every ten minute period or to 100 Amps for six minutes out of every ten minute period.

CONTROL FUNCTION / OPERATION

“Current Control Dial”

Provides welding current adjustment from 70 through 125 Amps.

To obtain maximum weld output, turn the “Current Control Dial” to “**125 Amps**” for either a cold or hot engine. As the machine is used, some welding voltage may decrease at high current settings. If you are welding for long periods of time, the dial may need to be slightly turned upward to provide the same welding results as when the machine was cold.

The numbers listed on the dial correspond to the average amperage needed to weld specific Lincoln rods. Refer to **Table B.2 “Welding Application Chart”** and “Electrode Selection Guide” listed on the machine nameplate for proper current and electrode settings.

WELDING GUIDELINES

TABLE B.2
WELDING APPLICATIONS/ELECTRODE SELECTION GUIDE

Material Thickness	Electrode Type	Size	Setting
1/8" and thinner	FLEETWELD® 37 AWS E6013	3/32"	90 amps
	FLEETWELD® 180 AWS E6011 Lincoln 7018 AC AWS E7018	90 amps	70 amps
3/16" Maximum	FLEETWELD® 37 AWS E6013	1/8"	125 amps
5/16" Maximum	FLEETWELD® 180 AWS E6011	1/8"	90 amps
Any Thickness	WEARSHIELD® ABR	1/8"	100 amps

NOTES:

The values listed are suggested settings. Actual setting may vary depending on individual preference and/or specific application. Beginners should use Lincoln E7018 AC.

For electrodes not listed, follow tables that are packed with the electrodes.

Ask for the Lincoln WELD DIRECTORY (Publication M210) for a complete listing of all Lincoln stick electrodes available.

¹AWS = American Welding Society

Semi-automatic, MIG Welding With a Lincoln Weld Pak 100 or Weld Pak 125

⚠ WARNING

ARC RAYS can burn.



- When using an open arc process, it is necessary to use correct eye, head and body protection.

The Power-Arc generator power can be used to supply power to a Lincoln Weld-Pak 100 or Weld-Pak 125 wire feed welder. The Weld-Pak is equipped with all the supplies needed for Flux-Cored Arc Welding (FCAW), and is available where Lincoln products are sold.

A K610-1 MIG Conversion Kit is also available for the Weld-Pak which provides all the essentials needed for Gas Metal Arc Welding, GMAW, or MIG processes. Contact your local authorized Lincoln representative for more details.

Stick Welding

Stick welding is probably the most familiar welding process known. A coated ELECTRODE, the weld rod, is clamped into an ELECTRODE HOLDER, an insulated clamping device, which in turn connects to the ELECTRODE CABLE, a heavy wire. The WORK, the metal piece to be welded, is connected to the WORK CABLE, a heavy wire which contains the WORK CLAMP. Quality Lincoln cables use many fine copper wires with a very flexible insulating covering for the electrode and work cables. When properly connected to the OUTPUT STUDS of a high current power source, the electrode melts and bonds the metal being repaired. See "**Cable Installation**" section for proper cable connection to a Power-Arc.

The Power-Arc provides excellent weld output characteristics when used in combination with Lincoln AC electrodes. Other AC electrodes may also be used.

Follow the settings listed in Table B.2 "Welding Application Chart" and the "Electrode Selection Guide" found on the nameplate of the machine.

Learning To Stick Weld

The serviceability of a product or structure utilizing this type of information is and must be the sole responsibility of the builder/user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying this type of information. These variables include, but are not limited to, welding procedure, plate chemistry and temperature, weldment design, fabrication methods and service requirements.

POWER-ARC 4000



Semi-automatic, MIG Welding With a Lincoln Weld Pak 100 or Weld Pak 125

⚠ WARNING

ARC RAYS can burn.



- When using an open arc process, it is necessary to use correct eye, head and body protection.

The Power-Arc generator power can be used to supply power to a Lincoln Weld-Pak 100 or Weld-Pak 125 wire feed welder. The Weld-Pak is equipped with all the supplies needed for Flux-Cored Arc Welding (FCAW), and is available where Lincoln products are sold.

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No one can learn to weld simply by reading about it. Skill comes only with practice. The following pages will help the inexperienced welder understand welding and develop his skill. For more detailed information, order a copy of the book “New Lessons in Arc Welding.” (See Book Division section at rear of manual).

The operator’s knowledge of arc welding must go beyond the arc itself. He must know how to control the arc, and this requires a knowledge of the welding circuit and the equipment that provides the electric current used in the arc. The circuit begins where the electrode cable is attached to the welding machine and ends where the work cable is attached to the machine. Current flows through the electrode cable to the electrode holder, through the electrode holder to the electrode and across the arc. On the work side of the arc, the current flows through base metal to the work cable and back to the welding machine. The circuit must be complete for the current to flow. To weld, the work clamp must be tightly connected to clean base metal. Remove paint, rust, etc. as necessary to get a good connection. Connect the work clamp as close as possible to the area you wish to weld. Avoid allowing the welding circuit to pass through hinges, bearings, electronic components or similar devices that can be damaged.



The Power-Arc 4000 has a voltage output of up to 62 volts which can shock.

⚠ WARNING

ELECTRIC SHOCK can kill.



- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground.
- Always wear dry insulating gloves.

ENGINE EXHAUST can kill.



- Use in open, well ventilated areas or vent exhaust outside.
- Do not stack anything on or near the engine.

MOVING PARTS can injure.



- Do not operate with doors open or guards off.
- Stop engine before servicing.
- Keep away from moving parts.

Only qualified personnel should install, use, or service this equipment.

The electric arc is made between the work and the tip end of a small metal wire, the electrode, which is clamped in a holder that is held by the welder. A gap is made in the welding circuit by holding the tip of the electrode 1/16 - 1/8" (1.6-3.2mm) away from the work or base metal being welded. The electric arc is established in this gap and is held and moved along the joint to be welded, melting the metal as it is moved.

Arc welding is a manual skill requiring a steady hand, good physical condition, and good eyesight. The operator controls the welding arc and, therefore, the quality of the weld made.

What Happens in the Arc?

Figure 4 illustrates the action that takes place in the electric arc. It closely resembles what is actually seen during welding.

The "arc stream" is seen in the middle of the picture. This is the electric arc created by the electric current flowing through the space between the end of the electrode and the work. The temperature of this arc is about 6000°F (3316°C) which is more than enough to melt metal. The arc is very bright, as well as hot,

and cannot be looked at with the naked eye without risking painful and possibly permanent injury. A very dark lens, specifically designed for arc welding must be used with the handshield or headshield whenever viewing the arc.

The arc melts the base metal and actually digs into it, much like water through a garden hose nozzle digs into the earth. The molten metal forms a pool or crater and tends to flow away from the arc. As it moves away from the arc, it cools and solidifies. Slag forms on top of the weld to protect it during cooling.

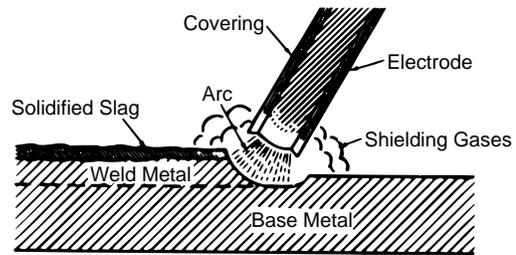


FIGURE 4. -The welding arc.

The function of the covered electrode is much more than simply to carry current to the arc. The electrode is composed of a core metal wire around which has been extruded and baked a chemical covering. The core wire melts into the arc and tiny droplets of molten metal shoot across the arc into the molten pool. The electrode provides additional filler metal for the joint to fill the groove or gap between the two pieces of the base metal. The covering also melts or burns in the arc. It has several functions. It makes the arc steadier, provides a shield of smoke-like gas around the arc to keep oxygen and nitrogen in the air away from the molten metal, and provides a flux for the molten pool. The flux picks up impurities and forms a protective slag. The principle differences between the various types of electrodes are in their coatings. By varying the coating, it is possible to greatly alter the operating characteristics of electrodes. By understanding the differences in the various coatings, you will gain a better understanding of selecting the best electrode for the job you have at hand. In selecting an electrode, you should consider:

1. The type of deposit you want, e.g., mild steel, stainless, low alloy, hardfacing.
2. The thickness of the plate you want to weld.
3. The position it must be welded in (downhand, out-of-position).
4. The surface condition of the metal to be welded.
5. Your ability to handle and obtain the desired electrode.

Four simple manipulations are of prime importance. **Without** complete mastery of these four, further attempts at welding are futile. **With** complete mastery of the four, welding will be easy.

POWER-ARC 4000

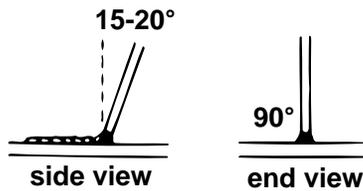


1. The Correct Welding Position

Illustrated is the correct welding position for right-handed people. (For left-handed people it is opposite.)

Whenever possible, weld from left to right (if right-handed). This enables you to see clearly what you are doing.

Hold the electrode at a slight angle as shown in Figure 5.



Correct Welding Position

Figure 5.

2. The Correct Way to Strike An Arc

Be sure the work clamp makes good electrical contact to the work.

Lower your headshield and scratch the electrode slowly over the metal, and you will see sparks fly. While scratching, lift the electrode 1/8" (3.2mm) and the arc is established.

NOTE: If you stop moving the electrode while scratching, the electrode will stick.

NOTE: Most beginners try to strike the arc by a fast jabbing motion down on the plate. Result: They either stick their electrode or their motion is so fast that they break the arc immediately.

3. The Correct Arc Length

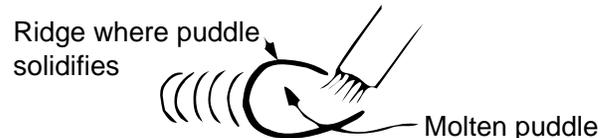
The arc length is the distance from the tip of the electrode core wire to the base metal.

Once the arc has been established, maintaining the correct arc length becomes extremely important. The arc should be short, approximately 1/16 to 1/8" (1.6-3.2mm) long. As the electrode burns off, the electrode must be fed to the work to maintain correct arc length.

The easiest way to tell whether the arc has the correct length is by listening to its sound. A nice, short arc has a distinctive, "crackling" sound, very much like eggs frying in a pan. The incorrect, long arc has a hollow, blowing or hissing sound.

4. The Correct Welding Speed

The important thing to watch while welding is the puddle of molten metal right behind the arc. **DO NOT WATCH THE ARC ITSELF.** The appearance of the puddle and the ridge where the molten puddle solidifies indicates correct welding speed. The ridge should be approximately 3/8" (9.5mm) behind the electrode.



Most beginners tend to weld too fast, resulting in a thin, uneven, "wormy" looking bead. They are not watching the molten metal.

IMPORTANT: It is not generally necessary to weave the arc forward, backward or sideways. Weld along at a steady pace, and you will have an easier time.

NOTE: When welding on thin plate, you will find that you have to increase the welding speed, whereas when welding on heavy plate, it is necessary to go more slowly to ensure fusion and penetration.

PRACTICE

The best way of getting practice in the four skills that enable you to maintain:

1. Correct Welding Position.
2. Correct Way to Strike An Arc.
3. Correct Arc Length.
4. Correct Welding Speed.

is to spend a little more time on the following exercise.

Use the following:

Mild Steel Plate:	3/16" (4.8mm), or heavier.
Electrode:	1/8" (3.2mm) AWS 6011 (Fleetweld® 180)
Current Setting:	90-125 Amps AC

Do the following:

1. Learn to strike the arc by scratching the electrode over the plate. Be sure the angle of the electrode is right and be sure to use both hands.
2. When you can strike an arc without sticking, practice the correct arc length. Learn to distinguish it by its sound.
3. When you are sure that you can hold a short, crackling arc, start moving. Look at the molten puddle constantly, and look for the ridge where the metal solidifies.
4. Run beads on a flat plate. Run them parallel to the top edge (the edge farthest away from you). This gives you practice in running straight welds, and also, it gives you an easy way to check your progress. The 10th weld will look considerably better than the first weld. By constantly checking on your mistakes and your progress, welding will soon be a routine matter.

Common Metals

Most metals found around the farm or small shop are low carbon steel, sometimes referred to as mild steel. Typical items made with this type of steel include most sheet metal, plate, pipe and rolled shapes such as channels, angle irons and "I" beams. This type of steel can usually be easily welded without special precautions. Some steel, however, contains higher carbon. Typical applications include wear plates, axles, connecting rods, shafts, plowshares and scraper blades.

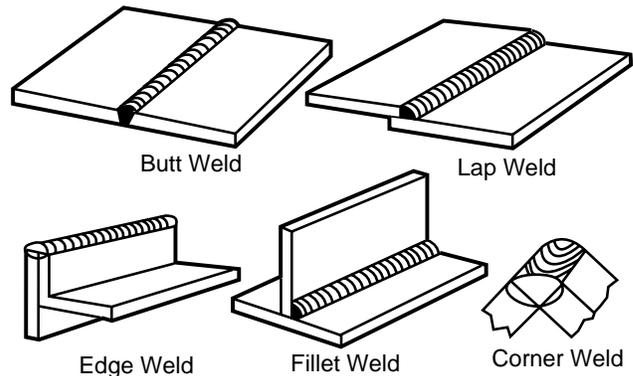
These higher carbon steels can be welded successfully in most cases; however, care must be taken to follow proper procedures, including preheating the metal to be welded and, in some cases, carefully controlling the temperature during and after the welding process. For further information on identifying various types of steel and other metals, and for proper procedures for welding them, we suggest you purchase a copy of "New Lessons in Arc Welding" (See Book Division section).

Regardless of the type of metal being welded, in order to get a quality weld, it is important that it be free of oil, paint, rust or other contaminants.

Types of Welds

Five types of welding joints are: Butt Welds, Fillet Welds, Lap Welds, Edge Welds and Corner Welds.

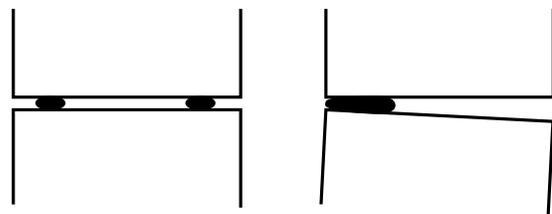
Of these, the Butt Weld and Fillet Weld are the most common.



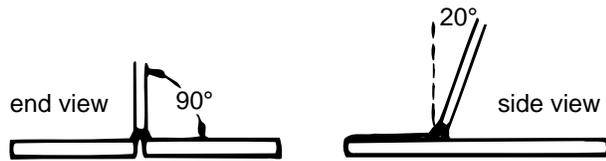
Butt Welds

Butt Welds are the most widely used welds. Place two plates side by side, leaving 1/16" (1.6mm) for thin metal to 1/8" (3.2mm) for heavy metal space between them in order to get deep penetration.

Tack the plates at both ends, otherwise the heat will cause the plates to move apart. (See drawing).



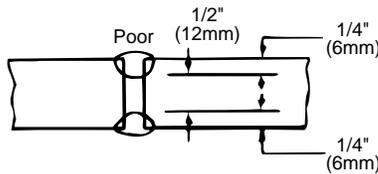
Now weld the two plates together. Weld from left to right (if right-handed). Point the electrode down in the gap between the two plates, keeping the electrodes slightly tilted in the direction of travel.



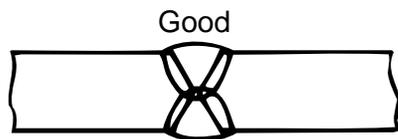
Watch the molten metal to be sure it distributes itself evenly on both edges and in between the plates.

Penetration

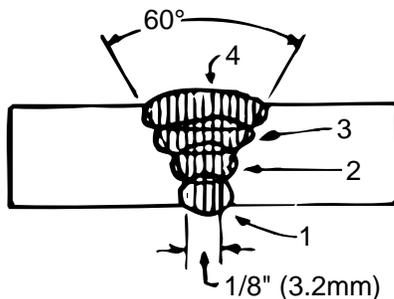
Unless a weld penetrates close to 100%, a butt weld will be weaker than the material welded together.



In this example, the total weld is only 1/2 the thickness of the material; thus, the weld is only approximately half as strong as the metal.



In this example, the joint has been flame beveled or ground prior to welding so that 100% penetration could be achieved. The weld, if properly made, is as strong or stronger than the original metal.

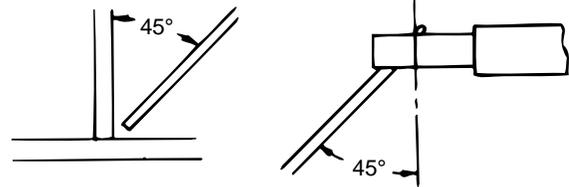


Successive passes must be used to build up butt welds on heavier metal.

Fillet Welds

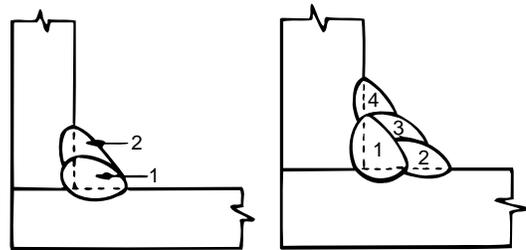
When welding fillet welds, it is very important to hold the electrode at a 45° angle between the two sides, or the metal will not distribute itself evenly.

To make it easier to get the 45° angle, it is best to put the electrode in the holder at a 45° angle, as shown.



Multiple Pass Welds

Make multiple pass horizontal fillets as shown in the sketch. Put the first bead in the corner with fairly high current. Hold the electrode angle needed to deposit the filler beads as shown putting the final bead against the vertical plate.



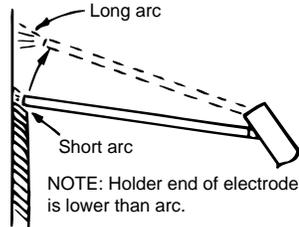
Welding in the Vertical Position

Welding in the vertical position can be done either vertical-up or vertical-down. Vertical-up is used whenever a large, strong weld is desired. Vertical-down is used primarily on sheet metal for fast, low penetrating welds.

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Vertical-Up Welding

The problem, when welding vertical-up, is to put the molten metal where it is wanted and make it stay there. If too much molten metal is deposited, gravity will pull it downwards and make it “drip”. Therefore, a certain technique has to be followed:



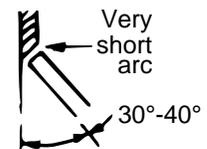
1. Use 1/8" (3.2mm) 90-115 amps or 3/32" (2.5mm) 70 amps AWS 6011.
2. When welding, the electrode should be kept horizontal or pointing slightly upwards. (See drawing above).
3. The arc is struck and metal deposited at the bottom of the two pieces to be welded together.
4. Before too much molten metal is deposited, the arc is SLOWLY moved 1/2-3/4" (12-20mm) upwards. This takes the heat away from the molten puddle, which solidifies. (If the arc is not taken away soon enough, too much metal will be deposited, and it will “drip”.)
5. The upward motion of the arc is caused by a very slight wrist motion. Most definitely, the arm must not move in and out, as this makes the entire process very complicated and difficult to learn.
6. If the upward motion of the arc is done correctly with a wrist motion, the arc will automatically become a long arc that deposits little or no metal. (See drawing above.)
7. During this entire process, the ONLY thing to watch is the molten metal. As soon as it has solidified, the arc is SLOWLY brought back, and another few drops of metal are deposited. DO NOT FOLLOW THE UP AND DOWN MOVEMENT OF THE ARC WITH YOUR EYES. KEEP THEM ON THE MOLTEN METAL.

8. When the arc is brought back to the now solidified puddle, IT MUST BE SHORT, otherwise no metal will be deposited, the puddle will melt again, and it will “drip”.
9. It is important to realize that the process consists of SLOW, DELIBERATE movements. There are no fast motions.

Vertical-Down Welding

Vertical-down welds are applied at a fast pace. These welds are therefore shallow and narrow, and are excellent for sheet metal. Do not use the vertical-down technique on heavy metal. The welds will not be strong enough.

1. Use 1/8" (3.2m) or 3/32" (2.5mm) AWS 6011.
2. On thin metal use 70-75 amps. (14 ga. 75 A - 16 ga. 60 A.)
3. Hold the electrode in a 30-45° angle with the tip of the electrode pointing upwards.
4. Hold a VERY SHORT arc, but do not let the electrode touch the metal.
5. An up and down whipping motion will help prevent burn-through on very thin plate.
6. Watch the molten metal carefully.



The important thing is to continue lowering the entire arm as the weld is made so the angle of the electrode does not change. Move the electrode fast enough so that the slag does not catch up with the arc.

Overhead Welding

Various techniques are used for overhead welding. However, in the interest of simplicity for the inexperienced welder, the following technique will probably take care of his needs for overhead welding:

1. Use 1/8" (3.2mm) 90-105 A or 3/32" (2.5mm) 70 A AWS 6011 electrode on AC.
2. Put the electrode in the holder so it sticks straight out.
3. Hold the electrode at an angle approximately 30° off vertical, both seen from the side and seen from end. (See drawing below.)



It is important to hold a VERY SHORT arc. (A long arc will result in falling molten metal; a short arc will make the metal stay.)

If necessary, and this is dictated by the appearance of the molten puddle, a slight back and forth whipping technique may be used to prevent "dripping".

Welding Sheet Metal

Welding sheet metal presents an additional problem—burn through. Follow these simple rules:

1. Hold a very short arc. This, together with the proper travel speed, will eliminate burn through.
2. Use 1/8" (3.2mm) or 3/32" (2.5mm) AWS 6011.
3. Use low amperage. 75 A for 1/8" (3.2mm) electrode, 70 A for 3/32" (2.5mm) electrode.

4. Move rapidly enough to stay ahead of the molten slag. A whipping technique may be used to further minimize burn through.
5. If you have a choice, use lap joints rather than fillets or butts; the double thickness effect of a lap joint makes it much easier to weld without burning through.

Hardfacing (To Reduce Wear)

There are several kinds of wear. The two most often encountered are:

1. Metal to Ground Wear: Plowshares, bulldozer blades, buckets, cultivator shares, and other metal parts moving in the soil.
2. Metal to Metal Wear: Trunnions, shafts, rollers and idlers, crane and mine car wheels, etc.

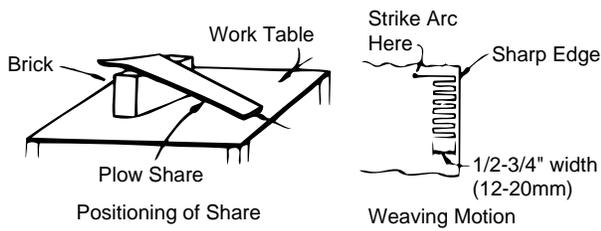
Each of these types of wear demands a different kind of hardfacing electrode.

When applying the proper electrode, the service life of the part will in most cases be more than double. For instance, hardfacing of plowshares results in 3-5 times more acreage plowed.

How to Hardface the Sharp Edge (Metal to Ground Wear)

1. Grind the share, approximately one inch along the edge, so the metal is bright and clean.
2. Place the share on an incline of approximately 20-30°. The easiest way to do this is to put one end of the share on a brick. (See drawings) Most users will want to hardface the underside of the share, but some might find that the wear is on the top side. The important thing is to hardface the side that wears.
3. Use 1/8" (3.2mm) Wearshield at 80-100 A. Strike the arc about one inch from the sharp edge.

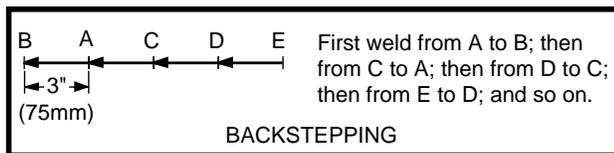
4. The bead should be put on with a weaving motion, and it should be $1/2$ - $3/4$ " (12.7-19.0mm) wide. Do not let the arc blow over the edge, as that will dull the edge. (See drawing below.)



When breaking the weld stays on one piece

To overcome this, the welding operator has two choices:

5. Use the back-stepping method. Begin to weld 3" (76mm) from the heel of the share and weld to the heel. The second weld will begin 6" (152mm) from the heel, the third weld 9" (229mm) from the heel, etc.



1. Preheat the entire casting to 500-1200°F (260-649°C). If the cast iron is hot before welding, there will be no sudden chilling which creates brittle white cast iron. The entire casting will cool slowly.
2. Weld $1/2$ " (12.7mm) at a time, and do not weld at that spot again until the weld is cool.

This way, no large amount of heat is put into the mass.

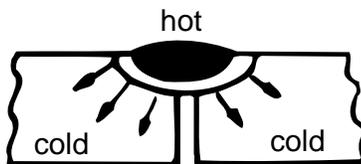
Most inexperienced welders will probably use the second method, because they have no way of preheating large castings. Smaller castings can easily (and should) be preheated before welding. A forge, stove, fire, or the Arc Torch are all excellent means of preheating.

Backstepping greatly reduces the chances for cracking of the share, and it also greatly reduces warping.

NOTE: The entire process is rather fast. Many beginners go much too slowly when hardfacing plow-shares, running the risk of burning through the thin metal.

Welding Cast Iron

When welding on a piece of cold cast iron, the tremendous heat from the arc will be absorbed and distributed rapidly into the cold mass. This heating and sudden cooling creates WHITE, BRITTLE cast iron in the fusion zone. (See drawing below.)



White brittle cast iron

This is the reason why welds in cast iron break. Actually, one piece of the broken cast iron has the entire weld on it and the other piece has no weld on it. (See drawing below.)

When using the $1/2$ " (12.7mm) at a time method, it is recommended to start $1/2$ " (12.7mm) away from the previous bead and weld into the previous bead. This is called backstepping.

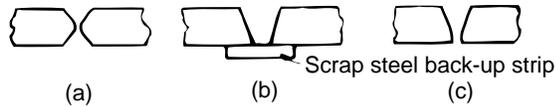
After welding Cast Iron, protect the casting against fast cooling. Put it in a container of warm, dry sand or lime.

If sand or lime is not available, cover it with sheet metal or any other non-flammable material that will diminish drafts and retain heat.

Cast Iron Plate Preparation

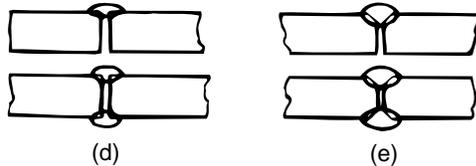
Wherever practical, the joint to be welded should be "veed" out by grinding or filing to give complete penetration as shown in figures (a), (b) and (c) below. This is especially important on thick castings where maximum strength is required. In some instances a back-up

strip may be used and plates may be gapped 1/8" (3.2mm) or more, as shown in figure (b).



Three ways to prepare plates where complete penetration is necessary.

On sections where only a sealed joint is required and strength is not important, the joint may be welded after slightly veeing out the seam as shown in figure (d) below.



Single and double beads, with and without beveling for tight, partial strength joints.

Selecting Electrodes

Which electrode is best for the particular job . . . how do you use it? These are important questions because the cost, quality, and appearance of your work depends on proper electrode selection and application. MILD STEEL ELECTRODES may be classified into the following groups:

Out-of-Position Group (AWS E6011)

This group includes electrodes which have a snappy, deep penetrating arc and fast freezing deposits.

These electrodes are used for general purpose, all-position fabrication and repair welding. They are also the best choice for pipe welding and sheet metal butt, corner, and edge welds. They can be used for repair work when dirt, grease, plating or paint cannot be completely cleaned from the steel. These electrodes are typically used with motions "A" and "B" (see drawing) for the first pass on vertical-up welds.

High-Speed Group (AWS E6013)

This group includes electrodes which have a moderately forceful arc and deposit rates between those of the out-of-position and high-deposit electrodes.

They are primarily general purpose production electrodes especially for downhill fillets and laps or short and irregular welds that change direction or position. They are also widely used in maintenance and recommended for sheet metal fillet and lap welds. Motion "D" (see drawing) is generally used for vertical-up welding, but motions "A" and "B" are also suitable.

Low Hydrogen Group (Stable-Arc E7018)

These electrodes are generally called "low hydrogen". The name comes from the fact that their coating contains little hydrogen in either moisture or chemical form. Low hydrogen electrodes offer these benefits: outstanding crack resistance, lowest porosity on sulphur bearing steels, and X-ray quality deposit capability. Thus, they are the first choice when welding "problem" steels. E7018 can be used in all positions, with Motion "C" (below) recommended for the first pass on vertical-up welds. NEVER use a whipping technique or a long arc with these electrodes. ALWAYS fill craters by drawing electrode away slowly. ALWAYS keep these electrodes dry. Electrodes, when not used within a few hours after a container is opened, must be stored in heated cabinets.

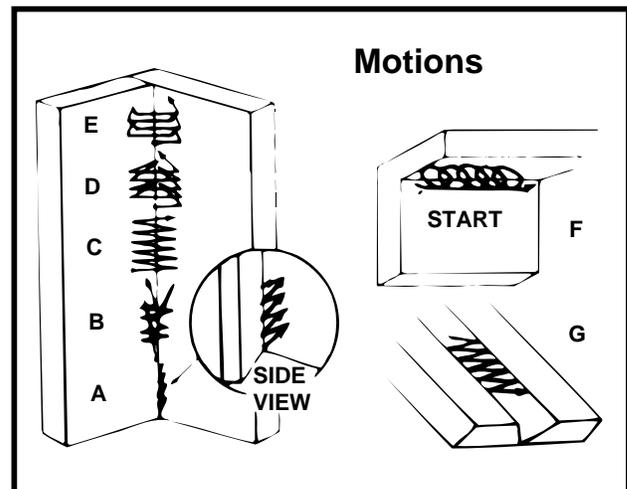


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OPTIONS/ACCESSORIES

LINCOLN ELECTRIC ACCESSORIES

The following options/accessories are available for your POWER-ARC 4000 from your local Lincoln Distributor.

Accessory Set (K875) – Includes the following:

- Twenty feet (6.1 meters) of #6 AWG electrode cable
- Fifteen feet (4.6 meters) of #6 work cable
- Headshield with No. 10 filter
- Work clamp
- Insulated electrode holder
- Sample electrodes

The cables are rated at 150 amps, 40% duty cycle.

Power Plug Kit (K802U) – Provides three plugs, two for the 120 volt duplex receptacle and one for the 240 volt receptacle. (Order **K802T** power plug kit for the CSA model)

GFCI Receptacle Kit (K896-3) - Includes one UL approved 115 volt ground fault circuit interrupter duplex type receptacle with cover and installation instructions. Replaces the factory installed 115 volt duplex receptacle. Each side of the GFCI duplex is rated at 15 amps but the maximum total current from the GFCI duplex is limited to 20 amps. (15 amps for CSA model)

Undercarriage (K882-2) - 2- wheeled, hand moving. A two-wheeled, hand movable, undercarriage available for field installation.

Rotor Removal Kit (S20925) – A service kit with thru and impact bolts for removing the generator rotor from the tapered engine crankshaft.

BRIGGS AND STRATTON ACCESSORIES (FOR THE 8 HP KOOL BORE ENGINE ONLY)

The following options/accessories are available for your POWER-ARC 4000 from your local Briggs & Stratton Distributor. Check with the distributor for availability of options/accessories for the 9 HP Vanguard engine.

Foam Pre-cleaner (B&S No. 492889) - Provides a foam pre-cleaner for placement around the paper cartridge air cleaner. Increases protection in extremely dusty or dirty environments.

Oil Gard® Low Oil Shutdown Kit (B&S No. 398182) – Installs in the crankcase access port. Senses low oil conditions and automatically stops the engine. The engine cannot be restarted until sufficient oil is added. It is recommended that the Oil Gard Kit be installed on Power Arc machines where the machine is subject to long periods of continuous running.

Super Lo-Tone® Muffler - Square (B&S No. 494221) – Replaces the round Lo-Tone muffler that comes installed on the engine. Limits exhaust noise but reduces maximum generator output by 100-200 watts.

Muffler Guard (B&S No. 494868) - This guard installs onto the muffler via a supplied bracket and protects against incidental contact with a “HOT” muffler. **Do not use this guard in tandem with both a deflector and spark arrester.**

SEMI-AUTOMATIC MIG WELDING WITH A LINCOLN WELD-PAK 100 OR WELD-PAK 125

In addition to using the accessories/options listed above, the POWER-ARC 4000 generator can supply power to a Lincoln Electric Weld-Pak 100 or Weld-Pak 125 wire feed welder. The Weld-Pak comes with all the supplies needed for Flux-Cored Arc Welding (FCAW).

A K610-1 MIG (Metal Inert Gas) Conversion Kit is also available for the Weld-Pak. The kit provides everything needed for Gas Metal Arc Welding (GMAW) or MIG processes. Contact your local authorized Lincoln representative for details about the Weld-Pak and MIG Conversion Kit.

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SAFETY PRECAUTIONS



WARNING

- Have qualified personnel do all maintenance and troubleshooting work.
- Turn the engine off before working inside the machine.
- Remove guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete.
- If guards are missing from the machine, get replacements from a Lincoln Distributor. See the EXPLODED VIEW AND PARTS LIST at the back of this manual.

Read the Safety Precautions in the front of this manual and in the Briggs & Stratton **Operating and Maintenance Instructions** manual before working on the POWER-ARC 4000.

Keep all equipment safety guards, covers, and devices in position and in good repair. Keep your hands, hair, clothing, and tools away from the recoil housing, fans, and all other moving parts when starting, operating, or repairing this machine.

ROUTINE AND PERIODIC MAINTENANCE

ENGINE MAINTENANCE



CAUTION

To prevent the engine from accidentally starting, disconnect the spark plug lead before servicing the engine.

See **Table D.1** for a summary of maintenance intervals for the items listed below. Follow either the hourly or the calendar intervals, whichever come first. More frequent service may be required, depending on your specific application and operating conditions. Table D.2 shows engine maintenance replacement parts and numbers.

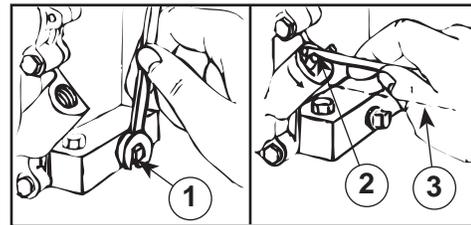


OIL: Check the oil level after every 5 hours of operation or daily. **BE SURE TO MAINTAIN THE OIL LEVEL.**

Change the oil the first time after 5 hours of operation. Then, under normal operating conditions, change the oil after every 50 hours or once a year, whichever occurs first. If the engine is operated under heavy load or in high ambient temperatures, change the oil every 25 hours.

Drain the oil from the drain plug located on either side of the engine bottom, as shown in Figure D.1. Refill through the oil fill plug until the oil reaches the top of the fill hole. Use the grade and viscosity recommended in the Engine Owner's Manual.

FIGURE D.1 - OIL DRAIN AND REFILL LOCATION



1. OIL DRAIN PLUG
2. OIL FILL PLUG
3. OIL LEVEL

FUEL: At the end of each day's use, refill the fuel tank to minimize moisture condensation and dirt contamination in the fuel line.



ENGINE ADJUSTMENTS



WARNING

OVERSPEED IS HAZARDOUS - The maximum allowable high idle speed for this machine is 3750 RPM, no load. DO NOT tamper with the governor components or setting or make any other adjustments to increase the maximum speed. Severe personal injury and damage to the machine can result if operated at speeds above maximum.

Adjustments to the engine are to be made only by a Lincoln Service Center or an authorized Field Service Shop.

**CAUTION**

Do not use petroleum solvents such as kerosene to clean the air cleaner. They may cause deterioration of the air cleaner. **DO NOT OIL THE AIR CLEANER OR USE PRESSURIZED AIR TO CLEAN OR DRY THE AIR CLEANER.**

To service the pre-cleaner:

1. Wash in liquid detergent and water.
2. Squeeze dry in a clean cloth.
3. Saturate in clean engine oil.
4. Squeeze in a clean, absorbent cloth to remove all excess oil.

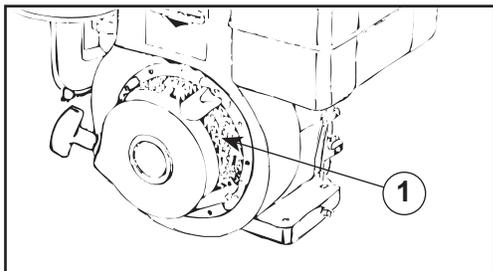
CLEAN ENGINE: Remove dirt and debris with a cloth or a brush. Do not clean with a forceful spray of water. Water might contaminate the fuel system.

**CAUTION**

Periodically clean the muffler area to remove combustible debris.

Clean Rotating Screen: See Figure D.2. Clean the rotating screen on your machine's engine as often as needed to remove dirt or debris that may collect on the screen. A dirty screen can result in engine overheating and damage.

FIGURE D.2 - CLEAN ROTATING SCREEN/FINGER GUARD/DEBRIS GUARD

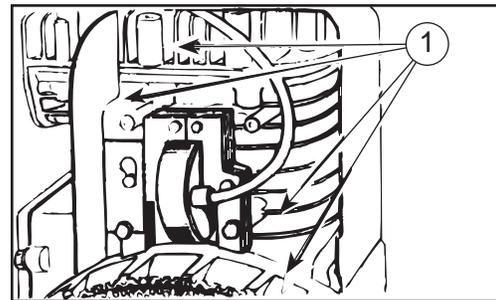


1. ROTATING SCREEN

CLEAN COOLING SYSTEM: See Figure D.3. Clean the internal cooling fins and surfaces to prevent over-

speeding, overheating, and engine damage. Clean every 100 operating hours or as often as necessary.

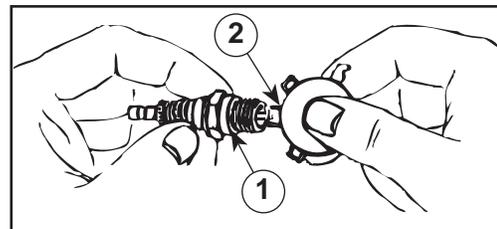
FIGURE D.3 - CLEAN COOLING SYSTEM



1. REMOVE DIRT FROM THESE AREAS.

CLEAN OR REPLACE SPARK PLUG: Clean or replace the spark plug after every 100 hours of operation or every season, whichever comes first. Do not blast the spark plug clean with an abrasive cleaning device. Clean the plug by scraping it or by using a wire brush. Wash the plug with a commercial solvent. After cleaning or when installing a new spark plug, set the terminal gap to .030 inch (.76 mm) with a feeler gauge. See Figure D.4.

FIGURE D.4 - SET SPARK PLUG GAP



Use the Briggs & Stratton Engine Manual for latest Plug Gap Info.

CLEAN SPARK ARRESTER SCREEN: If the muffler has the optional spark arrester assembly, remove it every 50 hours or once a year, whichever comes first, and inspect it. Clean the arrester. Replace it if you find any damage.

**TABLE D.1
ENGINE MAINTENANCE SCHEDULE**

Maintenance Operation	Every 5 Hours or Daily	25 Hours or Yearly	50 Hours or Yearly	100 Hours or Yearly	100-300 Hours
Check Oil Level	●				
Change Oil ♦			● Note 1		
Clean Rotating Screen, Finger Guard, or Debris Screen	● Note 2				
Service Foam Pre-Cleaner		● Note 2			
Service Air Cleaner (if no pre-cleaner)		● Note 2			
Service Air Cleaner (if pre-cleaner present)				● Note 2	
Clean Cooling System				●	
Inspect Spark Arrester (Option)			●		
Clean or Replace Spark Plug				●	
Replace In-Line Fuel Filter (Option)				●	
Remove Combustion Deposits					●

♦ Change oil after first 5 hours, then after every 50 hours or once a year.

Note 1: Change oil every 25 hours when operating under heavy load in high ambient temperatures.

Note 2: Clean more often under dusty conditions or when airborne debris is present.

TABLE D.2 – ENGINE MAINTENANCE PARTS

	B&S 8 HP KOOL BORE PART #	B&S 9 HP VAN-GUARD PART #	B&S 8 HP INTEK PART #	HONDA PART #
SPARK PLUG (RESISTOR)	B&S 802592 Champion RJ19LM	B&S 491055 Champion RC12YC Autolite 3924	B&S 491055 Champion RC12YC	NGK BPR6ES DENSO W20EPR-U
FUEL FILTER	B&S 394358	None	None	None
AIR CLEANER (PLEATED PAPER)	B&S 494511	B&S 710266	B&S 491588 (5043)	5266721 (17210-ZE2-505)
AIR PRE-CLEANER (AS NEEDED)	B&S 492889	B&S 710268	B&S 493537	2538429 (17218-ZE2-821)
(CAN BE CLEANED AND REUSED AS NEEDED)				

GENERATOR/WELDER MAINTENANCE

STORAGE: Store the POWER-ARC 4000 in clean, dry, protected areas.

CLEANING: Blow out the generator and controls periodically with low pressure air. Do this at least once a week in particularly dirty areas.

BRUSH REMOVAL AND REPLACEMENT: See Figure D.5. It's normal for the brushes and slip rings to wear and darken slightly. Inspect the brushes when a generator overhaul is necessary. Remove the brushes and clean the slip rings with fine grit emery paper. Refer to the Troubleshooting chapter for *Brush Removal and Replacement Procedures*.



CAUTION

Do not attempt to polish slip rings while engine is running.

To reinstall the brushes, press them upward and slide a cable tie or wooden stick through the brush holder tabs. Install the brush holder into the bearing end bracket and secure with the screws previously removed. Remove the cable tie or wooden stick and the brushes will seat onto the slip rings.

RECEPTACLES: Keep the electrical receptacles in good condition. Remove any dirt, oil, or other debris from their surfaces and holes.

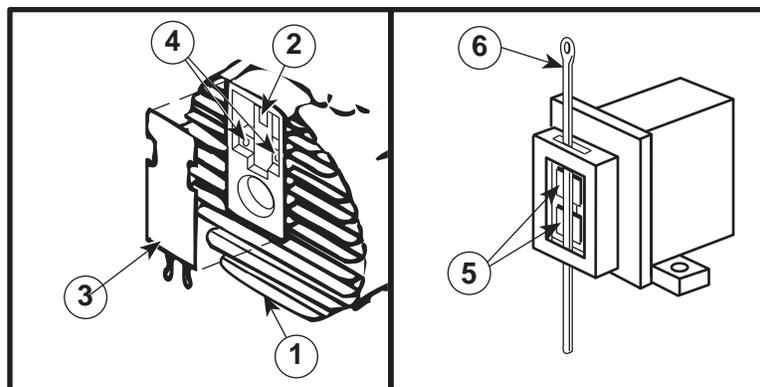
CABLE CONNECTIONS: Check the welding cable connections at the weld output terminals often. Be sure that the connections are always tight.

NOTE: Lincoln offers a rotor removal kit for any service which requires removal of the rotor from the engine. See the *ACCESSORIES* section for further details.

Removal of the engine/generator assembly from the cradle can be achieved as follows:

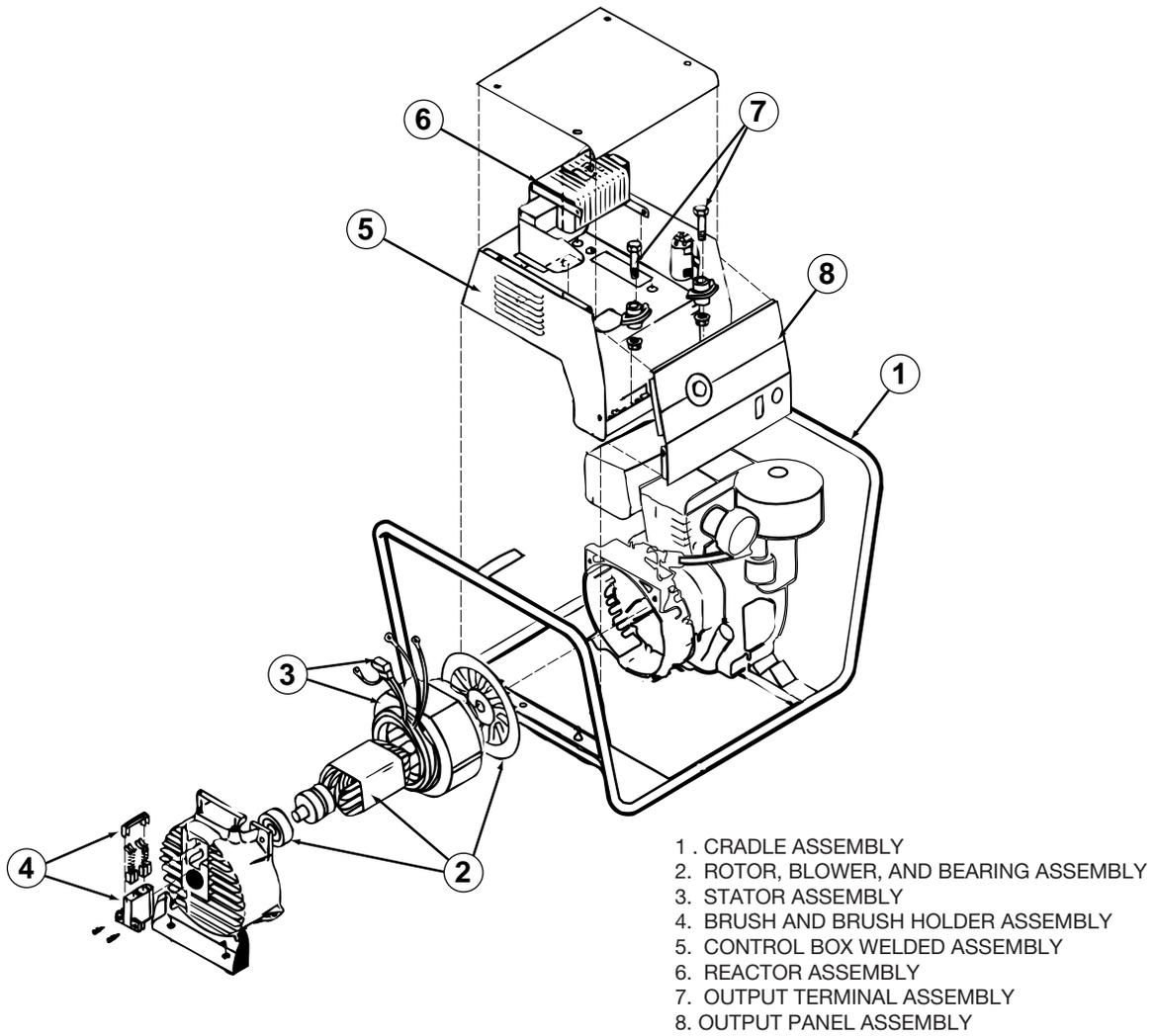
- Remove the two 5/16-18 hex head cap screws from the engine block via the access hole located in the cradle cross support channel. Leave all other engine mountings intact.
- Remove the two hex nuts from the isolator threaded posts at the stator support bracket located opposite the engine. Leave all other stator mountings intact.
- With a jib hoist or crane, lift the unit upward and remove loose cradle from engine/generator assembly.

FIGURE D.5. – BRUSH REMOVAL AND REPLACEMENT



1. GENERATOR END BRACKET
2. BRUSH HOLDER ASSEMBLY
3. COVER
4. SCREWS (2)
5. BRUSHES
6. CABLE TIE

FIGURE D.6. - MAJOR COMPONENT LOCATIONS



- 1 . CRADLE ASSEMBLY
- 2 . ROTOR, BLOWER, AND BEARING ASSEMBLY
- 3 . STATOR ASSEMBLY
- 4 . BRUSH AND BRUSH HOLDER ASSEMBLY
- 5 . CONTROL BOX WELDED ASSEMBLY
- 6 . REACTOR ASSEMBLY
- 7 . OUTPUT TERMINAL ASSEMBLY
- 8 . OUTPUT PANEL ASSEMBLY

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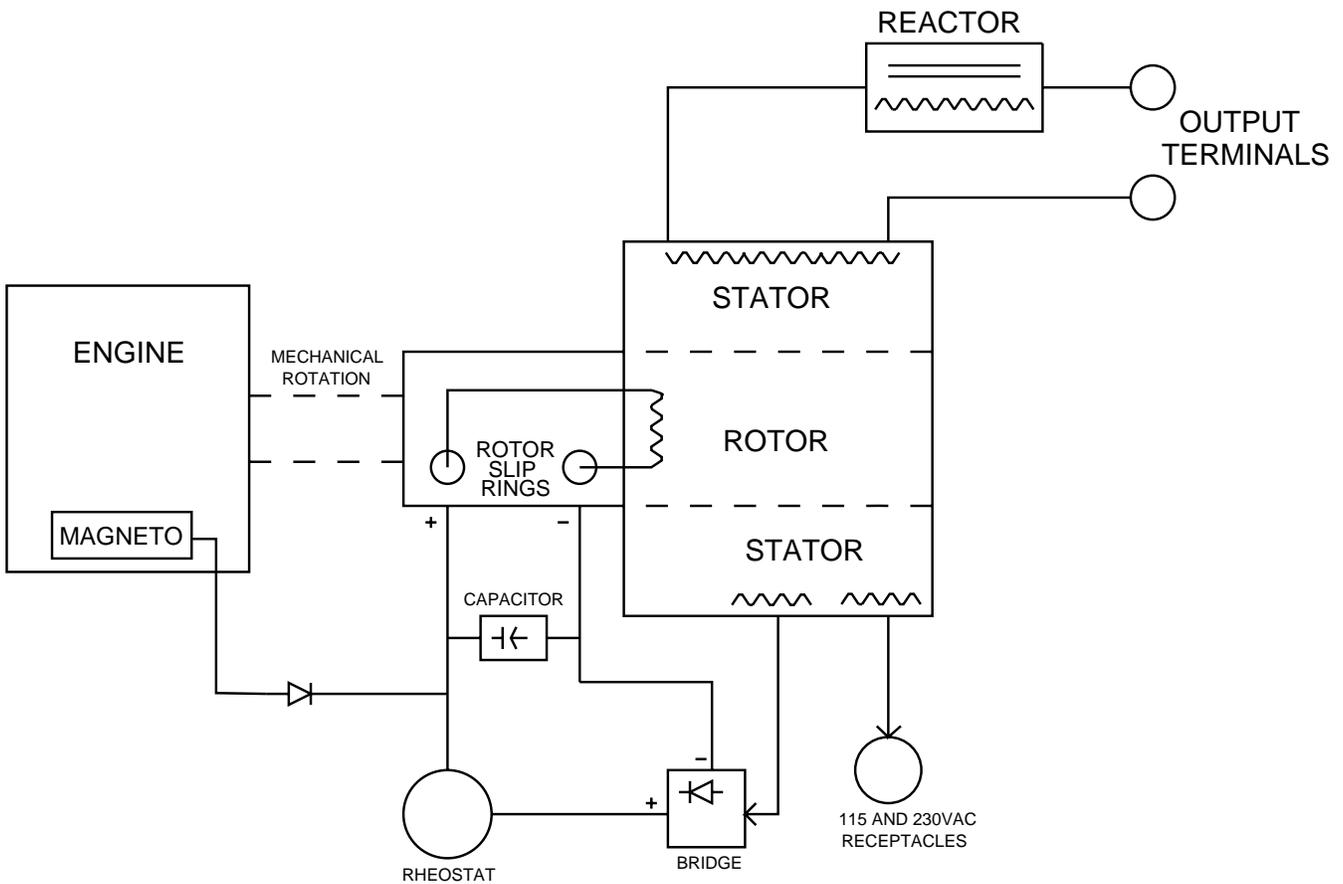
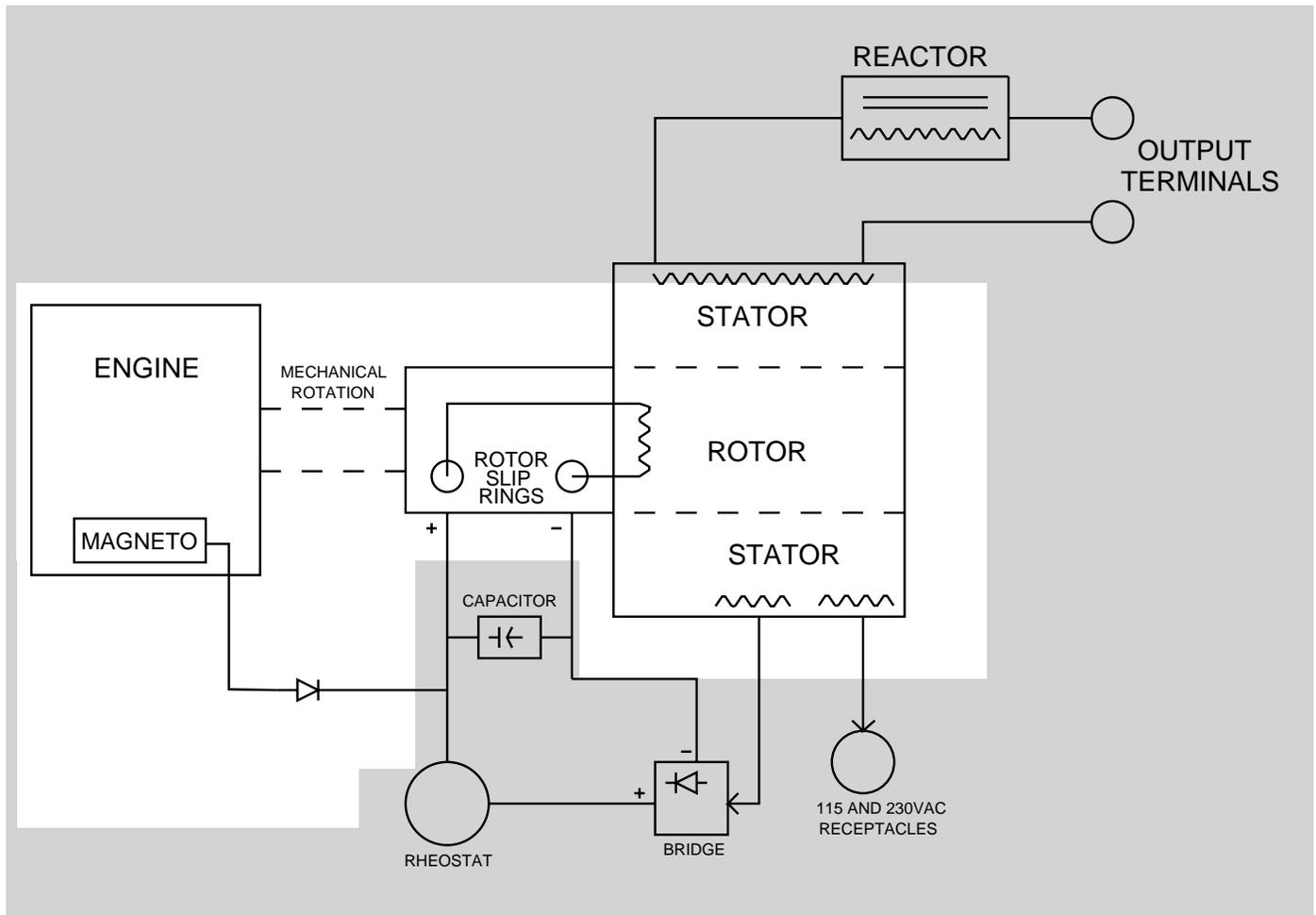


FIGURE E.1 – POWER-ARC 4000 BLOCK LOGIC DIAGRAM

FIGURE E.2 – ENGINE, ROTOR AND STATOR



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).

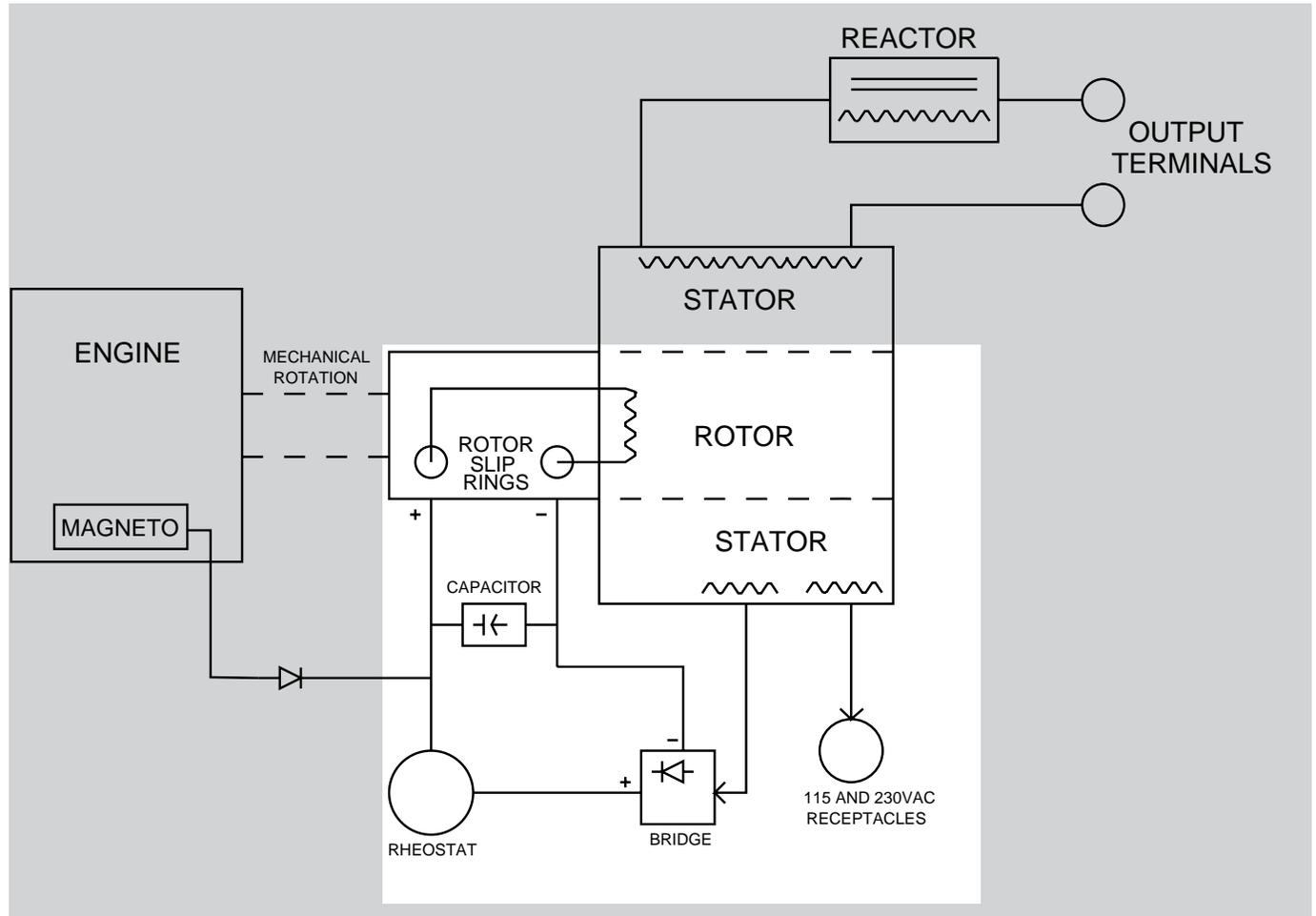
Three separate and isolated windings are incorporated in the stator lamination assembly. Each winding set has a different number of turns, producing different magnitudes of AC output voltages. The three windings are the weld winding, the auxiliary power winding and the field feedback winding. The field feedback winding provides rotor current during machine operation. The output of the PowerArc 4000 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

POWER-ARC 4000

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FIGURE E.3 – FIELD EXCITATION 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.

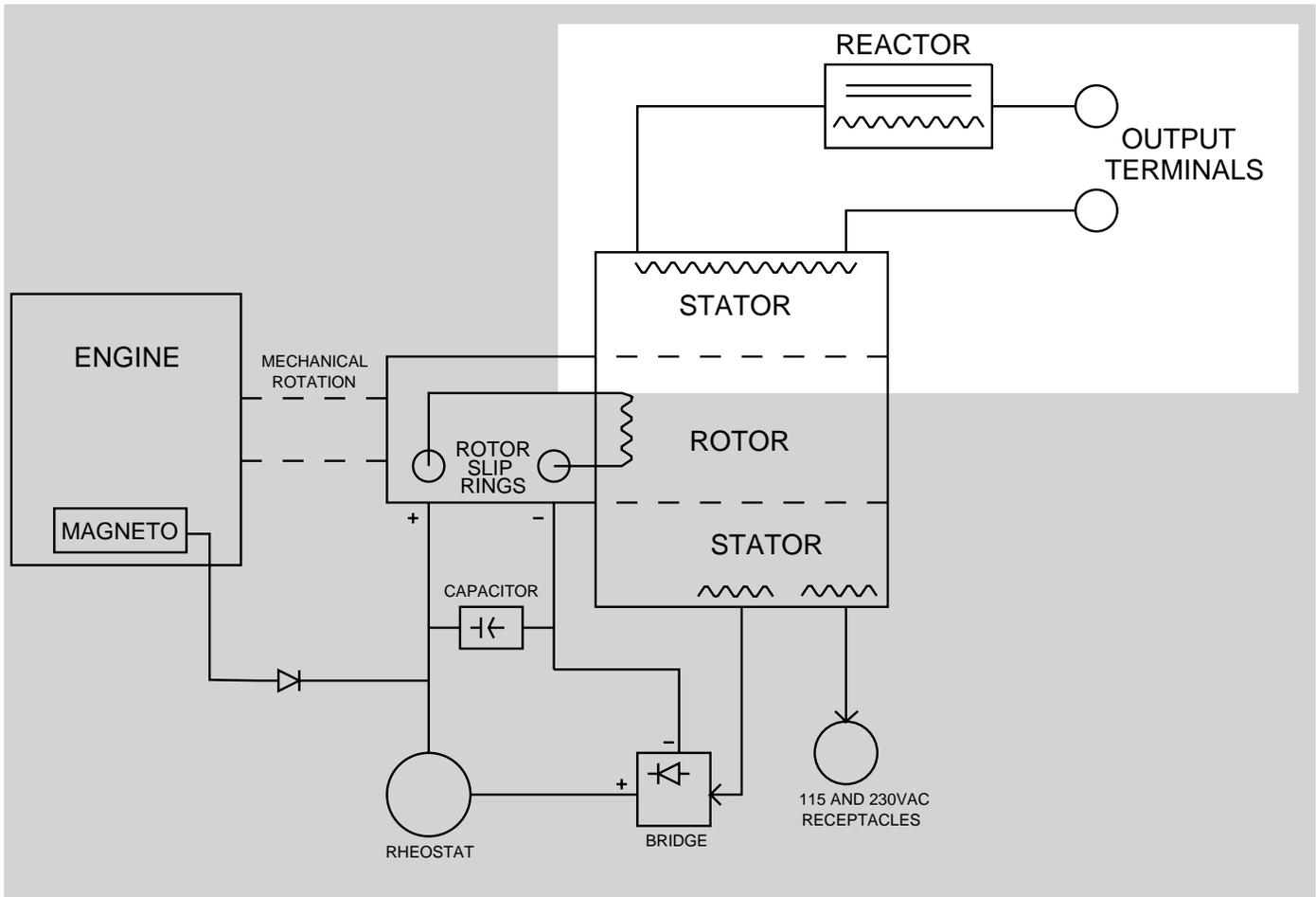
When full field voltage is applied to the rotor and the engine is running at high speed (3700 RPM), a 230 VAC voltage is developed in the stator auxiliary winding. This winding is tapped to provide 115 VAC. The two voltages (115 VAC and 230 VAC) are connected to the appropriate receptacles and offer 4000 watts (total) of AC power.

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

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FIGURE E.4 – WELDING OUTPUT



WELD WINDING AND REACTOR

The AC voltage developed in the stator weld winding is delivered, through the reactor, to the machine output terminals. The PowerArc 4000 provides the user with 125 amps of constant current AC welding for stick electrodes. The reactor stores energy, and this energy is released into the welding arc when the AC voltage passes through the zero point. In this manner the reactor enhances and stabilizes the AC welding arc. The reactor is designed to provide optimum welding characteristics when used with the recommended electrodes.

AUXILIARY POWER OVERCURRENT PROTECTION

The 4000 watt auxiliary power winding and circuitry is protected from an overload condition by two 20 amp circuit breakers. The circuit breakers are located below the output receptacles. 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 be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

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

Step 1. LOCATE PROBLEM (SYMPTOM).

Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into three main categories: Welding Problems, Engine Problems, and Output 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. PERFORM COMPONENT TESTS.

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

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

**CAUTION**

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

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident.	Contact the Lincoln Electric Service Department at 1-888-935-3877.	

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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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No weld output and no auxiliary output - engine runs normally.	1. The generator brushes may be worn or faulty. See the Maintenance section of this manual or contact your local Lincoln Electric Authorized Field Service Facility.	1. Perform the Rotor Voltage Test. 2. If the rotor voltage is zero to 3 VDC, check the flywheel alternator and associated wires 202 and 202A for continuity. The voltage from lead 202 to ground should be at least 0.5 to 1.5 VDC at high idle (3700 RPM). Normal voltage is approximately 45 VDC. If the voltage is low or missing, the flashing circuit may be faulty. See the wiring diagram. Check diode D2 & lead #202C. 3. Check lead 201B for continuity (zero ohms) to ground. See wiring diagram. 4. The field capacitor (C1) or bridge (D1) may be faulty. Test or replace. 5. Test the rheostat (R1). Normal resistance is 3.3 ohms. See the Rheostst Replacement drawing. 6. The rotor may be faulty. Perform the Rotor Resistance Test.



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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
<p>No weld output - auxiliary power (230 - 115 VAC) operates normally - engine runs normally.</p>	<p>1. Check the open circuit voltage (OCV) at the welder output terminals. If OCV is okay, go to Step 2, below.</p> <p>If OCV is not present at the welder output terminals, contact your local Lincoln Electric Authorized Field Service Facility.</p> <p>2. Check the welding cables, clamps and electrode holder for loose or broken connections.</p>	<p>1. Check continuity (zero ohms) of lead W1A (black) from output terminal to reactor (L1). See the Wiring Diagram.</p> <p>2. Check continuity (zero ohms) of lead W2 (black) from output terminal to stator winding. See the Wiring Diagram.</p> <p>3. Check continuity (zero ohms) of lead W1 (black) from reactor (L1) to stator winding. See the Wiring Diagram.</p> <p>4. Check reactor (L1) for continuity of winding. See the Wiring Diagram.</p> <p>5. Check the stator for continuity of winding. See the Wiring Diagram.</p> <p>6. Make certain the reactor and/or stator are NOT grounded. Minimum acceptable resistance to ground is 500 K-ohms.</p>



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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No auxiliary power - welding output is normal - engine runs normally.	<ol style="list-style-type: none"> 1. Check circuit breakers CB1 and CB2. Reset if tripped. 2. Make sure that the control rheostat (R1) is set at "GENERATOR" (maximum). 3. Check for loose or faulty plug at power receptacle. 	<ol style="list-style-type: none"> 1. Check the auxiliary power receptacles and associated wires for loose or faulty connections. 2. Check the continuity (zero ohms) of leads 3, 3A, 3B; 6, 6A, 6B, 6C; and 5, 5A, 5B from the receptacles to the stator windings. See the Wiring Diagram. 3. Make sure lead 5 (white) is grounded to the machine frame (zero ohms). 4. Check for an open or grounded auxiliary winding in the stator, 6 to 3. See the Wiring Diagram.



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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
<p>Low weld output and low auxiliary output.</p>	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1. Perform the Rotor Voltage Test. 2. If the rotor voltage is low, the field capacitor (C1) or bridge (D1) may be faulty. Test or replace. 3. Check the rheostat (R1). Normal resistance is 3.3 ohm. See the Rheostat Replacement drawing. 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 engine idle RPM is okay, the engine may have lost horsepower and be in need of major repair.



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

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
Engine will not start.	<ol style="list-style-type: none"> 1. Make sure the ON/OFF Switch is in the "ON" position. 2. Check spark plug boot and wire for loose or faulty connection. 3. Make sure that the fuel shutoff valve is in the "ON" position. 4. Make certain that the engine has adequate fuel and oil. 5. Adjust the choke to prevent carburetor flooding. 6. The recoil starter may not be engaged with the engine. gently hit the blower housing and/or pull the rope to its fully extended position and rapidly wiggle it. Repeat until the clutch engages with the engine shaft and resistance is felt. 7. Low oil and engine low oil shutdown protection will not allow unit to start. Light in ON-OFF switch will flash when engine is cranked. (Engines equipped with low oil shutdown protection only). 	<ol style="list-style-type: none"> 1. Check the fuel line for breaks or obstructions. Replace the fuel filter. DO NOT RUN THE ENGINE WITHOUT AN IN-LINE FUEL FILTER. 2. The spark plug may be faulty. Replace. 3. Service the engine as outlined in the Maintenance section of this manual. 4. The engine magneto may be faulty. Consult engine owner's manual. 5. The engine may be faulty. Replace.



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

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TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
Engine will not stop running.	1. Make sure the Rotary Switch is in the "OFF" position.	1. Make sure the Rotary ON/OFF Switch is functioning correctly. See wiring diagram.
Engine runs erratically or stops running.	1. Check the spark plug boot and wire for loose or faulty connection. 2. The spark plug may be faulty. Replace. 3. The fuel and air mixture may be out of adjustment. Consult Briggs & Stratton owner's manual. 4. The fuel supply may be contaminated with water.	1. The engine may require service to the head or carburetor. 2. The fuel pump may be faulty. Consult Briggs & Stratton.
Engine sputters but will not start.	1. The spark plug may be faulty. 2. The fuel supply may be contaminated with water. 3. The air filter may be clogged. Replace. 4. The fuel and air mixture may be out of adjustment.	Consult Briggs & Stratton owner's manual.



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

POWER-ARC 4000



Return to Section TOC
Return to Master TOC

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
<p>The welding arc is “cold.” The engine runs normally (3700 RPM, no load). Auxiliary power is functioning normally.</p>	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 1. Check for the correct open circuit voltage (OCV) at the welder output terminals – 62 VAC is normal. If the correct voltage is present at the output terminals, check for loose connections on the heavy current-carrying leads inside the POWER-ARC 4000. See the Wiring Diagram. 2. If the OCV is low at the welder output terminals, perform Engine Throttle Adjustment Test. 3. Check for shorted or grounded windings in the reactor (L1) and also in the main stator. See the Wiring Diagram.



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

POWER-ARC 4000



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ROTOR VOLTAGE TEST



WARNING

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

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

TEST DESCRIPTION

This test will determine if the 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.

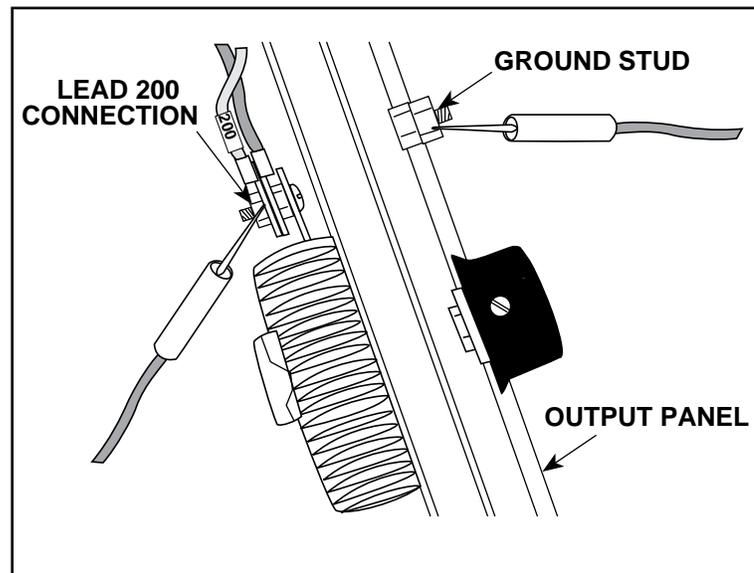
MATERIALS NEEDED

Volt/Ohmmeter
5/16" Nut driver
Wiring Diagram

This procedure takes approximately 15 minutes to perform.

ROTOR VOLTAGE TEST *(continued)*

FIGURE F.1 - LOCATION OF LEAD 200A FOR ROTOR VOLTAGE TEST



TEST PROCEDURE

1. With the 5/16" nut driver, remove the 4 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 or GENERATOR setting.
3. Set the volt/ohmmeter at the DC position.
4. Place the positive probe on lead 200 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 45 - 48 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 D1 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 4 sheet metal screws with the 5/16" nut driver.

ROTOR RESISTANCE TEST



WARNING

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

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

TEST DESCRIPTION

This test will determine if there is a shorted winding in the rotor or if the rotor is grounded.

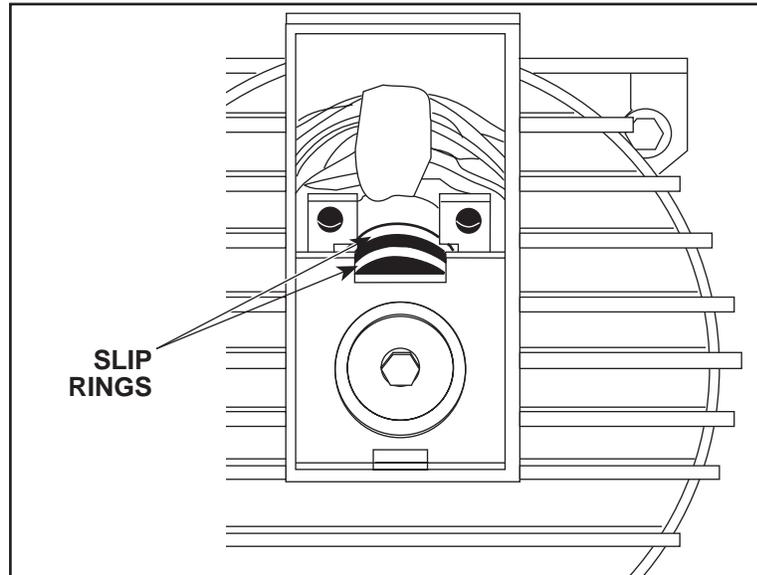
MATERIALS NEEDED

Volt/Ohmmeter
1/4" Nut driver
Small slot head screw driver
Wiring Diagram

This procedure takes approximately 25 minutes to perform.

ROTOR RESISTANCE TEST *(continued)*

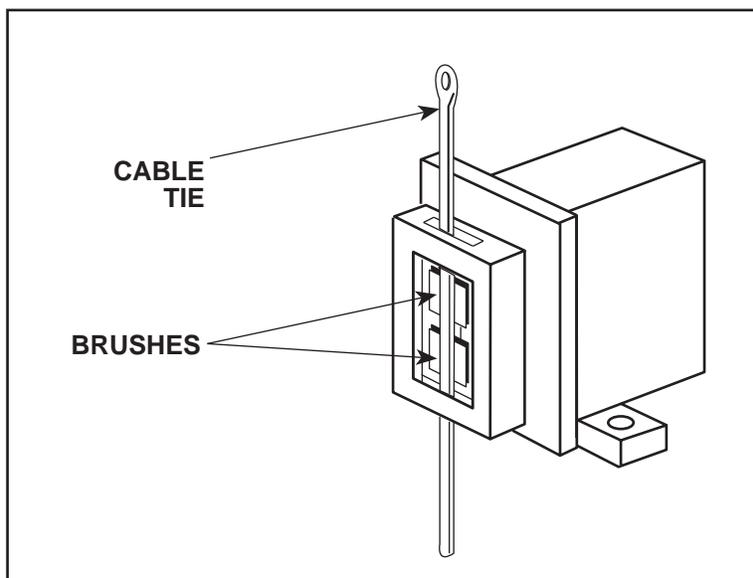
FIGURE F.2
LOCATION OF ROTOR SLIP RINGS - BRUSH HOLDER ASSEMBLY REMOVED



TEST 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 8 - 9 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.

ENGINE THROTTLE ADJUSTMENT TEST



WARNING

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

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TEST DESCRIPTION

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

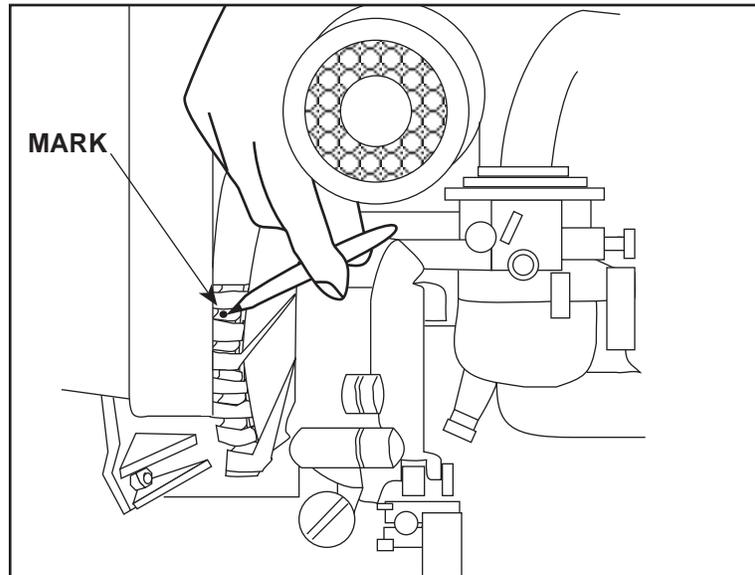
MATERIALS NEEDED

- 7/16" open end or box wrench
- Frequency counter or strobe-tach
- Black or red marking pencil

This procedure takes approximately 20 minutes to perform.

ENGINE THROTTLE ADJUSTMENT TEST *(continued)*

FIGURE F.4 - BLOWER PADDLE MARKED FOR STROBE-TACH METHOD



TEST PROCEDURE

This test can be conducted by any of three methods.

Strobe-tach Method:

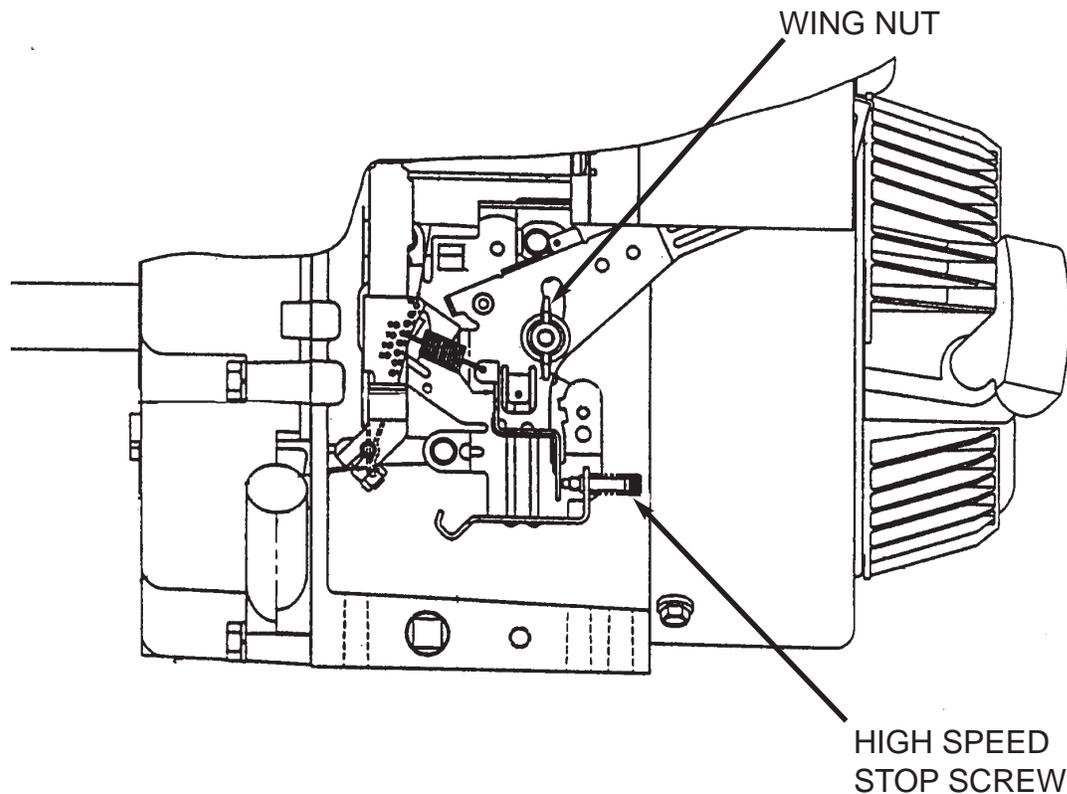
1. Stop the engine and remove the spark plug wire to prevent accidental kickback or starting.
2. With the black or red marking pencil, place a mark on one of the blower paddles, which can be reached through the vent slots in the end bracket. See Figure F.4.
3. Connect the strobe-tach according to the 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. Loosen Wing Nut (Refer to **Figure F.5**)
6. Referring to **Figure F.5**, adjust high speed stop screw until tach reads 3700 RPM.
7. Re-tighten wing nut until wave washer is completely compressed.

Frequency Counter Method:

1. Plug the frequency counter into one of the 115 VAC auxiliary receptacles.
2. Start the engine and check the frequency counter. At the proper RPM (3700), the counter should read 63 Hz.
3. Loosen Wing Nut (Refer to **Figure F.5**)
4. Referring to **Figure F.5**, adjust high speed stop screw until the frequency counter reads 63Hz.
5. Re-tighten wing nut until wave washer is completely compressed.

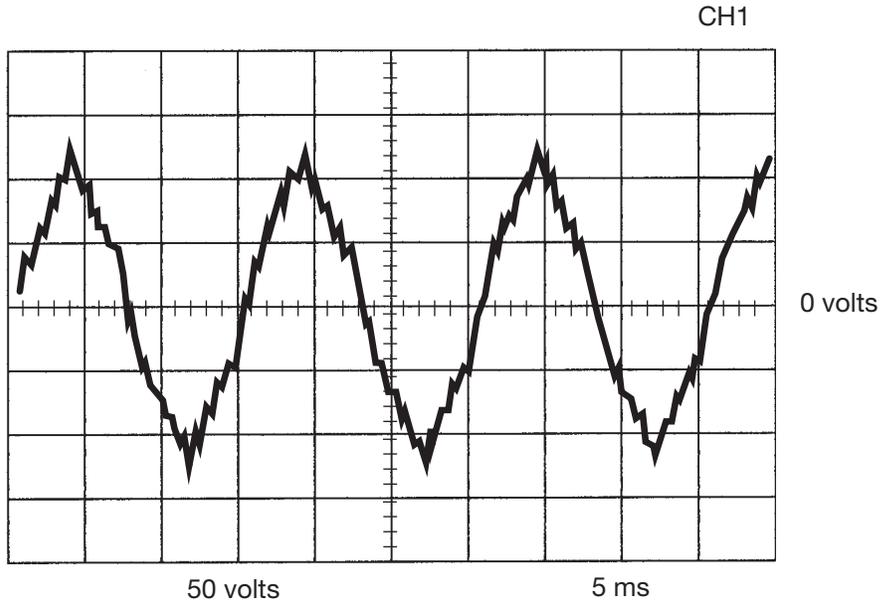
Oscilloscope Method:

1. Connect the oscilloscope according to the manufacturer's instructions. At 3700 RPM, the waveform should exhibit a period of 15.8 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.5 - LOCATION OF ENGINE THROTTLE ADJUSTMENT NUT**

2. Loosen Wing Nut (Refer to Figure F.5)
3. Referring to Figure F.5, adjust high speed stop screw to adjust the waveform period to 15.8 milliseconds.
4. Re-tighten wing nut until wave washer is completely compressed.

NORMAL OPEN CIRCUIT WELD VOLTAGE WAVEFORM
HIGH IDLE – NO LOAD



This is the typical AC 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

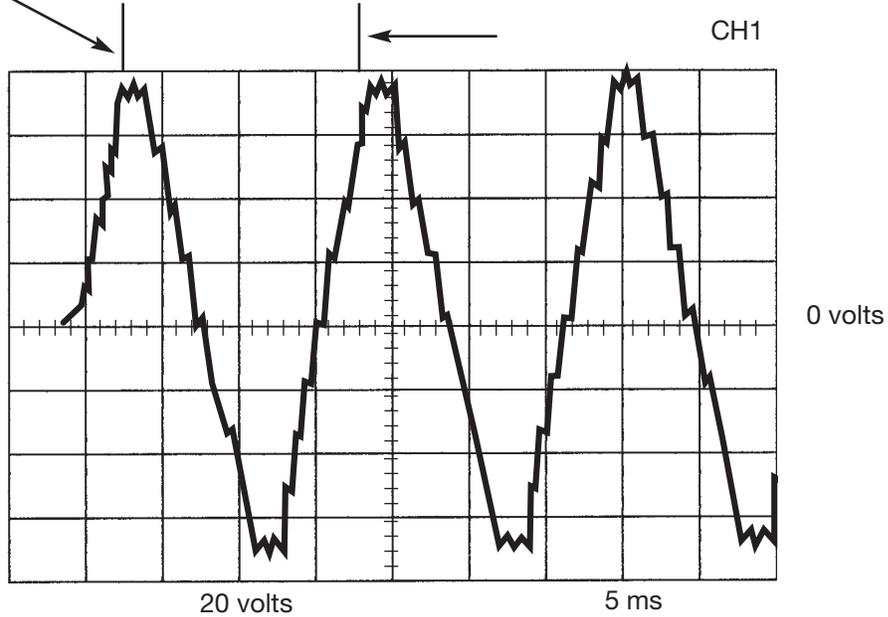
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Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (115 VAC SUPPLY)

HIGH IDLE – NO LOAD

1 Period = 16.2 ms @ 3700 rpm



This is the typical AC 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 115 VAC receptacle.

SCOPE SETTINGS

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

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BRUSH REMOVAL AND REPLACEMENT



WARNING

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

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

DESCRIPTION

The following procedure will aid the technician in accessing the generator brushes for maintenance or replacement.

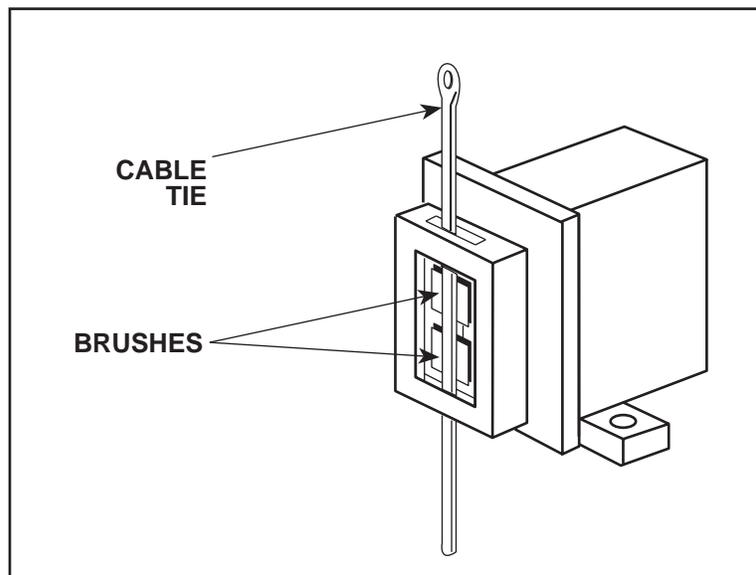
MATERIALS NEEDED

- Small slot head screw driver
- 1/4" Nut driver
- Needle nose pliers

This procedure takes approximately 20 minutes to perform.

BRUSH REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.6 - 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 black and the red wires.
5. To change the brushes, use the slot head screw driver 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 on the slip rings.

Note: The red wire is inboard. "RED" is marked on the brush holder beside the terminal for the red wire.

BRUSH REMOVAL AND REPLACEMENT *(continued)***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.6**. This will hold the brushes up so that you can easily install the holder.
9. With the needle nose pliers, reinstall the red and the black wires to the appropriate terminals on the brushes. The red wire 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.

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RHEOSTAT REMOVAL AND REPLACEMENT



WARNING

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

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

DESCRIPTION

The following procedure will aid the technician in accessing and removing the output control rheostat for maintenance or replacement.

MATERIALS NEEDED

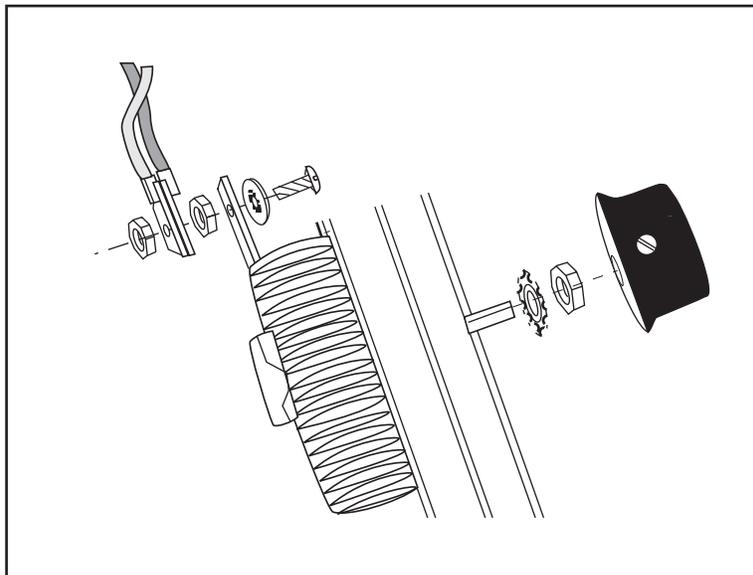
- 5/16" Nut driver
- Small slot head screw driver
- 9/16" Open or box end wrench
- 5/16" Open or box end wrench
- Needle nose pliers
- Wiring Diagram

This procedure takes approximately 25 minutes to perform.

TROUBLESHOOTING & REPAIR

RHEOSTAT REMOVAL AND REPLACEMENT

FIGURE F.7 - RHEOSTAT REMOVAL



See Figure F.7 for steps 3 - 9.

PROCEDURE

1. Remove the spark plug wire.
2. With the 5/16" nut driver, remove the 4 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.
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 top cover of the control box and tighten the 4 sheet metal screws with the 5/16" nut driver.

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

POWER-ARC 4000

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CAPACITOR AND/OR DIODE BRIDGE REMOVAL AND REPLACEMENT



WARNING

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

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

DESCRIPTION

The following procedure will aid the technician in accessing and removing the capacitor and diode bridge for maintenance or replacement of either component.

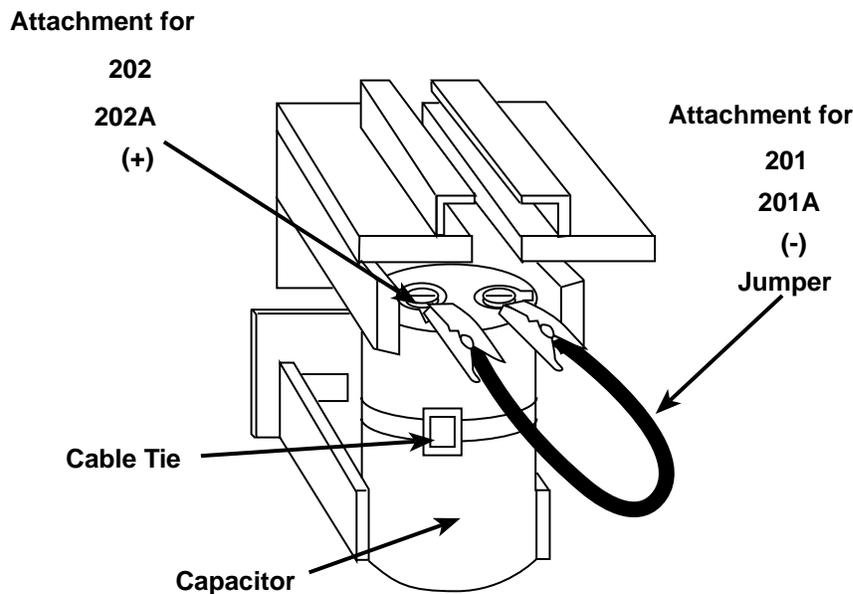
MATERIALS NEEDED

- 5/16" Nut driver
- 5/16" Wrench
- Jumper wire with alligator clips on each end for discharging the field capacitor
- Slot head screw driver
- Needle nose pliers
- Wiring Diagram

This procedure takes approximately 35 minutes to perform.

CAPACITOR AND/OR DIODE BRIDGE REMOVAL AND REPLACEMENT (continued)

FIGURE F.8 - LOCATION AND DISCHARGING THE FIELD CAPACITOR



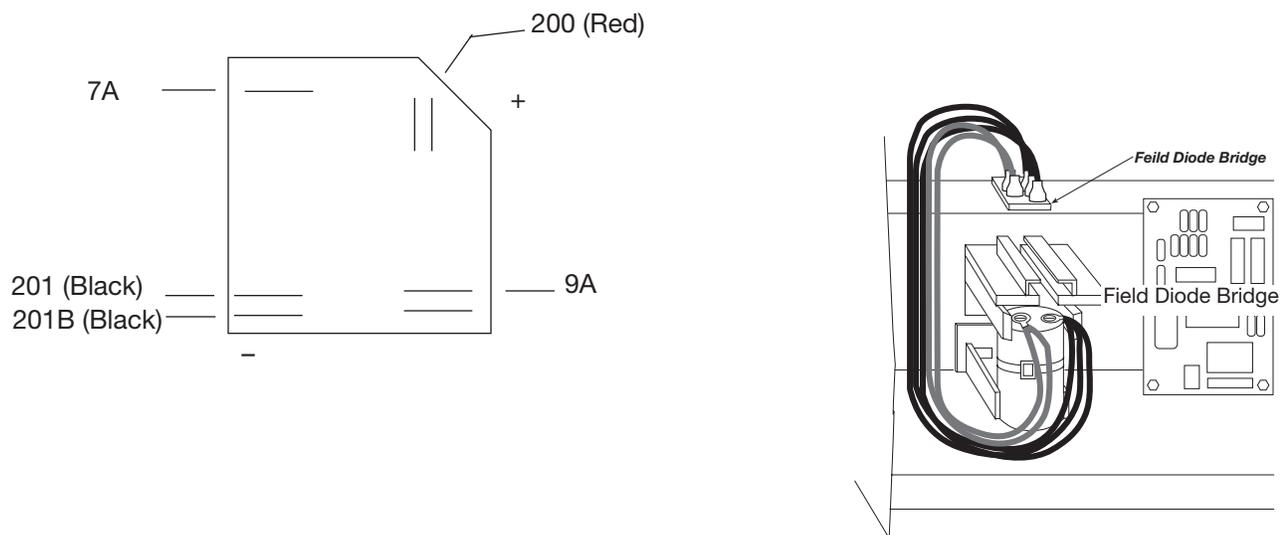
PROCEDURE - CAPACITOR REMOVAL AND REPLACEMENT

1. Remove the engine spark plug wire.
2. With the 5/16" nut driver, remove the sheet metal screws that hold the top cover to the control box. Remove the top cover.
3. With the 5/16" nut driver and wrench remove the screws that hold the control panel in place. Move the panel aside as far as the leads will allow.
4. Discharge the field capacitor by connecting the jumper wire clips on the black and the red wire terminals on the top of the capacitor. See Figure F.8 for location. Leave the clips on for at least 5 seconds, then remove.
5. The capacitor is mounted in a molded plastic holder. To remove it, pull out on the top of the holder, then slide it upward.
6. Snap the capacitor out of the assembly.
7. Loosen the two screws on the top of the capacitor. Leads 202A and 202 attach to the positive (+) terminal. Leads 201 and 201A attach to the negative (-) terminal.
8. To replace the capacitor, reattach the leads to their respective terminals (202A and 202 to positive (+); 201 and 201A to negative (-) and tighten the screws securely. Snap the capacitor back into the molded plastic holder and slide the holder back into position in the panel. Replace the control panel and top cover of the control box and tighten down the sheet metal screws with the 5/16" nut driver.

CAPACITOR AND/OR DIODE BRIDGE REMOVAL AND REPLACEMENT

(continued)

FIGURE F.8A - FIELD DIODE BRIDGE LOCATION



PROCEDURE - FIELD DIODE BRIDGE REMOVAL AND REPLACEMENT

1. Remove the engine spark plug wire.
2. With the 5/16" nut driver, remove the sheet metal screws that hold the top cover to the control box. Remove the top cover.
3. With the 5/16" nut driver and wrench remove the screws that hold the control panel in place. Move the panel aside as far as the leads will allow.
4. Discharge the field capacitor by connecting the jumper wire clips on the black and the red wire terminals on the top of the capacitor. See **Figure F.8** for location. Leave the clips on for at least 5 seconds, then remove.
5. The field diode bridge is mounted to the sheet metal just above the capacitor. See Figure F.8A. Remove it using the slot head screw driver.
6. With the needle nose pliers, gently remove the wires from the diode bridge.
7. Replace the wires to their appropriate locations on the new diode bridge:
 - Lead 200 attached to the positive (+) terminal. Depending on the bridge used, this corner may be beveled and/or marked with a + sign.
 - Lead 201 and 201B are piggy-backed on the negative (-) terminal, which will always be located diagonally across from the positive (+) terminal.
 - Leads 9A and 7A are attached to the AC side of the bridge and are attached to the other two corner terminals. Either lead can go on either terminal.
8. Mount the field diode bridge using the screw. Use the slot head screwdriver.
9. Check that the leads are not grounded and for clearance and tightness.
10. Replace the control panel and tighten the sheet metal screws with the 5/16" nut driver and 5/16" wrench.
11. Replace the top cover of the control box and tighten the sheet metal screws with the 5/16" nut driver.

STATOR/ROTOR REMOVAL AND REPLACEMENT



WARNING

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

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

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**

- 5/16" nut driver
- 1/2" socket wrench
- 6" socket extension
- Slot head screw driver
- 5/8" socket wrench
- 7/16" socket wrench
- 7/16" open or box end wrench
- 3/4" socket or box end wrench
- 1/2" socket or box end wrench
- Needle nose 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 -17 under STATOR REMOVAL PROCEDURE. For reassembly of stator, go to REASSEMBLY PROCEDURE steps 3 - 18.

For rotor removal, follow the STATOR REMOVAL PROCEDURE, ROTOR REMOVAL PROCEDURE, and REASSEMBLY PROCEDURE.

This procedure takes approximately 3 hours to perform.

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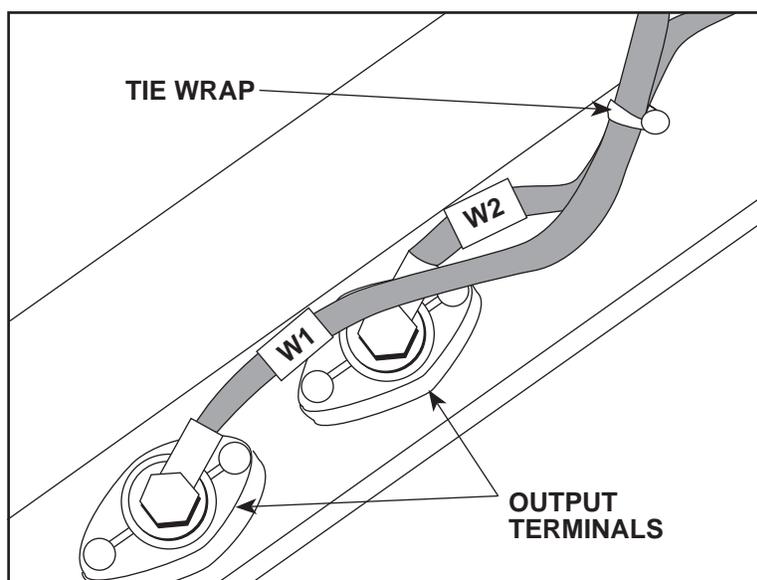


STATOR/ROTOR REMOVAL AND REPLACEMENT *(continued)*

STATOR REMOVAL PROCEDURE

1. Remove engine spark plug wire to prevent accidental kickback or starting.
2. With the 5/16" nut driver, remove the 4 sheet metal screws that hold the top cover to the control box. Remove the top cover.
3. Remove the 4 1/2" nuts and washers that anchor the control box to the stator frame. Two of the nuts also anchor the reactor. The reactor must be moved over to access the front left hand nut anchoring the control box. Be careful not to drop the washers into the machine.
4. Lift up the control box and unscrew the 4 rubber mounts. Set the control box onto the stator frame for the moment.
5. Pull apart the molex coupling that connects the stator to the wiring harness.
6. With the slot head screw driver, remove the 6 sheet metal screws that hold the control panel to the control box - 3 on each side. You may need to use the 5/16" end wrench on the engine side because of limited clearance. Pull the panel away from the control box.
7. With the 9/16" open end wrench, remove lead W2 (Black) from the output terminal. See Figure F.9 for location. With the diagonal cutters, cut the cable tie that holds the two output leads together. Pull lead W2 back out of the way; screw the bolt back into the output terminal hole loosely for reassembly. Set the control panel back on the control box and hold it in place with 1 sheet metal screw in each side.
8. Remove the brush holder assembly. 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. With the 1/4" nut driver, remove the 2 screws that hold the brush holder assembly in place. With the needle nose pliers, gently remove the black and the red wires. Set the brush holder aside. Pull the wires up into the control box.
9. Disconnect lead #202C from the engine magneto, located next to the throttle adjustment (See wiring diagram). This is the single wire on the left side of the machine, running from the engine to the stator.
10. Disconnect lead W1 (Black) that connects to the reactor lead. Replace the nut, splitting lock washer, and flat washer finger tight on the bolt for reassembly.
11. Slide the control panel and box assembly out of the machine cradle. Carefully pull the wire leads down through the box as you remove it. Note that the reactor is loose inside the box and may slide around.

FIGURE F.9 - OUTPUT LEAD LOCATION



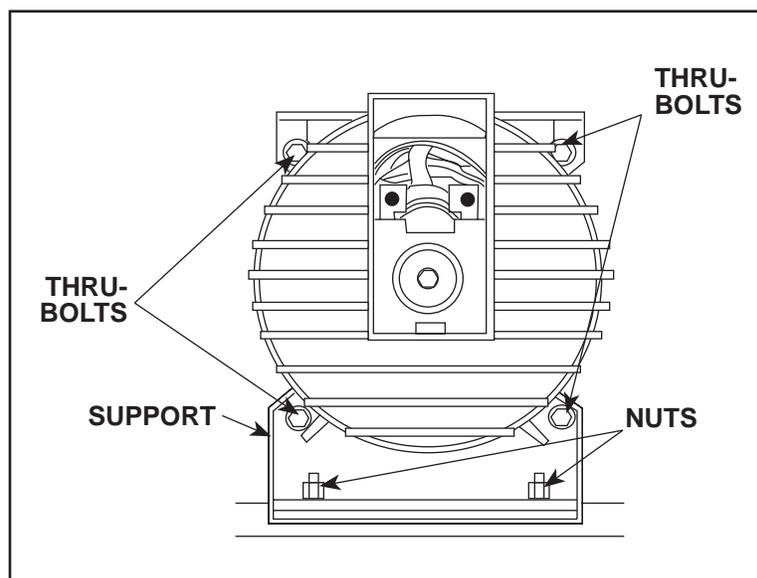
POWER-ARC 4000



STATOR/ROTOR REMOVAL AND REPLACEMENT *(continued)*

12. Slide a short length of 2 X 4 under the engine to support it when the stator is removed.
13. With the 1/2" socket wrench, remove the 2 nuts that hold the stator end bracket support. See Figure F.10 for location. There are 2 split-ring lock washers and 2 flat washers along with the nuts.
14. With the 7/16" socket and 7/16" end wrench, remove the 4 thru-bolts for the generator assembly. See Figure F.10. Note the green grounding wire on the top right hand bolt. It has a flat washer. All 4 bolts have a split-ring lock washer under the head and a shake-proof star washer on the nut side. The bolts must point toward the engine for reassembly.
15. Lift up the stator and slide out the support bracket. The engine will now rest on the 2 X 4.
16. With the babbitt/leather/wooden mallet, tap off the end bracket. Alternate sides as you tap; watch the bearing to judge the amount of movement you're getting.
17. Once the end bracket is off, carefully pull off the stator. IMPROPER HANDLING OF THE STATOR CAN RESULT IN SHORTED WINDINGS AND/OR LOST OUTPUT.

FIGURE F.10 – STATOR END BRACKET SUPPORT AND THRU-BOLTS

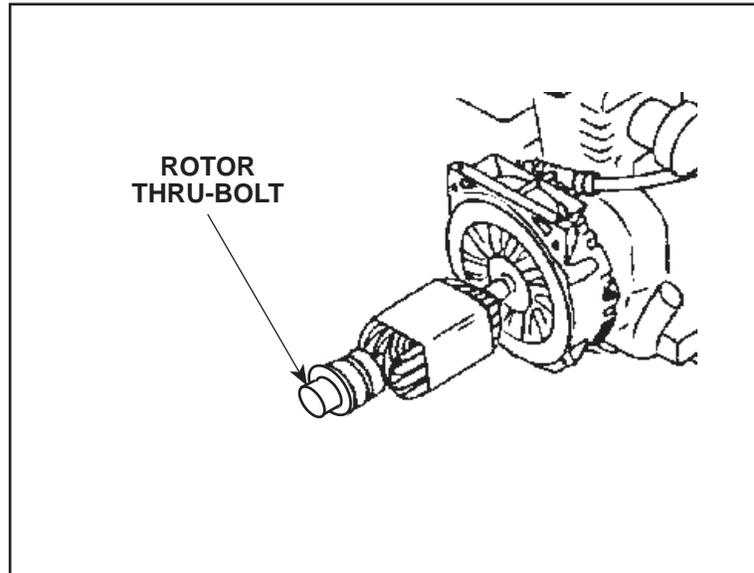


POWER-ARC 4000

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STATOR/ROTOR REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.11 - ROTOR WITH STATOR REMOVED



ROTOR REMOVAL PROCEDURE

1. To remove the rotor, double check that the spark plug wire is disconnected. You will be turning the rotor during this procedure, and this could accidentally cause engine kickback.
2. With an impact wrench, remove the rotor thru-bolt. See Figure F.11. If an impact wrench is not available, use the 1/2" box wrench. Hold the rotor with one hand and shock the wrench with the mallet to loosen the thru-bolt. The thru-bolt has a star washer and lock washer, beveled to conform to the rotor shaft. Pull out the thru-bolt.
3. Install the long thru-bolt supplied with Lincoln Electric Rotor Removal Kit S20925. The slot head must face out. Screw in the bolt with the slot head screw driver until the bolt bottoms out on the engine crankshaft, about 3/4".
4. Turning it counterclockwise, screw in the reverse thread bolt from the kit into the rotor shaft until it bottoms out on the thru-bolt.
5. With an impact wrench, tighten the

reverse thread bolt until the rotor pops off the engine crankshaft. If an impact wrench is not available, use the 1/2" box wrench. Hold the rotor with one hand and shock the wrench with the mallet until the rotor pops off the engine crankshaft.

6. Slide the rotor and blower (press-fitted to the rotor) the rest of the way off the crankshaft.

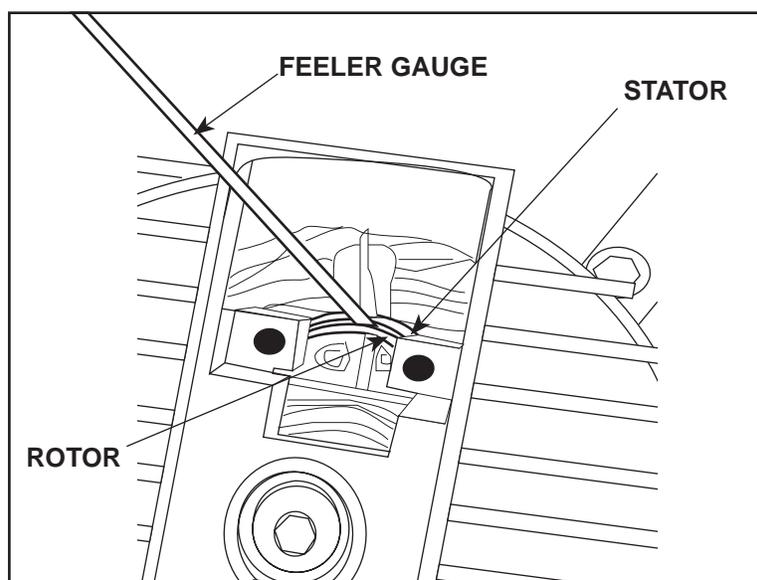
REASSEMBLY PROCEDURE

1. Lubricate the tapered engine crankshaft. Slide the rotor onto the shaft.
2. Coat the rotor thru-bolt threads with Lincoln E177-R retaining compound (Loctite(277)). Place the beveled lock washers onto the thru-bolt and insert it into the rotor shaft. Hold the rotor and tighten the thru-bolt to 22 - 25 ft lbs.
3. Carefully install the stator, with the leads at the 1 o' clock position. **IMPROPER HANDLING OF THE STATOR CAN RESULT IN SHORTED WINDINGS AND/OR LOST OUTPUT.**
4. Install the end bracket. Slide it on and install the two top thru-bolts loosely to hold the end bracket for the next step.
5. Install the end bracket support.

STATOR/ROTOR REMOVAL AND REPLACEMENT *(continued)*

6. Install the bottom two end bracket thru-bolts.
- Note: The flat washer goes on the top right hand thru-bolt for the green ground wire.
7. Tap the end bracket with the mallet as necessary to position it. Tighten the bolts to 4.5 - 5.5 ft lbs. Alternate tightening in order to pull the assembly together evenly. As you tighten, look through the brush housing access door and watch the bearing to judge end bracket movement and alignment.
 8. Check the rotor-stator air gap with the long .010 feeler gauge. The measurement is taken through the brush holder access door; see Figure F12. Turn the engine with the recoil starter rope slightly so that the rotor "iron" is up to take the measurement. (The rotor has two flat sides, which are not measured for air gap.) Slide in the gauge. Then rotate the shaft 180 degrees and measure again. If the gauge does not clear, loosen the four end bracket thru-bolts, reposition the end bracket, retighten the bolts, and recheck the air gap. Repeat until the proper .010 minimum air gap is achieved.
 9. Tighten the end bracket support nuts and lock washers. Remove the 2 X 4 engine support.
 10. Reinstall the brush holder assembly. Refer to the topic "**BRUSH REMOVAL AND REPLACEMENT**" in this section of the manual.
 11. Slide the control box back into place. Pull the stator and ground wire up through.
 12. Remove the control panel (2 screws) and reconnect the output terminal leads (W1, W2). Install a new cable tie to hold the leads together. Reconnect the stator wire/harness molex coupling. Install the 6 screws that hold the control panel to the box.
 13. Reconnect Lead #202C.
 14. Lift the control box and screw in the rubber mountings. Set the control box onto the mountings.
 15. Install the front left hand washer and nut that anchors the control box to the stator frame. Position the reactor and install the remaining washers and nuts.
 16. Check all terminal connections for clearance, grounding, and tightness.
 17. Replace the top cover to the control box and tighten the 4 nuts.
 18. Conduct the "**RETEST AFTER REPAIR**" procedure, the following topic in this section of the manual.

FIGURE F.12 - CHECKING ROTOR-STATOR AIR GAP



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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	3725	3650
Minimum Speed	3675	3400

WELDER/GENERATOR OUTPUT¹

Output Control	Field Volts	Field Amps	Open Circuit Volts	Load Volts	Load Amps
Maximum	43 - 49	4.8 - 5.8	60 - 63	12 - 25	120 - 125
Minimum	-	-	55 - 60	14 - 27	75 - 85

AUXILIARY POWER RECEPTACLE OUTPUT¹

Output Control	230 Volt Receptacle			115 Volt Receptacle ²		
	Open Circuit Volts	Load Volts	Load Amps	Open Circuit Volts	Load Volts	Load Amps
Maximum	255 - 267	215 - 230	18 - 20	127 - 133	112 - 120	18 - 20

¹ Current Control Dial set at MAXIMUM or GENERATOR.

² Output values of each receptacle can vary within the range shown

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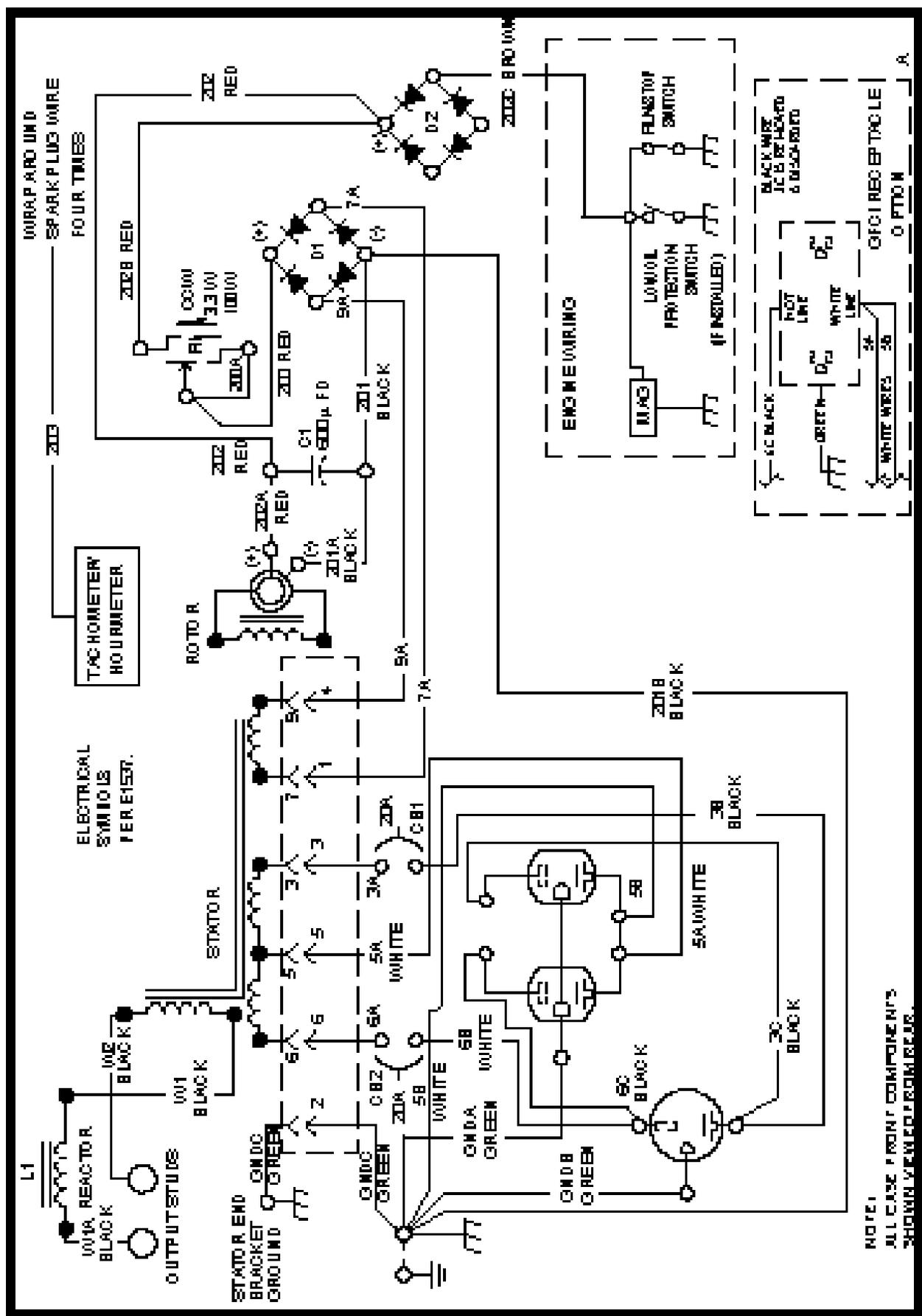
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WIRING DIAGRAM - POWER ARC 4000



NOTE:
 ALL CASE FRONT COMPONENTS
 SHOWN VIEWED FROM REAR.

SEE FIG-1

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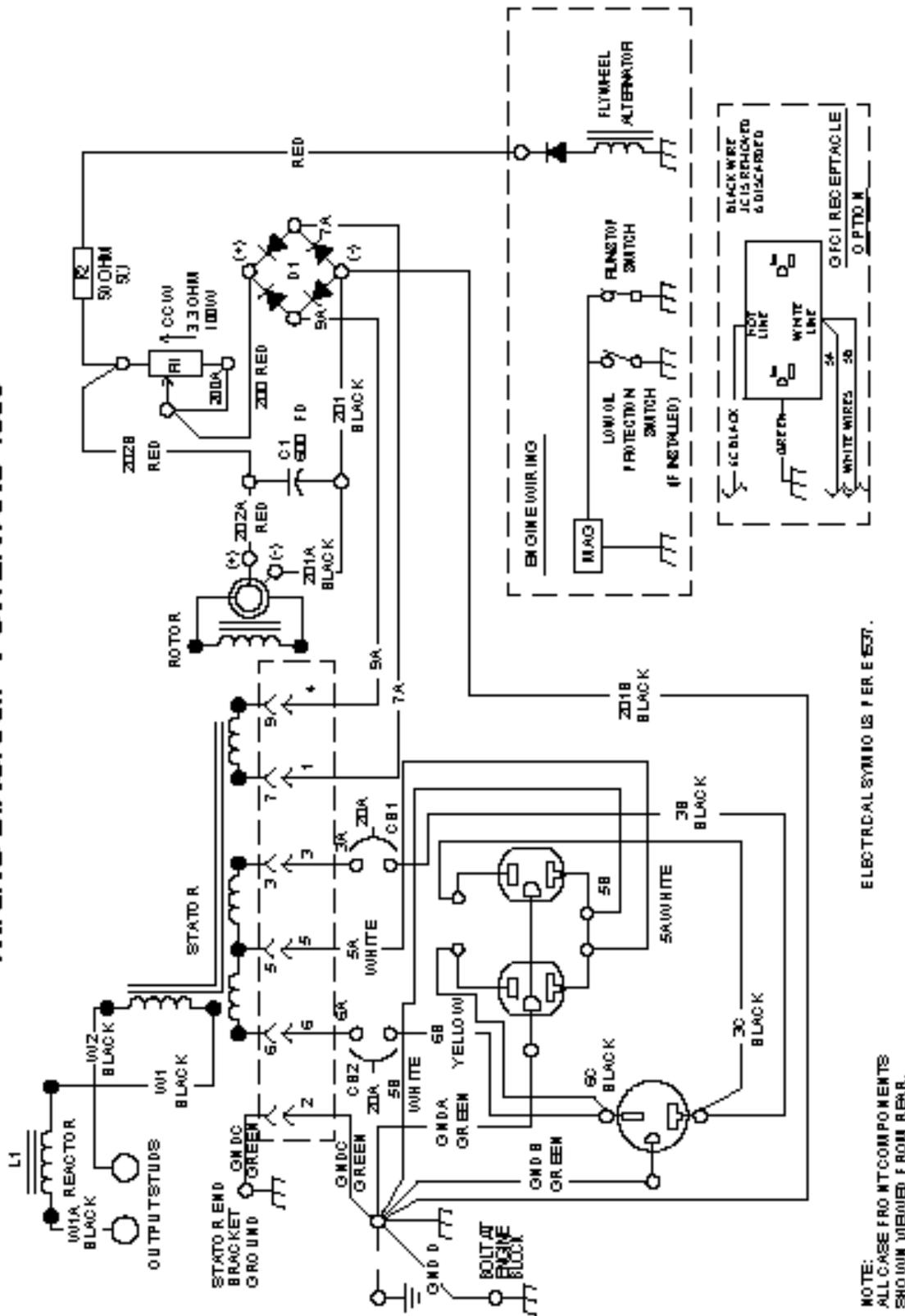
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WIRING DIAGRAM - POWER ARC 4000



ELECTRICAL SYMBOLS PER E 537.

NOTE:
ALL CASE FRONT COMPONENTS
SHOWN VIEWED FROM REAR.

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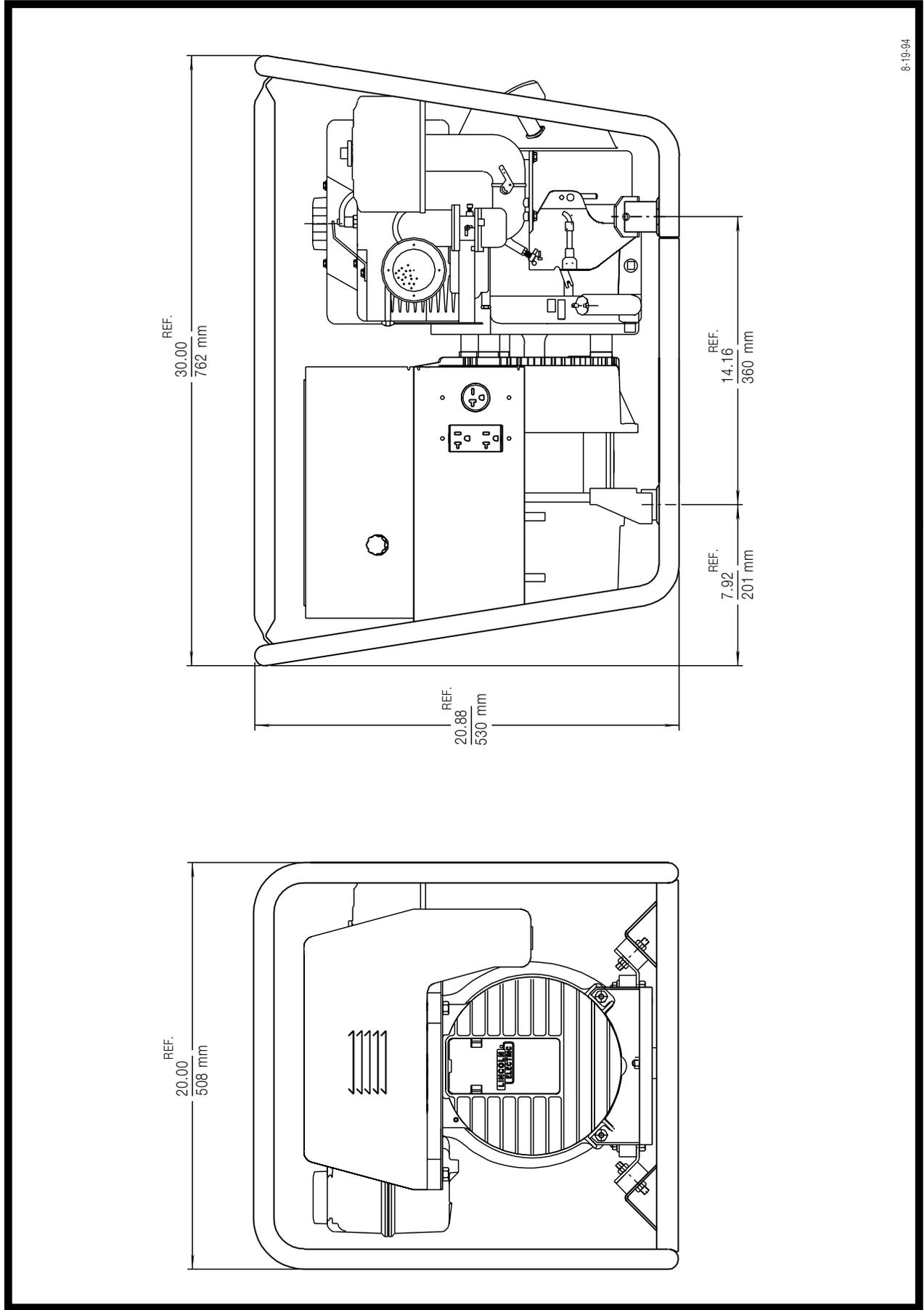
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DIMENSION PRINT - POWER ARC 4000



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