LINCOLN ELECTRIC

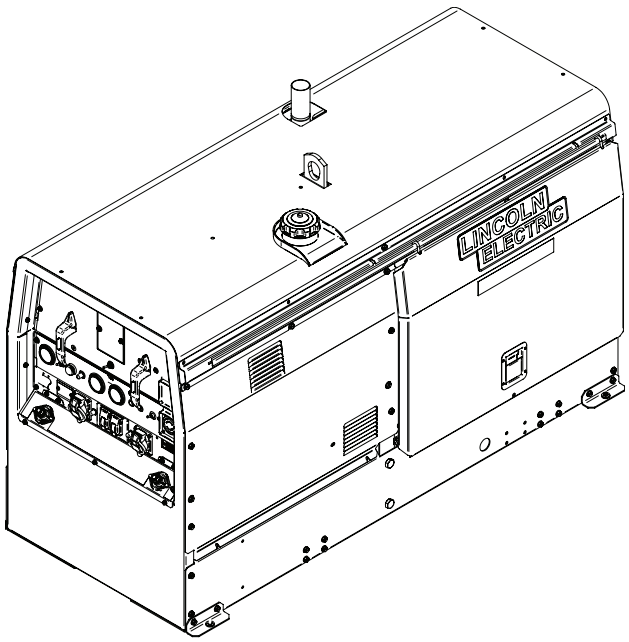
GENUINE LINCOLN PARTS™

BIG RED® 500/600

For use with machines having Code Numbers:

11585, 11599

SERVICE MANUAL



Need Help? Call 1.888.935.3877
to talk to a Service Representative

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

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

For Service outside the USA:
Email: globalservice@lincolnelectric.com

SVM212-A | Issue Date 11-Jul

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⚠ 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.

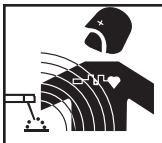
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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. I standards.

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

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

FUMES AND GASES can be dangerous.

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

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

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

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

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

5.f. Also see item 1.b.

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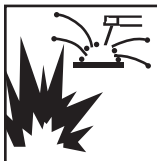

WELDING and CUTTING SPARKS can cause fire or explosion.

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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

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

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

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

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

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

FOR ELECTRICALLY powered equipment.

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

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

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

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

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PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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TECHNICAL SPECIFICATIONS - BIG RED® 500 (K2810-1)

INPUT - DIESEL ENGINE					
Make/Model	**Description**	**Speed (RPM)**	**Displacement**	**Starting System**	**Capacities**
Deutz D2011L03i Diesel Engine EPA Tier 4i Compliant	3 cylinder 32HP (24 kw) @ 1800 RPM	Idle 1890 Full Load 1800	125 cu. in (2.05L) **Bore x Stroke** 3.89" x 4.13" (99mm x 105mm)	12VDC battery & Starter	Fuel (20 US gal) 75.7L Oil: 6.3 QTS. 6.0L

RATED OUTPUT @ 104° F (40° C) - WELDER			
Welding Process	**Welding Output Current/Voltage/Duty Cycle**	**Output Range Amps**	Max. Weld OCV Voltage @ 1800RPM
DC Constant Current	400A / 36V / 100% 450A / 34V / 60% 500A / 30V / 40%	65A TO 500A	90 Volts
TIG	250A / 20V / 100%	65A TO 250A	75 Volts

RATED OUTPUT @ 104° F (40° C) - GENERATOR			
Auxiliary Power [1] **Single Phase 60 Hz AC**			
OUTLETS	**VOLTS**	**AMPS**	**POWER**
1	120	20	2400 Watts
1	120	15	1800 Watts
1	240	15	3600 Watts

RECEPTACLES AND CIRCUIT BREAKERS		
RECEPTACLES	**AUXILIARY POWER CIRCUIT BREAKER**	**OTHER CIRCUIT BREAKERS**
1 - 120VAC Duplex NEMA(5-20R) GFCI protected 1 - 120VAC European (IEC-309)-GFCI protected 1 - 240VAC European (IEC-309)	1 - 20 AMP for 120 VAC Duplex (NEMA) 1 - 15 AMP for 120 VAC European (IEC-309) 1 - 15 AMP for 240 VAC European (IEC-309)	20AMP for Battery Charging Circuit

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
36.87[(2)] in. 936.5 mm	28.28 in 718.3 mm	65.1 in. 1653.5 mm	1538 lbs. (697 kg.)

1. Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within ± 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.
2. To Top of enclosure, add 9.63"(244.6mm) to top of exhaust pipe.

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SAFETY PRECAUTION

Read this entire installation section before you start installation.

⚠ 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.**

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

See additional warning information at front of this operator's manual.

LOCATION AND VENTILATION

The welder should be located to provide an unrestricted flow of clean, cool air to the cooling air inlets and to avoid restricting the cooling air outlets. Also, locate the welder so that the engine exhaust fumes are properly vented to an outside area.

STORING

1. Store the machine in a cool, dry place when it is 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. Drain the engine oil and refill with fresh 10W30 oil. Run the engine for about five minutes to circulate oil to all the parts. See the ***MAINTENANCE*** section of this manual for details on changing oil.
3. Remove the battery, recharge it, and adjust the electrolyte level. Store the battery in a dry, dark place.

STACKING

BIG RED® 500 machines cannot be stacked.

ANGLE OF OPERATION

To achieve optimum engine performance the BIG RED® 500 should be run in a level position. The maximum angle of operation for the Deutz engine is 20 degrees in direction of control panel angled up and 30 degrees for left, right and control panel angled down. If the engine is to be operated at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity in the crankcase. When operating the welder at an angle, the effective fuel capacity will be slightly less than the amount specified.

LIFTING

The BIG RED® 500 weighs approximately 1653lbs. (750kg.) with a full tank of fuel 1538lbs.(697kg) less fuel. A lift bail is mounted to the machine and should always be used when lifting the machine.

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- **Lift only with equipment of adequate lifting capacity.**
- **Be sure machine is stable when lifting.**
- **Do not lift this machine using lift bail if it is equipped with a heavy accessory such as trailer or gas cylinder.**
- **Do not lift machine if lift bail is damaged.**
- **Do not operate machine while suspended from lift bail.**

HIGH ALTITUDE OPERATION

At higher altitudes, output derating may be necessary. For maximum rating, derate the welder output 5% for every 300 meters (984 ft.) above 1500 meters (4920 ft.). For output of 400A and below, derate the welder output 5% for every 300 meters (984 ft.) above 2100 meters (6888 ft.).

Contact a Deutz Service Representative for any engine adjustments that may be required.

HIGH TEMPERATURE OPERATION

WELDER OUTPUT RATINGS AT TEMPERATURES ABOVE 40°C			
AMPS	DUTY CYCLE	VOLTS	TEMPERATURE
350 DC	30%	34	55°C
400 DC	30%	36	50°C
450 DC	30%	34	45°C

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TOWING

Use a recommended trailer for use with this equipment for road, in-plant and yard towing by a vehicle(1). If the user adapts a non-Lincoln trailer, he must assume responsibility that the method of attachment and usage does not result in a safety hazard or damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of trailer vs. weight of Lincoln equipment and likely additional attachments.
2. Proper support of, and attachment to, the base of the welding equipment so there will be no undue stress to the framework.
3. Proper placement of the equipment on the trailer to insure stability side to side and front to back when being moved and when standing by itself while being operated or serviced.
4. Typical conditions of use, i.e., travel speed; roughness of surface on which the trailer will be operated; environmental conditions; like maintenance.
5. Conformance with federal, state and local laws.(1)

(1) Consult applicable federal, state and local laws regarding specific requirements for use on public highways.

VEHICLE MOUNTING

⚠ WARNING

Improperly mounted concentrated loads may cause unstable vehicle handling and tires or other components to fail.

- **Only transport this Equipment on serviceable vehicles which are rated and designed for such loads.**
- **Distribute, balance and secure loads so vehicle is stable under conditions of use.**
- **Do not exceed maximum rated loads for components such as suspension, axles and tires.**
- **Mount equipment base to metal bed or frame of vehicle.**
- **Follow vehicle manufacture's instructions.**

PRE-OPERATION ENGINE SERVICE

READ the engine operating and maintenance instructions supplied with this machine.

⚠ WARNING

DIESEL FUEL can cause fire.

Stop engine while fueling.
- **Do not smoke when fueling.**
- **Keep sparks and flame away from tank.**
- **Do not leave unattended while fueling.**
- **Wipe up spilled fuel and allow fumes to clear before starting engine.**
- **Do not overfill tank, fuel expansion may cause overflow.**

DIESEL FUEL ONLY

USE DIESEL FUEL ONLY - Low Sulphur fuel or ultra low sulphur fuel in USA and CANADA only.

OIL

The BIG RED® 500 is shipped with the engine crankcase filled with high quality SAE 10W-30 oil (API class CD or better). Check the oil level before starting the engine. If it is not up to the full mark on the dip stick, add oil as required. Check the oil level every four hours of running time during the first 35 running hours. Refer to the engine Operator's Manual for specific oil recommendations and break-in information. The oil change interval is dependent on the quality of the oil and the operating environment. Refer to the engine Operator's Manual for the proper service and maintenance intervals. The machine is equipped with an oil drain valve.

FUEL

⚠ WARNING

USE DIESEL FUEL ONLY - Low Sulphur fuel or ultra low sulphur fuel in USA and CANADA only.

- **Fill the fuel tank with clean, fresh fuel. The capacity of the tank is 20 gals. (75.7 ltrs). When the fuel gauge reads empty the tank contains approximately 2 gals. (7.6ltrs.) of reserve fuel.**

⚠ WARNING

NOTE: A fuel shut off valve is located to the left of the fuel lift pump and should be in the closed position when the welder is not used for extended periods of time.

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ENGINE BREAK-IN

Lincoln Electric selects high quality, heavy-duty industrial engines for the portable welding machines we offer. While it is normal to see a small amount of crankcase oil consumption during initial operation, excessive oil use, wetstacking (oil or tar like substance at the exhaust port), or excessive smoke is not normal.

Larger machines with a capacity of 350 amperes and higher, which are operated at low or no-load conditions for extended periods of time are especially susceptible to the conditions described above. To accomplish successful engine break-in, most diesel-powered equipment needs only to be run at a reasonably heavy load within the rating of the welder for some period of time during the engine's early life. However, if the welder is subjected to extensive light loading, occasional moderate to heavy loading of the engine may sometimes be necessary. Caution must be observed in correctly loading a diesel/generator unit.

1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator and voids the warranty.
2. Set the welder controls for an output current and voltage within the welder rating and duty cycle. Note that any attempt to exceed the welder rating or duty cycle for any period of time will result in catastrophic damage to the generator and voids the warranty.
3. Periodically shut off the engine and check the crankcase oil level.

ENGINE COOLING SYSTEM

The Deutz engine is air cooled by a belt driven axial blower. The oil cooler and engine cooling fins should be blown out with compressed air or steam to maintain proper cooling (See the engine Owners Manual for procedures and frequency).

BATTERY CONNECTION

⚠ WARNING

GASES FROM BATTERY can explode.

- **Keep sparks, flame and cigarettes away from battery.**

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY — disconnect negative cable from old battery first and connect to new battery last.**
- **CONNECTING A BATTERY CHARGER — remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.**
- **USING A BOOSTER — connect positive lead to battery first then connect negative lead to negative battery lead at engine foot.**

BATTERY ACID can burn eyes and skin.

- **Wear gloves and eye protection and be careful when working near battery.**
- **Follow instructions printed on battery.**

IMPORTANT: To prevent ELECTRICAL DAMAGE WHEN:

a) Installing new batteries.

b) Using a booster.

Use correct polarity — Negative Ground.

The BIG RED® 500 is shipped with the negative battery cable disconnected. Before you operate the machine, make sure the Engine Switch is in the OFF position and attach the disconnected cable securely to the negative (-) battery terminal.

Remove the insulating cap from the negative battery terminal. Replace and tighten negative battery cable terminal.

NOTE: This machine is furnished with a wet charged battery; if unused for several months, the battery may require a booster charge. Be sure to use the correct polarity when charging the battery.

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MUFFLER OUTLET PIPE

Remove the plastic plug covering the muffler outlet tube. Using the clamp provided secure the outlet pipe to the outlet tube with the pipe positioned such that it will direct the exhaust in the desired position.

SPARK ARRESTOR

Some federal, state or local laws may require that petrol or diesel engines be equipped with exhaust spark arrestors when they are operated in certain locations where unarrested sparks may present a fire hazard. The standard muffler included with this welder does not qualify as a spark arrestor. When required by local regulations, a suitable spark arrestor, must be installed and properly maintained.

⚠ CAUTION

An incorrect arrestor may lead to damage to the engine or adversely affect performance.

WELDING OUTPUT CABLES

With the engine off, connect the electrode and work cables to the output studs. The welding process dictates the polarity of the electrode cable. These connections should be checked periodically and tightened if necessary.

Listed in Table A.1 are copper cable sizes recommended for the rated current and duty cycle. Lengths stipulated are the distance from the welder to work and back to the welder again. Cable sizes are increased for greater lengths primarily for the purpose of minimizing cable voltage drop.

Table A.1 Combined Length of Electrode and Work Cables.

	TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES		
AMPS @100% Duty Cycle	Up to 150 ft. (Up to 45m)	150-200 ft. (45-60m)	200-250 ft. (60-75m)
400	3/0 AWG 95mm^2	3/0 AWG 95mm^2	4/0 AWG 120mm^2

MACHINE GROUNDING

Because this portable engine driven welder creates its own power, it is not necessary to connect its frame to an earth ground, unless the machine is connected to premises wiring (home, shop, etc.).

To prevent dangerous electric shock, other equipment powered by this engine driven welder must:

a) be grounded to the frame of the welder using a grounding type plug,

or

b) be double insulated.

When this welder is mounted on a truck or trailer, its frame must be securely connected to the metal frame of the vehicle. When this engine driven welder is connected to premises wiring such as that in a home or shop, its frame must be connected to the system earth ground. See further connection instructions in the section entitled ***Standby Power Connections*** as well as the article on grounding in the latest National Electrical Code and the local codes.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal ground stake going into the ground for at least 10 Feet or to the metal framework of a building which has been effectively grounded. The National Electric Code lists a number of alternate means of grounding electrical equipment. A machine grounding stud marked with the symbol is provided on the front of the welder.

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AUXILIARY POWER RECEPTACLES

The auxiliary power of the BIG RED® 500 consists of Single Phase 60Hz Power. Output Voltage is within +/- 10% at loads up to rated capacity.

One 120VAC NEMA (5-20R) 20 amp duplex receptacle is protected by a 20 amp circuit breaker that provides 2400 watts Continuous power. Maximum current is 20 amps total.

One 120VAC European (IEC-309) 16 amp receptacle is protected by a 15 amp circuit breaker that provides 1800 watts Continuous power. Maximum current is 15 amps.

One 240VAC European (IEC-309) 16 amp receptacle is protected by a 15 amp 2-pole circuit breaker that provides 3600 watts Continuous power. The 2-pole circuit breaker disconnects both hot leads at the same time. Maximum current is 15 amps.

120 VOLT RECEPTACLES

A GFCI module protects, the two 120V Auxiliary Power receptacles. A GFCI (Ground Fault Circuit Interrupter) electrical receptacle is a device to protect against electric shock should a piece of defective equipment connected to it develop a ground fault. If this situation should occur, the GFCI module will trip, removing voltage from the output of the receptacle. If a GFCI module is tripped see the ***MAINTENANCE*** section for detailed information on testing and resetting it. A GFCI module should be properly tested at least once every month.

The 120 V auxiliary power receptacles should only be used with three wire grounded type plugs or approved double insulated tools with two wire plugs. The current rating of any plug used with the system must be at least equal to the current capacity of the associated receptacle.

RESIDUAL CURRENT DEVICE READY

The BIG RED® 500 is configured to allow for the addition of a Residual Current Device (RCD) to protect the 240V Single Phase Receptacle. The auxiliary power area on the front panel of the BIG RED® 500 has a hole sized and shaped to accept a typical 2-pole (RCD) along with a protective rubber boot. A cover plate with a label "**RCD READY**" covers the hole and secures a mounting bracket on the backside of the panel.

NOTE: The (RCD) should be rated for at least 15 amps.

There are many suppliers of RCD's. One example is Allen Bradley, part number 1492-RCD2A40.

The protective boot can be obtained from:
APM-Hexseal, part number HE-1035

See **Section F** Diagrams of the Operator's Manual for this machine for instructions on installing an RCD and protective rubber boot.

STANDBY POWER CONNECTIONS

The BIG RED® 500 is suitable for temporary, standby or emergency power using the engine manufacturer's recommended maintenance schedule.

The BIG RED® 500 can be permanently installed as a standby power unit for 240 VAC(60Hz). Connections must be made by a licensed electrician who can determine how the 120/240 VAC power can be adapted to the particular installation and comply with all applicable electrical codes.

Take necessary steps to assure load is limited to the capacity of the BIG RED® 500

⚠ WARNING

- **Only a licensed, certified, trained electrician should install the machine to a premises or residential electrical system. Be certain that:**
- **The installation complies with the National Electrical Code and all other applicable electrical codes.**
- **The premises is isolated and no feedback 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.**

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CONNECTION OF LINCOLN ELECTRIC WIRE FEEDERS

⚠ WARNING

Shut off Welder before making any electrical connections.

The LN-15® Across-the-Arc model, LN-25® with or without an internal contactor, and LN-25® PRO may be used with the BIG RED® 500.

1. Shut the welder off.

2. For electrode Positive, connect the electrode cable from the wire feeder to the "+" terminal of the welder and work cable to the "-" terminal of the welder. For electrode Negative, connect the electrode cable from the wire feeder to the "-" terminal of the welder and work cable to the "+" terminal of the welder.

3. Set the CV/CC mode of the wire feeder to CC. (Refer to wire feeder operator manual for details on setting the wire feeder in the CC mode and for setting welding parameters).

4. Attach the single lead from the front of the wire feeder to work using the spring clip at the end of the lead. This is a sense lead to supply current to the wire feeder motor; it does not carry welding current.

5. When the gun trigger is closed, the current sensing circuit will cause the wire to begin to feed and the welding process is started.

NOTE: The LN-25® (K444-1) Remote Control Module (K431) and Remote Cable (K432) cannot be used with the BIG RED® 500. See the appropriate connection diagram in **Section F** of the Operator's manual.

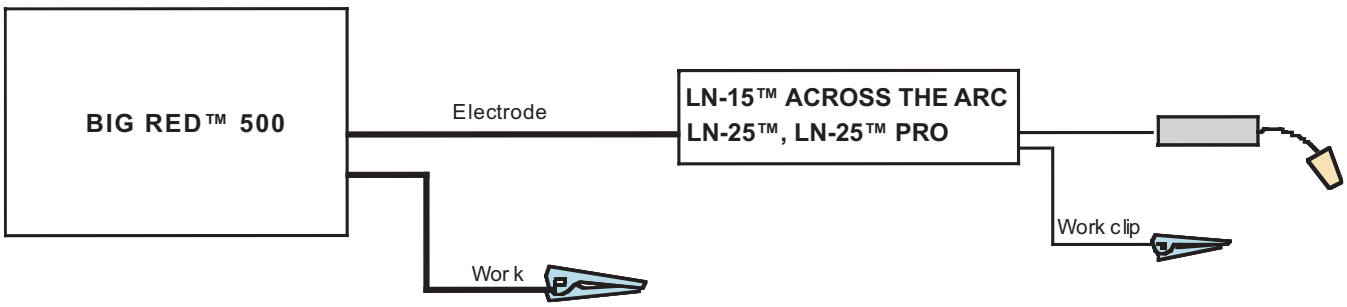
⚠ WARNING

If you are using an LN-25® without an internal contactor, the electrode will be energized when the BIG RED® 500 is started.

The Wire Feeder sensor has full OCV potential between spring clip and work return. Turn machine off when attaching spring clip.

Lincoln Electric does NOT recommend constant current semiautomatic welding for applications which need to meet specified weld metal chemical or mechanical property requirements or weld quality requirements.

FIGURE A-1



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SAFETY INSTRUCTIONS

Read and understand this entire section before operating your BIG RED® 500.

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read all operating 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 such as output terminals or internal wiring.**
- **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 outside**
- **Do not stack anything 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 operate this equipment.

ADDITIONAL SAFETY PRECAUTIONS

Always operate the welder with the hinged door closed and the side panels in place as these provide maximum protection from moving parts and insure proper cooling air flow.

GENERAL DESCRIPTION

The BIG RED® 500 is a diesel engine driven welder, offering reliable DC arc welding performance, with outstanding arc characteristics for all welding applications. The BIG RED® 500 is both a rugged three cylinder, diesel engine driven 500 amp DC arc welder and 3.6 KW AC power generator. This powerful generator can be used to provide electricity for lights, power tools, etc.

The BIG RED® 500 delivers ideal DC arc characteristic for each welding process. Stick electrode welding, Scratch-Start TIG, or carbon arc gouging, to make the BIG RED® 500 the ideal all purpose engine driven welder for on-site work.

The BIG RED® 500 has “no PC Boards” and “no electronics”.

The BIG RED® 500 is service friendly with a minimal number of major parts, simplifying in field servicing of the BIG RED® 500. The generator is a dual stator and rotor design with two sealed bearings for maintenance free service. The rotors are copper wound design with two slip rings and brushes. The stators are wound entirely with heavy gauge copper wire and insulated with NEMA class F insulation material. The stator is then impregnated with three layers of high quality varnish. After the stator is assembled using tie bars, the entire assembly Is covered with an environmentally protective coating . These measures insure trouble-free operation in the harshest environments.

RECOMMENDED APPLICATIONS

WELDER

The BIG RED® 500 provides constant current DC welding output for stick (SMAW) and TIG (GTAW) welding (scratch start). In addition the Big Red can be used for Arc Gouging with carbons up to 8.0 mm (5/16”) diameter.

The BIG RED® 500 is **not recommended** for pipe thawing.

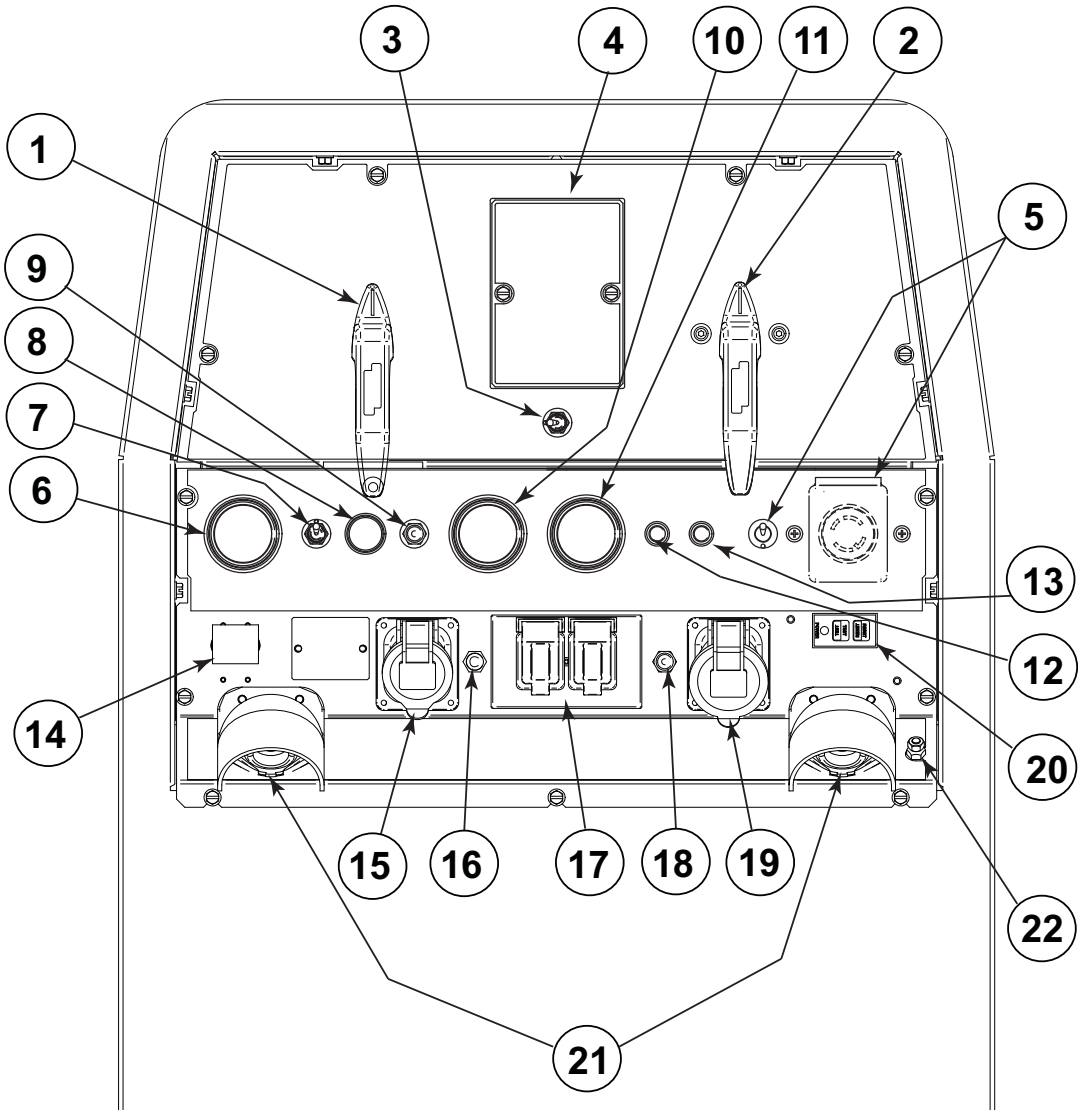
GENERATOR

The BIG RED® 500 provides smooth output for auxiliary power and emergency standby power. The auxiliary power is independent of the welding power and thus not effected by the weld control settings. Full power is available provided welding output is below 200 amps. Above 200 amps refer to the Simultaneous Welding and Auxiliary Power chart in the operation section of this manual.

CONTROLS AND SETTINGS

All welder and engine controls are located on the case front panel. Refer to Figure B.1 and the explanations that follow.

Figure B.1 Case Front Panel Controls



WELDING CONTROLS (Items 1-5)

1. OUTPUT RANGE SELECTOR SWITCH

A 5 position switch that provides 5 overlapping output current settings:

- 65 - 115
- 105 - 220
- 150 - 330
- 200 - Maximum

NOTE: Do not switch while welding

2. OUTPUT CONTROL

Provides fine adjustment of the current and open circuit voltage from minimum to maximum within each Range.

"1" is minimum and "10" is maximum.

3. WELD MODE SELECTOR SWITCH

Provides selection of either Stick / Arc Gouging Mode or TIG Mode.

4. VOLT/AMP METERS (optional)

Optional analog volt and amp meter kit available for easy installation into front panel.

(See ***Accessory Section*** For "K" number)

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5. LOCAL / REMOTE CONTROL SWITCH and REMOTE RECEPTACLE

The toggle switch provides the option of controlling the welding output at the control panel or remotely. For control at the control panel set the switch in the "LOCAL" position. For remote control set the switch in the "REMOTE" position. The receptacle is for attaching an optional remote control equipment.

(See ***Accessory Section*** For "K" number)

ENGINE CONTROLS (Items 6 Through to 13)

6. ENGINE HOUR METER / FUEL GAUGE

Combination hour meter fuel level gauge. The hour meter displays the total time that the engine has been running. This meter is a useful indicator for scheduling preventive maintenance. The fuel gauge displays the level of diesel fuel in the fuel tank. The operator must watch the fuel level closely to prevent running out of fuel and possibly having to bleed the system.

7. RUN STOP SWITCH

The RUN position energizes the hold coil of the fuel solenoid, hour meter, and rotor flashing circuit. The STOP position stops the engine.

NOTE: Do not leave switch in RUN position when the engine is not running. In the RUN position the battery will be discharged.

8. START PUSH BUTTON

Energizes the starter motor to crank the engine. With the RUN / STOP switch in the RUN position, push and hold the Start button to crank the engine; release as the engine starts. Do not press while engine is running as this can cause damage to the ring gear and/or starter motor.

9. CIRCUIT BREAKER

The battery circuit breaker protects the engine circuitry that powers the three gauges, fuel/hours, temperature and pressure. It also protects the engine shutdown relay, timer delay relay, hot start relay hold solenoid, and flashing circuitry. When the circuit breaker opens because of a fault, the engine will crank but will not start.

10. OIL TEMPERATURE GAUGE

An indicator of engine oil temperature.

11. OIL PRESSURE GAUGE

An indicator of engine oil pressure.

12. ENGINE PROTECTION

A warning indicator light for high oil temperature or low oil pressure. The light remains off with proper oil temperature and proper oil pressure. If a fault is detected the light will turn on and the engine protection system will stop the engine. The light will remain on when the engine has been shut down. In order to try and re-start the engine the engine protection system must be reset by returning the RUN-STOP switch to the STOP position.

NOTE: The light remains off when the RUN-STOP switch is in the RUN position prior to starting the engine. However if the engine is not started within 60 seconds the light will come on. When this happens the RUN-STOP switch must be returned to the STOP position to reset the engine protection system and light.

13. BATTERY CHARGING LIGHT

An indicator light for low/no battery charging. The light is off when the battery charging system is functioning normally. If light turns on, the alternator or the voltage regulator may not be operating correctly or the cooling blower belt may be broken. The light will remain on when the engine is stopped and the RUN / STOP switch is in the RUN position.

AUXILIARY POWER (14-22)

14. CIRCUIT BREAKER

2-pole 15A rated. Provides overload protection for the 240VAC European (IEC-309) receptacle.

15. 240 VAC RECEPTACLE

European (IEC-309) receptacle rated up to 16 amps and is IP44 rated.

NOTE: A space is provided on the panel for adding a 2-pole Residual Current Device (RCD) to protect the 240V receptacle. See Section F of Operator's Manual for instructions on installing an RCD.

16. CIRCUIT BREAKER

Single-pole 20A rated. Provides overload protection for the 120VAC (5-20R) NEMA Duplex Receptacle.

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17. 120 VAC DUPLEX RECEPTACLE

Single-pole 20A rated. Provides overload protection for the 120VAC (5-20R) NEMA Duplex Receptacle.

18. CIRCUIT BREAKERS

Single pole 15A rated. Provides overload protection for the 120VAC European (IEC-309) receptacle.

19. 120 VAC RECEPTACLE

European (IEC-309) receptacle rated up to 16 amps and is IP44 rated. Receptacle is GFCI protected.

20. GFCI (Ground Fault Circuit Interrupter) Module

Protects both 120VAC Auxiliary Power receptacles.

If a GFCI Module is tripped, See the ***MAINTENANCE*** section for detailed information on testing and resetting the GFCI Module.

21. WELD OUTPUT TERMINALS + AND -

Covered terminals that provide welding connection points for the electrode and work cables.

22. GROUND STUD ⏚

Protects both 120VAC Auxiliary Power receptacles.

ENGINE OPERATION

STARTING THE ENGINE

1. Open the engine compartment door and check that the fuel shut off valve located screwed into the fuel filter housing is in the open position (lever to be in line with the hose).
2. Check for proper oil level. Close engine compartment door.
3. Remove all plugs connected to the AC power receptacles.
4. Set the RUN/STOP switch to “RUN”. Observe that the battery charging light is on and fuel is in the fuel tank (see fuel gauge).
5. Within 30 seconds, press and hold the engine START button until the engine starts.
6. Release the engine START button when the engine starts.
7. Check that the engine protection and battery charging lights are off. The engine protection light is on after starting, the engine will shutdown in a few seconds. Investigate any indicated problem.
8. Allow the engine to warm up for several minutes before applying a load. Allow a longer warm up time in cold weather.

COLD WEATHER STARTING

With a fully charged battery and the proper weight oil, the engine should start satisfactorily even down to about -15°C(5°F). If the engine must be frequently started below -15°C(5°F), it may be desirable to install additional starting aids. The use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below -5°C(23° F).

STOPPING THE ENGINE

Switch the RUN/STOP switch to “STOP”. This turns off the voltage supplied to the shutdown solenoid. A backup shutdown can be accomplished by shutting off the fuel valve located on the fuel line.

NOTE: Also put Run/Stop switch in “Stop” position when engine is not running - battery will be discharged otherwise.

TABLE B.1

TYPICAL BIG RED® 500 FUEL CONSUMPTION

	Deutz D2011L03i Engine 32HP (24Kw) @ 1800 RPM	Running Time for 75.7 L (20 Gal.)
High Idle - No Load 1890 R.P.M.	2.1 liters/hr (.56 gal/hr)	35.6 hrs
DC, CC Weld Output 400A/36V/100%	5.6 liters/hr (1.49 gal/hr)	13.4 hrs
DC, CC Weld Output 500A/30V/40%	3.6 liters/hr (.97 gal/hr)	20.7 hrs
Auxiliary Power 3.6 Kw	2.6 liters/hr (.69 gal/hr)	28.9 hrs

NOTE: This data is for reference only. Fuel consumption is approximate and can be influenced by many factors, including engine maintenance, environmental conditions and fuel quality.

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WELDER OPERATION

DUTY CYCLE

Duty Cycle is the percentage of time the load is being applied in a 10 minute period. For example a 60% duty cycle, represents 6 minutes of load and 4 minutes of no load in a 10 minute period.

ELECTRODE INFORMATION

The BIG RED® 500 is designed for horizontal, vertical up, and overhead welding with all types of DC stick electrodes.

For any electrode the procedures should be kept within the rating of the machine. For information on electrodes and their proper application see **(www.lincolnelectric.com)** or the appropriate Lincoln publication.

WELDING MODE

Set the Welding mode switch for the desired process, either Stick / Gouging or TIG.

CONSTANT CURRENT STICK WELDING

⚠ CAUTION

DO NOT TURN THE "OUTPUT RANGE SELECTOR" WHILE WELDING because the current may arc between the contacts and damage the switch.

The "Output Range Selector" provides five overlapping current ranges. The "Output Current Adjustment" adjusts the current from minimum to maximum within each range. Open circuit voltage is also controlled by the "Output Current Adjustment" permitting control of the arc characteristics.

A high open circuit voltage setting provides the soft "buttering" arc with best resistance to pop-outs preferred for most welding. To get this characteristic, set the "Output Range Selector" to the lowest setting that still provides the current you need and set the "Output Current Adjustment" near maximum.

For example: to obtain 175 amps and a soft arc, set the "Output Range Selector" to the 105-220 position and then adjust the "Output Current Adjustment" to get 175 amps.

When a forceful "digging" arc is required, usually for vertical and overhead welding, use a higher "Output Range Selector" setting and lower open circuit voltage.

For example: to obtain 175 amps and a forceful arc, set the "Output Range Selector" to the 150-330 position and the "Output Current Adjustment" setting to get 175 amps.

Some arc instability may be experienced with EXX10 electrodes when trying to operate with long arc techniques at settings at the lower end of the open circuit voltage range.

⚠ CAUTION

DO NOT attempt to set the "Current Range Selector" between the five points designated on the nameplate.

ARC GOUGING

Using the "Output Range Selector" and "Output Control Adjustment" set the output to the desired level for the gouging electrode being used see table B.2.

TABLE B.2

Carbon Diameter	Current Range (DC, electrode positive)
1/8"(3.2mm)	60-90 Amps
5/32"(4.0mm)	90-150 Amps
3/16"9(4.8mm)	200-250 Amps
1/4"(6.4mm)	300-400 Amps
5/16"(8.0mm)	350-500 Amps

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TIG

The BIG RED® 500 can be used for Scratch-Start of DC TIG welding applications.

Use the "Output Range Selector" and "Output Control Adjustments" to set the desired current. To initiate a weld, the tungsten electrode is then scratched on the work which establishes the arc. To stop the arc, simply lift the TIG torch away from the work piece. The tungsten may then be scratched on the work piece to restrike the arc.

If a high frequency start is desired, the K930-2 TIG Module can be used with the BIG RED® 500. The BIG RED® 500 and any high frequency generating equipment must be properly grounded. See the K930-2 TIG Module operating manuals for complete instructions on installation, operation, and maintenance.

When using the TIG Module, the OUTPUT control on the BIG RED® 500 is used to set the maximum range of the CURRENT CONTROL on the TIG Module or an Amptrol if connected to the TIG Module.

TABLE B.3

TYPICAL CURRENT RANGES (1) FOR TUNGSTEN ELECTRODES(2)

Tungsten Electrode Diameter in. (mm)		DCEN (-)	DCEP (+)	Approximate Argon Gas Flow Flow Rate C.F.H. (l /min.)				TIG TORCH Nozzle Size (4), (5)	
		1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Aluminum		Stainless Steel			
.010	(.25)	2-15	(3)	3-8	(2-4)		3-8	(2-4)	#4, #5, #6
0.020	(.50)	5-20	(3)	5-10	(3-5)	5-10	(3-5)		
0.040	(1.0)	15-80	(3)	5-10	(3-5)	5-10	(3-5)		
1/16	(1.6)	70-150	10-20	5-10	(3-5)	9-13	(4-6)	#5, #6	
3/32	(2.4)	150-250	15-30	13-17	(6-8)	11-15	(5-7)	#6, #7, #8	
1/8	(3.2)	250-400	25-40	15-23	(7-11)	11-15	(5-7)		
5/32	(4.0)	400-500	40-55	21-25	(10-12)	13-17	(6-8)	#8, #10	
3/16	(4.8)	500-750	55-80	23-27	(11-13)	18-22	(8-10)		
1/4	(6.4)	750-1000	80-125	28-32	(13-15)	23-27	(11-13)		

(1) When used with argon gas. The current ranges shown must be reduced when using argon/helium or pure helium shielding gases.
(2) Tungsten electrodes are classified as follows by the American Welding Society (AWS):

Pure	EWP
1% Thoriated	EWTh-1
2% Thoriated	EWTh-2

Though not yet recognized by the AWS, Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.
(3) DCEP is not commonly used in these sizes.
(4) TIG torch nozzle "sizes" are in multiples of 1/16ths of an inch:

# 4 = 1/4 in.	(6 mm)
# 5 = 5/16 in.	(8 mm)
# 6 = 3/8 in.	(10 mm)
# 7 = 7/16 in.	(11 mm)
# 8 = _ in.	(12.5 mm)
#10 = 5/8 in.	(16 mm)

(5) TIG torch nozzles are typically made from alumina ceramic. Special applications may require lava nozzles, which are less prone to breakage, but cannot withstand high temperatures and high duty cycles.

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CONSTANT CURRENT OPERATION WITH A LINCOLN ELECTRIC WIRE FEEDER

Lincoln Electric does NOT recommend constant current semiautomatic welding for applications which need to meet specified weld metal chemical or mechanical property requirements or weld quality requirements.

Most semiautomatic welding processes perform better using constant voltage power sources. Welding codes usually do not address the power source selection or specifically, whether the welding process is to be operated in the constant voltage or constant current mode. Instead, codes typically specify limitations on the current, voltage, heat input and preheat temperature based on the material to be welded. The intention is to assure that proper weld material properties will develop. Welding is sometimes performed using constant current power sources. The operation can be more convenient because it may allow the use of an existing stick (SMAW) power source and the power source can be placed at a distant location without any provision for adjusting the output settings.

For constant current operation, the power source is set to deliver the specified current. The power source regulates this current regardless of changes in the welding circuit, including cable length, electrode diameter, wire feed speed, contact tip to work distance, etc.

Changes in the wire feed speed (WFS) or contact tip to work distance (CTWD) affect the arc voltage when constant current power sources are used. Lowering the wire feed speed raises the voltage, raising the wire feed speed lowers the voltage. Lengthening the contact tip to work distance raises the voltage, shortening the contact tip to work distance lowers the voltage. If the contact tip to work distance is properly maintained, a satisfactory operating voltage range may be achieved, and a sound weld may result. However, when a welder uses a longer contact tip to work distance, an arc-sensing wire feeder compensates by increasing the wire feed speed to regulate the voltage.

Even if the voltage and current remain unchanged, the increased wire feed speed may result in a deposition rate well beyond the specified range of the electrode. Under these conditions, the specified weld metal properties may not be achieved. Constant voltage power sources deliver large current surges to stabilize the arc when the electrode is shorted or the arc length is very short.

However, a constant current power source does not provide such a response to stabilize the arc. It may be difficult to achieve required weld metal properties, or to achieve the required quality of welds needed to pass nondestructive tests, when such welds are made under constant current operation.

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AUXILIARY POWER:

The auxiliary power is independent of the welding power and thus not effected by the weld control settings.

Simultaneous Welding and Auxiliary Power Loads

The auxiliary power ratings are with no welding load. Simultaneous welding and power loads are specified in the following Table B.4.

TABLE B.4

BIG RED® 500 Simultaneous Welding and Power Loads

Weld Amps		1 PHASE (120V) WATTS	1 PHASE (120V) AMPS		1 PHASE (240V) WATTS	1 PHASE (240V) AMPS
0	PLUS	2400	20	OR	3600	15
100		2400	20		3600	15
200		2400	20		2400	10
300		1200	10		1200	5
400		0	0		0	0
500		0	0		0	0

TABLE B.5

BIG RED® 500 Extension Cord Length Recommendations

(Use the shortest length extension cord possible sized per the following table.)

Current	Voltage	Load	Maximum Allowable Cord Length in ft. (m) for Conductor Size											
(Amps)	Volts	(Watts)	14 AWG		12 AWG		10 AWG		8 AWG		6 AWG		4 AWG	
15	120	1800	30	(9)	40	(12)	75	(23)	125	(38)	175	(53)	300	(91)
20	120	2400			30	(9)	50	(15)	88	(27)	138	(42)	225	(69)
15	240	3600	60	(18)	75	(23)	150	(46)	225	(69)	350	(107)	600	(183)

Conductor size is based on maximum 2.0% voltage drop.

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OPTIONAL FEATURES

K2641-2 FOUR WHEELED STEERABLE YARD TRAILER

For in plant and yard towing. Comes standard with a Duo-Hitch®, a 2" Ball and Lunette Eye combination Hitch.

K2636-1 TRAILER - Two-wheeled trailer with optional fender and light package. For highway use, consult applicable federal, state, and local laws regarding possible additional requirements. Comes standard with a Duo-Hitch®, a 2" Ball and Lunette Eye combination hitch.
Order:
K2636-1 Trailer
K2639-1 Fender & Light Kit
K2640-1 Cable Storage Rack

K704 ACCESSORY SET - Includes 35 ft. (10m) of electrode cable and 30 ft. (9.1m) of work cable, headshield, work clamp electrode holder. Cables are rated at 400 amps, 100% duty cycle.

K2861-1 REMOTE CONTROL - 100 ft. (30.4m)
Portable control provides same dial range as the output control on the welder. Has a convenient twist-lock plug for easy connection to the welder.

K2863-1 METER KIT
Easy-to-read analog meters for volts and amps. Easy to install.

K2864-1 SPARK ARRESTOR - Includes a heavy gage steel, approved spark arrestor, attaches to the muffler exhaust tube. Includes clamp.

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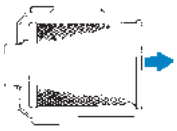
Service Instructions

Single- and Two-Stage Engine Air Cleaners

1 Remove the Filter



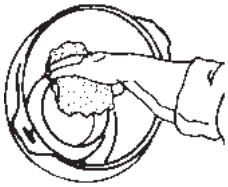
Rotate the filter while pulling straight out.

Unfasten or unlatch the service cover. Because the filter fits tightly over the outlet tube to create the critical seal, there will be some initial resistance, similar to breaking the seal on a jar. Gently move the end of the filter back and forth to break the seal then rotate while pulling straight out. Avoid knocking the filter against the housing.

If your air cleaner has a safety filter, replace it every third primary filter change. Remove the safety filter as you would the primary filter. Make sure you cover the air cleaner outlet tube to avoid any unfiltered contaminant dropping into the engine.

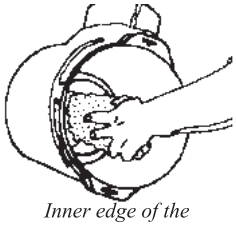
2 Clean Both Surfaces of the Outlet Tube and Check the Vacuator™ Valve

Use a clean cloth to wipe the filter sealing surface and the inside of the outlet tube. Contaminant on the sealing surface could hinder an effective seal and cause leakage. Make sure that all contaminant is removed before the new filter is inserted. Dirt accidently transferred to the inside of the outlet tube will reach the engine and cause wear. Engine manufacturers say that it takes only a few grams of dirt to "dust" an engine! Be careful not to damage the sealing area on the tube.



Outer edge of the outlet tube

Wipe both sides of the outlet tube clean.

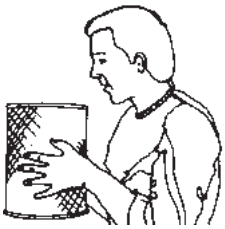


Inner edge of the outlet tube

If your air cleaner is equipped with a Vacuator Valve
Visually check and physically squeeze to make sure the valve is flexible and not inverted, damaged or plugged.

3 Inspect the Old Filter for Leak Clues

Visually inspect the old filter for any signs of leaks. A streak of dust on the clean side of the filter is a telltale sign. Remove any cause of leaks before installing new filter.



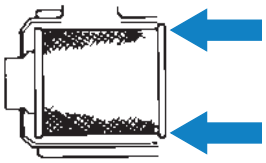
4 Inspect the New Filter for Damage

Inspect the new filter carefully, paying attention to the inside of the open end, which is the sealing area. NEVER install a damaged filter. A new Donaldson radial seal filter may have a dry lubricant on the seal to aid installation.

5 Insert the New Radial Seal Filter Properly

If you're servicing the safety filter, this should be seated into position before installing the primary filter.

Insert the new filter carefully. Seat the filter by hand, making certain it is completely into the air cleaner housing before securing the cover in place.



The critical sealing area will stretch slightly, adjust itself and distribute the sealing pressure evenly. To complete a tight seal, apply pressure by hand at the outer rim of the filter, not the flexible center. (Avoid pushing on the center of the urethane end cap.) No cover pressure is required to hold the seal. NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.

If the service cover hits the filter before it is fully in place, remove the cover and push the filter (by hand) further into the air cleaner and try again. The cover should go on with no extra force.

Once the filter is in place, secure the service cover.

Caution

NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.

6 Check Connectors for Tight Fit

Make sure that all mounting bands, clamps, bolts, and connections in the entire air cleaner system are tight. Check for holes in piping and repair if needed. Any leaks in your intake piping will send dust directly to the engine!

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SAFETY PRECAUTIONS

⚠ WARNING

Have qualified personnel do the maintenance work. Turn the engine off before working inside the machine. 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.

Do not put your hands near the engine cooling blower fan. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

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.**

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

See additional warning information throughout this operator's manual and the Engine manual as well.

ROUTINE AND PERIODIC MAINTENANCE

DAILY

- Check the crankcase oil level .
- Refill the fuel tank to minimize moisture condensation in the tank.
- Open the water drain valve located on the bottom of the water separator element 1 or 2 turns and allow to drain into a container suitable for diesel fuel for 2 to 3 seconds. Repeat the above drainage procedure until diesel fuel is detected in the co

WEEKLY

Blow out the machine with low pressure air periodically. In particularly dirty locations, this may be required once a week.

ENGINE MAINTENANCE

Refer to the "Periodic Checks" section of the Engine Operator's Manual for the recommended maintenance schedule of the following:

a) Engine Oil and Filter
b) Air Cleaner
c) Fuel Filter - and Delivery System
d) Cooling Blower Belt
e) Battery
f) Cooling System

Refer to ***Table D.1*** at the end of this section for various engine maintenance components.

ENGINE OIL CHANGE

Drain the engine oil while the engine is warm to assure rapid and complete draining. It is recommended that each time the oil is changed the oil filter be changed as well.

- Be sure the unit is off. Disconnect the negative battery cable to ensure safety.
- Locate oil drain hose and valve in bottom of base and pull through the hole in the case back or side of base on the welder.
- Remove the cap from the drain valve. Push valve in and twist counterclockwise. Pull to open and drain the oil into a suitable container for disposal.
- Close the drain valve by pushing in and twisting clockwise. Replace the cap.
- Re-fill the crankcase to the upper limit mark on the dipstick with the recommended oil (see engine operation manual OR engine service items decal OR below). Replace and tighten the oil filler cap securely.
- Push oil drain hose and valve back into unit, re-connect negative battery cable, and close doors and engine top cover before restarting unit. Wash your hands with soap and water after handling used motor oil. Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local service station or recycling center for reclamation. DO NOT throw it in the trash; pour it on the ground or down a drain.

Use motor oil designed for diesel engines that meets requirements for API service classification CC/CD/CE/CF/CF-4/CG-4 or CH-4.

ACEA E1/E2/E3. Always check the API service label on the oil container to be sure it includes the letters indicated. (Note: An S-grade oil must not be used in a diesel engine or damage may result. It IS permissible to use an oil that meets S and C grade service classifications.)

SAE 10W30 is recommended for general, all temperature use, 5F to 104F (-15C to 40C).

See engine owner's manual for more specific information on oil viscosity recommendations.

OIL FILTER CHANGE

- Drain the oil.
- Remove the oil filter with an oil filter wrench and drain the oil into a suitable container. Discard the used filter. Note: Care should be taken during filter removal to not disrupt or damage in any way the fuel lines.
- Clean the filter mounting base and coat the gasket of the new filter with clean engine oil.
- Screw the new filter on by hand until the gasket contacts the mounting base. Using an oil filter wrench, tighten the filter an additional 1/2 to 7/8 of a turn.
- Refill the crankcase with the specified amount of the recommended engine oil. Reinstall the oil filler cap and tighten securely.
- Start the engine and check for oil filter leaks.
- Stop the engine and check the oil level. If necessary, add oil to the upper limit mark on the dipstick.

AIR FILTER

⚠ CAUTION

EXCESSIVE AIR FILTER RESTRICTION WILL RESULT IN REDUCED ENGINE LIFE.

The air filter element is a dry cartridge type. It can be cleaned and reused; however, damaged elements should not be reused. Stop engine after 100 hours of running time and clean filter element , replace the filter if necessary. Service air cleaner regularly according to Engine Operator's Manual.

1. Locate the air filter canister located behind the engine door on the top of the engine.
2. Remove air filter element.
3. Remove loose dirt from element with compressed air or water hose directed from inside out.

   Compressed Air: 100 psi maximum with nozzles at least one inch away from element.

   Water Hose: 40 psi maximum without nozzle.
4. Soak element in a mild detergent solution for 15 minutes. Do not soak more than 24 hours. Swish element around in the solution to help remove dirt.
5. Rinse elements from inside out with a gentle stream of water (less than 40 psi) to remove all suds and dirt.
6. Dry element before reuse with warm air at less than 160°F (71°C). Do not use a light bulb to dry the element.
7. Inspect for holes and tears by looking through the element toward a bright light. Check for damaged gaskets or dented metal parts. Do not reuse damaged elements. Protect element from dust and damage during drying and storage.
8. Reinstall air filter element.

   After six cleanings replace air filter. A cleaned filter will have approximately 70% of the life of a new filter element. A restricted filter element may not appear excessively dirty.

FUEL

USE DIESEL FUEL ONLY - Low Sulphur fuel or ultra low sulphur fuel in USA and CANADA only.

At the end of each day's use, refill the fuel tank to minimize moisture condensation and dirt contamination in the fuel line. Do not overfill; leave room for the fuel to expand.

Use only fresh No. 2D diesel fuel, the use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below 23°F (-5°C). Do not use kerosene.

See the Engine Operator's Manual for instructions on replacing the fuel filter.

BLEEDING THE FUEL SYSTEM

You may need to bleed air from the fuel system if the fuel filter or fuel lines have been detached, the fuel tank has been ran empty or after periods of long storage. It is recommended that the fuel shutoff valve be closed during periods of non-use.

⚠ WARNING

To avoid personal injury, do not bleed a hot engine. This could cause fuel to spill onto a hot exhaust manifold, creating a danger of fire.

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FUEL FILTERS

⚠ WARNING

When working on the fuel system

- **Keep naked lights away, do not smoke !**
- **Do not spill fuel !**

The BIG RED® 500 is equipped with a **Fuel Filter/Water Separator Assembly** located after the lift pump and before the fuel injectors. The Fuel Filter/Water Separator is mounted to the engine block just left of the lift pump.

1. Close the fuel shutoff valve.
2. Clean the area around the fuel filter head. Remove the filter. Clean the gasket surface of the filter head and replace the o-ring.
3. Fill the clean filter with clean fuel, and lubricate the o-ring seal with clean lubricating oil.
4. Install the filter as specified by the filter manufacturer.

⚠ WARNING

Mechanical overtightening will distort the threads, filter element seal or filter can.

BATTERY HANDLING

GASES FROM BATTERY can explode.

- **Keep sparks, flame and cigarettes away from battery.**

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY - disconnect negative cable from old battery first and connect to new battery last.**
- **CONNECTING A BATTERY CHARGER - Remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.**

- **USING A BOOSTER - connect positive lead to battery first then connect negative lead to engine foot.**

BATTERY ACID CAN BURN EYES AND SKIN.

- **Wear gloves and eye protection and be careful when working near battery. Follow instructions printed on battery.**

PREVENTING ELECTRICAL DAMAGE

1. When replacing, jumping, or otherwise connecting the battery to the battery cables, the proper polarity must be observed. Failure to observe the proper polarity could result in damage to the charging circuit. The positive (+) battery cable has a red terminal cover.
2. If the battery requires charging from an external charger, disconnect the negative battery cable first and then the positive battery cable before attaching the charger leads. Failure to do so can result in damage to the internal charger components. When reconnecting the cables, connect the positive cable first and the negative cable last.

PREVENTING BATTERY DISCHARGE

Turn off the RUN/STOP to stop when engine is not running.

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PREVENTING BATTERY BUCKLING

Tighten nuts on battery clamp until snug.

CHARGING THE BATTERY

When you charge, jump, replace, or otherwise connect battery cables to the battery, be sure the polarity is correct. Improper polarity can damage the charging circuit. The Vantage positive (+) battery terminal has a red terminal cover.

If you need to charge the battery with an external charger, disconnect the negative cable first, then the positive cable before you attach the charger leads. After the battery is charged, reconnect the positive battery cable first and the negative cable last. Failure to do so can result in damage to the internal charger components.

Follow the instructions of the battery charger manufacturer for proper charger settings and charging time.

SERVICING OPTIONAL SPARK ARRESTOR

Clean every 100 hours.

⚠ WARNING

- **MUFFLER MAY BE HOT**
- **ALLOW ENGINE TO COOL BEFORE INSTALLING THE SPARK ARRESTER!**
- **DO NOT OPERATE ENGINE WHILE INSTALLING THE SPARK ARRESTER!**

NAMEPLATES / WARNING DECALS MAINTENANCE

Whenever routine maintenance is performed on this machine - or at least yearly - inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

Table D.1 Engine Maintenance Components

REPLACEMENT SERVICE ITEMS			
ITEM	MAKE	PART NUMBER	SERVICE INTERVAL
AIR CLEANER ELEMENT	DONALDSON FLEETGUARD	P822768 AF25436	CLEAN AS NEEDED, REPLACE EVERY 200 HOURS.
COOLING BLOWER BELT	DEUTZ GATES	117-9564 7440	SEE DEUTZ MAINTENANCE DECAL S28160
OIL FILTER ELEMENT	DEUTZ DONALDSON FRAM	117-4416 P550335 PH46	
FUEL FILTER ELEMENT	DEUTZ DONALDSON FRAM	117-4482 P550587 1145A	INSPECT EVERY 1000 HOURS
BATTERY	------	BCI GROUP 34	INSPECT EVERY 500 HOURS

WELDER / GENERATOR MAINTENANCE

STORAGE

Store the BIG RED® 500 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

It is normal for the brushes and slip rings to wear and darken slightly. Inspect the brushes when a generator overhaul is necessary.

⚠ WARNING

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

GFCI MODULE TESTING AND RESETTING PROCEDURE

The GFCI module should be properly tested at least once every month or whenever it is tripped. To properly test and reset the GFCI module:

- If the module has tripped, first carefully remove any load and check it for damage.
- If the equipment has been shut down, it must be restarted.
- The equipment needs to be operating at high idle speed and any necessary adjustments made on the control panel so that the equipment is providing at least 80 volts to the receptacle input terminals.
- The circuit breaker for this receptacle must not be tripped. Reset if necessary.
- Push the "Reset" button located on the GFCI module. This will assure normal GFCI operation.
- Plug a night-light (with an "ON/OFF" switch) or other product (such as a lamp) into the Duplex receptacle and turn the product "ON".
- Push the "Test" button located on the GFCI module. The night-light or other product should go "OFF".
- Push the "Reset" button, again. The light or other product should go "ON" again.

If the light or other product remains "ON" when the "Test" button is pushed, the GFCI module is not working properly or has been incorrectly installed (miswired). If your GFCI module is not working properly, contact a qualified, certified electrician who can assess the situation, rewire the GFCI module if necessary or replace the device.

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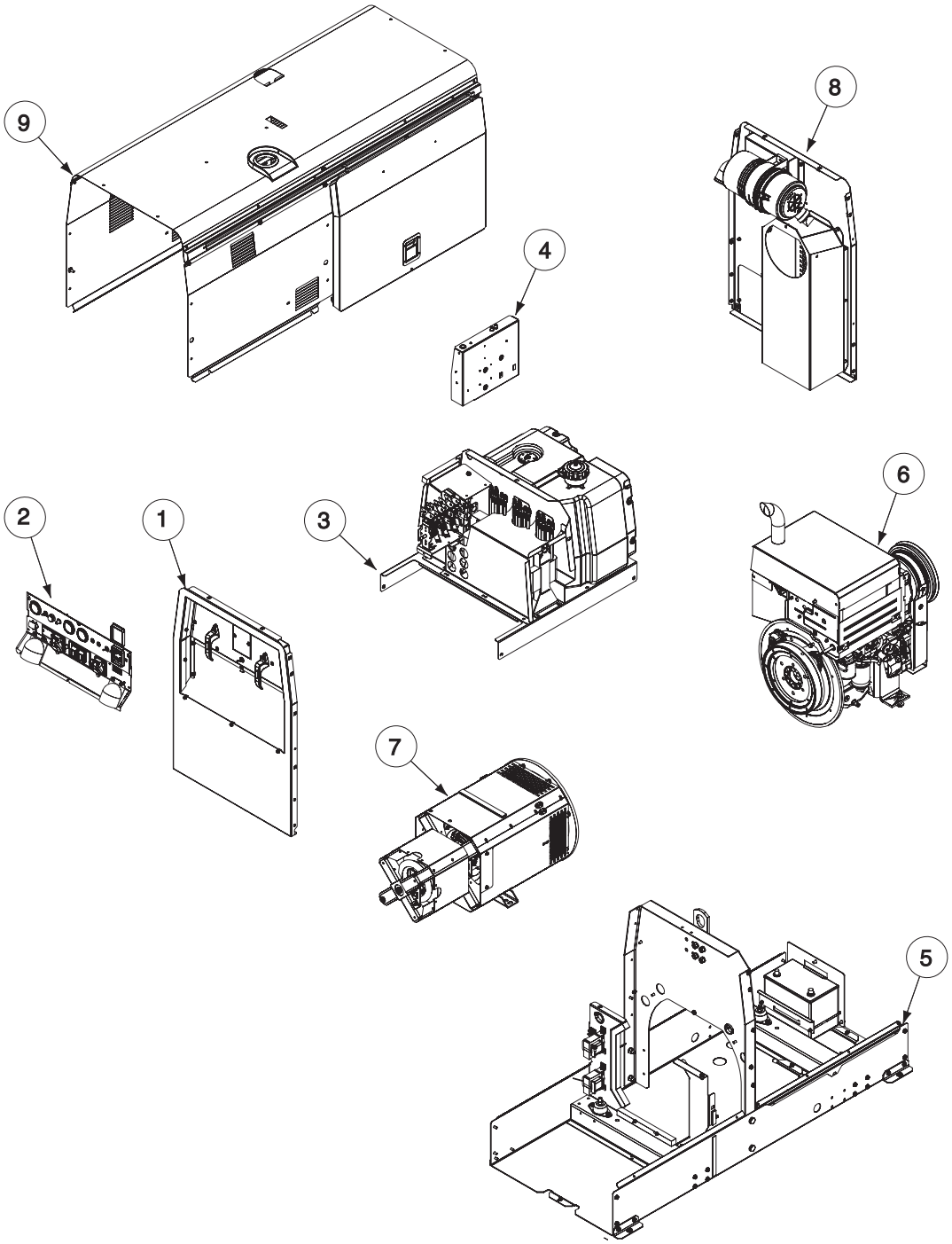
FIGURE D.2 - MAJOR COMPONENT LOCATIONS

1. Case Front & Control Panel Assembly
2. Lower Control Panel Assembly
3. Reactor, Rectifier & Fuel Tank Assembly
4. Inner Control Panel Assembly
5. Base, Battery & Lift Bale Assembly
6. Engine & Filter Assembly
7. Generator Assembly
8. Case Back Assembly
9. Covers Assembly



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TECHNICAL SPECIFICATIONS - BIG RED® 600 (K2811-1)

INPUT - DIESEL ENGINE					
Make/Model	**Description**	**Speed (RPM)**	**Displacement**	**Starting System**	**Capacities**
Deutz F3L 912 Diesel Engine	3 cylinder 44HP (33 kw) @ 1800 RPM	Idle 1890 Full Load 1800	173 cu. in (2.83L) **Bore x Stroke** 3.94" x 4.72" (100mm x 120mm)	12VDC battery & Starter	Fuel (20 US gal) 75.7L Oil: 9.5 QTS. 9.0L

RATED OUTPUT @ 104° F (40° C) - WELDER			
Welding Process	**Welding Output Current/Voltage/Duty Cycle**	**Output Range Amps**	Max. Weld OCV Voltage @ 1800RPM
DC Constant Current	500A / 40V / 100% 550A / 34V / 60% 600A / 30V / 40%	65A TO 600A	90 Volts
TIG	250A / 20V / 100%	65A TO 250A	75 Volts

RATED OUTPUT @ 104° F (40° C) - GENERATOR			
Auxiliary Power [1] **Single Phase 60 Hz AC**			
OUTLETS	**VOLTS**	**AMPS**	**POWER**
1	120	20	2400 Watts
1	120	15	1800 Watts
1	240	15	3600 Watts

RECEPTACLES AND CIRCUIT BREAKERS		
RECEPTACLES	**AUXILIARY POWER CIRCUIT BREAKER**	**OTHER CIRCUIT BREAKERS**
1 - 120VAC Duplex NEMA(5-20R) GFCI protected 1 - 120VAC European (IEC-309)-GFCI protected 1 - 240VAC European (IEC-309)	1 - 20 AMP for 120 VAC Duplex (NEMA) 1 - 15 AMP for 120 VAC European (IEC-309) 1 - 15 AMP for 240 VAC European (IEC-309)	20AMP for Battery Charging Circuit

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
36.87[(2)] in. 916.5 mm	28.28 in 718.3 mm	65.1 in. 1653.5 mm	1657 lbs. (752 kg.)

1. Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within ± 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.
2. To Top of enclosure, add 8.28"(210.1mm) to top of exhaust pipe.

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SAFETY PRECAUTION

Read this entire installation section before you start installation.

⚠ 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.**

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

See additional warning information at front of this operator's manual.

LOCATION AND VENTILATION

The welder should be located to provide an unrestricted flow of clean, cool air to the cooling air inlets and to avoid restricting the cooling air outlets. Also, locate the welder so that the engine exhaust fumes are properly vented to an outside area.

STORING

1. Store the machine in a cool, dry place when it is 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. Drain the engine oil and refill with fresh 10W30 oil. Run the engine for about five minutes to circulate oil to all the parts. See the ***MAINTENANCE*** section of this manual for details on changing oil.
3. Remove the battery, recharge it, and adjust the electrolyte level. Store the battery in a dry, dark place.

STACKING

BIG RED® 600 machines cannot be stacked.

ANGLE OF OPERATION

To achieve optimum engine performance the BIG RED® 600 should be run in a level position. The maximum angle of operation for the Deutz engine is 30 degrees fore and aft, 40 degrees right and 45 degrees left. If the engine is to be operated at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity in the crankcase. When operating the welder at an angle, the effective fuel capacity will be slightly less than the amount specified.

LIFTING

The BIG RED® 600 weighs approximately 1772lbs. (804kg.) with a full tank of fuel 1657lbs.(752kg) less fuel. A lift bail is mounted to the machine and should always be used when lifting the machine.

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- **Lift only with equipment of adequate lifting capacity.**
- **Be sure machine is stable when lifting.**
- **Do not lift this machine using lift bail if it is equipped with a heavy accessory such as trailer or gas cylinder.**
- **Do not lift machine if lift bail is damaged.**
- **Do not operate machine while suspended from lift bail.**

HIGH ALTITUDE OPERATION

At higher altitudes, output derating may be necessary. For maximum rating, derate the welder output 5% for every 300 meters (984 ft.) above 1500 meters (4920 ft.). For output of 500A and below, derate the welder output 5% for every 300 meters (984 ft.) above 2100 meters (6888 ft.).

Contact a Deutz Service Representative for any engine adjustments that may be required.

HIGH TEMPERATURE OPERATION

WELDER OUTPUT RATINGS AT TEMPERATURES ABOVE 40°C			
AMPS	DUTY CYCLE	VOLTS	TEMPERATURE
450 DC	30%	38	55°C
500 DC	30%	40	50°C
550 DC	30%	34	45°C

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TOWING

Use a recommended trailer for use with this equipment for road, in-plant and yard towing by a vehicle(1). If the user adapts a non-Lincoln trailer, he must assume responsibility that the method of attachment and usage does not result in a safety hazard or damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of trailer vs. weight of Lincoln equipment and likely additional attachments.
2. Proper support of, and attachment to, the base of the welding equipment so there will be no undue stress to the framework.
3. Proper placement of the equipment on the trailer to insure stability side to side and front to back when being moved and when standing by itself while being operated or serviced.
4. Typical conditions of use, i.e., travel speed; roughness of surface on which the trailer will be operated; environmental conditions; like maintenance.
5. Conformance with federal, state and local laws.(1)

(1) Consult applicable federal, state and local laws regarding specific requirements for use on public highways.

VEHICLE MOUNTING

⚠ WARNING

Improperly mounted concentrated loads may cause unstable vehicle handling and tires or other components to fail.

- **Only transport this Equipment on serviceable vehicles which are rated and designed for such loads.**
- **Distribute, balance and secure loads so vehicle is stable under conditions of use.**
- **Do not exceed maximum rated loads for components such as suspension, axles and tires.**
- **Mount equipment base to metal bed or frame of vehicle.**
- **Follow vehicle manufacture's instructions.**

PRE-OPERATION ENGINE SERVICE

READ the engine operating and maintenance instructions supplied with this machine.

⚠ WARNING

DIESEL FUEL can cause fire.

Stop engine while fueling.
- **Do not smoke when fueling.**
- **Keep sparks and flame away from tank.**
- **Do not leave unattended while fueling.**
- **Wipe up spilled fuel and allow fumes to clear before starting engine.**
- **Do not overfill tank, fuel expansion may cause overflow.**

DIESEL FUEL ONLY

OIL

The BIG RED® 600 is shipped with the engine crankcase filled with high quality SAE 10W-30 oil (API class CD or better). Check the oil level before starting the engine. If it is not up to the full mark on the dip stick, add oil as required. Check the oil level every four hours of running time during the first 35 running hours. Refer to the engine Operator's Manual for specific oil recommendations and break-in information. The oil change interval is dependent on the quality of the oil and the operating environment. Refer to the engine Operator's Manual for the proper service and maintenance intervals. The machine is equipped with an oil drain valve.

FUEL

USE DIESEL FUEL ONLY

⚠ WARNING

- **Fill the fuel tank with clean, fresh fuel. The capacity of the tank is 20 gals. (75.7 ltrs). When the fuel gauge reads empty the tank contains approximately 2 gals. (7.6ltrs.) of reserve fuel.**

⚠ WARNING

NOTE: A fuel shut off valve is located on the pre-filter/sediment filter. Which should be in the closed position when the welder is not used for extended periods of time.

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ENGINE BREAK-IN

Lincoln Electric selects high quality, heavy-duty industrial engines for the portable welding machines we offer. While it is normal to see a small amount of crankcase oil consumption during initial operation, excessive oil use, wetstacking (oil or tar like substance at the exhaust port), or excessive smoke is not normal.

Larger machines with a capacity of 350 amperes and higher, which are operated at low or no-load conditions for extended periods of time are especially susceptible to the conditions described above. To accomplish successful engine break-in, most diesel-powered equipment needs only to be run at a reasonably heavy load within the rating of the welder for some period of time during the engine's early life. However, if the welder is subjected to extensive light loading, occasional moderate to heavy loading of the engine may sometimes be necessary. Caution must be observed in correctly loading a diesel/generator unit.

1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator and voids the warranty.
2. Set the welder controls for an output current and voltage within the welder rating and duty cycle. Note that any attempt to exceed the welder rating or duty cycle for any period of time will result in catastrophic damage to the generator and voids the warranty.
3. Periodically shut off the engine and check the crankcase oil level.

ENGINE COOLING SYSTEM

The Deutz engine is air cooled by a belt driven axial blower. The oil cooler and engine cooling fins should be blown out with compressed air or steam to maintain proper cooling (See the engine Owners Manual for procedures and frequency).

BATTERY CONNECTION

⚠ WARNING

GASES FROM BATTERY can explode.

- **Keep sparks, flame and cigarettes away from battery.**

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY — disconnect negative cable from old battery first and connect to new battery last.**
- **CONNECTING A BATTERY CHARGER — remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.**
- **USING A BOOSTER — connect positive lead to battery first then connect negative lead to negative battery lead at engine foot.**

BATTERY ACID can burn eyes and skin.

- **Wear gloves and eye protection and be careful when working near battery.**
- **Follow instructions printed on battery.**

IMPORTANT: To prevent ELECTRICAL DAMAGE WHEN:

a) Installing new batteries.

b) Using a booster.

Use correct polarity — Negative Ground.

The BIG RED® 600 is shipped with the negative battery cable disconnected. Before you operate the machine, make sure the Engine Switch is in the OFF position and attach the disconnected cable securely to the negative (-) battery terminal.

Remove the insulating cap from the negative battery terminal. Replace and tighten negative battery cable terminal.

NOTE: This machine is furnished with a wet charged battery; if unused for several months, the battery may require a booster charge. Be sure to use the correct polarity when charging the battery.

MUFFLER OUTLET PIPE

Remove the plastic plug covering the muffler outlet tube. Using the clamp provided secure the outlet pipe to the outlet tube with the pipe positioned such that it will direct the exhaust in the desired position.

SPARK ARRESTOR

Some federal, state or local laws may require that petrol or diesel engines be equipped with exhaust spark arrestors when they are operated in certain locations where unarrested sparks may present a fire hazard. The standard muffler included with this welder does not qualify as a spark arrestor. When required by local regulations, a suitable spark arrestor, must be installed and properly maintained.

⚠ CAUTION

An incorrect arrestor may lead to damage to the engine or adversely affect performance.

WELDING OUTPUT CABLES

With the engine off, connect the electrode and work cables to the output studs. The welding process dictates the polarity of the electrode cable. These connections should be checked periodically and tightened if necessary.

Listed in Table AA.1 are copper cable sizes recommended for the rated current and duty cycle. Lengths stipulated are the distance from the welder to work and back to the welder again. Cable sizes are increased for greater lengths primarily for the purpose of minimizing cable voltage drop.

Table AA.1 Combined Length of Electrode and Work Cables.

	TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES		
AMPS @100% Duty Cycle	Up to 150 ft. (Up to 45m)	150-200 ft. (45-60m)	200-250 ft. (60-75m)
500	3/0 AWG 95mm^2	3/0 AWG 95mm^2	4/0 AWG 120mm^2

MACHINE GROUNDING

Because this portable engine driven welder creates its own power, it is not necessary to connect its frame to an earth ground, unless the machine is connected to premises wiring (home, shop, etc.).

To prevent dangerous electric shock, other equipment powered by this engine driven welder must:

a) be grounded to the frame of the welder using a grounding type plug,

or

b) be double insulated.

When this welder is mounted on a truck or trailer, its frame must be securely connected to the metal frame of the vehicle. When this engine driven welder is connected to premises wiring such as that in a home or shop, its frame must be connected to the system earth ground. See further connection instructions in the section entitled ***Standby Power Connections*** as well as the article on grounding in the latest National Electrical Code and the local codes.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal ground stake going into the ground for at least 10 Feet or to the metal framework of a building which has been effectively grounded. The National Electric Code lists a number of alternate means of grounding electrical equipment. A machine grounding stud marked with the symbol is provided on the front of the welder.

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AUXILIARY POWER RECEPTACLES

The auxiliary power of the BIG RED® 600 consists of Single Phase 60Hz Power. Out put Voltage is within +/- 10% at loads up to rated capacity.

One 120VAC NEMA (5-20R) 20 amp duplex receptacle is protected by a 20 amp circuit breaker that provides 2400 watts Peak / 2400 watts Continuous power. Maximum current is 20 amps total.

One 120VAC European (IEC-309) 16 amp receptacle is protected by a 15 amp circuit breaker that provides 1800 watts Peak / 1800 watts Continuous power. Maximum current is 15 amps.

One 240VAC European (IEC-309) 16 amp receptacle is protected by a 15 amp 2-pole circuit breaker that provides 3600 watts Peak / 3600 watts Continuous power. The 2-pole circuit breaker disconnects both hot leads at the same time. Maximum current is 15 amps.

120 VOLT RECEPTACLES

A GFCI module protects, the two 120V Auxiliary Power receptacles. A GFCI (Ground Fault Circuit Interrupter) electrical receptacle is a device to protect against electric shock should a piece of defective equipment connected to it develop a ground fault. If this situation should occur, the GFCI module will trip, removing voltage from the output of the receptacle. If a GFCI module is tripped see the ***MAINTENANCE*** section for detailed information on testing and resetting it. A GFCI module should be properly tested at least once every month.

The 120 V auxiliary power receptacles should only be used with three wire grounded type plugs or approved double insulated tools with two wire plugs. The current rating of any plug used with the system must be at least equal to the current capacity of the associated receptacle.

RESIDUAL CURRENT DEVICE READY

The BIG RED® 600 is configured to allow for the addition of a Residual Current Device (RCD) to protect the 240V Single Phase Receptacle. The auxiliary power area on the front panel of the BIG RED® 600 has a hole sized and shaped to accept a typical 2-pole (RCD) along with a protective rubber boot. A cover plate with a label "**RCD READY**" covers the hole and secures a mounting bracket on the backside of the panel.

NOTE: The (RCD) should be rated for at least 15 amps.

There are many suppliers of RCD's. One example is Allen Bradley, part number 1492-RCD2A40.

The protective boot can be obtained from:
APM-Hexseal, part number HE-1035

See **Section F** Diagrams of the Operator's Manual for instructions on installing an RCD and protective rubber boot.

STANDBY POWER CONNECTIONS

The BIG RED® 600 is suitable for temporary, standby or emergency power using the engine manufacturer's recommended maintenance schedule.

The BIG RED® 600 can be permanently installed as a standby power unit for 240 VAC(60Hz). Connections must be made by a licensed electrician who can determine how the 120/240 VAC power can be adapted to the particular installation and comply with all applicable electrical codes.

Take necessary steps to assure load is limited to the capacity of the BIG RED® 600

⚠ WARNING

- **Only a licensed, certified, trained electrician should install the machine to a premises or residential electrical system. Be certain that:**
- **The installation complies with the National Electrical Code and all other applicable electrical codes.**
- **The premises is isolated and no feedback 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.**

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CONNECTION OF LINCOLN ELECTRIC WIRE FEEDERS

⚠ WARNING

Shut off Welder before making any electrical connections.

The LN-15® Across-the-Arc model, LN-25® with or without an internal contactor, and LN-25® PRO may be used with the BIG RED® 600.

1. Shut the welder off.

2. For electrode Positive, connect the electrode cable from the wire feeder to the "+" terminal of the welder and work cable to the "-" terminal of the welder. For electrode Negative, connect the electrode cable from the wire feeder to the "-" terminal of the welder and work cable to the "+" terminal of the welder.

3. Set the CV/CC mode of the wire feeder to CC. (Refer to wire feeder operator manual for details on setting the wire feeder in the CC mode and for setting welding parameters).

4. Attach the single lead from the front of the wire feeder to work using the spring clip at the end of the lead. This is a sense lead to supply current to the wire feeder motor; it does not carry welding current.

5. When the gun trigger is closed, the current sensing circuit will cause the wire to begin to feed and the welding process is started.

NOTE: The LN-25® (K444-1) Remote Control Module (K431) and Remote Cable (K432) cannot be used with the BIG RED® 600. See the appropriate connection diagram in **Section F** of the Operator's Manual.

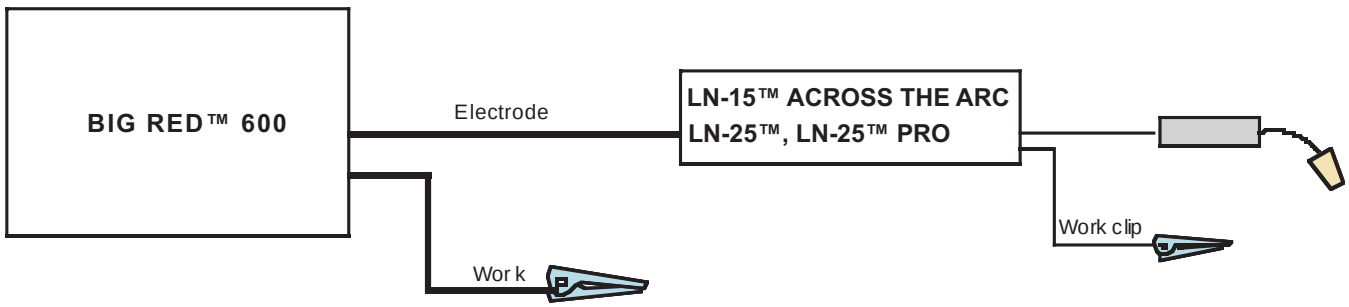
⚠ WARNING

If you are using an LN-25® without an internal contactor, the electrode will be energized when the BIG RED® 600 is started.

The Wire Feeder sensor has full OCV potential between spring clip and work return. Turn machine off when attaching spring clip.

Lincoln Electric does NOT recommend constant current semiautomatic welding for applications which need to meet specified weld metal chemical or mechanical property requirements or weld quality requirements.

FIGURE AA-1



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SAFETY INSTRUCTIONS

Read and understand this entire section before operating your BIG RED® 600.

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read all operating 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 such as output terminals or internal wiring.**
- **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 outside**
- **Do not stack anything 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 operate this equipment.

ADDITIONAL SAFETY PRECAUTIONS

Always operate the welder with the hinged door closed and the side panels in place as these provide maximum protection from moving parts and insure proper cooling air flow.

GENERAL DESCRIPTION

The BIG RED® 600 is a diesel engine driven welder, offering reliable DC arc welding performance, with outstanding arc characteristics for all welding applications. The BIG RED® 600 is both a rugged three cylinder, diesel engine driven 600 amp DC arc welder and 3.6 KW AC power generator. This powerful generator can be used to provide electricity for lights, power tools, etc.

The BIG RED® 600 delivers ideal DC arc characteristic for each welding process. Stick electrode welding, Scratch-Start TIG, or carbon arc gouging, to make the BIG RED® 600 the ideal all purpose engine driven welder for on-site work.

The BIG RED® 600 has “no PC Boards” and “no electronics”.

The BIG RED® 600 is service friendly with a minimal number of major parts, simplifying in field servicing of the BIG RED® 600. The generator is a dual stator and rotor design with two sealed bearings for maintenance free service. The rotors are copper wound design with two slip rings and brushes. The stators are wound entirely with heavy gauge copper wire and insulated with NEMA class F insulation material. The stator is then impregnated with three layers of high quality varnish. After the stator is assembled using tie bars, the entire assembly Is covered with an environmentally protective coating . These measures insure trouble-free operation in the harshest environments.

RECOMMENDED APPLICATIONS

WELDER

The BIG RED® 600 provides constant current DC welding output for stick (SMAW) and TIG (GTAW) welding (scratch start). In addition the Big Red can be used for Arc Gouging with carbons up to 9.5 mm (3/8”) diameter.

The BIG RED® 600 is **not recommended** for pipe thawing.

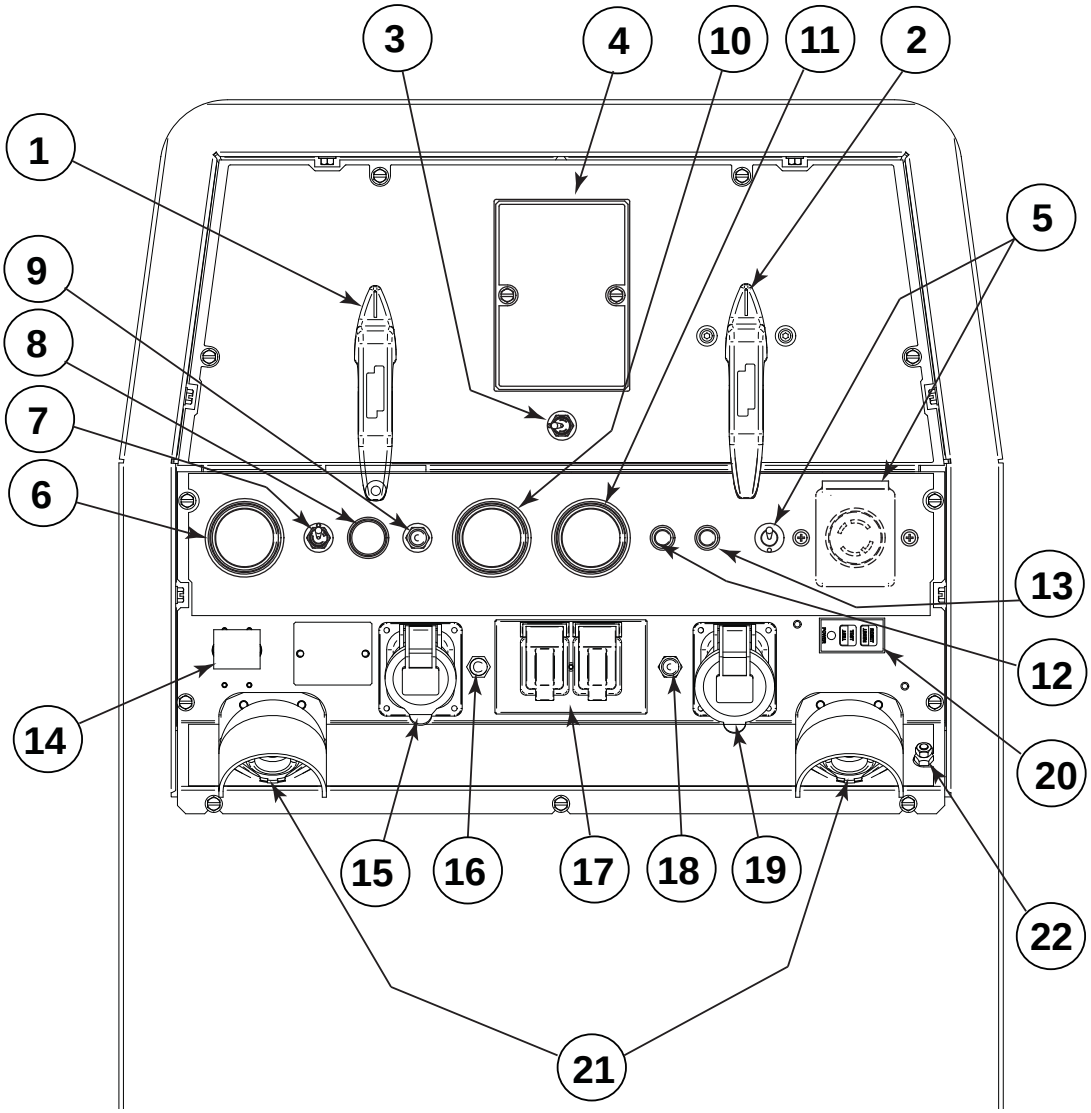
GENERATOR

The BIG RED® 600 provides smooth output for auxiliary power and emergency standby power. The auxiliary power is independent of the welding power and thus not effected by the weld control settings. Full power is available provided welding output is below 200 amps. Above 200 amps refer to the Simultaneous Welding and Auxiliary Power chart in the operation section of this manual.

CONTROLS AND SETTINGS

All welder and engine controls are located on the case front panel. Refer to Figure BB.1 and the explanations that follow.

Figure BB.1 Case Front Panel Controls



WELDING CONTROLS (Items 1-5)

1. OUTPUT RANGE SELECTOR SWITCH

A 5 position switch that provides 5 overlapping output current settings:

- 65 - 115
- 105 - 220
- 150 - 330
- 200 - 435
- 300 – Maximum

NOTE: Do not switch while welding

2. OUTPUT CONTROL

Provides fine adjustment of the current and open circuit voltage from minimum to maximum within each Range.

"1" is minimum and "10" is maximum.

3. WELD MODE SELECTOR SWITCH

Provides selection of either Stick / Arc Gouging Mode or TIG Mode.

4. VOLT/AMP METERS (optional)

Optional analog volt and amp meter kit available for easy installation into front panel.

(See ***Accessory Section*** For "K" number)

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5. LOCAL / REMOTE CONTROL SWITCH and REMOTE RECEPTACLE

The toggle switch provides the option of controlling the welding output at the control panel or remotely. For control at the control panel set the switch in the "LOCAL" position. For remote control set the switch in the "REMOTE" position. The receptacle is for attaching an optional remote control equipment. (See ***Accessory Section*** For “K” number)

ENGINE CONTROLS (Items 6 Through to 13)

6. ENGINE HOUR METER / FUEL GAUGE

Combination hour meter fuel level gauge. The hour meter displays the total time that the engine has been running. This meter is a useful indicator for scheduling preventive maintenance. The fuel gauge displays the level of diesel fuel in the fuel tank. The operator must watch the fuel level closely to prevent running out of fuel and possibly having to bleed the system.

7. RUN STOP SWITCH

The RUN position energizes the hold coil of the fuel solenoid, hour meter, and rotor flashing circuit. The STOP position stops the engine.

NOTE: Do not leave switch in RUN position when the engine is not running. In the RUN position the battery will be discharged.

8. START PUSH BUTTON

Energizes the starter motor to crank the engine. With the RUN / STOP switch in the RUN position, push and hold the Start button to crank the engine; release as the engine starts. Do not press while engine is running as this can cause damage to the ring gear and/or starter motor.

9. CIRCUIT BREAKER

The battery circuit breaker protects the engine circuitry that powers the three gauges, fuel/hours, temperature and pressure. It also protects the engine shutdown relay, timer delay relay, hot start relay hold solenoid, and flashing circuitry. When the circuit breaker opens because of a fault, the engine will crank but will not start.

10. OIL TEMPERATURE GAUGE

An indicator of engine oil temperature.

11. OIL PRESSURE GAUGE

An indicator of engine oil pressure.

12. ENGINE PROTECTION

A warning indicator light for high oil temperature or low oil pressure. The light remains off with proper oil temperature and proper oil pressure. If a fault is detected the light will turn on and the engine protection system will stop the engine. The light will remain on when the engine has been shut down. In order to try and re-start the engine the engine protection system must be reset by returning the RUN-STOP switch to the STOP position.

NOTE: The light remains off when the RUN-STOP switch is in the RUN position prior to starting the engine. However if the engine is not started within 60 seconds the light will come on. When this happens the RUN-STOP switch must be returned to the STOP position to reset the engine protection system and light.

13. BATTERY CHARGING LIGHT

An indicator light for low/no battery charging. The light is off when the battery charging system is functioning normally. If light turns on, the alternator or the voltage regulator may not be operating correctly or the cooling blower belt may be broken. The light will remain on when the engine is stopped and the RUN / STOP switch is in the RUN position.

AUXILIARY POWER (14-22)

14. CIRCUIT BREAKER

2-pole 15A rated. Provides overload protection for the 240VAC European (IEC-309) receptacle.

15. 240 VAC RECEPTACLE

European (IEC-309) receptacle rated up to 15 amps and is IP44 rated.

NOTE: A space is provided on the panel for adding a 2-pole Residual Current Device (RCD) to protect the 240V receptacle. See Section F of the Operator’s Manual for instructions on installing an RCD.

16. CIRCUIT BREAKER

Single-pole 20A rated. Provides overload protection for the 120VAC (5-20R) NEMA Duplex Receptacle.

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17. 120 VAC DUPLEX RECEPTACLE

Single-pole 20A rated. Provides overload protection for the 120VAC (5-20R) NEMA Duplex Receptacle.

18. CIRCUIT BREAKERS

Single pole 15A rated. Provides overload protection for the 120VAC European (IEC-309) receptacle.

19. 120 VAC RECEPTACLE

European (IEC-309) receptacle rated up to 15 amps and is IP44 rated. Receptacle is GFCI protected.

20. GFCI (Ground Fault Circuit Interrupter) Module

Protects both 120VAC Auxiliary Power receptacles.

If a GFCI Module is tripped, See the ***MAINTENANCE*** section for detailed information on testing and resetting the GFCI Module.

21. WELD OUTPUT TERMINALS + AND -

Covered terminals that provide welding connection points for the electrode and work cables.

22. GROUND STUD ⏚

Protects both 120VAC Auxiliary Power receptacles.

ENGINE OPERATION

STARTING THE ENGINE

1. Open the engine compartment door and check that the fuel shut off valve located screwed into the fuel filter housing is in the open position (lever to be in line with the hose).
2. Check for proper oil level. Close engine compartment door.
3. Remove all plugs connected to the AC power receptacles.
4. Set the RUN/STOP switch to “RUN”. Observe that the battery charging light is on and fuel is in the fuel tank (see fuel gauge).
5. Within 30 seconds, press and hold the engine START button until the engine starts.
6. Release the engine START button when the engine starts.
7. Check that the engine protection and battery charging lights are off. The engine protection light is on after starting, the engine will shutdown in a few seconds. Investigate any indicated problem.
8. Allow the engine to warm up for several minutes before applying a load. Allow a longer warm up time in cold weather.

COLD WEATHER STARTING

With a fully charged battery and the proper weight oil, the engine should start satisfactorily even down to about -15°C(5°F). If the engine must be frequently started below -15°C(5°F), it may be desirable to install additional starting aids. The use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below -5°C(23° F).

STOPPING THE ENGINE

Switch the RUN/STOP switch to “STOP”. This turns off the voltage supplied to the shutdown solenoid. A backup shutdown can be accomplished by shutting off the fuel valve located on the fuel line.

NOTE: Also put Run/Stop switch in “Stop” position when engine is not running - battery will be discharged otherwise.

TABLE BB.1

TYPICAL BIG RED® 600 FUEL CONSUMPTION

	Deutz F3L912 Engine 44HP (33Kw) @ 1800 RPM	Running Time for 75.7 L (20 Gal.)
High Idle - No Load 1890 R.P.M.	2.6 liters/hr (.69 gal/hr)	28.9 hrs
DC, CC Weld Output 500A/40V/100%	7.5 liters/hr (1.97 gal/hr)	10.1 hrs
DC, CC Weld Output 600A/30V/40%	4.4 liters/hr (1.16 gal/hr)	17.2 hrs
Auxiliary Power 3.6 Kw	3.0 liters/hr (.78 gal/hr)	25.5 hrs

NOTE: This data is for reference only. Fuel consumption is approximate and can be influenced by many factors, including engine maintenance, environmental conditions and fuel quality.

WELDER OPERATION

DUTY CYCLE

Duty Cycle is the percentage of time the load is being applied in a 10 minute period. For example a 60% duty cycle, represents 6 minutes of load and 4 minutes of no load in a 10 minute period.

ELECTRODE INFORMATION

The BIG RED® 600 is designed for horizontal, vertical up, and overhead welding with all types of DC stick electrodes.

For any electrode the procedures should be kept within the rating of the machine. For information on electrodes and their proper application see **(www.lincolnelectric.com)** or the appropriate Lincoln publication.

WELDING MODE

Set the Welding mode switch for the desired process, either Stick / Gouging or TIG.

CONSTANT CURRENT STICK WELDING

⚠ CAUTION

DO NOT TURN THE "OUTPUT RANGE SELECTOR" WHILE WELDING because the current may arc between the contacts and damage the switch.

The "Output Range Selector" provides five overlapping current ranges. The "Output Current Adjustment" adjusts the current from minimum to maximum within each range. Open circuit voltage is also controlled by the "Output Current Adjustment" permitting control of the arc characteristics.

A high open circuit voltage setting provides the soft "buttering" arc with best resistance to pop-outs preferred for most welding. To get this characteristic, set the "Output Range Selector" to the lowest setting that still provides the current you need and set the "Output Current Adjustment" near maximum.

For example: to obtain 175 amps and a soft arc, set the "Output Range Selector" to the 105-220 position and then adjust the "Output Current Adjustment" to get 175 amps.

When a forceful "digging" arc is required, usually for vertical and overhead welding, use a higher "Output Range Selector" setting and lower open circuit voltage.

For example: to obtain 175 amps and a forceful arc, set the "Output Range Selector" to the 150-330 position and the "Output Current Adjustment" setting to get 175 amps.

Some arc instability may be experienced with EXX10 electrodes when trying to operate with long arc techniques at settings at the lower end of the open circuit voltage range.

⚠ CAUTION

DO NOT attempt to set the "Current Range Selector" between the five points designated on the nameplate.

ARC GOUGING

Using the "Output Range Selector" and "Output Control Adjustment" set the output to the desired level for the gouging electrode being used see table BB.2.

TABLE BB.2

Carbon Diameter	Current Range (DC, electrode positive)
1/8"(3.2mm)	60-90 Amps
5/32"(4.0mm)	90-150 Amps
3/16"9(4.8mm)	200-250 Amps
1/4"(6.4mm)	300-400 Amps
5/16"(8.0mm)	350-450 Amps
3/8"(9.5mm)	450-600 Amps

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TIG

The BIG RED® 600 can be used for Scratch-Start of DC TIG welding applications.

Use the “Output Range Selector” and “Output Control Adjustments” to set the desired current. To initiate a weld, the tungsten electrode is then scratched on the work which establishes the arc. To stop the arc, simply lift the TIG torch away from the work piece. The tungsten may then be scratched on the work piece to restrike the arc.

If a high frequency start is desired, the K930-2 TIG Module can be used with the BIG RED® 600. The BIG RED® 600 and any high frequency generating equipment must be properly grounded. See the K930-2 TIG Module operating manuals for complete instructions on installation, operation, and maintenance.

When using the TIG Module, the OUTPUT control on the BIG RED® 600 is used to set the maximum range of the CURRENT CONTROL on the TIG Module or an Amptrol if connected to the TIG Module.

TABLE BB.3

TYPICAL CURRENT RANGES (1) FOR TUNGSTEN ELECTRODES(2)

Tungsten Electrode Diameter in. (mm)		DCEN (-)	DCEP (+)	Approximate Argon Gas Flow Flow Rate C.F.H. (l /min.)				TIG TORCH Nozzle Size (4), (5)
		1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Aluminum		Stainless Steel		
.010	(.25)	2-15	(3)	3-8	(2-4)	3-8	(2-4)	#4, #5, #6
0.020	(.50)	5-20	(3)	5-10	(3-5)	5-10	(3-5)	
0.040	(1.0)	15-80	(3)	5-10	(3-5)	5-10	(3-5)	
1/16	(1.6)	70-150	10-20	5-10	(3-5)	9-13	(4-6)	#5, #6
3/32	(2.4)	150-250	15-30	13-17	(6-8)	11-15	(5-7)	#6, #7, #8
1/8	(3.2)	250-400	25-40	15-23	(7-11)	11-15	(5-7)	
5/32	(4.0)	400-500	40-55	21-25	(10-12)	13-17	(6-8)	#8, #10
3/16	(4.8)	500-750	55-80	23-27	(11-13)	18-22	(8-10)	
1/4	(6.4)	750-1000	80-125	28-32	(13-15)	23-27	(11-13)	

(1) When used with argon gas. The current ranges shown must be reduced when using argon/helium or pure helium shielding gases.
(2) Tungsten electrodes are classified as follows by the American Welding Society (AWS):

Pure	EWP
1% Thoriated	EWTh-1
2% Thoriated	EWTh-2

Though not yet recognized by the AWS, Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.
(3) DCEP is not commonly used in these sizes.
(4) TIG torch nozzle "sizes" are in multiples of 1/16ths of an inch:

# 4 = 1/4 in.	(6 mm)
# 5 = 5/16 in.	(8 mm)
# 6 = 3/8 in.	(10 mm)
# 7 = 7/16 in.	(11 mm)
# 8 = _ in.	(12.5 mm)
#10 = 5/8 in.	(16 mm)

(5) TIG torch nozzles are typically made from alumina ceramic. Special applications may require lava nozzles, which are less prone to breakage, but cannot withstand high temperatures and high duty cycles.

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CONSTANT CURRENT OPERATION WITH A LINCOLN ELECTRIC WIRE FEEDER

Lincoln Electric does NOT recommend constant current semiautomatic welding for applications which need to meet specified weld metal chemical or mechanical property requirements or weld quality requirements.

Most semiautomatic welding processes perform better using constant voltage power sources. Welding codes usually do not address the power source selection or specifically, whether the welding process is to be operated in the constant voltage or constant current mode. Instead, codes typically specify limitations on the current, voltage, heat input and preheat temperature based on the material to be welded. The intention is to assure that proper weld material properties will develop. Welding is sometimes performed using constant current power sources. The operation can be more convenient because it may allow the use of an existing stick (SMAW) power source and the power source can be placed at a distant location without any provision for adjusting the output settings.

For constant current operation, the power source is set to deliver the specified current. The power source regulates this current regardless of changes in the welding circuit, including cable length, electrode diameter, wire feed speed, contact tip to work distance, etc.

Changes in the wire feed speed (WFS) or contact tip to work distance (CTWD) affect the arc voltage when constant current power sources are used. Lowering the wire feed speed raises the voltage, raising the wire feed speed lowers the voltage. Lengthening the contact tip to work distance raises the voltage, shortening the contact tip to work distance lowers the voltage. If the contact tip to work distance is properly maintained, a satisfactory operating voltage range may be achieved, and a sound weld may result. However, when a welder uses a longer contact tip to work distance, an arc-sensing wire feeder compensates by increasing the wire feed speed to regulate the voltage.

Even if the voltage and current remain unchanged, the increased wire feed speed may result in a deposition rate well beyond the specified range of the electrode. Under these conditions, the specified weld metal properties may not be achieved. Constant voltage power sources deliver large current surges to stabilize the arc when the electrode is shorted or the arc length is very short.

However, a constant current power source does not provide such a response to stabilize the arc. It may be difficult to achieve required weld metal properties, or to achieve the required quality of welds needed to pass nondestructive tests, when such welds are made under constant current operation.

AUXILIARY POWER:

The auxiliary power is independent of the welding power and thus not effected by the weld control settings.

Simultaneous Welding and Auxiliary Power Loads

The auxiliary power ratings are with no welding load. Simultaneous welding and power loads are specified in the following Table BB.4.

TABLE BB.4

BIG RED® 600 Simultaneous Welding and Power Loads

Weld Amps		1 PHASE (120V) WATTS	1 PHASE (120V) AMPS		1 PHASE (240V) WATTS	1 PHASE (240V) AMPS
0	PLUS	2400	20	OR	3600	15
100		2400	20		3600	15
200		2400	20		3600	15
300		2400	20		2400	10
400		1200	10		1200	5
500		0	0		0	0
600		0	0		0	0

TABLE BB.5

BIG RED® 600 Extension Cord Length Recommendations

(Use the shortest length extension cord possible sized per the following table.)

Current	Voltage	Load	Maximum Allowable Cord Length in ft. (m) for Conductor Size											
(Amps)	Volts	(Watts)	14 AWG		12 AWG		10 AWG		8 AWG		6 AWG		4 AWG	
15	120	1800	30	(9)	40	(12)	75	(23)	125	(38)	175	(53)	300	(91)
20	120	2400			30	(9)	50	(15)	88	(27)	138	(42)	225	(69)
15	240	3600	60	(18)	75	(23)	150	(46)	225	(69)	350	(107)	600	(183)

Conductor size is based on maximum 2.0% voltage drop.

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OPTIONAL FEATURES

K2641-2 FOUR WHEELED STEERABLE YARD TRAILER

For in plant and yard towing. Comes standard with a Duo-Hitch®, a 2" Ball and Lunette Eye combination Hitch.

K2636-1 TRAILER - Two-wheeled trailer with optional fender and light package. For highway use, consult applicable federal, state, and local laws regarding possible additional requirements. Comes standard with a Duo-Hitch®, a 2" Ball and Lunette Eye combination hitch.
Order:
K2636-1 Trailer
K2639-1 Fender & Light Kit
K2640-1 Cable Storage Rack

K704 ACCESSORY SET - Includes 35 ft. (10m) of electrode cable and 30 ft. (9.1m) of work cable, headshield, work clamp electrode holder. Cables are rated at 400 amps, 100% duty cycle.

K2861-1 REMOTE CONTROL - 100 ft. (30.4m)
Portable control provides same dial range as the output control on the welder. Has a convenient twist-lock plug for easy connection to the welder.

K2863-1 METER KIT
Easy-to-read analog meters for volts and amps. Easy to install.

K2864-1 SPARK ARRESTOR - Includes a heavy gage steel, approved spark arrestor, attaches to the muffler exhaust tube. Includes clamp.

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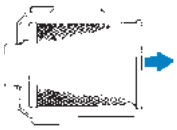
Service Instructions

Single- and Two-Stage Engine Air Cleaners

1 Remove the Filter



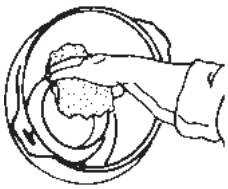
Rotate the filter while pulling straight out.

Unfasten or unlatch the service cover. Because the filter fits tightly over the outlet tube to create the critical seal, there will be some initial resistance, similar to breaking the seal on a jar. Gently move the end of the filter back and forth to break the seal then rotate while pulling straight out. Avoid knocking the filter against the housing.

If your air cleaner has a safety filter, replace it every third primary filter change. Remove the safety filter as you would the primary filter. Make sure you cover the air cleaner outlet tube to avoid any unfiltered contaminant dropping into the engine.

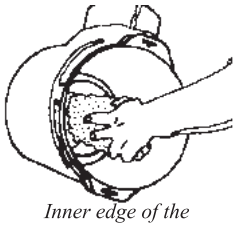
2 Clean Both Surfaces of the Outlet Tube and Check the Vacuator™ Valve

Use a clean cloth to wipe the filter sealing surface and the inside of the outlet tube. Contaminant on the sealing surface could hinder an effective seal and cause leakage. Make sure that all contaminant is removed before the new filter is inserted. Dirt accidently transferred to the inside of the outlet tube will reach the engine and cause wear. Engine manufacturers say that it takes only a few grams of dirt to "dust" an engine! Be careful not to damage the sealing area on the tube.



Outer edge of the outlet tube

Wipe both sides of the outlet tube clean.

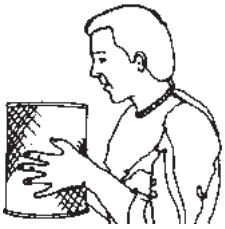


Inner edge of the outlet tube

If your air cleaner is equipped with a Vacuator Valve
Visually check and physically squeeze to make sure the valve is flexible and not inverted, damaged or plugged.

3 Inspect the Old Filter for Leak Clues

Visually inspect the old filter for any signs of leaks. A streak of dust on the clean side of the filter is a telltale sign. Remove any cause of leaks before installing new filter.



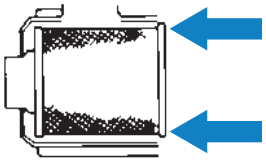
4 Inspect the New Filter for Damage

Inspect the new filter carefully, paying attention to the inside of the open end, which is the sealing area. NEVER install a damaged filter. A new Donaldson radial seal filter may have a dry lubricant on the seal to aid installation.

5 Insert the New Radial Seal Filter Properly

If you're servicing the safety filter, this should be seated into position before installing the primary filter.

Insert the new filter carefully. Seat the filter by hand, making certain it is completely into the air cleaner housing before securing the cover in place.



The critical sealing area will stretch slightly, adjust itself and distribute the sealing pressure evenly. To complete a tight seal, apply pressure by hand at the outer rim of the filter, not the flexible center. (Avoid pushing on the center of the urethane end cap.) No cover pressure is required to hold the seal. NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.

If the service cover hits the filter before it is fully in place, remove the cover and push the filter (by hand) further into the air cleaner and try again. The cover should go on with no extra force.

Once the filter is in place, secure the service cover.

Caution

NEVER use the service cover to push the filter into place! Using the cover to push the filter in could cause damage to the housing, cover fasteners and will void the warranty.

6 Check Connectors for Tight Fit

Make sure that all mounting bands, clamps, bolts, and connections in the entire air cleaner system are tight. Check for holes in piping and repair if needed. Any leaks in your intake piping will send dust directly to the engine!

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SAFETY PRECAUTIONS

⚠ WARNING

Have qualified personnel do the maintenance work. Turn the engine off before working inside the machine. 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.

Do not put your hands near the engine cooling blower fan. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

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.**

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

See additional warning information throughout this operator's manual and the Engine manual as well.

ROUTINE AND PERIODIC MAINTENANCE

DAILY

- Check the crankcase oil level .
- Refill the fuel tank to minimize moisture condensation in the tank.
- Open the water drain valve located on the bottom of the water separator element 1 or 2 turns and allow to drain into a container suitable for diesel fuel for 2 to 3 seconds. Repeat the above drainage procedure until diesel fuel is detected in the co

WEEKLY

Blow out the machine with low pressure air periodically. In particularly dirty locations, this may be required once a week.

ENGINE MAINTENANCE

Refer to the "Periodic Checks" section of the Engine Operator's Manual for the recommended maintenance schedule of the following:

a) Engine Oil and Filter
b) Air Cleaner
c) Fuel Filter - and Delivery System
d) Cooling Blower Belt
e) Battery
f) Cooling System

Refer to ***Table DD.1*** at the end of this section for various engine maintenance components.

ENGINE OIL CHANGE

Drain the engine oil while the engine is warm to assure rapid and complete draining. It is recommended that each time the oil is changed the oil filter be changed as well.

- Be sure the unit is off. Disconnect the negative battery cable to ensure safety.
- Locate oil drain hose and valve in bottom of base and pull through the hole in the case back or side of base on the welder.
- Remove the cap from the drain valve. Push valve in and twist counterclockwise. Pull to open and drain the oil into a suitable container for disposal.
- Close the drain valve by pushing in and twisting clockwise. Replace the cap.
- Re-fill the crankcase to the upper limit mark on the dipstick with the recommended oil (see engine operation manual OR engine service items decal OR below). Replace and tighten the oil filler cap securely.
- Push oil drain hose and valve back into unit, re-connect negative battery cable, and close doors and engine top cover before restarting unit. Wash your hands with soap and water after handling used motor oil. Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take it in a sealed container to your local service station or recycling center for reclamation. DO NOT throw it in the trash; pour it on the ground or down a drain.

Use motor oil designed for diesel engines that meets requirements for API service classification CC/CD/CE/CF/CF-4/CG-4 or CH-4.

ACEA E1/E2/E3. Always check the API service label on the oil container to be sure it includes the letters indicated. (Note: An S-grade oil must not be used in a diesel engine or damage may result. It IS permissible to use an oil that meets S and C grade service classifications.)

SAE 10W30 is recommended for general, all temperature use, 5F to 104F (-15C to 40C).

See engine owner's manual for more specific information on oil viscosity recommendations.

OIL FILTER CHANGE

- Drain the oil.
- Remove the oil filter with an oil filter wrench and drain the oil into a suitable container. Discard the used filter. Note: Care should be taken during filter removal to not disrupt or damage in any way the fuel lines.
- Clean the filter mounting base and coat the gasket of the new filter with clean engine oil.
- Screw the new filter on by hand until the gasket contacts the mounting base. Using an oil filter wrench, tighten the filter an additional 1/2 to 7/8 of a turn.
- Refill the crankcase with the specified amount of the recommended engine oil. Reinstall the oil filler cap and tighten securely.
- Start the engine and check for oil filter leaks.
- Stop the engine and check the oil level. If necessary, add oil to the upper limit mark on the dipstick.

AIR FILTER

⚠ CAUTION

EXCESSIVE AIR FILTER RESTRICTION WILL RESULT IN REDUCED ENGINE LIFE.

The air filter element is a dry cartridge type. It can be cleaned and reused; however, damaged elements should not be reused. Stop engine after 100 hours of running time and clean filter element , replace the filter if necessary. Service air cleaner regularly according to Engine Operator's Manual.

1. Locate the air filter canister located behind the engine door on the top of the engine.
2. Remove air filter element.
3. Remove loose dirt from element with compressed air or water hose directed from inside out.

   Compressed Air: 100 psi maximum with nozzles at least one inch away from element.

   Water Hose: 40 psi maximum without nozzle.
4. Soak element in a mild detergent solution for 15 minutes. Do not soak more than 24 hours. Swish element around in the solution to help remove dirt.
5. Rinse elements from inside out with a gentle stream of water (less than 40 psi) to remove all suds and dirt.
6. Dry element before reuse with warm air at less than 160°F (71°C). Do not use a light bulb to dry the element.
7. Inspect for holes and tears by looking through the element toward a bright light. Check for damaged gaskets or dented metal parts. Do not reuse damaged elements. Protect element from dust and damage during drying and storage.
8. Reinstall air filter element.

   After six cleanings replace air filter. A cleaned filter will have approximately 70% of the life of a new filter element. A restricted filter element may not appear excessively dirty.

FUEL

At the end of each day's use, refill the fuel tank to minimize moisture condensation and dirt contamination in the fuel line. Do not overfill; leave room for the fuel to expand.

Use only fresh No. 2D diesel fuel, the use of No. 1D diesel fuel is recommended in place of No. 2D at temperatures below 23°F (-5°C). Do not use kerosene.

See the Engine Operator's Manual for instructions on replacing the fuel filter.

BLEEDING THE FUEL SYSTEM

You may need to bleed air from the fuel system if the fuel filter or fuel lines have been detached, the fuel tank has been ran empty or after periods of long storage. It is recommended that the fuel shutoff valve be closed during periods of non-use.

⚠ WARNING

To avoid personal injury, do not bleed a hot engine. This could cause fuel to spill onto a hot exhaust manifold, creating a danger of fire.

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FUEL FILTERS

⚠ WARNING

When working on the fuel system

- **Keep naked lights away, do not smoke !**
- **Do not spill fuel !**

The BIG RED® 600 is equipped with a **Fuel Pre-Filter/Water Separator Assembly** located before the lift pump and a **Secondary Fuel Filter** located after the lift pump and before the fuel injectors. The Fuel Pre-Filter/Water Separator is mounted to the engine block just below the lift pump. The Secondary Fuel Filter is mounted directly to the engine just above the oil filter.

FUEL PRE-FILTER/WATER SEPARATOR ASSEMBLY

The pre-filter is a 150 micron screen designed to protect against gross fuel contamination of the water separator element and the Secondary Fuel Filter. If the pre-filter becomes plugged it may be removed, inspected, cleaned and reinstalled. In general this only needs to be done with each water separator element change (about every 1,000 hrs.) However if at any time excessive fuel contamination is suspected or a sudden fall-off in engine performance is detected the pre-filter screen should be inspected and cleaned. Follow the following procedure:

1. Close the fuel shutoff valve (Lever should be perpendicular to the hose) located on the side of the Fuel Pre-Filter/Water Separator Assembly.

2. Unscrew the cap ring located on the top of the filter header and remove the plastic center cap and O-ring.

3. Remove the large white volume plug located directly under the center cap in the upper cavity of the filter header. Use a small screw driver (or similar device) to lift the plug part way out of the cavity to assist with its removal.

   Be careful not to damage the pre-filter screen with the tool used to remove the plug.

4. Using a pair of pliers, gently tug on the pull tabs of the pre-filter screen in an alternating pattern to gradually remove the pre-filter screen.

5. Brush off any debris and rinse in diesel fuel.

6. Re-install the pre-filter screen into the upper cavity of the filter header making sure the four pull tabs are pointing up. Putting your fingers on the pull tabs, push down evenly until the lower body of the pre-filter screen contacts the floor of the upper cavity.

7. Re-insert the large white volume plug into the upper cavity.

8. Place the O-ring onto the angled seal surface of the filter header and re-install the plastic cap. Make sure its flange rests on the O-ring.

9. Screw on the cap ring and tighten hand tight.

10. Remember to open the fuel shutoff valve (Lever in line with the hose) before starting the engine.

WATER SEPARATOR ELEMENT

The water separator element is a two stage filter with a special filtration/water separating media, and an expanded water reservoir providing maximum protection against water in the fuel. The recommended change interval for the water separator element is 1,000 hours. The procedure for changing the element is as follows:

1. Close the fuel shutoff valve (Lever should be perpendicular to the hose) located on the side of the Fuel Pre-Filter/Water Separator Assembly.

2. Rotate the quick change ring (located just below filter header) clockwise approximately 1/2 turn and slide it down and off of the element.

3. Grasp the element and pull down with a slight rocking motion to remove the element from the grommet post on the bottom of the filter header.

4. Slide the new element onto the grommet post on the bottom of the filter header until the element no longer easily moves up into the filter header. Now rotate the element (may take almost 1 full turn) with a slight upward pressure until the element begins to further engage the header. With the proper orientation now established apply additional pressure to seat the element in the filter header. You should feel the element “pop” into place when properly seated.

   NOTE: The element will only go on one way. Never use excessive force when mounting the element to the header.

5. Slide the quick change ring up over the element and rotate counter clockwise until an audible click or pop is heard. If you do not hear the click you have not rotated the ring far enough and the element is not in the locked position. Another indication that the ring is in the locked position is that one set (it doesn't matter which one) of arrows located on the outside of the ring should be located directly under the air vent valve.
6. Open the fuel shutoff valve (lever in line with the hose).
7. Open the air vent valve on the front of the filter header until fuel emerges free of air bubbles and then close the air vent valve.

NOTE: Consult your engine operation manual for information on air bleeding the entire fuel system.

SECONDARY FUEL FILTER

The Secondary Fuel Filter is a spin on cartridge type mount directly to the engine. Consult your engine operation manual for complete information on service intervals and element changing procedures.

COOLING SYSTEM

The cooling system of the Deutz engine needs to be checked and cleaned periodically. Consult the engine owners manual for the proper frequency and procedure.

COOLING BLOWER BELT

The following procedure should be followed to replace the cooling blower belt:

1. Allow the machine to cool.
2. Unfasten and slide the battery holder out from the welder.
3. Disconnect the negative battery cable.
4. Remove engine case side.
5. Loosen air cleaner hose clamp and detach hose.
6. Remove screws securing the engine end panel with air box and air cleaner attached to the base and roof. Pull this assembly away from roof and base. This will provide access for removing the belt from the blower pulley in step 8.
7. Loosen the alternator mounting bolts and rotate the alternator towards the engine.
8. Remove the old cooling blower belt and install a new one.
9. Adjust the cold belt tension to 63-73 lbs. midway between any two pulleys.
10. Reinstall the air cleaner hose, engine case side and end panel. Reattach the negative battery cable. Slide in and refasten the battery holder.
11. Check the cooling blower belt tension after 100 hours of operation. (Follow steps 1,2,3,4,9 & 10)

BATTERY HANDLING

GASES FROM BATTERY can explode.

- **Keep sparks, flame and cigarettes away from battery.**

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY - disconnect negative cable from old battery first and connect to new battery last.**
- **CONNECTING A BATTERY CHARGER - Remove battery from welder by disconnecting negative cable first, then positive cable and battery clamp. When reinstalling, connect negative cable last. Keep well ventilated.**

- **USING A BOOSTER - connect positive lead to battery first then connect negative lead to engine foot.**

BATTERY ACID CAN BURN EYES AND SKIN.

- **Wear gloves and eye protection and be careful when working near battery. Follow instructions printed on battery.**

PREVENTING ELECTRICAL DAMAGE

1. When replacing, jumping, or otherwise connecting the battery to the battery cables, the proper polarity must be observed. Failure to observe the proper polarity could result in damage to the charging circuit. The positive (+) battery cable has a red terminal cover.
2. If the battery requires charging from an external charger, disconnect the negative battery cable first and then the positive battery cable before attaching the charger leads. Failure to do so can result in damage to the internal charger components. When reconnecting the cables, connect the positive cable first and the negative cable last.

PREVENTING BATTERY DISCHARGE

Turn off the RUN/STOP to stop when engine is not running.

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PREVENTING BATTERY BUCKLING

Tighten nuts on battery clamp until snug.

CHARGING THE BATTERY

When you charge, jump, replace, or otherwise connect battery cables to the battery, be sure the polarity is correct. Improper polarity can damage the charging circuit. The Vantage positive (+) battery terminal has a red terminal cover.

If you need to charge the battery with an external charger, disconnect the negative cable first, then the positive cable before you attach the charger leads. After the battery is charged, reconnect the positive battery cable first and the negative cable last. Failure to do so can result in damage to the internal charger components.

Follow the instructions of the battery charger manufacturer for proper charger settings and charging time.

SERVICING OPTIONAL SPARK ARRESTOR

Clean every 100 hours.

⚠ WARNING

- **MUFFLER MAY BE HOT**
- **ALLOW ENGINE TO COOL BEFORE INSTALLING THE SPARK ARRESTER!**
- **DO NOT OPERATE ENGINE WHILE INSTALLING THE SPARK ARRESTER!**

NAMEPLATES / WARNING DECALS MAINTENANCE

Whenever routine maintenance is performed on this machine - or at least yearly - inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

Table DD.1 Engine Maintenance Components

ITEM	MAKE	PART NUMBER	SERVICE INTERVAL
Air Cleaner Element	DONALDSON FLEETGUARD	P822768 AF25436	CLEAN AS NEEDED REPLACE EVERY 200 HOURS
Cooling Blower Belt	DEUTZ GATES	223-5256 7580	SEE
Oil Filter Element	DEUTZ PUROLATOR NAPA FRAM	117-4418 PER2168 1820 PH3776	DEUTZ MAINTENANCE
Fuel Filter Element	DEUTZ PUROLATOR NAPA FRAM	117-4423 PC42 3358 P4102	DECAL
Water Separator Element	LINCOLN STANADYNE	M16890-C 31572	REPLACE EVERY 1000 HOURS
Fuel Pre-Filter Screen	LINCOLN STANADYNE	M16890-B 29575	INSPECT EVERY 1000 HOURS
Battery	----------	BCI Group 34	INSPECT EVERY 500 HOURS

WELDER / GENERATOR MAINTENANCE

STORAGE

Store the BIG RED® 600 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

It is normal for the brushes and slip rings to wear and darken slightly. Inspect the brushes when a generator overhaul is necessary.

⚠ WARNING

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

GFCI MODULE TESTING AND RESETTING PROCEDURE

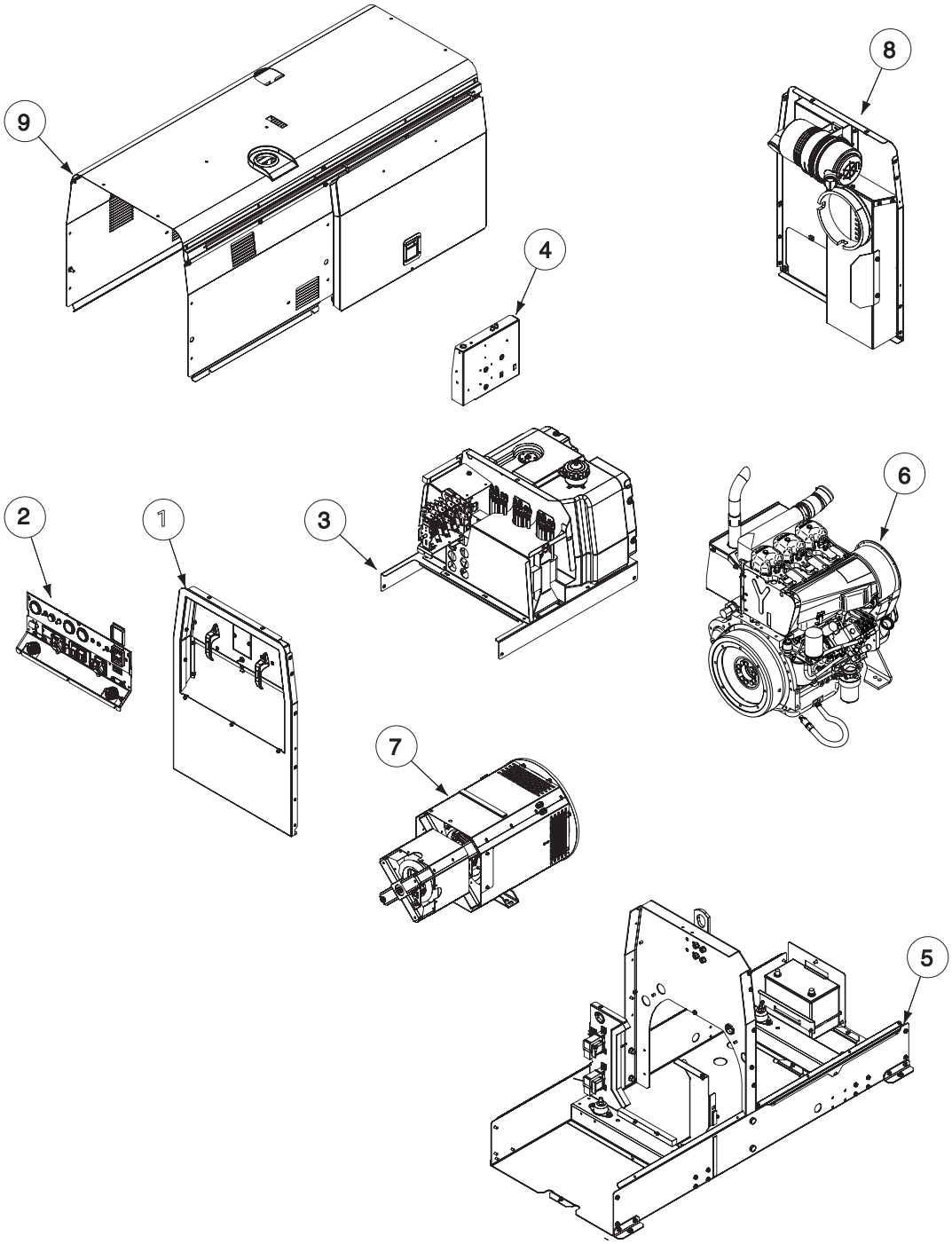
The GFCI module should be properly tested at least once every month or whenever it is tripped. To properly test and reset the GFCI module:

- If the module has tripped, first carefully remove any load and check it for damage.
- If the equipment has been shut down, it must be restarted.
- The equipment needs to be operating at high idle speed and any necessary adjustments made on the control panel so that the equipment is providing at least 80 volts to the receptacle input terminals.
- The circuit breaker for this receptacle must not be tripped. Reset if necessary.
- Push the "Reset" button located on the GFCI module. This will assure normal GFCI operation.
- Plug a night-light (with an "ON/OFF" switch) or other product (such as a lamp) into the Duplex receptacle and turn the product "ON".
- Push the "Test" button located on the GFCI module. The night-light or other product should go "OFF".
- Push the "Reset" button, again. The light or other product should go "ON" again.

If the light or other product remains "ON" when the "Test" button is pushed, the GFCI module is not working properly or has been incorrectly installed (miswired). If your GFCI module is not working properly, contact a qualified, certified electrician who can assess the situation, rewire the GFCI module if necessary or replace the device.

FIGURE DD.2 - MAJOR COMPONENT LOCATIONS

1. Case Front & Control Panel Assembly
2. Lower Control Panel Assembly
3. Reactor, Rectifier & Fuel Tank Assembly
4. Inner Control Panel Assembly
5. Base, Battery & Lift Bale Assembly
6. Engine & Filter Assembly
7. Generator Assembly
8. Case Back Assembly
9. Covers Assembly



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UNLESS NOTED OTHERWISE THE FOLLOWING SECTIONS ARE FOR THE SERVICING AND REPAIR OF THE BIG RED® 500 AND THE BIG RED® 600.

Theory of Operation E-1

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Battery, Run/Stop Switch, Starter, Engine Alternator, And Engine Shutdown Circuits E-3

Auxiliary Rotor, Auxiliary Stator And Excitation (Flashing) E-4

Weld Rotor, Weld Stator, Selector Switch And Field Circuit E-5

Tapped Reactor And Three-Phase Rectifier Bridge E-6

Engine Protection E-7

Battery Circuit E-7

FIGURE E.1 BLOCK LOGIC DIAGRAM

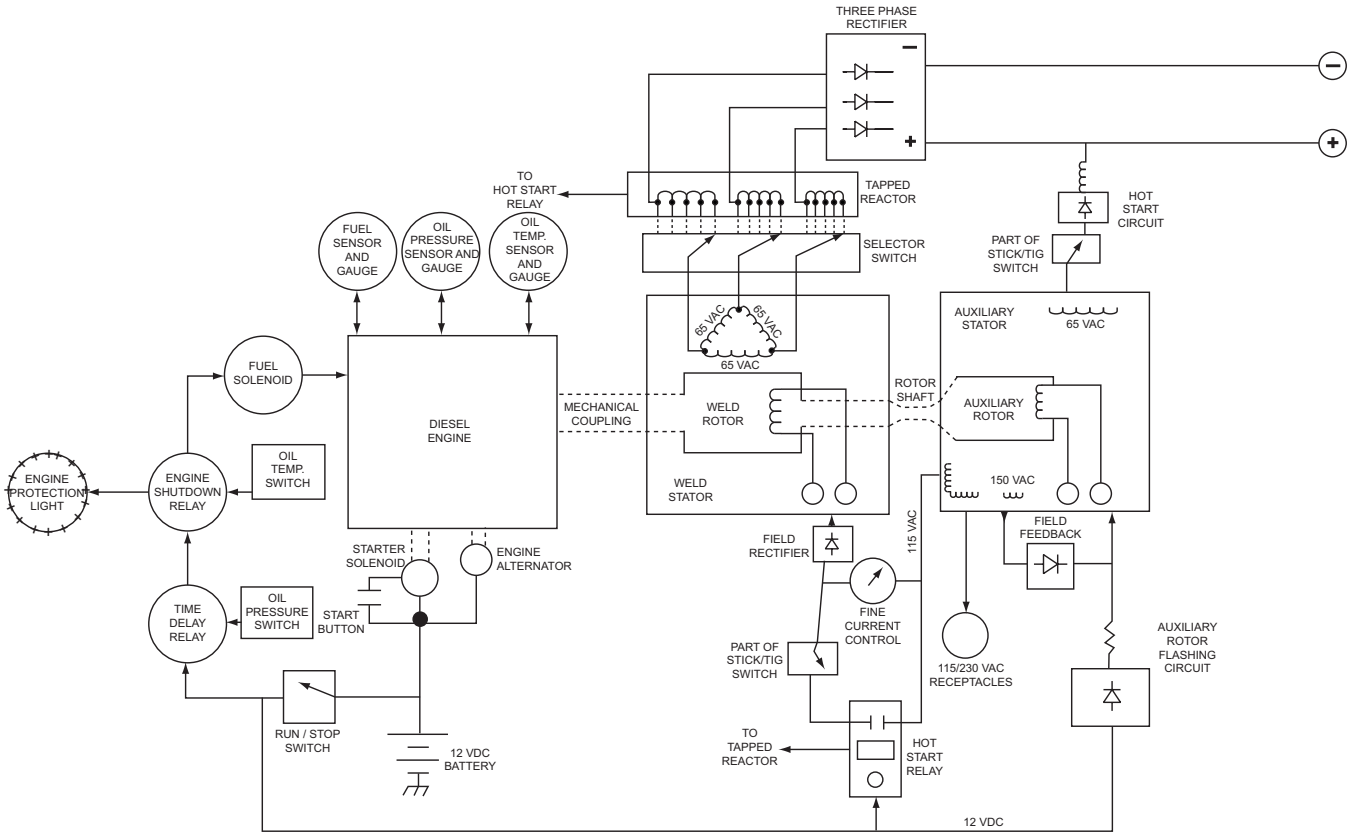
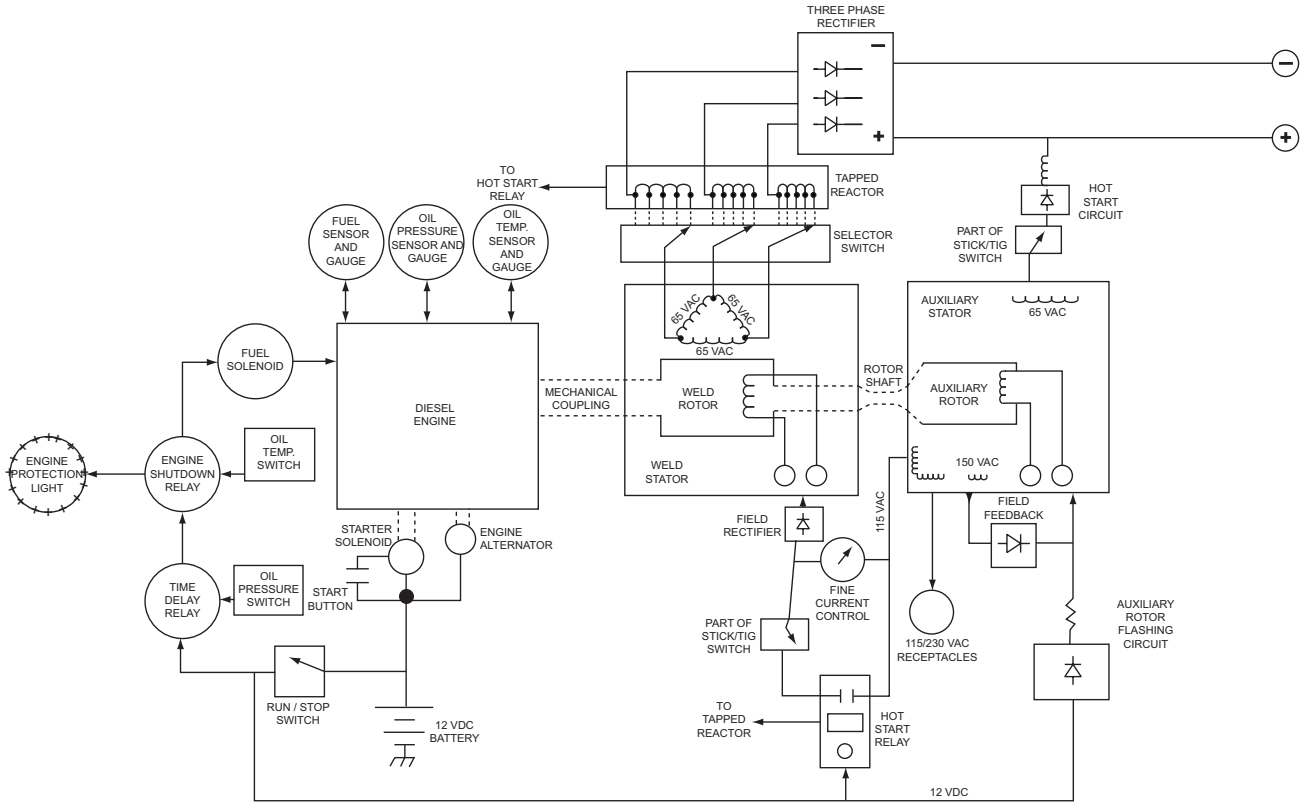


FIGURE E.1 - GENERAL DESCRIPTION



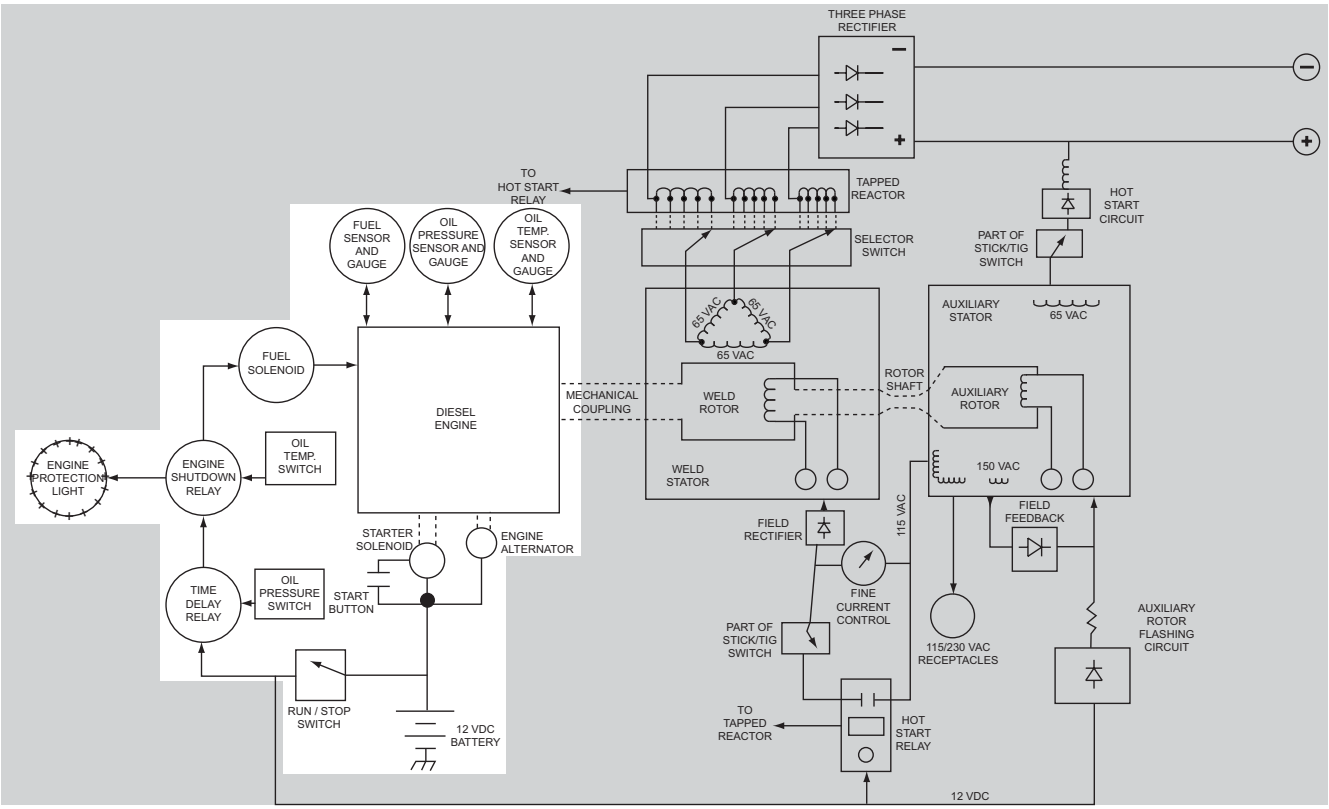
GENERAL DESCRIPTION

The BIG RED 500 and 600 machines are diesel engine driven welders capable of producing DC constant current output for stick welding, arc gouging, and DC TIG welding. They are also capable of producing 6000 watts of auxiliary power via an independent auxiliary rotor and stator.

The generator is a dual stator and rotor design with two sealed bearings for maintenance free service. The rotors are copper wound design with two slip rings and brushes. The stators are would entirely with heavy gauge copper wire and insulated with NEMA class F insulation material.

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

FIGURE E.2 - BATTERY, RUN/STOP SWITCH, STARTER, ENGINE ALTERNATOR, AND ENGINE SHUTDOWN CIRCUITS



BATTERY, RUN/STOP SWITCH, STARTER, ENGINE ALTERNATOR, AND ENGINE SHUTDOWN CIRCUITS

The 12VDC battery supplies power to the engine's Starter/Solenoid, the engine's Alternator and, through the Run/Stop switch, to the engine's shutdown circuitry.

When the Run/Stop switch is closed (run position) 12VDC is applied to the Timer Delay Relay, the Engine Shutdown Relay, and via the Engine Shutdown Relay to the Fuel Shutdown Solenoid. 12VDC is also applied to the various engine sensors and gauges.

When the Run/Stop switch is closed and the Start Button is pushed the Starter/Solenoid and the Fuel Solenoid will be energized. When the Run/Stop switch is closed, the Timer Delay Relay allows 60 seconds for the engine to be started and oil pressure to "open" the normally "closed" oil pressure switch. In the event of a low oil pressure or high oil temperature condition the Engine Protection Relay will activate and de-energize the Fuel Shutdown Solenoid and the engine will stop running. The Engine Protection Light will also come on.

When the Run/Stop switch is opened (stop position) the 12VDC is removed from the Fuel Shutdown Solenoid and the engine stops running.

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

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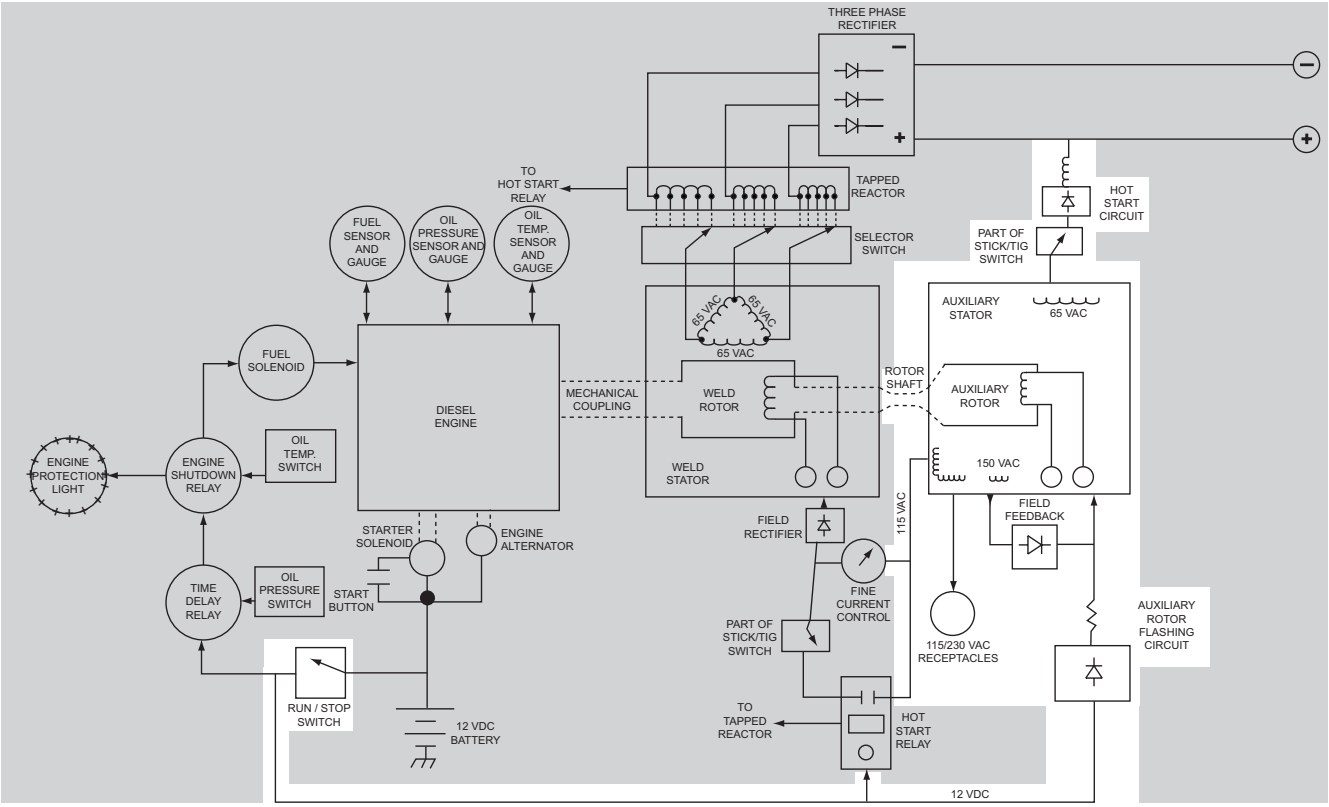
FIGURE E.3 - AUXILIARY ROTOR, AUXILIARY STATOR AND EXCITATION (FLASHING)



AUXILIARY ROTOR, AUXILIARY STATOR AND EXCITATION (FLASHING)

When the Run/Stop switch is in the run position battery voltage (12VDC) is applied to the Auxiliary Rotor Flashing circuit and also to the Hot Start Relay. The 12VDC from the Auxiliary Rotor Flashing circuit is applied, via a brush and slip ring configuration, to the Auxiliary Rotor. This excitation voltage magnetizes the Auxiliary Rotor lamination. The Auxiliary Rotor is mechanically coupled to the diesel engine. When the engine is started this rotating magnet (Rotor) induces an AC voltage in the stationary windings of the Auxiliary Stator. The 150VAC from the field feedback winding, that is housed in the Auxiliary Stator, is rectified and applied to the Auxiliary Rotor.

There are two other isolated windings incorporated in the Auxiliary Stator lamination. One of these windings is tapped and provides 120VAC and 240VAC of auxiliary power to the appropriate receptacles. One side of the 120VAC is also utilized to supply field excitation and power to the Weld Rotor. The 65VAC winding powers the Hot Start Circuit via the Stick/TIG Switch.

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

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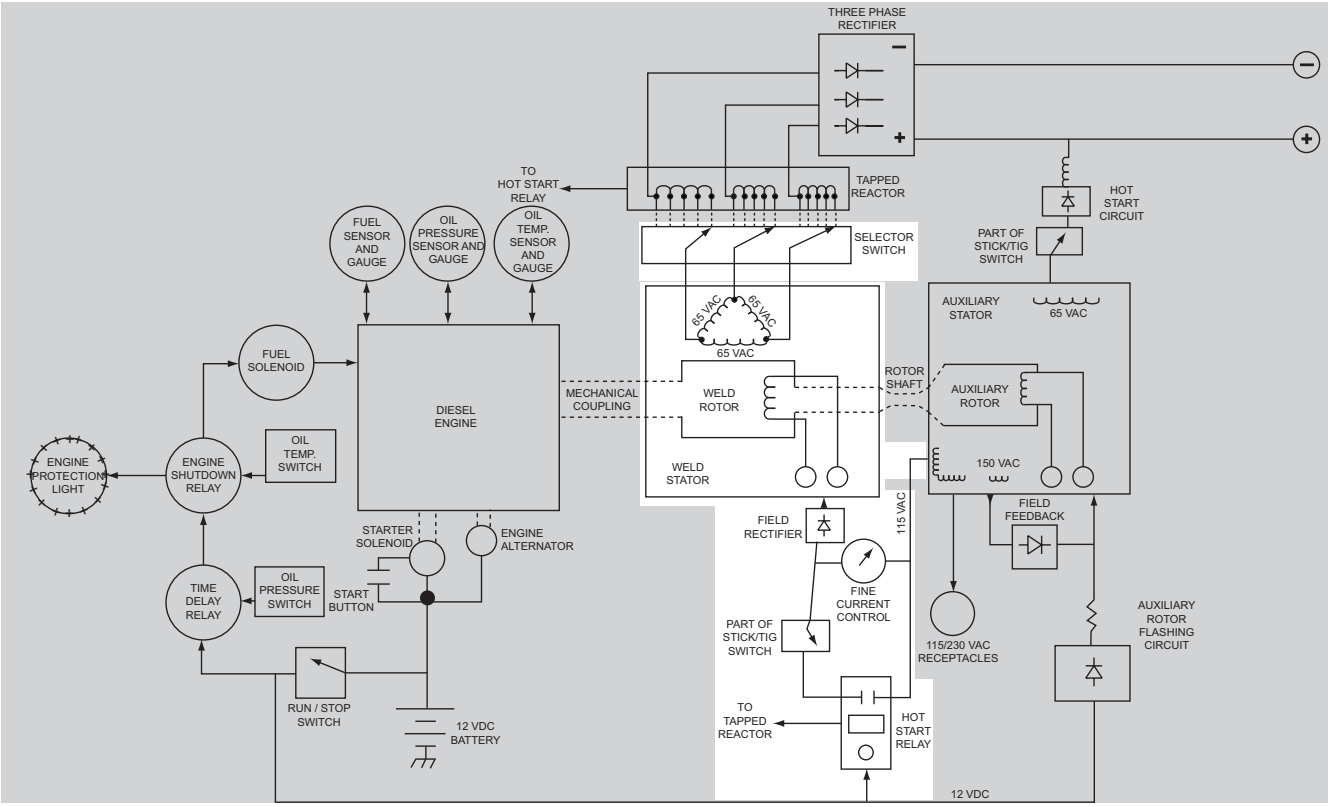
FIGURE E.4 - WELD ROTOR, WELD STATOR, SELECTOR SWITCH AND FIELD CIRCUIT



WELD ROTOR, WELD STATOR, SELECTOR SWITCH AND FIELD CIRCUIT

Once the Auxiliary Stator has been energized 120VAC is applied through the Fine Current Control Rheostat to the weld field rectifier and filter capacitor. This rectified and filtered DC voltage is applied to the Weld Rotor via a brush and slip ring configuration. This field voltage magnetizes the Weld Rotor lamination. The Weld Rotor is mechanically coupled to the diesel engine. When the engine is running this rotating magnet (Rotor) induces an AC voltage in the three-phase stationary windings of the Weld Stator.

The amount of current applied to the Weld Rotor is dependent upon the position of the Fine Current Control Rheostat. If the Stick/TIG switch is in the Stick (closed position) the Fine Current Control Rheostat is shunted out by the contacts in the Hot Start Relay and the full potential of the 120VAC winding is applied to the weld field rectifier and filter capacitor. This provides maximum open circuit voltage for “hot starting” with stick electrodes. The Hot Start Relay is energized by the 12VDC battery voltage and it is de-energized when weld current passes through the Reactor and a small voltage drop is developed across the Reactor windings.

With maximum rotor field current the three-phase windings in the Weld Stator develop approximately 65VAC measured phase to phase. This is at open circuit conditions with no load on the machine. This three-phase welding output is connected to a Selector Switch. This heavy duty switch couples the AC output of the Weld Stator to the Tapped Reactor.

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

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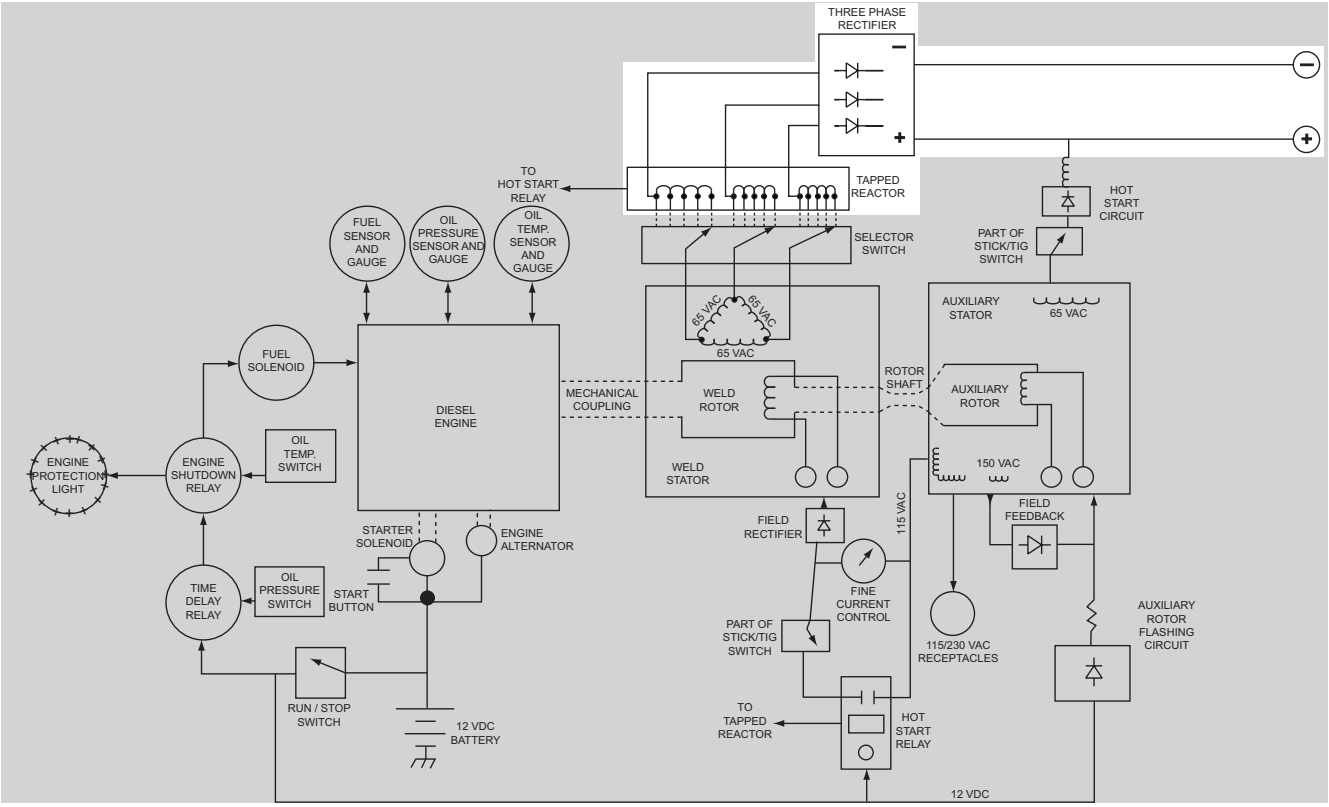
FIGURE E.5 - TAPPED REACTOR AND THREE-PHASE RECTIFIER BRIDGE



TAPPED REACTOR AND THREE-PHASE RECTIFIER BRIDGE

The three-phase welding output of the stator is coupled to the Tapped Reactor through the Selector Switch. Dependent on the Selector Switch setting the Tapped Reactor provides four (Big Red 500) or five (Big Red 600) overlapping output current settings. The more reactor windings that are in the welding circuit the lower the output current.

The output of the Tapped Reactor is connected to the Three-Phase Output Rectifier Bridge. The Rectifier Bridge changes the AC output of the Weld Stator to a DC output for welding. This DC output is connected to the positive and negative welding output terminals.

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

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ENGINE PROTECTION:

There is a warning indicator light for engine high oil temperature or low oil pressure. The light remains off with proper oil temperature and proper oil pressure. In the event of a high oil temperature or a low oil pressure condition the light will turn on and the engine protection circuitry will shut down the engine. The light will remain on after the engine has stopped. In order to re-start the engine the engine protection system must be reset by returning the Run/Stop switch to the Stop position and then back to the Run position.

NOTE: Under normal conditions the engine protection light will remain off when the Run/Stop switch is in the Run position. However, if the engine is not started within 60 seconds the light will come on. When this occurs the Run/Stop switch must be returned to the Stop position to reset the engine protection system.

BATTERY CIRCUIT:

The battery circuit breaker protects the engine circuitry that powers the three gauges, fuel/hours, oil temperature and oil pressure. It also protects the engine shutdown relay, the timer delay relay, the hot start relay hold solenoid, and the auxiliary rotor flashing circuitry.

There is a light to indicate a malfunctioning battery charging system. The light is off when the battery charging system is functioning correctly. If the light turns on the engine alternator may not be operating correctly or the cooling blower belt may be broken.

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

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

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

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

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

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

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal cover(s) are removed.	1. Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	1. Contact the Lincoln Electric Service Department. 1-888-935-3877.
The engine starts and runs normally but there is no welding output or auxiliary voltage output. (120VAC/240VAC).	1. Check the 15amp auxiliary rotor circuit breaker (CB6). Reset if tripped. 2. Check for loose or missing brushes on the auxiliary rotor. 3. Check for loose or broken lead connections at the auxiliary rotor brush holder.	1. Check for loose or broken connections between the Run/Stop switch and the auxiliary rotor positive brush holder. See the Wiring Diagram. 2. Check the flashing diode bridge (D1) and the R1 resistor. See the Wiring Diagram. 3. Check the field diode bridge (D3) and associated leads for loose or faulty connections. See the Wiring Diagram. 4. Perform the ***Auxiliary Rotor Test***. 5. Check for “opens” or “shorts” in the auxiliary stator windings. See the Wiring Diagram.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The engine starts and runs normally but there is no welding output. The auxiliary voltage output is normal. (120VAC/240VAC).	1. Check the 15amp weld rotor circuit breaker (CB1). Reset if tripped. 2. Check the welding cables for loose or faulty connections. 3. If a remote control device is NOT connected to the Remote Receptacle, the Local/Remote switch must be in the "local" position. 4. Check for loose or missing brushes at the welding rotor. 5. Check for loose or broken lead connections at the welding rotor brush holder.	1. Check the weld rotor field diode bridge (D2), the filter capacitor and associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check the Local/Remote switch for proper operation. 3. Check the Fine Current Control Rheostat for resistance and proper operation. Normal resistance is 50 ohms. See the Wiring Diagram. 4. Check the continuity of lead #6, 6E, 6A and 6B. See the Wiring Diagram. 5. Perform the ***Weld Rotor Test***. 6. Check the Output Range Switch and associated connections. See the Wiring Diagram. 7. Check the Output Reactor for "opens". 8. Check the heavy current carrying output leads, between the output terminals and the three phase rectifier bridge, for loose or faulty connections. See the Wiring Diagram. 9. Perform the ***Three Phase Output Rectifier Test***. 10. Check for "opens" or "shorts" in the weld stator windings. Perform the ***Weld Stator Test***. See the Wiring Diagram.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The engine starts and runs normally but there is no auxiliary output. The welding output is normal. (90VDC –Stick Mode- open circuit voltage).	1. Check the circuit breakers CB4, CB3 and the Ground Fault Circuit Interrupter (See the **Maintenance Section**). See the Wiring Diagram. Reset if tripped.	1. Check the connections between the auxiliary receptacles, the circuit breakers and the stator windings for loose or faulty connections. See the Wiring Diagram.
The welding open circuit voltage (OCV) cannot be varied or adjusted.	1. If the machine is in the TIG mode the OCV should be adjustable using the Fine Current Control or the Remote Control Potentiometer. 2. If the machine is in the Stick mode the OCV will be held at a high level, for hot starting, and will not be adjustable until an arc is established.	1. The Fine Current Control may be faulty. Normal resistance is 50 ohms total. See the Wiring Diagram. 2. The Local/Remote switch may be faulty. See the Wiring Diagram. 3. The Hot Start Relay may be faulty. See the Wiring Diagram. 4. The Stick/Tig switch may be faulty. See the Wiring Diagram.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
The engine will not “crank” when the Start Button is activated.	1. The battery may be low or faulty. 2. Check for loose or faulty battery cable connections at the battery and also at the starter solenoid and chassis ground. See the Wiring Diagram.	1. Check the wiring for loose or faulty connections between the Start Button and the starter solenoid. See the Wiring Diagram. 2. The Start Button may be faulty. 3. The starter motor or starter solenoid may be faulty. 4. The engine may be seized and in need of major repair.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
The engine "cranks" but will not start.	1. Make sure the Run/Stop switch is in the "Run" position. 2. Make sure the fuel shut-off valve is in the "open" position. 3. If the Run/Stop switch is in the "Run" position for more that 60 seconds without the engine being started the Run/Stop switch must be switched off (stop position) and then turned back to the "Run" position. 4. The fuel filters may be clogged. 5. If there is high oil temperature condition or a low oil pressure situation the engine protection light will be lit and the engine will "crank" but will not start.	1. The time delay relay CR3 may be faulty. See the Wiring Diagram. 2. The engine protection relay (CR1) may be faulty. Perform the ***Engine Protection Relay Test***. See the Wiring Diagram. 3. The shutdown fuel solenoid may be faulty. See the Wiring Diagram.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
ENGINE PROBLEMS		
The engine starts but shuts down shortly after it starts.	1. Make sure there is an adequate fuel supply in the fuel tank. 2. The fuel filters may be clogged. 3. If the engine protection light is lit there may be a low oil pressure or high oil temperature condition. 4. If the battery light is lit the battery charging system may be faulty causing a low battery condition.	1. The shutdown fuel solenoid may be faulty. See the Wiring Diagram 2. The engine protection relay (CR1) may be faulty. Perform the ***Engine Protection Relay Test***. See the Wiring Diagram. 3. If the battery light is lit perform the ***Engine Alternator Test***.
The battery will not stay charged.	1. If the Battery Light is lit the engine alternator may not be functioning correctly. 2. Check for a loose or broken fan belt. 3. The battery may be faulty.	1. Perform the ***Engine Alternator Test***. 2. Check for loose or faulty connections in the battery charging circuit. See the Wiring Diagram.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The welding arc is weak and or erratic.	1. Check the welding cables for loose or faulty connections. 2. Make sure the electrode being used is correct for the process.	1. Perform the ***Weld Rotor Test***. 2. Check the Output Range Switch and associated connections. See the Wiring Diagram. 3. Check the Output Reactor for "opens". 4. Check the heavy current carrying output leads, between the output terminals and the three phase rectifier bridge, for loose or faulty connections. See the Wiring Diagram. 5. Perform the ***Three Phase Output Rectifier Test***.
When in the "Stick" mode getting the arc started is difficult.	1. Make sure the Stick/Tig switch is in the Stick position and functioning correctly. See the Wiring Diagram.	1. Check the Hot Start Relay (CR4). Make sure it is receiving 12VDC on the relay coil and the contacts are closing. See the Wiring Diagram. 2. Check the Hot Start Diode Bridge (D4) and associated chokes. See the Wiring Diagram. 3. With the engine running at 1890RPM check for the presence of 65VAC at leads #206 to #207. See the Wiring Diagram.

⚠ CAUTION

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

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ENGINE ALTERNATOR TEST (BIG RED 500 ONLY) (DEUTZ 2011L03i)

⚠ WARNING

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

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

TEST DESCRIPTION

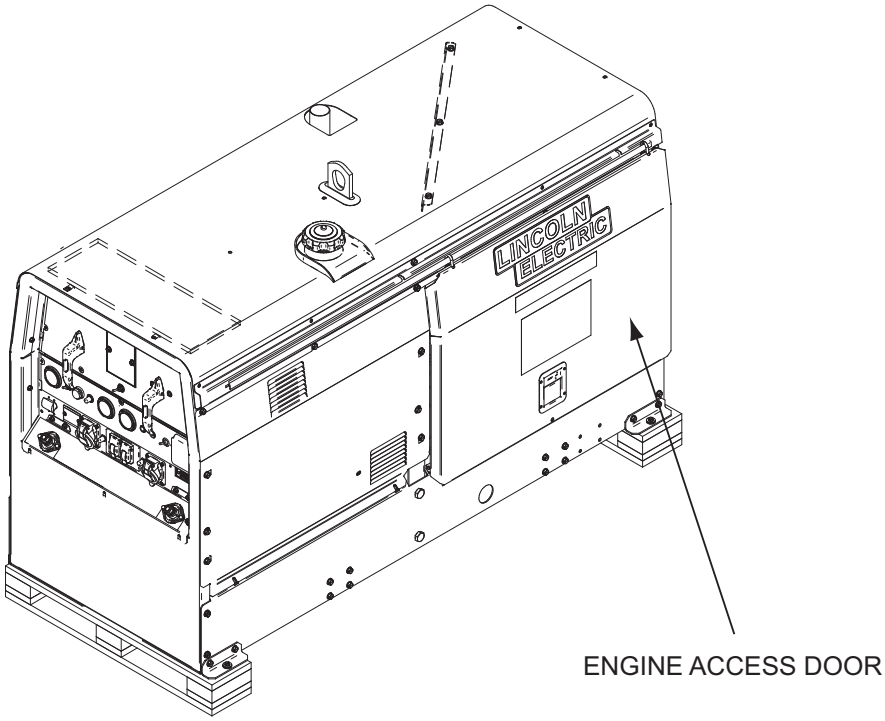
This procedure will determine if the Engine Alternator is functioning properly.

MATERIALS NEEDED

1/2” Wrench
Volt / Ohmmeter

ENGINE ALTERNATOR TEST
(BIG RED 500 ONLY) (DEUTZ 2011L03i) (continued)

FIGURE F.1 – ENGINE ACCESS DOOR



PROCEDURE

1. Turn the engine off.
2. Open and remove engine access door. See Figure F.1.
3. Using a 1/2" wrench, remove the two bolts securing the engine side panel. ***See Figure F.2***.
4. Locate the engine alternator. Alternator is located behind engine side panel.
5. Locate leads 238, 239 and 5F (ground) on the alternator. See Wiring Diagram.
6. Set the run/stop switch to the STOP position, check for the presence of 12 to 13VDC (battery voltage) from leads 238 to 5F.
7. Check for the presence of 0VDC between leads 239 and 5F.

⚠ WARNING

ELECTRIC SHOCK can kill.

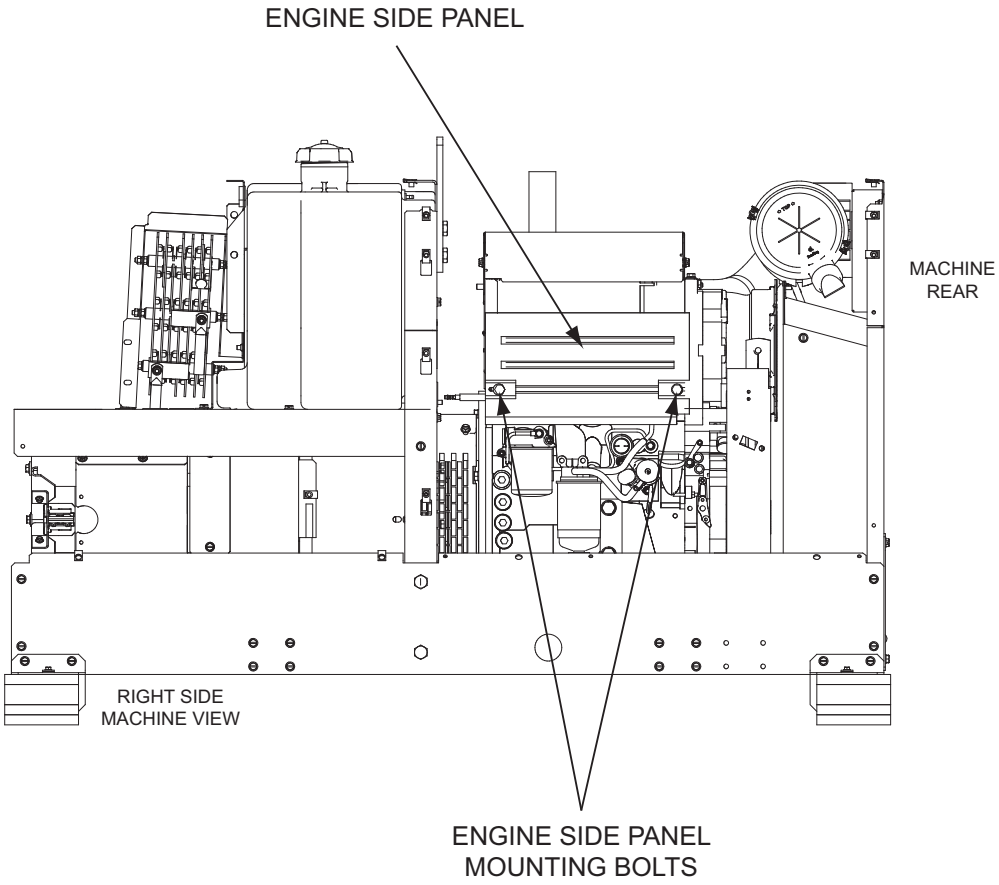
- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground**
- **Always wear dry insulating gloves.**

8. Set the run/stop switch to the RUN position (engine OFF), check for the presence of approx. 1.2 VDC from leads 239 to 5F. This is the alternator flashing voltage. If this voltage is missing, check the run/stop switch and circuit breaker CB5. See Wiring Diagram.
9. Start the engine.

Return to Section TOC
Return to Master TOC

ENGINE ALTERNATOR TEST (BIG RED 500 ONLY) (DEUTZ 2011L03i) (continued)

FIGURE F.2 – ENGINE SIDE PANEL



10. Carefully check from leads 238 to 5F and 239 to 5F. Expected readings should be approx. 14VDC.

    NOTE: If either voltage is missing or low, the alternator may be faulty. See Wiring Diagram.

11. When testing is complete, install previously removed engine side panel and close engine access door.

NOTES

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Return to Master TOC

OUTPUT RECTIFIER TEST (3 PHASE)

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will determine if the Output Rectifier is functioning properly.

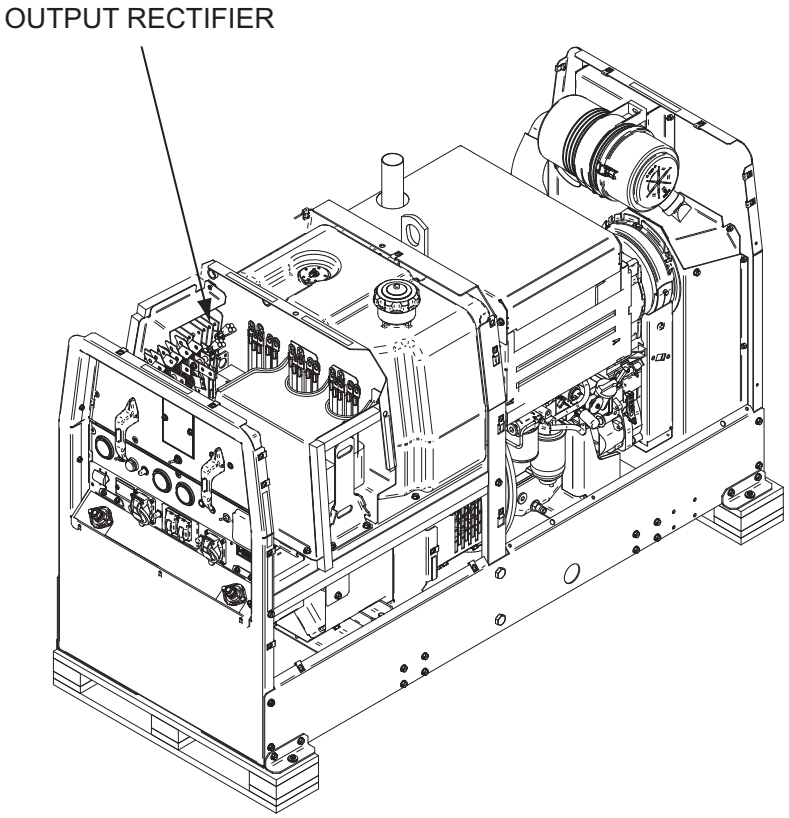
MATERIALS NEEDED

1/2” Wrench
Analog Ohm/Voltmeter or Diode Tester

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER TEST (3 PHASE) (continued)

FIGURE F.3 – OUTPUT RECTIFIER LOCATION



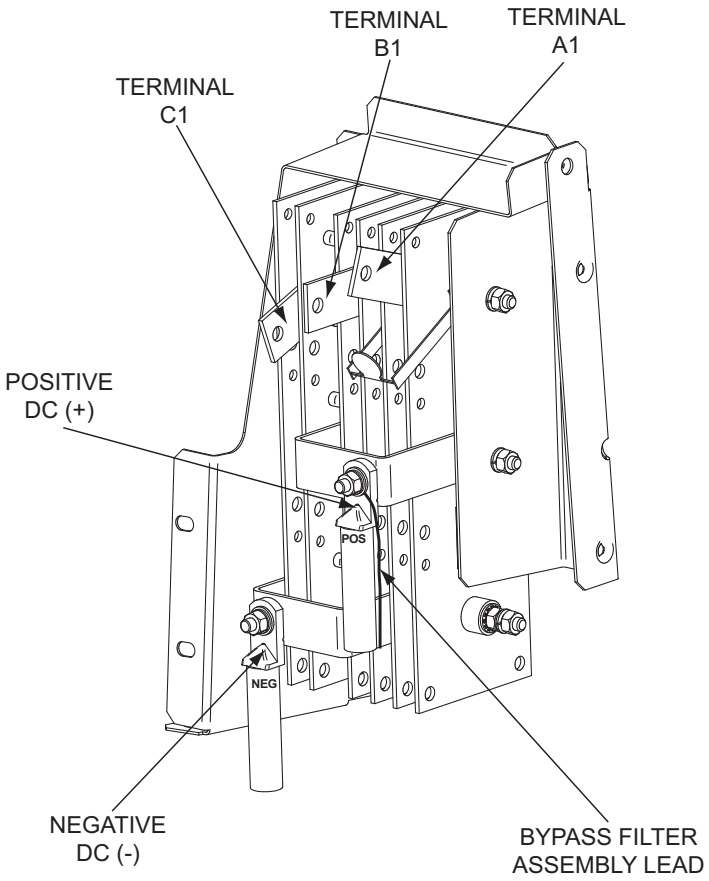
PROCEDURE

1. Turn the engine off.
2. Perform the ***Case Cover Removal Procedure,*** as needed.
3. Locate the Output Rectifier. See Figure F.3.
4. Locate leads A1, B1, C1, positive DC(+) and negative DC(-) terminals on the Output Rectifier. ***See Figure F.4***.
5. Using a 1/2" wrench, label and disconnect Leads A1, B1 and C1. Note washer placement for reassembly.
   NOTE: Electrically isolate the flexible terminal leads by bending them outward into the free air.
6. Disconnect bypass filter assembly lead located at the back of the positive output terminal. ***See Figure F.4***.
7. Using an ohmmeter or diode tester, check the Output Rectifier. ***See Table F.1***.
   NOTE: An individual open diode will not be detected.
8. If any faults are indicated, replace the Output Rectifier. ***See Output Rectifier Removal and Replacement Procedure.***
9. When testing is complete, connect previously removed leads A1, B1, C1 leads.
10. Connect bypass filter assembly lead previously removed.
11. Install case roof and left side case covers.

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER TEST (3 PHASE) (continued)

FIGURE F.4 – OUTPUT RECTIFIER TERMINAL LOCATIONS



Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER TEST (3 PHASE) (continued)

TABLE F.1 – DIODE TEST TABLE

RECTIFIER TERMINAL CONNECTIONS	DIODE TEST		
	TEST INSTRUMENT		DIODE BIAS & EXPECTED TEST RESULT
	(+) Lead	(-) Lead	
	Terminal A1	DC(+)	Forward Bias (Low Resistance)
	Terminal B1	DC(+)	Forward Bias (Low Resistance)
	Terminal C1	DC(+)	Forward Bias (Low Resistance)
	DC(-)	Terminal A1	Forward Bias (Low Resistance)
	DC(-)	Terminal B1	Forward Bias (Low Resistance)
	DC(-)	Terminal C1	Forward Bias (Low Resistance)
	Terminal A1	DC(-)	ReverseBias (High Resistance)
	Terminal B1	DC(-)	ReverseBias (High Resistance)
	Terminal C1	DC(-)	ReverseBias (High Resistance)
	DC(+)	Terminal A1	ReverseBias (High Resistance)
	DC(+)	Terminal B1	ReverseBias (High Resistance)
	DC(+)	Terminal C1	ReverseBias (High Resistance)

ENGINE PROTECTION RELAY TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will determine if the Engine Protection Relay is functioning properly.

MATERIALS NEEDED

Ohmmeter
12VDC Supply

Return to Section TOC
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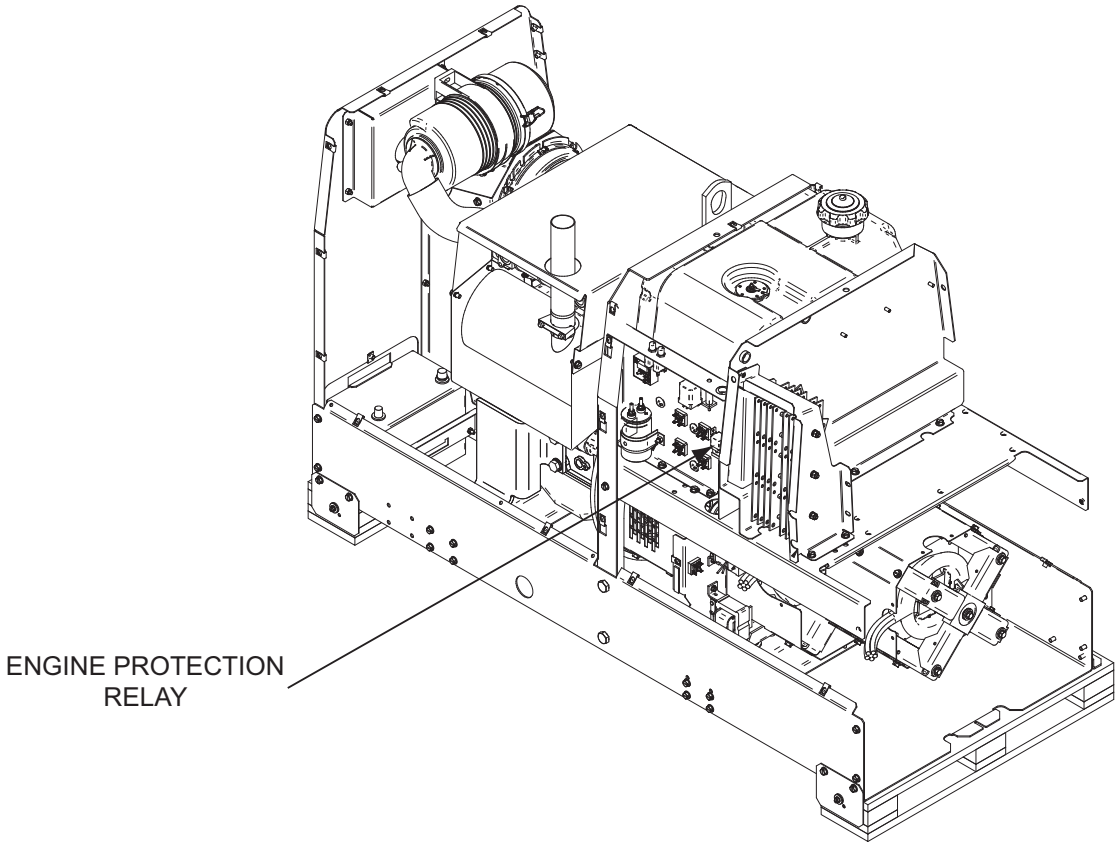
ENGINE PROTECTION RELAY TEST (continued)

FIGURE F.5 – ENGINE PROTECTION RELAY LOCATION



PROCEDURE

1. Turn the engine off.
2. Perform the ***Case Cover Removal Procedure,*** as necessary***.***
3. Locate the Engine Protection Relay. See Figure F.5.
4. Carefully unplug the Engine Protection Relay from it's socket.

⚠ 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.**

5. Using an ohmmeter, perform the tests in ***Table F.2***. ***See Figure F.6***.
6. If any faults are indicated, replace the Engine Protection Relay.
7. When testing is complete, connect the Engine Protection Relay.
8. Install the left side case cover.

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ENGINE PROTECTION RELAY TEST (continued)

FIGURE F.6 – TEST POINTS

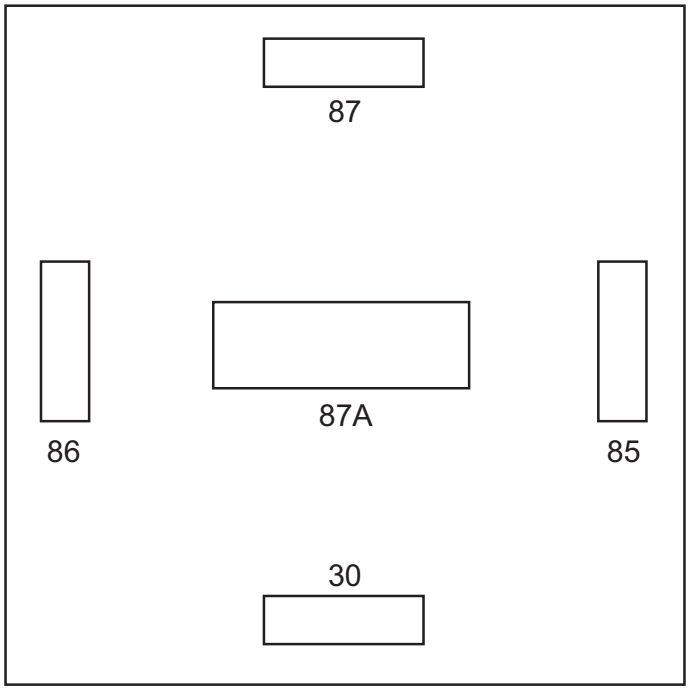

TABLE F.2 – ENGINE PROTECTION RELAY TESTING

TEST CONDITIONS	TERMINAL	TERMINAL	EXPECTED READING
NO VOLTAGE APPLIED	30	87A	0 OHMS
NO VOLTAGE APPLIED	30	87	INFINITE RESISTANCE
NO VOLTAGE APPLIED	86 (+)	85 (-)	80 - 90 OHMS
12 VDC APPLIED TO 86 (+) TO 85 (-)	30	87A	INFINITE RESISTANCE
12 VDC APPLIED TO 86 (+) TO 85 (-)	30	87	0 OHMS

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Return to Section TOC
Return to Master TOC

WELD STATOR VOLTAGE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will determine if the correct AC voltages are being generated from the Weld Stator Windings.

MATERIALS NEEDED

Volt/Ohmmeter
7/16” Wrench

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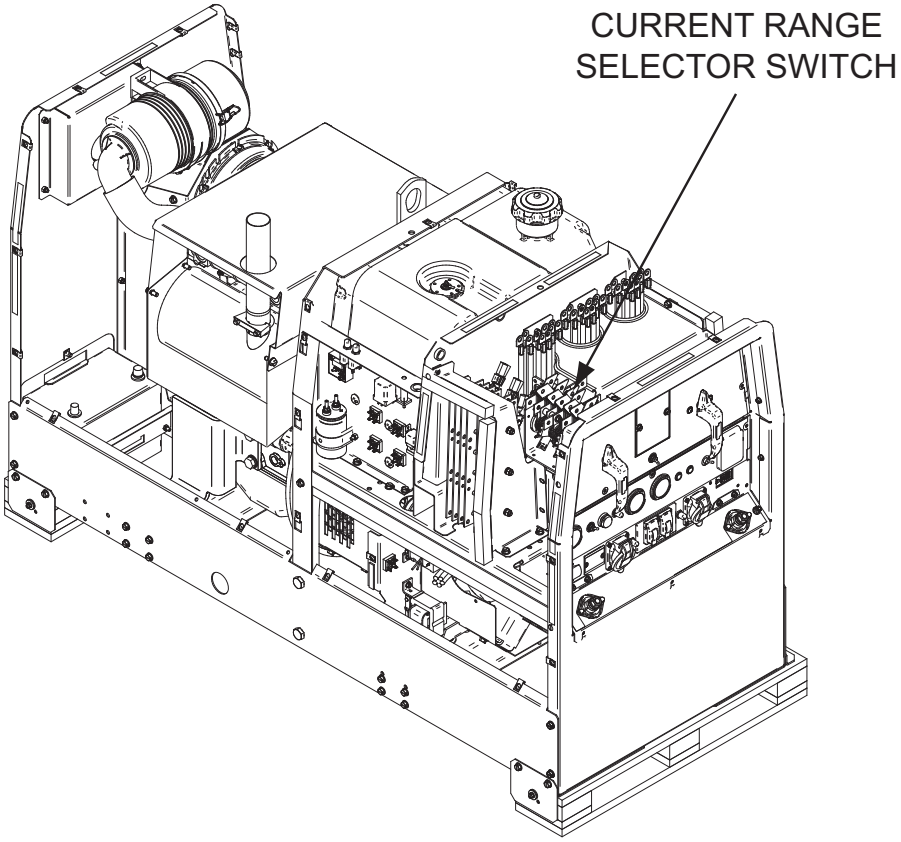
Return to Master TOC

WELD STATOR VOLTAGE TEST (continued)

FIGURE F.7 – OUTPUT RANGE SELECTOR SWITCH LOCATION



PROCEDURE

1. Turn the engine off.
2. Perform the ***Case Cover Removal Procedure***, as necessary.
3. Locate the output range selector switch . See Figure F.7.
4. Locate leads W1 thru W6 on the output range selector switch. ***See Figure F.8***.

⚠ 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.**

5. Start the engine
6. Check for approx. 55VAC from leads W1/W6 to W4/W5.
7. Check for approx. 55VAC from leads W4/W5 to W2/W3.
8. Check for approx. 55VAC from leads W2/W3 to W1/W6.
9. If any voltages are low or missing, disconnect the stator leads from the current selector switch using a 7/16” wrench. ***See Figure F.8***. Note lead and washer placement for reassembly.

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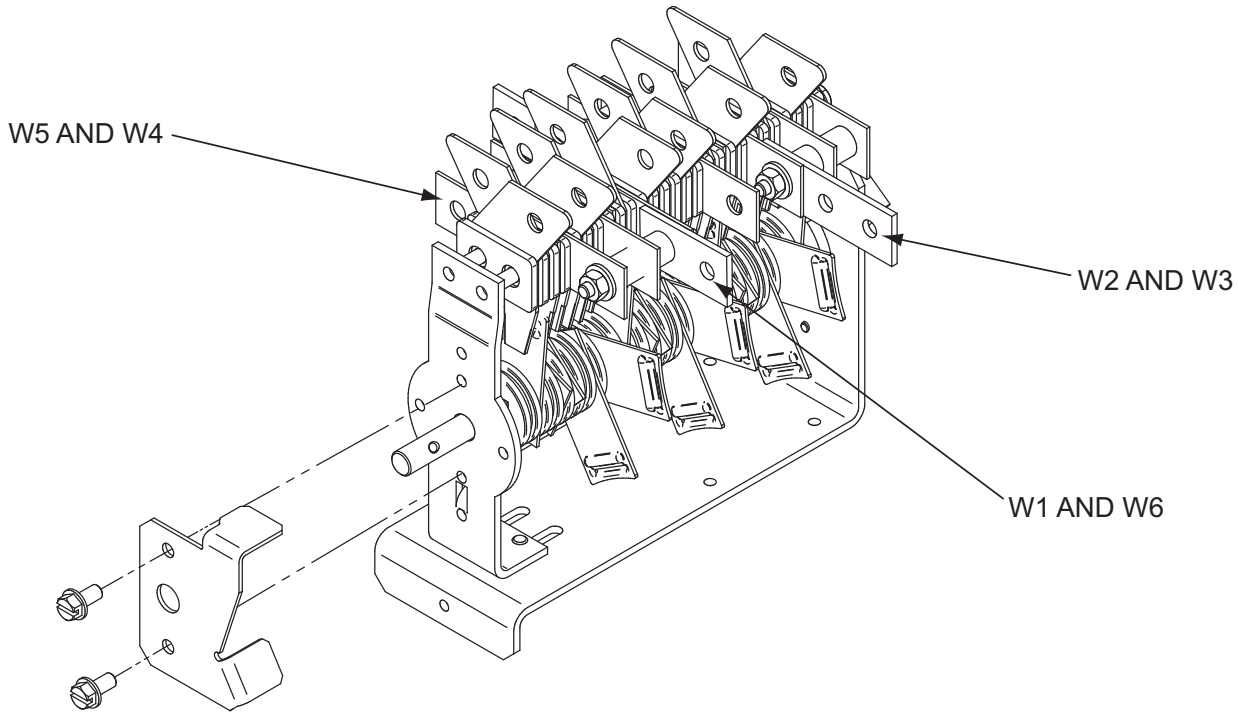
WELD STATOR VOLTAGE TEST (continued)

FIGURE F.8 – SELECTOR SWITCH LEAD LOCATIONS



10. Check the resistances from phase to phase. The resistance should be very low. See Wiring Diagram.
11. Check the resistances from phases to ground. The resistance should be greater than 500,000 ohms.
12. If the stator is faulty, replace. ***See Weld Stator Removal and Replacement Procedure.***
13. When test is complete, connect previously removed leads.
14. Install the case roof cover.

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Return to Master TOC

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Return to Master TOC

AUXILIARY ROTOR VOLTAGE AND RESISTANCE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will determine if the Auxiliary Rotor is receiving the correct input voltage and is functioning properly.

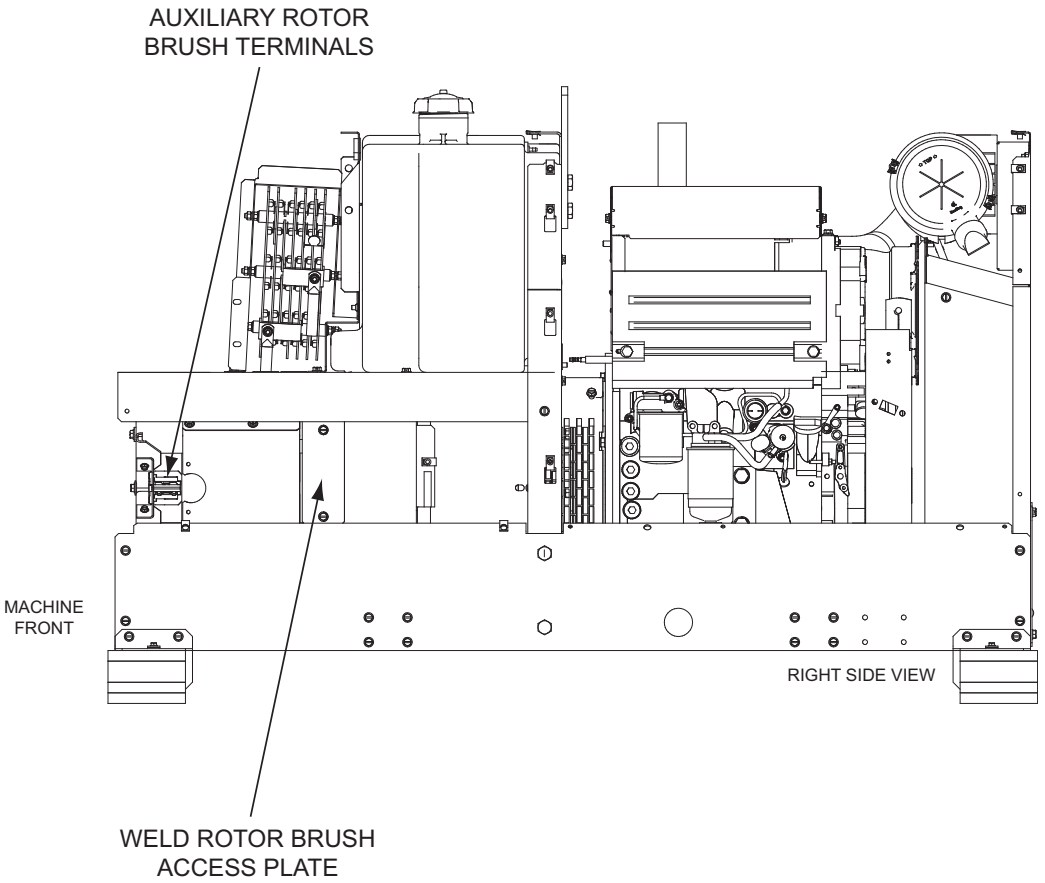
MATERIALS NEEDED

Volt/Ohmmeter

Return to Section TOC
Return to Master TOC

AUXILIARY ROTOR VOLTAGE AND RESISTANCE TEST (continued)

FIGURE F.9 – AUXILIARY ROTOR BRUSH TERMINAL LOCATION



PROCEDURE

1. Turn the engine off.
2. Perform the ***Case Cover Removal Procedure***, as necessary.
3. Locate the Auxiliary Rotor Brush terminals. Leads 202(-) and 204(+) (brush nearest the lamination). ***See Figure*** F.9 ***and F.10***.

⚠ 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.**

4. Start the engine.
5. Check the voltage from leads 202(-) and 204(+). Normal reading should be approx. 136VDC. ***See Figure F.10***.
6. If the voltage is low or missing, check the following components and see Wiring Diagram.

   CB6 (15 amps)

   Bridge D3

   Bridge D5

   Bridge D1

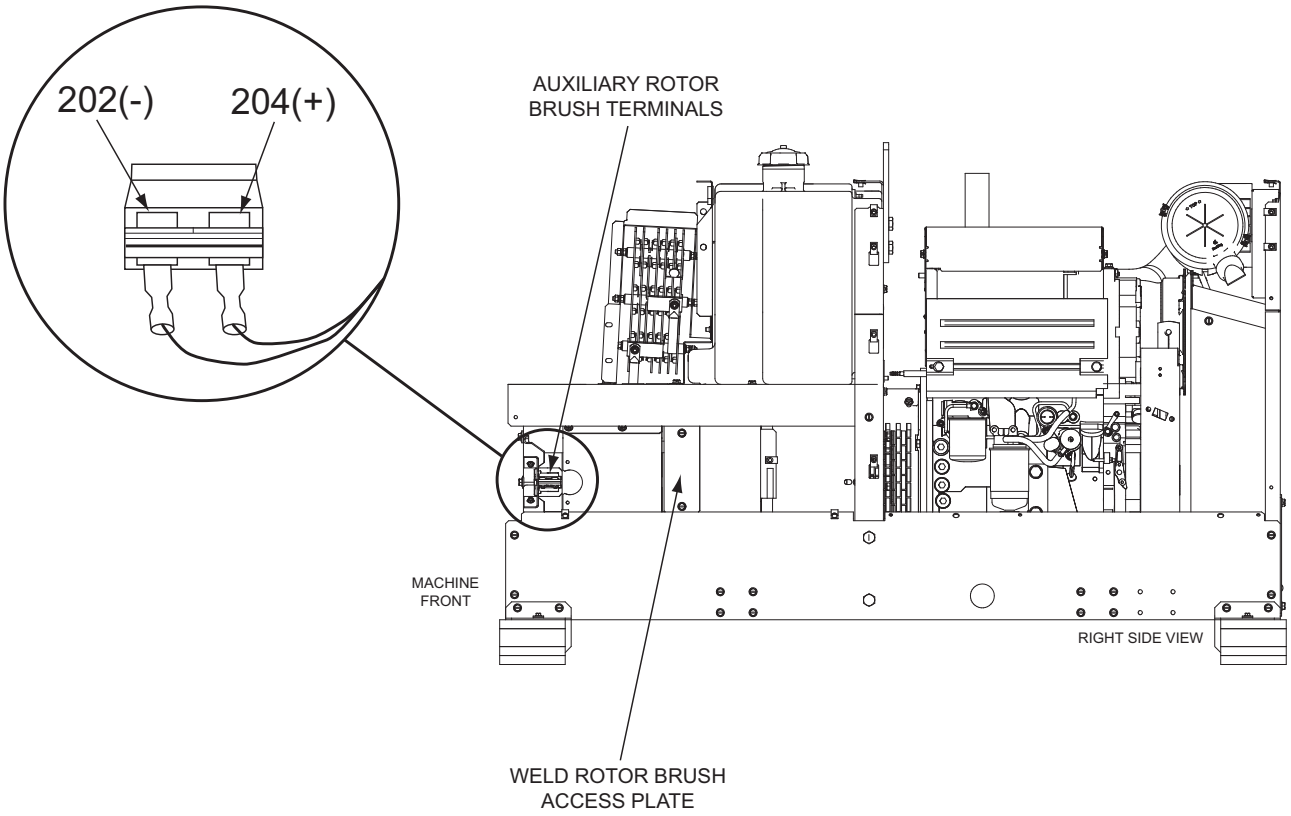
   Resistor R1 (10 ohms)

   NOTE: The normal flashing voltage is 9-10VDC. If the correct flashing voltage is present from leads 202 to 204, and the field is not building up to 136VDC, check the brushes and the rotor resistance.

Return to Section TOC
Return to Master TOC

AUXILIARY ROTOR VOLTAGE AND RESISTANCE TEST (continued)

FIGURE F.10 – LEADS 202(-) AND 204(+)



AUXILIARY ROTOR RESISTANCE CHECK:

7. To check the rotor resistance, perform the ***Case Cover Removal Procedure***, as necessary.
8. Disconnect leads 202(-) and 204(+) from the brush terminals. See Figure F.10.
9. Using an ohmmeter, check the rotor resistance at the slip rings. Normal rotor resistance is approx. 44 ohms (cold).
10. Check from either slip ring to ground. The resistance should be very high. At least 500,000 ohms.
11. If the rotor resistance's are not correct, the Auxiliary Rotor may be faulty. See ***Auxiliary Rotor Removal and Replacement Procedure.***
12. When test is complete, reconnect all previously removed leads.
13. Replace all case sides previously removed.

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WELD ROTOR RESISTANCE TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will determine if the Weld Rotor is receiving the correct input voltage and is functioning properly.

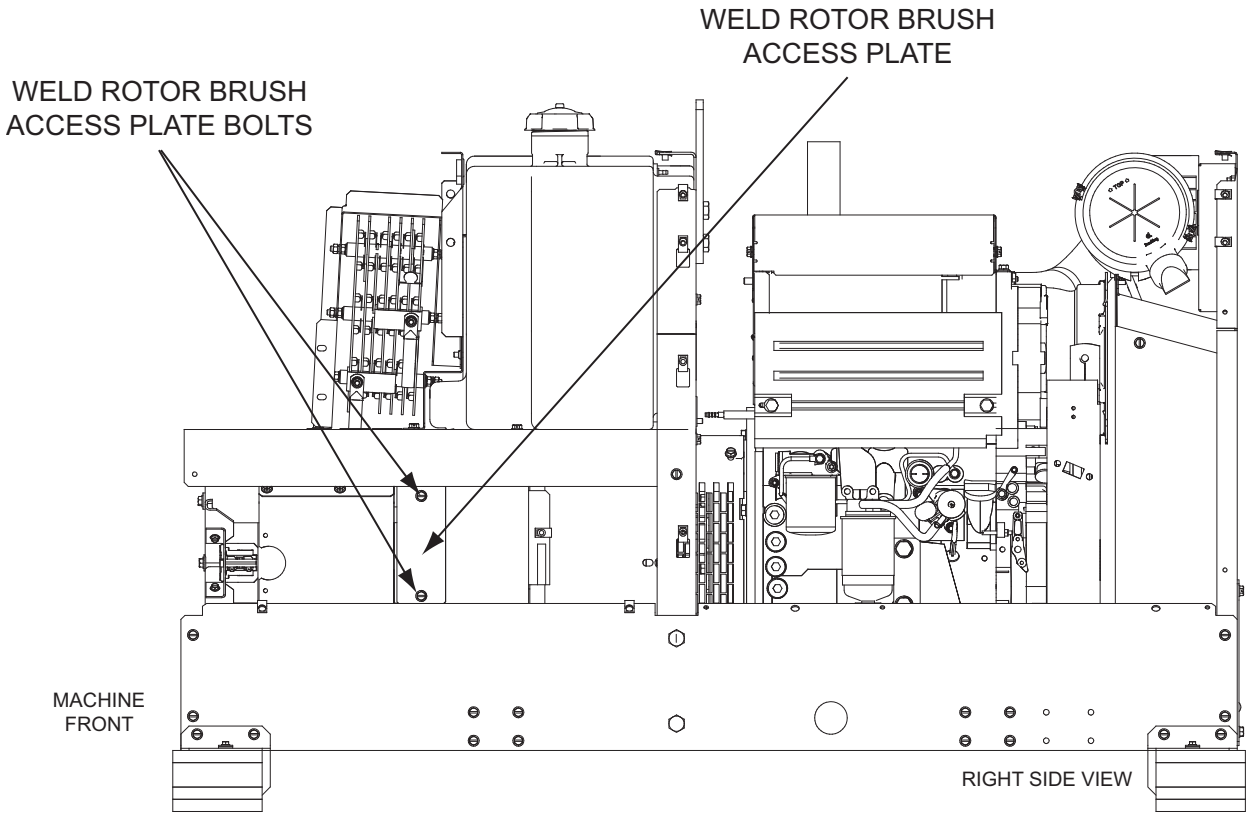
MATERIALS NEEDED

Volt/Ohmmeter
1/2” Wrench

Return to Section TOC
Return to Master TOC

WELD ROTOR RESISTANCE TEST (continued)

FIGURE F.11 – WELD ROTOR BRUSH ACCESS PLATE LOCATION



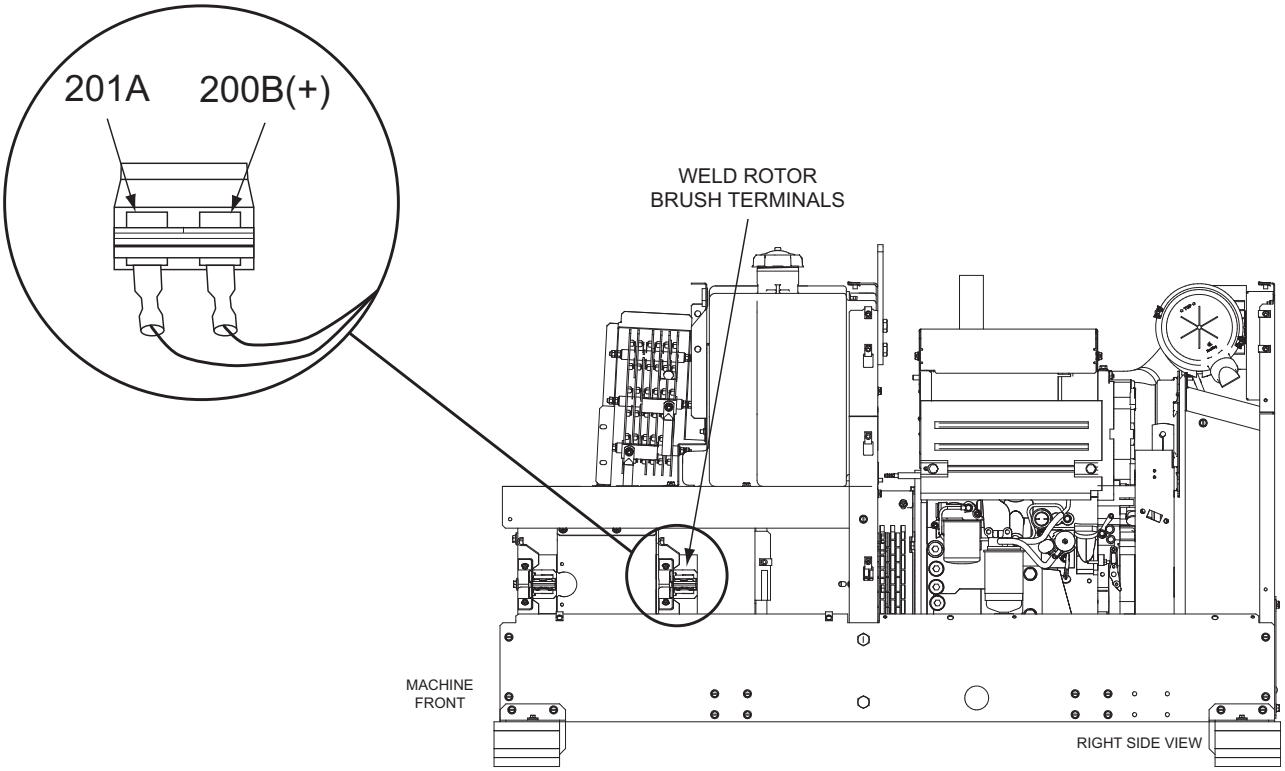
PROCEDURE

1. Turn the engine off.
2. Perform the ***Case Cover Removal Procedure***, as necessary.
3. Locate the weld rotor brush access plate. See Figure F.11.
4. Using a 1/2" wrench, remove the two bolts securing the weld rotor brush access plate. See Figure F.11.
5. Remove leads 201A and 200B(+) from the Weld Rotor brush terminals. ***See Figure F.12***.
6. Using an ohmmeter, check the rotor resistance at the slip rings. Normal rotor resistance is approx. 30 ohms (cold).
7. Check from either slip ring to ground. The resistance should be very high. At least 500,000 ohms.
8. If the rotor resistance's are not correct, the Weld Rotor may be faulty. ***See Weld Rotor Removal and Replacement Procedure.***
9. When test is complete, reconnect all previously removed leads.
10. Replace case side previously removed.

Return to Section TOC
Return to Master TOC

WELD ROTOR RESISTANCE TEST (continued)

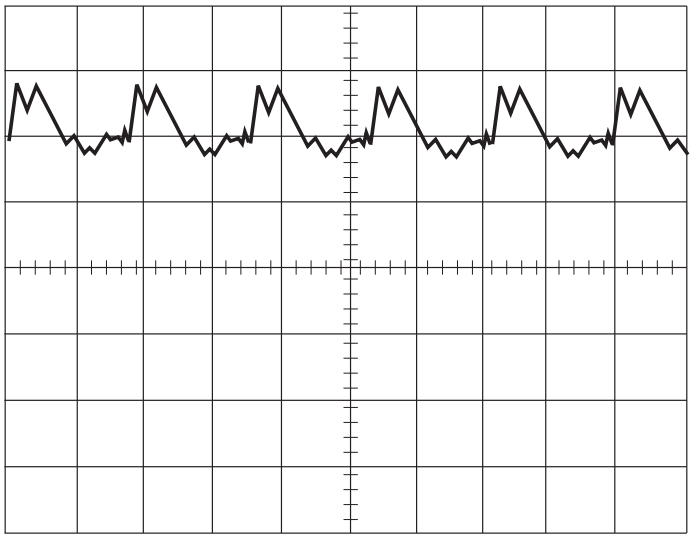
FIGURE F.12 – LEADS 201A AND 200A(+)



OCV STICK MODE

WELD OUTPUT VOLTAGE WAVEFORM

FINE CURRENT CONTROL AT MAXIMUM



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

Note: Scope probes connected at the welding output terminal.

SCOPE SETTINGS

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

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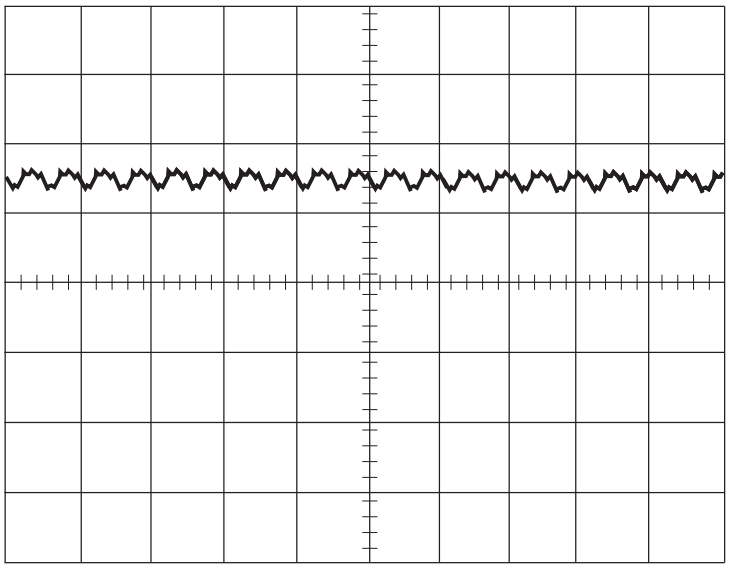
OCV TIG MODE

FINE CURRENT CONTROL AT MAXIMUM



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

Note: Scope probes connected at the welding output terminal.

SCOPE SETTINGS

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

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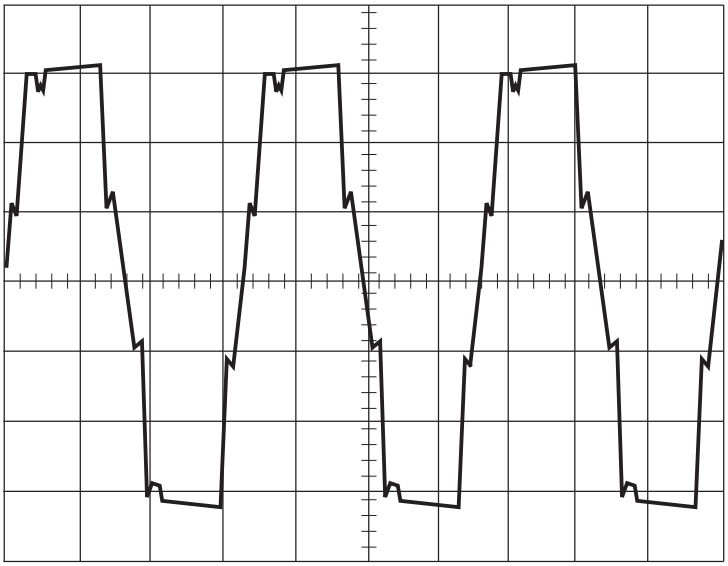
Return to Master TOC

NORMAL OCV WAVEFORM

120 VAC SUPPLY (NO LOAD)



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

Note: Scope probes connected to the 120AC receptacle.

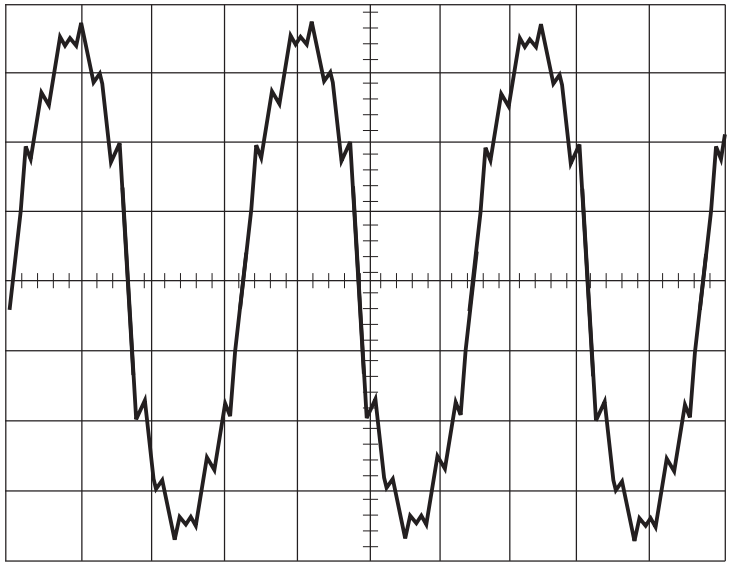
SCOPE SETTINGS

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

Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT WAVEFORM

240 VAC SUPPLY (NO LOAD)



This is the typical auxiliary output voltage generated from a properly operating machine. Note that each vertical division represents 100 volts and that each horizontal division represents 5 milliseconds in time.

Note: Scope probes connected to the 240VAC receptacle.

SCOPE SETTINGS

Volts/Div	100V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

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CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

1/2" Wrench

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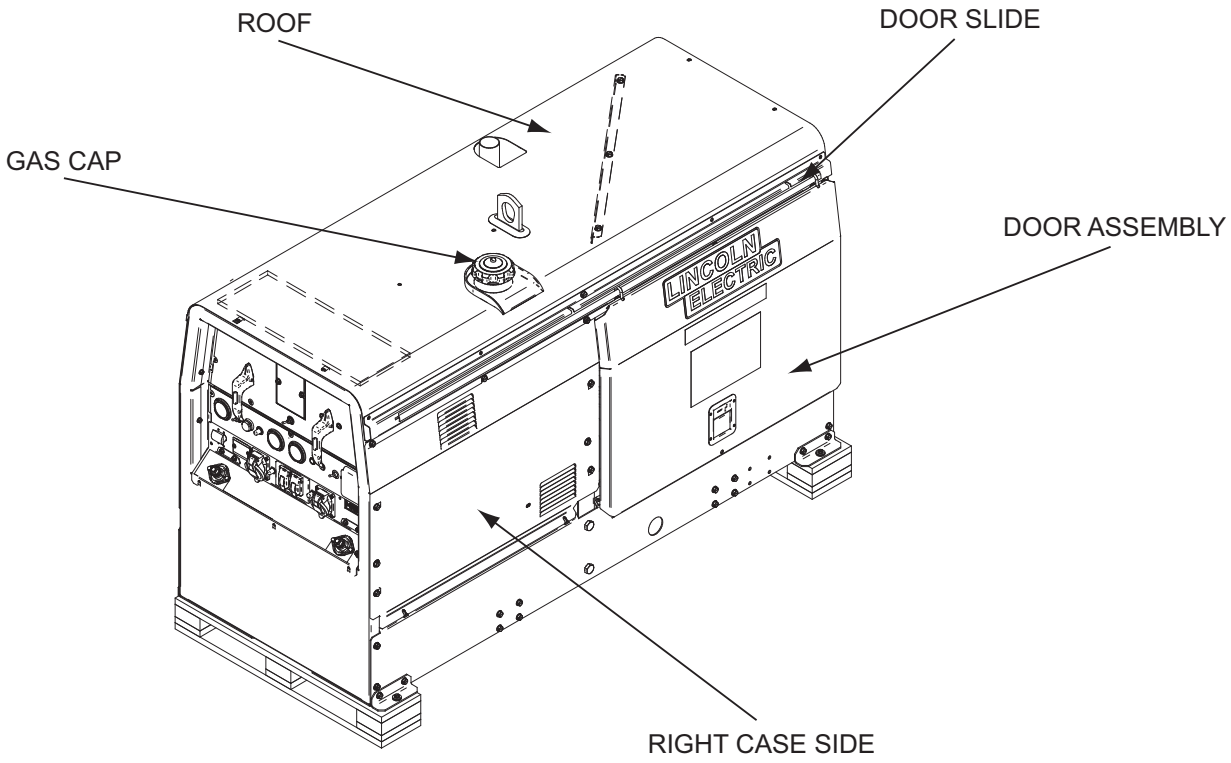
CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.13 – CASE COVER LOCATIONS RIGHT SIDE VIEW



PROCEDURE

1. Open door. See Figure F.13.
2. Slide door approximately four inches to the left and remove.
3. Using 1/2” wrench, remove the ten mounting screws on the right case side. See Figure F.13.
4. Using a 1/2” wrench, remove the seven mounting screws on the door slide. See Figure F.13.
5. Using 1/2” wrench, remove ten mounting screws on the roof. See Figure F.13.
6. Remove gas cap. See Figure F.13.
7. Remove roof.
8. Using a 1/2” wrench, remove seven mounting screws from left front case side. ***See Figure F.14***.
9. Using 1/2” wrench, remove four mounting screws from left rear case side. ***See Figure F.14***.

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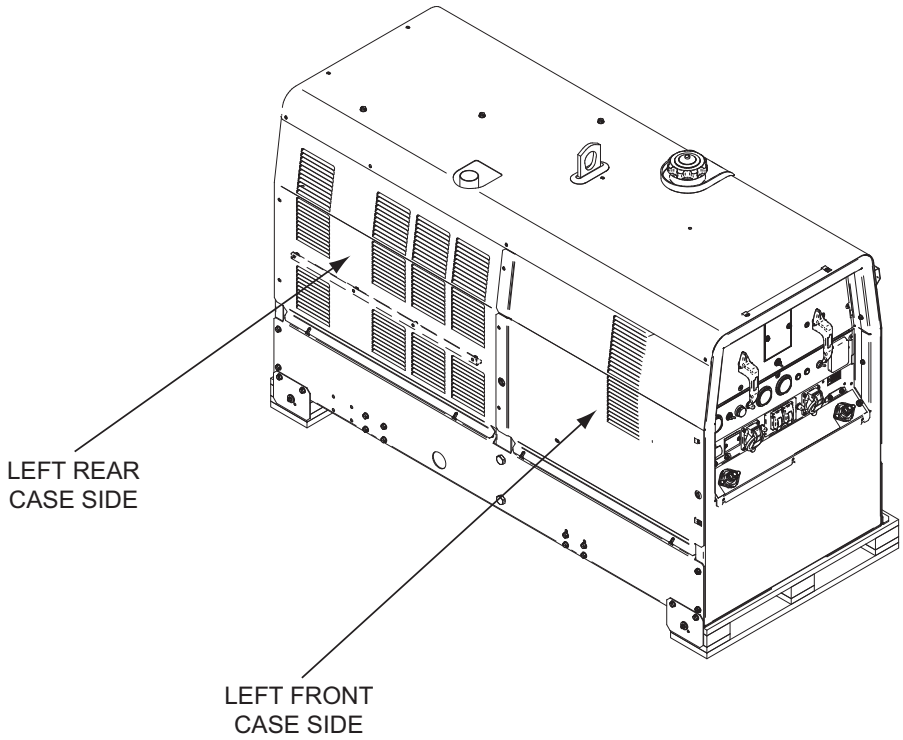
Return to Master TOC

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.14 – CASE COVER LOCATIONS LEFT SIDE VIEW



REPLACEMENT PROCEDURE

1. Using a 1/2” wrench, replace four mounting bolts on the left rear case side.
2. Using a 1/2” wrench, replace seven mounting screws on the left front case side.
3. Replace roof.
4. Replace gas cap.
5. Using 1/2” wrench, replace ten mounting screws on the roof.
6. Using 1/2” wrench, replace 10 mounting screws on the right case side.
7. Attach door and slide into place.

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Return to Master TOC

NOTES

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Return to Section TOC
Return to Master TOC

CURRENT RANGE SWITCH REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Current Range Switch.

MATERIALS NEEDED

Drift Pin
3mm Allen Wrench
7/16” Wrench
3/8” Wrench

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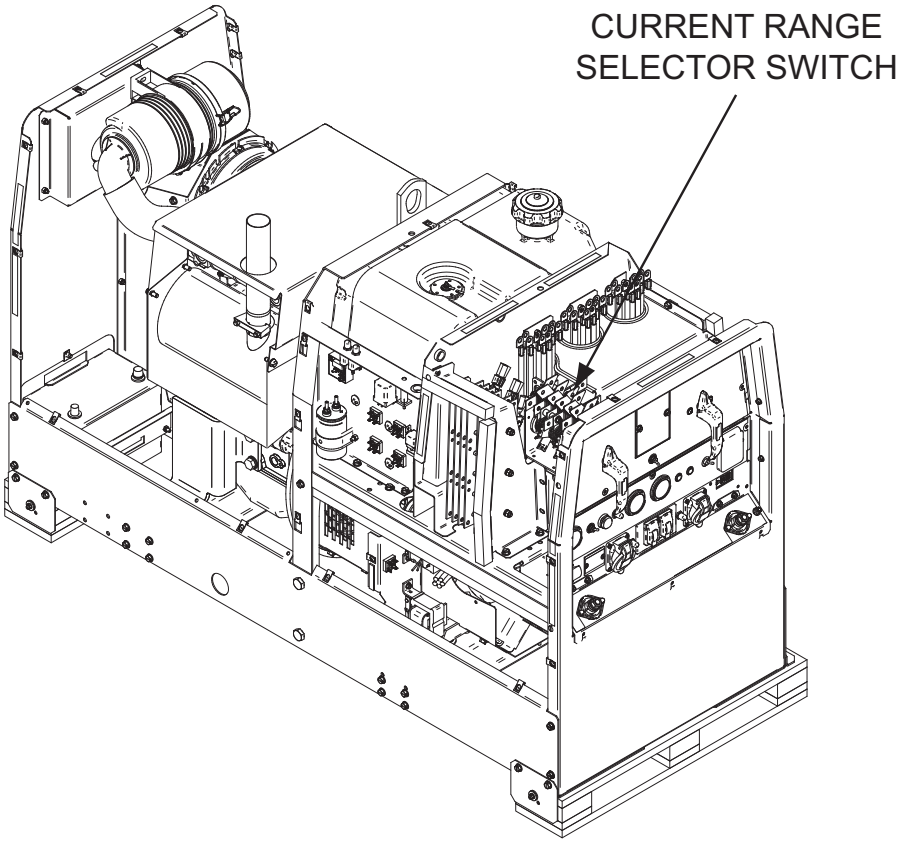
CURRENT RANGE SWITCH REMOVAL AND REPLACEMENT (continued)

FIGURE F.15 – CURRENT RANGE SELECTOR SWITCH LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the Current Range Switch. See Figure F.15.
4. Using a 3mm allen wrench, remove the allen bolt from the Current Range Switch handle. ***See Figure.16***.
5. Using a drift pin, carefully remove the roll pin securing the Current Range Switch handle to the shaft. ***See Figure F.16***.
6. Using a 7/16” wrench, label and remove all leads from the switch. ***See Figure F.17***. Carefully note lead and washer placement for reassembly. See Wiring Diagram.
7. Using a 3/8” wrench, remove the three Current Range Switch mounting screws. One is located on the casefront. Two are located on the bottom of the Current Range Switch. ***See Figure F.18***.
8. Carefully remove the Current Range Switch out of the machine and replace.

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CURRENT RANGE SWITCH REMOVAL AND REPLACEMENT (continued)

FIGURE F.16 – CURRENT RANGE SELECTOR SWITCH HANDLE LOCATION

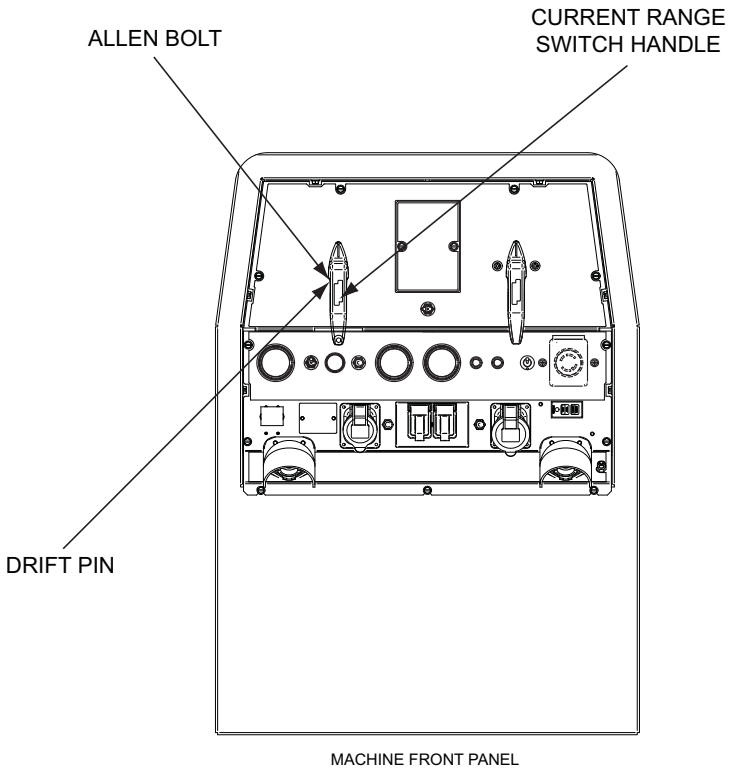
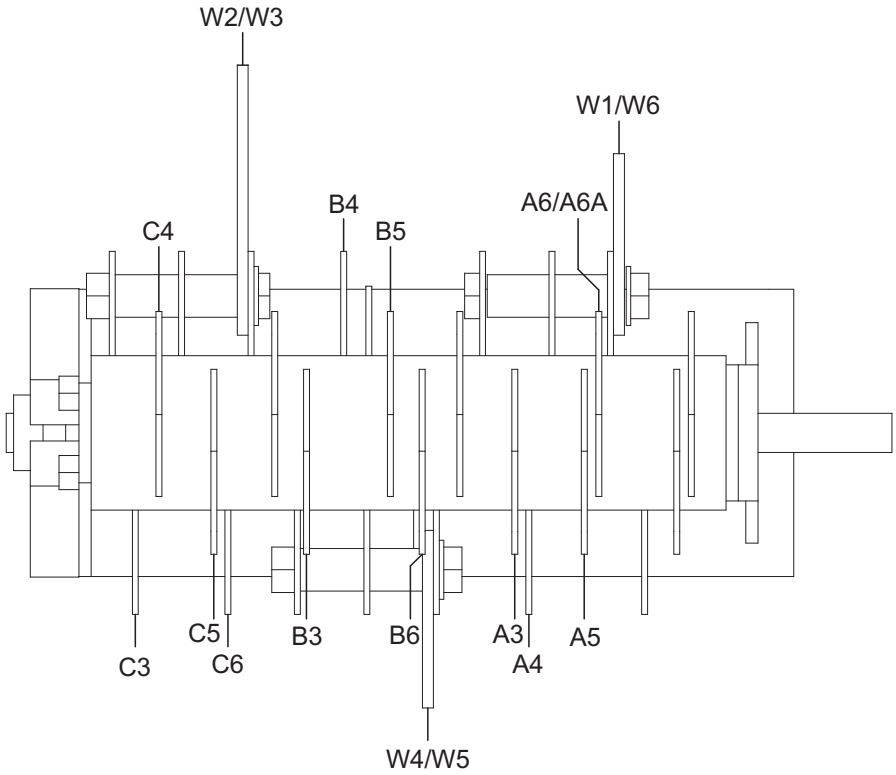
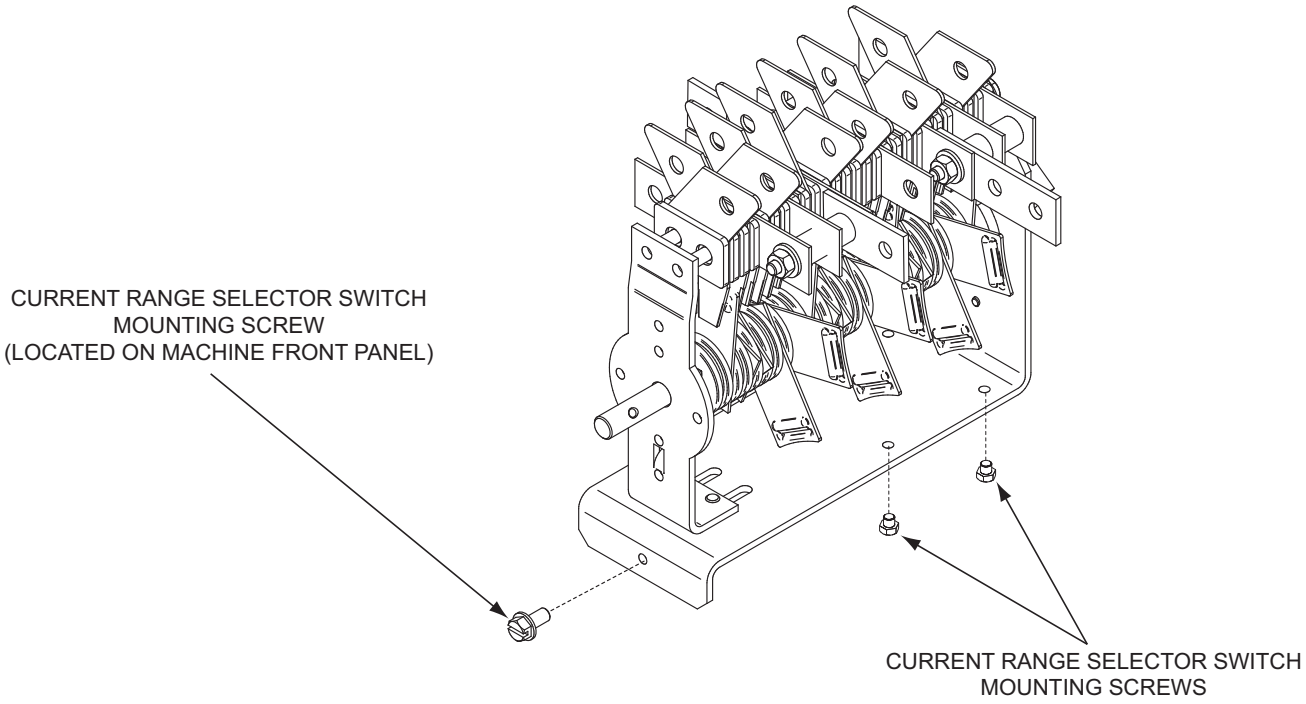


FIGURE F.17 – CURRENT RANGE SELECTOR SWITCH LEAD LOCATIONS



CURRENT RANGE SWITCH REMOVAL AND REPLACEMENT (continued)

FIGURE F.18 – CURRENT RANGE SWITCH MOUNTING SCREWS



REPLACEMENT PROCEDURE

1. Position the new Current Range Switch into its proper location.
2. Secure the new Current Range Switch using the three previously removed mounting screws.
3. Connect all previously removed leads to their proper locations. Be sure to include washers.
4. Secure the handle to the shaft using the previously removed drift pin.
5. Install the previously removed allen bolt.
6. Perform the ***Case Cover Replacement Procedure***.

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OUTPUT RECTIFIER BRIDGE REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Output Rectifier Bridge.

MATERIALS NEEDED

1/2” Wrench
Dow Corning 340 Heat Sink Compound

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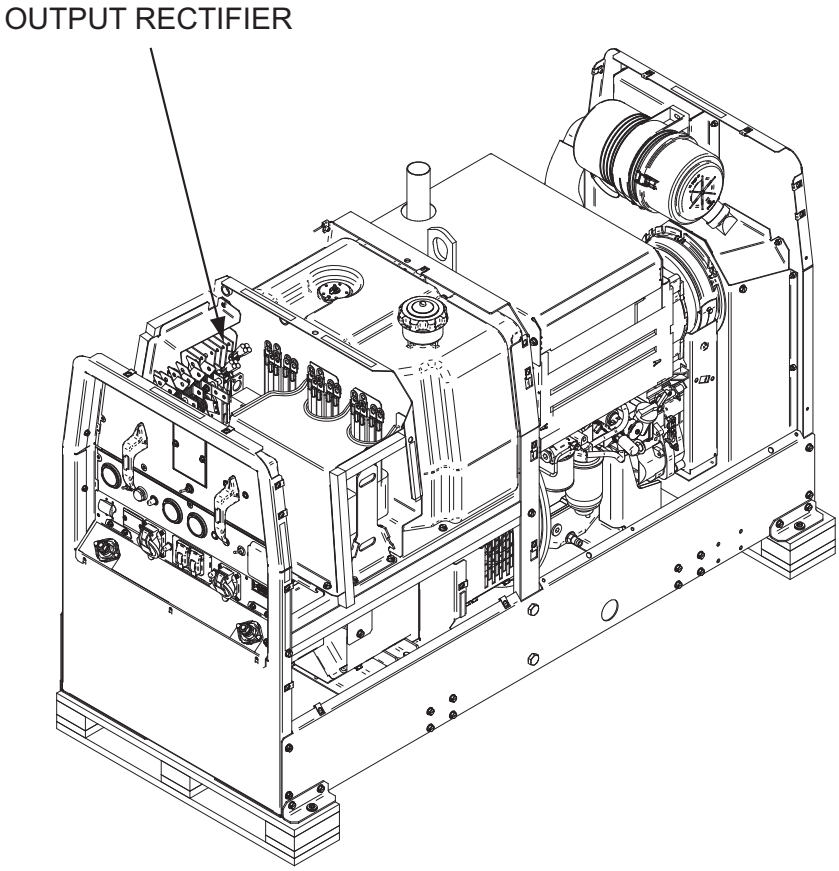
OUTPUT RECTIFIER BRIDGE REMOVAL AND REPLACEMENT (continued)

FIGURE F.19 – OUTPUT RECTIFIER LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the Output Rectifier Bridge. See Figure F.19.
4. Using a 1/2” wrench, label and remove the leads from the five terminals on the Output Rectifier Bridge. Note lead and washer placement for reassembly. ***See Figure F.20***. See Wiring Diagram.
5. Using a 1/2” wrench, remove the seven Output Rectifier Bridge mounting screws. ***See Figure F.21***.
6. Carefully maneuver the Output Rectifier out of the machine and replace.

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OUTPUT RECTIFIER BRIDGE REMOVAL AND REPLACEMENT (continued)

FIGURE F.20 – OUTPUT RECTIFIER TERMINAL LOCATIONS

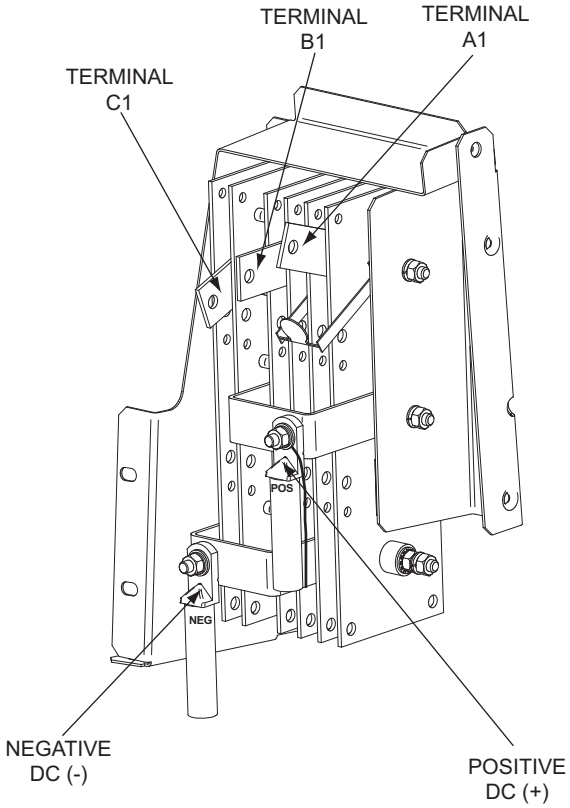
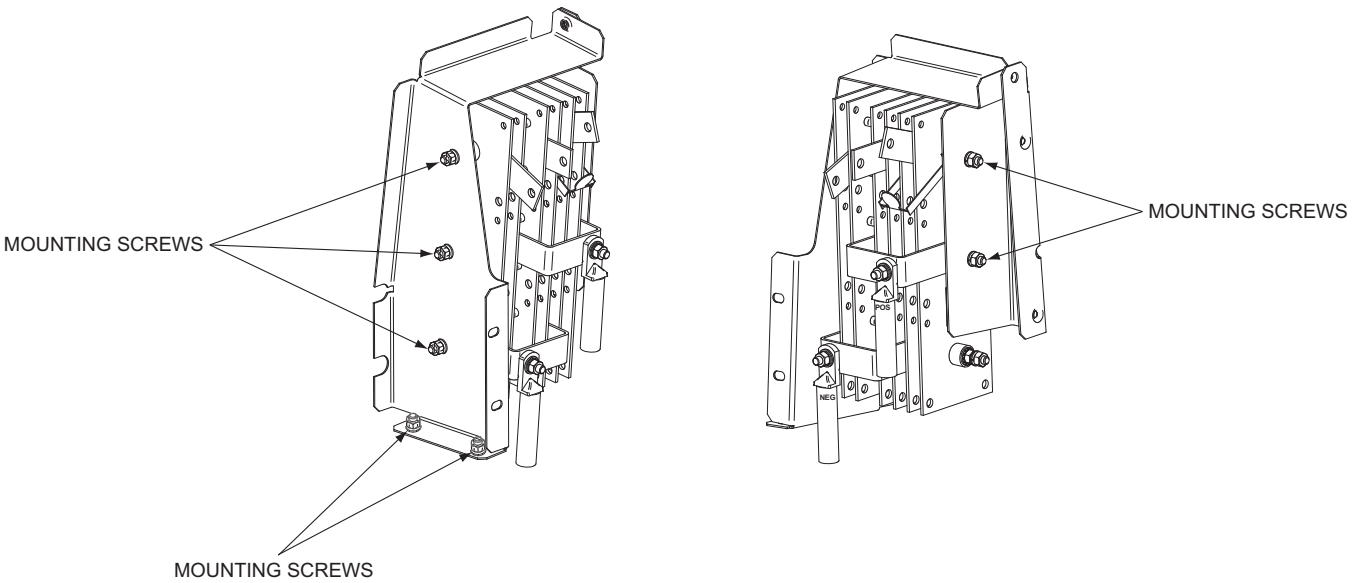


FIGURE F.21 – OUTPUT RECTIFIER MOUNTING SCREWS



Return to Section TOC
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OUTPUT RECTIFIER BRIDGE REMOVAL AND REPLACEMENT (continued)

REPLACEMENT PROCEDURE

1. Apply a thin coating of Dow Corning 340 to all electrical connection points.
2. Carefully maneuver the new Output Rectifier into its proper location.
3. Secure the Output Rectifier using the seven previously removed mounting screws.
4. Connect all previously removed leads to their proper locations. Be sure to include washers. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.

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Return to Master TOC
Return to Section TOC
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WELDER SEPARATION PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the separation of the machine. This is necessary to gain access to longer components that may need replaced.

MATERIALS NEEDED

1/2” Wrench
3/4” Wrench
Hoist
Hoisting Straps
8mm Wrench
Pliers

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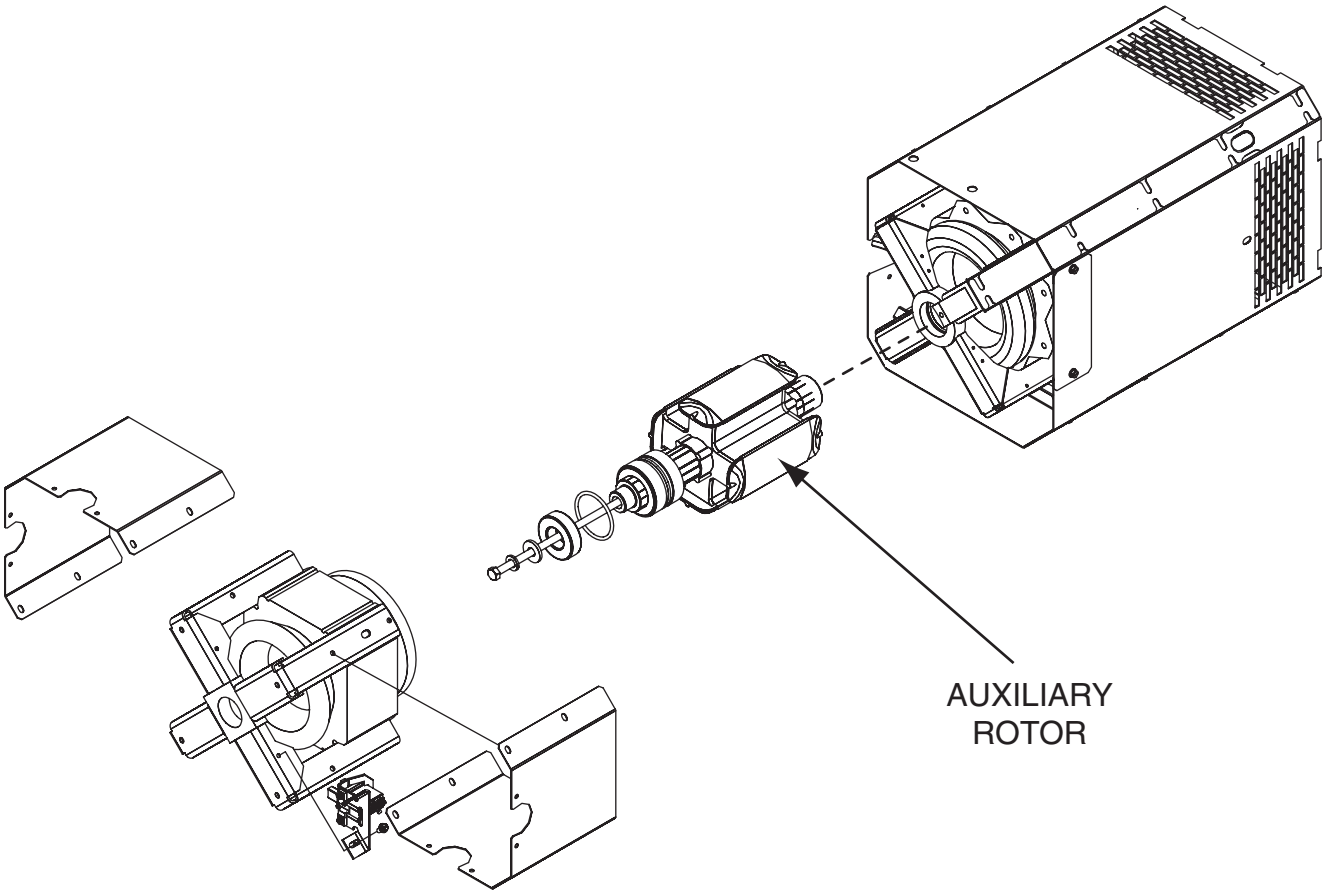
WELDER SEPARATION PROCEDURE (continued)

FIGURE F.22 – AUXILIARY ROTOR LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Locate the Auxiliary Rotor. See Figure F.22.

⚠ 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.**

4. Using a 1/2" wrench, remove the negative battery cable and isolate.
5. Turn OFF the fuel stop valve. ***See Figure F.23***.
6. Using pliers, disconnect the fuel line from the engine side of the fuel stop valve.
7. Using pliers, disconnect the fuel return line. ***See Figure F.23***.
8. Locate, label and remove the following leads: (See Wiring Diagram)

   238A (remove from engine starter solenoid)

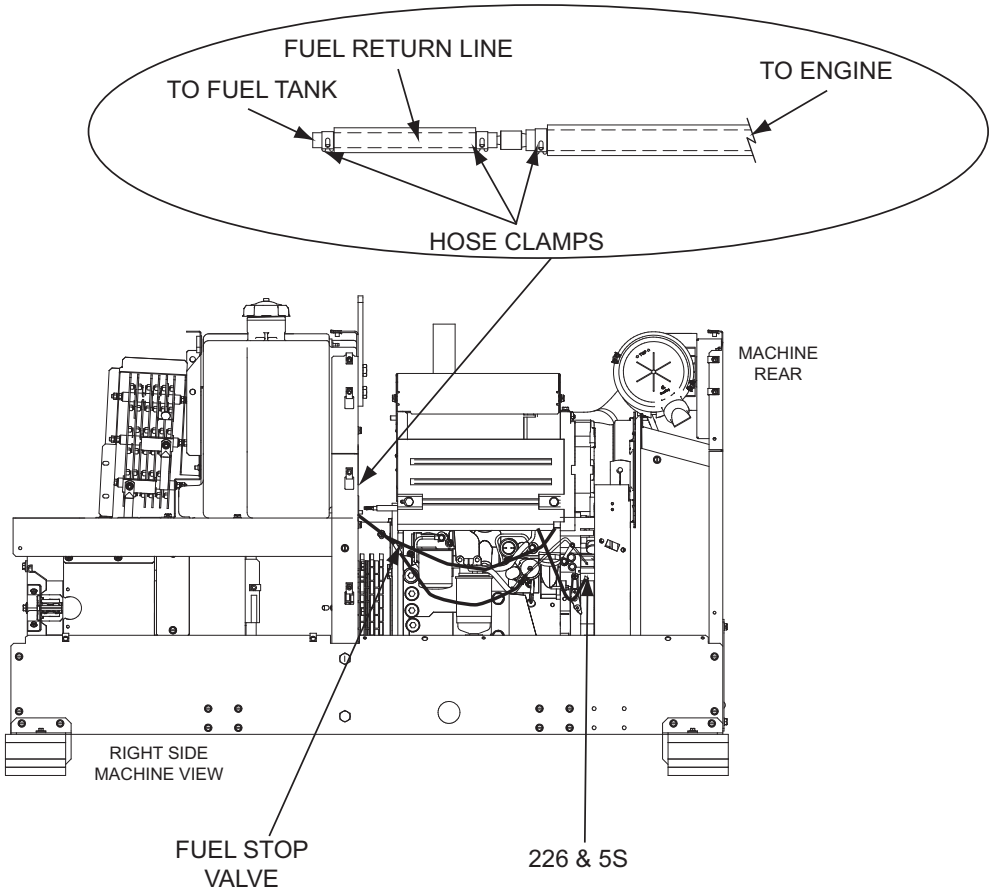
   231 (remove from engine starter solenoid)

   5N, 5F & Ground lead (remove from negative battery grounding terminal)

   226 & 5S from the fuel shutdown hold coil (unplugged from right side of machine) ***See Figure F.23***.
9. Using a 1/2" wrench, remove the two bolts from the engine side panel. ***See Figure F.24***.
10. Using a 8mm wrench, remove leads 5F and 239 from the engine alternator. Leads located behind engine side panel.

WELDER SEPARATION PROCEDURE (continued)

FIGURE F.23 – FUEL STOP VALVE, FUEL RETURN LINE, LEADS 226 & 5F



11. Disconnect leads 241, 235A & 234 from oil temperature switch. Leads located behind engine side cover. See Wiring Diagram.
12. Disconnect leads 228 & 235 from the oil pressure sensor. Leads located behind engine side cover. See Wiring Diagram.
13. Using a 7/16" wrench, locate, label and disconnect leads W1/W6, W4/W5, W2/W3 from the output current range switch. Note lead and washer positions upon removal. ***See Figure F.25***.
14. Clear and isolate leads, cut any necessary cable ties.
15. Label and disconnect leads 207 from diode D4 and lead 206 from Stick/Tig switch. Cut any necessary cable ties. See Wiring Diagram.
16. Disconnect lead 203A from circuit breaker CB6. See Wiring Diagram.
17. Disconnect lead 602C from diode bridge D3. See Wiring Diagram.
18. Disconnect leads 3 and 6 from circuit breaker CB4. See Wiring Diagram.
19. Disconnect lead 5 from the ground stud on the back of casefront. ***See Figure F.26***.
20. Disconnect leads 202 & 204 from the auxiliary rotor brushes. ***See Figure F.27***.

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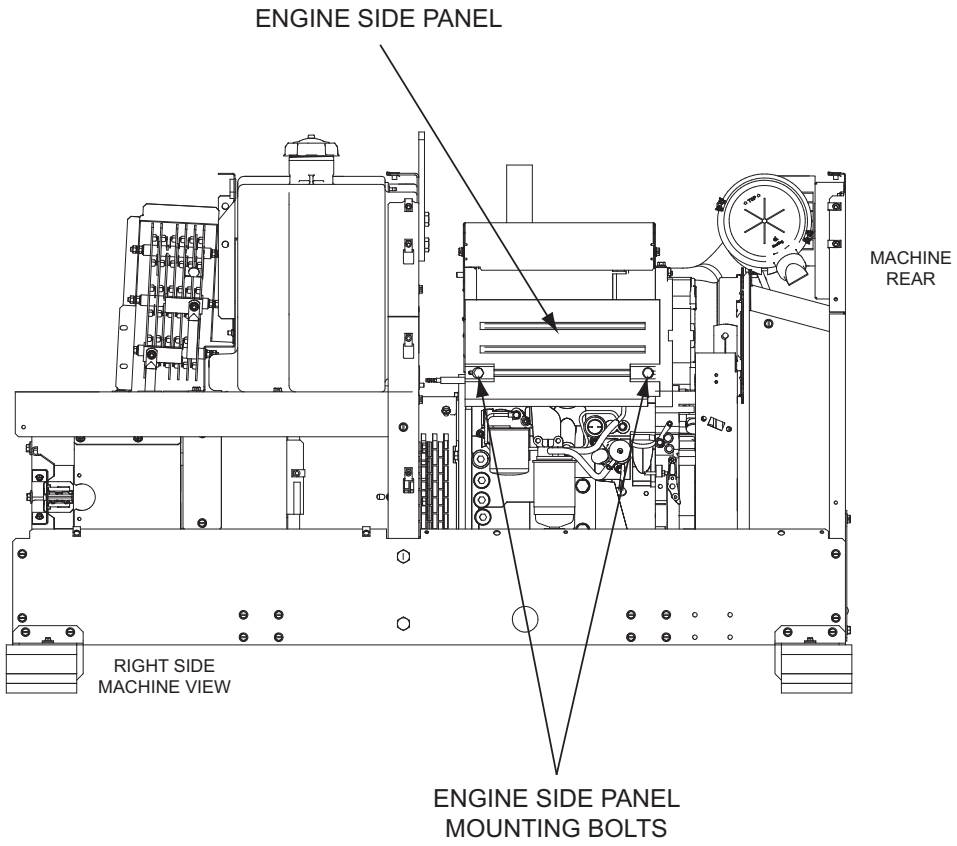
WELDER SEPARATION PROCEDURE (continued)

FIGURE F.24 – ENGINE SIDE COVER BOLTS & LEADS 5F & 239



21. Disconnect leads 201 & 200B from the weld rotor brushes. ***See Figure F.28***.
22. Disconnect leads 206A & 221 from diode bridge D4. See Wiring Diagram.
23. Disconnect lead 222 from the hot start choke. See Wiring Diagram.
24. Using a 1/2" wrench, remove the two bolts (left and right) securing the horizontal shelf to the left and right vertical baffle assemblies. ***See Figure F.29***.
25. Using a 1/2" wrench, remove the four bolts securing the front panel assembly to the base assembly. ***See Figure F.30***.
26. Using a 1/2" wrench, remove the two bolts securing the case front to the horizontal support rails. ***See Figure F.30***.
27. Using a 7/16" wrench, remove the nut and washer from the center locating bolt from the inside lower center of the case front assembly. ***See Figure F.30***.
28. Using a 3/4" wrench, remove the four bolts securing the lift frame assembly to the base assembly. Note washer placement upon removal. ***See Figure F.30***.
29. Clear all leads and prepare for front end removal from machine.

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- **Lift only with equipment of adequate lifting capacity.**
- **Be sure machine is stable when lifting.**
- **Do not lift this machine using lift bail if it is equipped with a heavy accessory such as trailer or gas cylinder.**
- **Do not lift machine if lift bail is damaged.**
- **Do not operate machine while suspended from lift bail.**

30. Using hoisting straps, carefully lift and remove the front half of the welder. Separating it from the engine stator assembly.

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WELDER SEPARATION PROCEDURE (continued)

FIGURE F.25 – OUTPUT CURRENT RANGE SWITCH CONNECTIONS

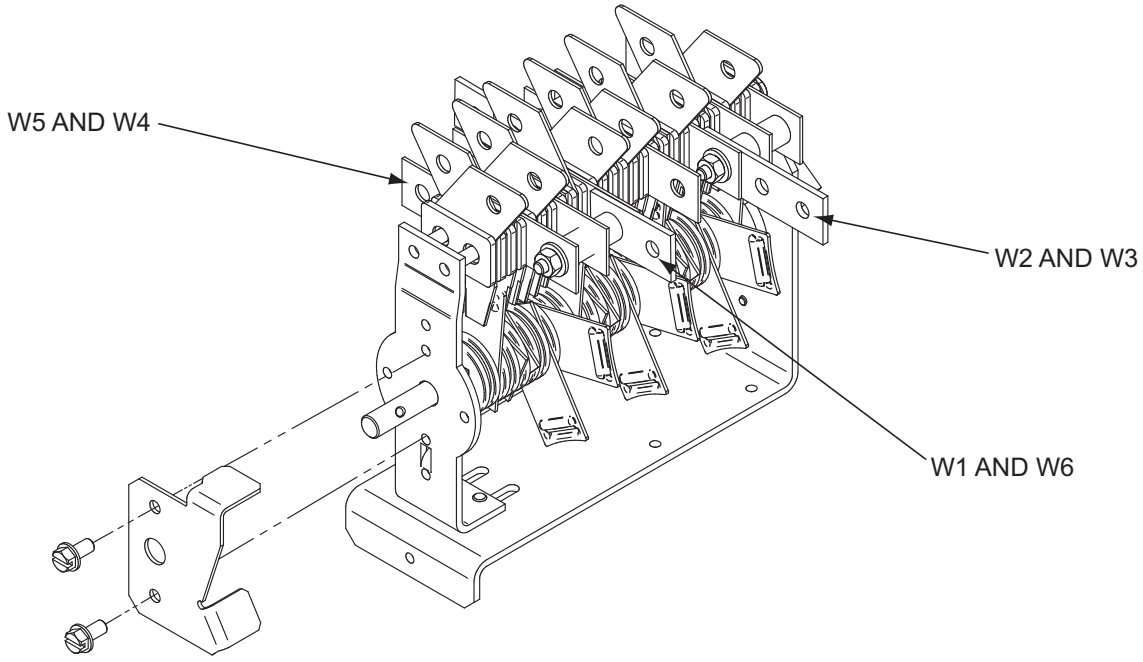
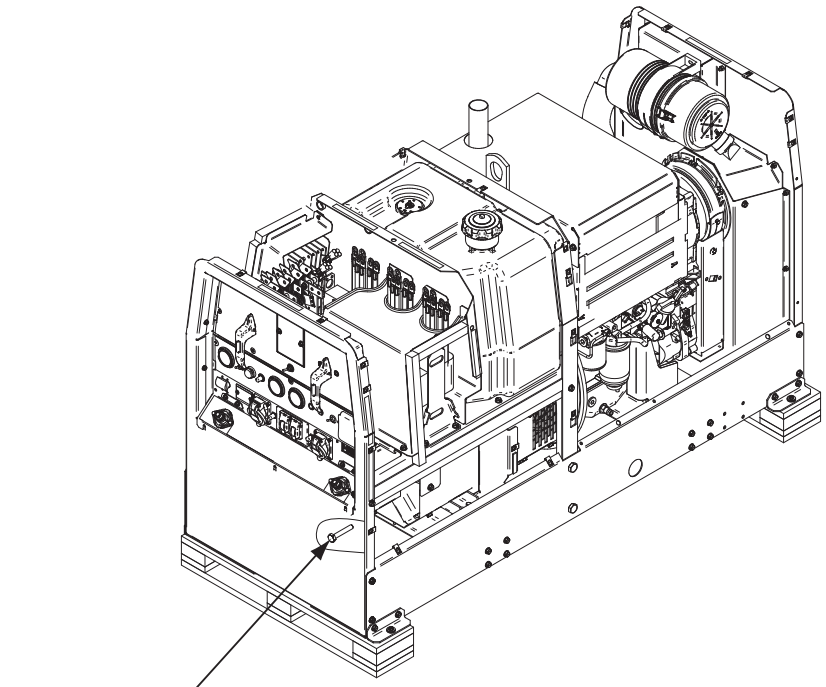


FIGURE F.26 – LEAD 5 FROM GROUND STUD



WELDER SEPARATION PROCEDURE (continued)

FIGURE F.27 – LEADS 202(-) & 204(+)

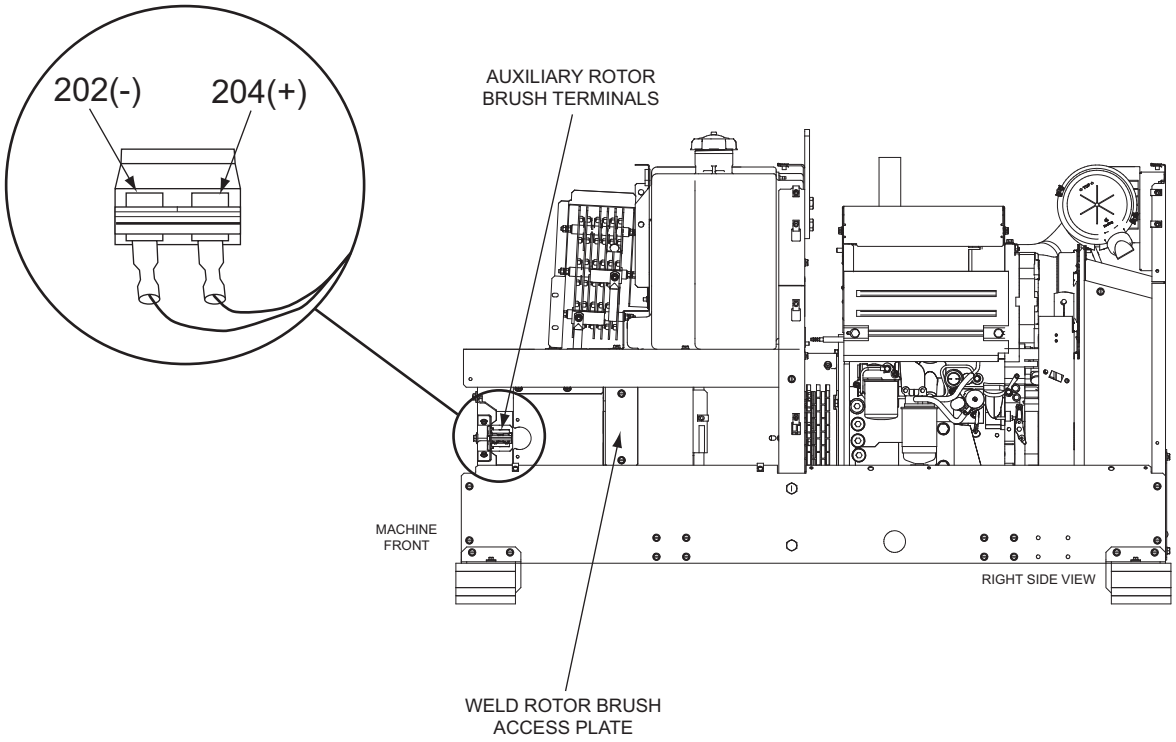
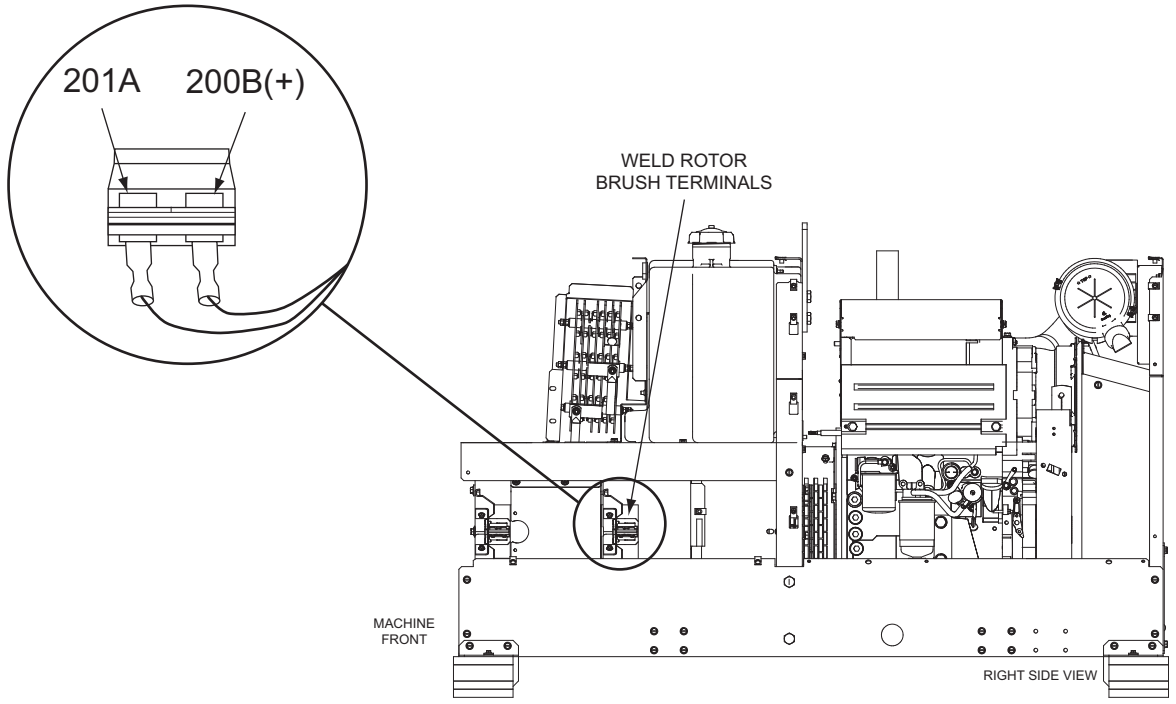


FIGURE F.28 – LEADS 201 & 200B



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WELDER SEPARATION PROCEDURE (continued)

FIGURE F.29 – HORIZONTAL SHELF MOUNTING BOLT LOCATIONS

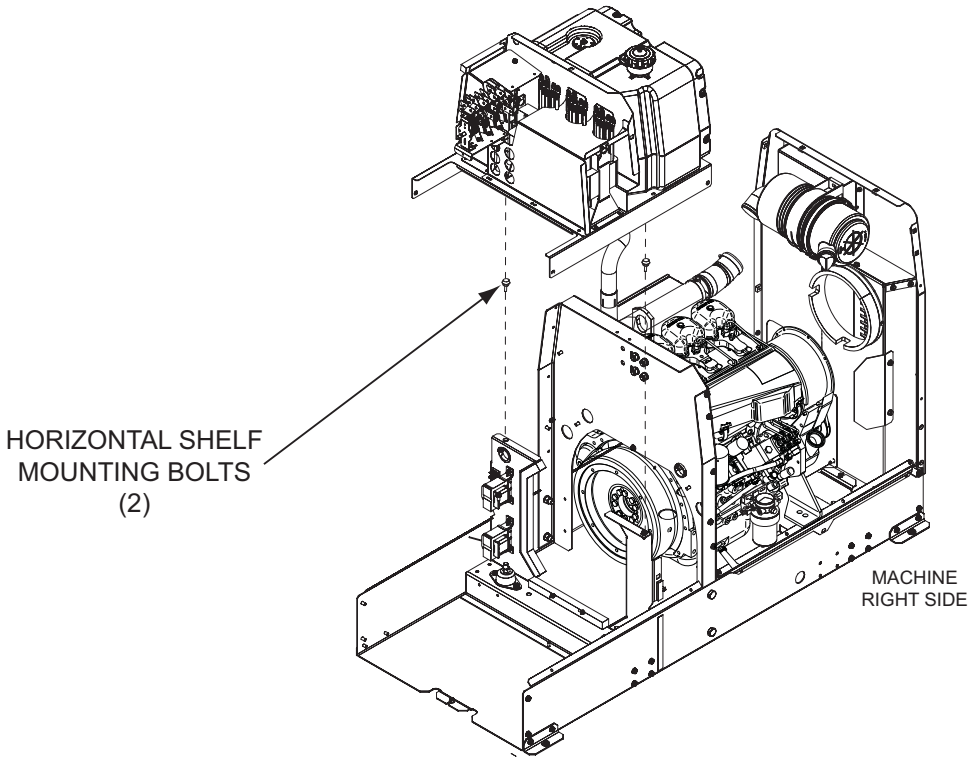
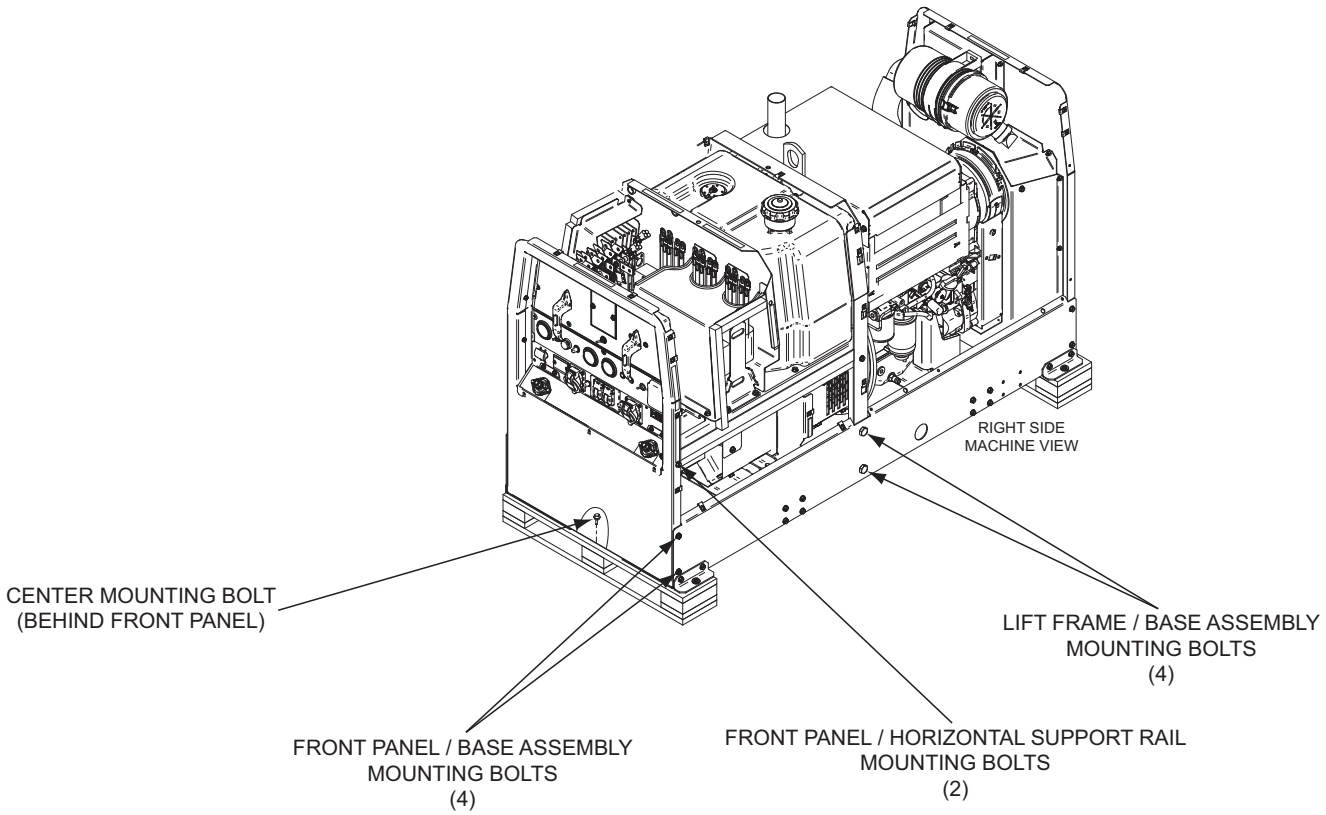


FIGURE F.30 – BASE ASSEMBLY MOUNTING BOLT LOCATIONS



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WELDER SEPARATION PROCEDURE (continued)

REPLACEMENT PROCEDURE

⚠ WARNING

FALLING EQUIPMENT can cause injury.

- **Lift only with equipment of adequate lifting capacity.**
- **Be sure machine is stable when lifting.**
- **Do not lift this machine using lift bail if it is equipped with a heavy accessory such as trailer or gas cylinder.**
- **Do not lift machine if lift bail is damaged.**
- **Do not operate machine while suspended from lift bail.**

1. Clear any obstructions and prepare for front end replacement to machine.
2. Using hoisting straps, carefully position the front half of the welder. Against the engine stator assembly.
3. Using a 3/4" wrench, replace the four bolts securing the lift frame assembly to the base assembly.
4. Using a 7/16" wrench, replace the nut and washer at the center locating bolt to the inside lower center of the case front assembly.
5. Using a 1/2" wrench, replace the two bolts securing the case front to the horizontal support rails.
6. Using a 1/2" wrench, replace the four bolts securing the front panel assembly to the base assembly.
7. Using a 1/2" wrench, replace the two bolts (left and right) securing the horizontal shelf to the left and right vertical baffle assemblies.
8. Connect lead 222 to the hot start choke. See Wiring Diagram.
9. Connect leads 206A & 221 to diode bridge D4. See Wiring Diagram.
10. Connect leads 201 & 200B to the weld rotor brushes. See Wiring Diagram.
11. Connect leads 202 & 204 to the auxiliary rotor brushes.
12. Connect lead 5 to the ground stud on the back of casefront.
13. Connect leads 3 and 6 to circuit breaker CB4. See Wiring Diagram.
14. Connect lead 602C from diode bridge D3. See Wiring Diagram.
15. Connect lead 203A to circuit breaker CB6. See Wiring Diagram.
16. Connect leads 207 to diode D4 and lead 206 to the Stick/Tig switch. See Wiring Diagram.
17. Install any necessary cable ties.
18. Using a 7/16" wrench, connect leads W1/W6, W4/W5, W2/W3 to the output current range switch.
19. Connect leads 228 & 235 to the oil pressure sensor. See Wiring Diagram.
20. Connect leads 241, 235A & 234 to the oil temperature switch. See Wiring Diagram.
21. Using a 8mm wrench, replace leads 5F and 239 to the engine alternator.
22. Using a 1/2" wrench, replace the two bolts to the engine side cover.
23. Connect the following leads: (See Wiring Diagrams)

    238A (replace to engine starter solenoid)

    231 (replace to engine starter solenoid)

    5N, 5F & Ground lead (replace to negative battery grounding terminal)

    226 & 5S to the fuel shutdown hold coil.
24. Using pliers, reconnect the fuel return line.
25. Turn ON the fuel stop valve. Check for leaks.
26. Using a 1/2" wrench, replace the negative battery cable.
27. Perform the ***Case Cover Replacement Procedure***.

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AUXILIARY STATOR REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Auxiliary Stator.

MATERIALS NEEDED

3/8" Wrench
1/2" Wrench
Torque Wrench

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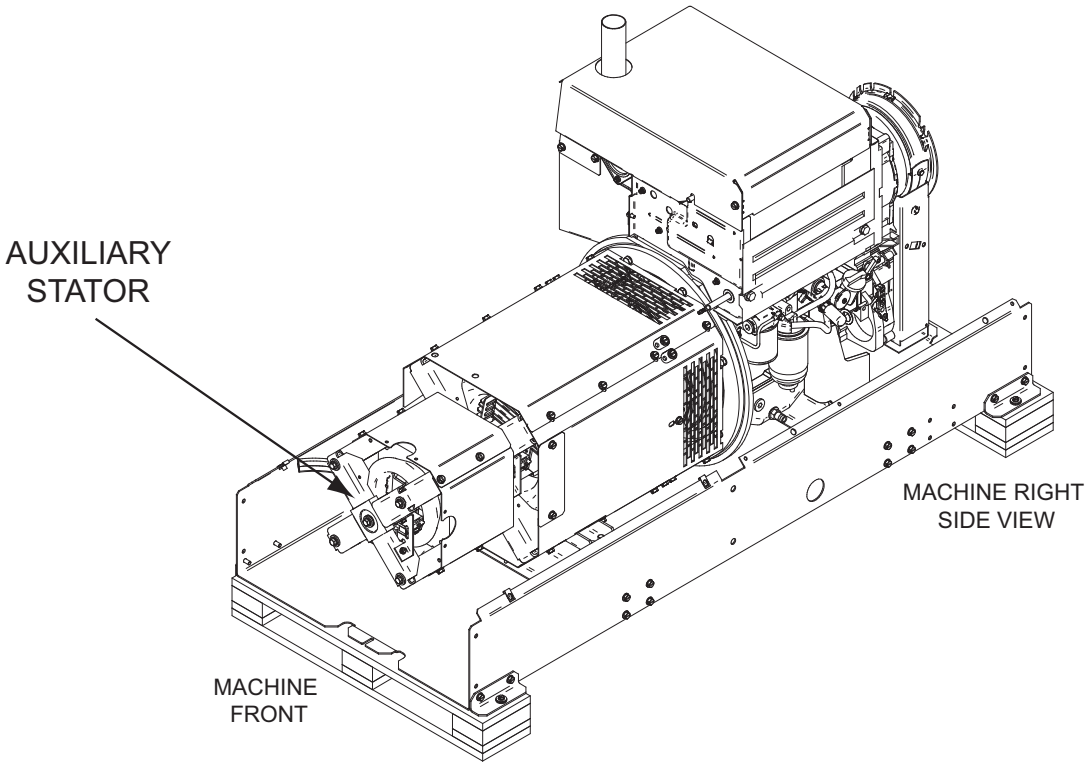
AUXILIARY STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.31 – EXCITOR STATOR LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Welder Separation Procedure***.
4. Locate the Auxiliary Stator. See Figure F.31.
5. Using a 1/2” wrench, remove the eight bolts securing the two cowlings to the Auxiliary Stator. ***See Figure F.32***.
6. Using a 3/8” wrench, remove the two screws securing the brush holder assembly. ***See Figure F.33***.
7. Using a 1/2” wrench, remove the four thru bolts securing the Auxiliary Stator to the main stator. ***See Figure F.34***.
8. Remove the Auxiliary Stator.

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AUXILIARY STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.32 – STATOR COWLING BOLT LOCATIONS

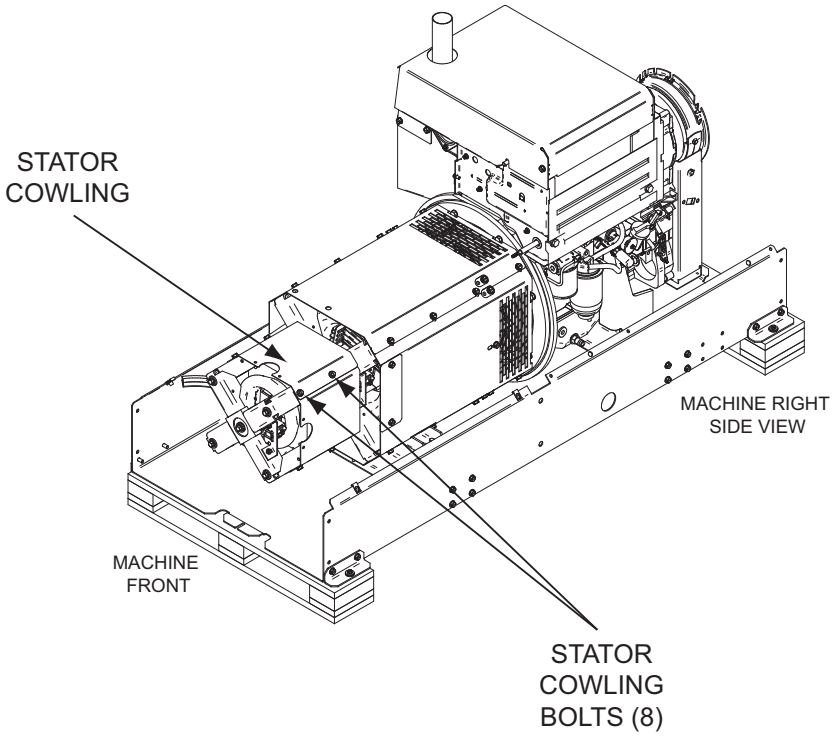
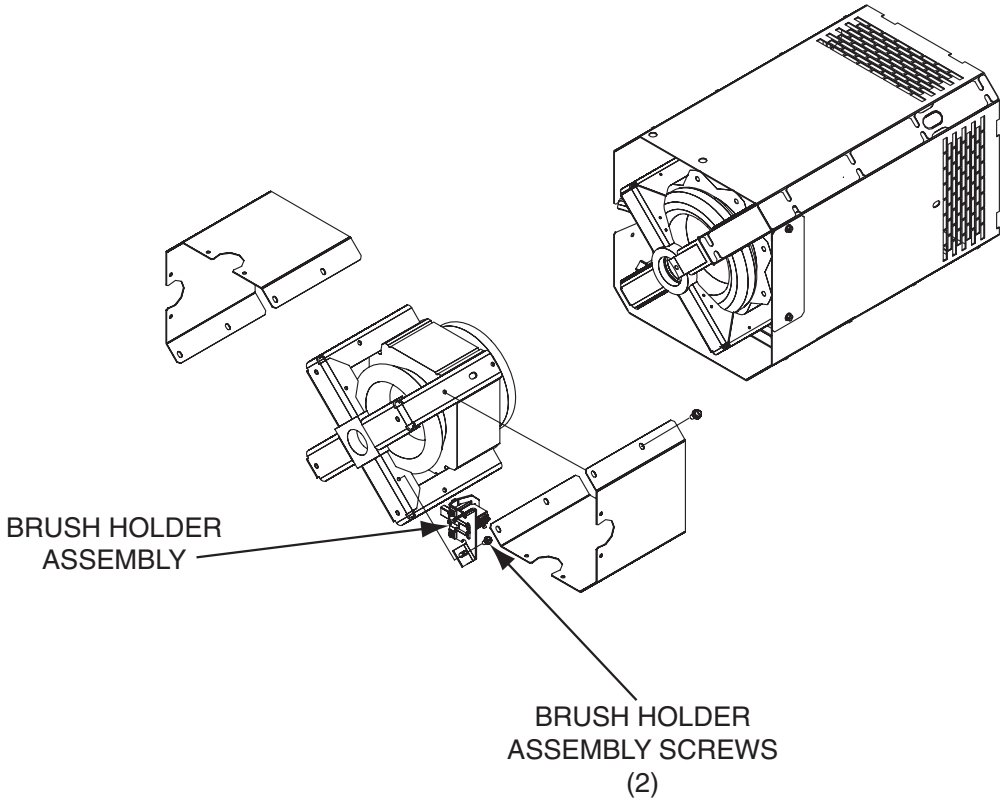


FIGURE F.33 – BRUSH HOLDER ASSEMBLY REMOVAL



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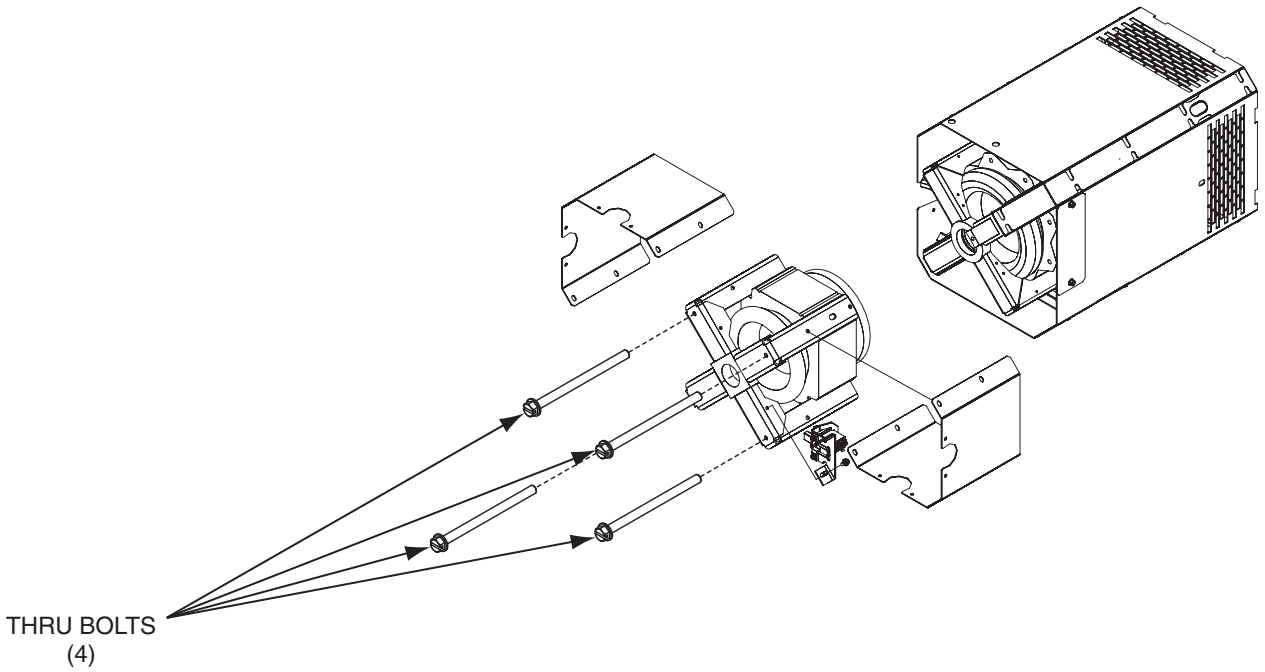
AUXILIARY STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.34 – THRU BOLT LOCATION



REPLACEMENT PROCEDURE

1. Replace Auxiliary Stator.
2. Using a 1/2” wrench, tighten the four thru bolts securing the Auxiliary Stator to the main stator to fourteen foot pounds.
3. Using a 3/8” wrench, replace the two brush holder mounting screws.

NOTE: When replacing brushes, make sure the brushes are centered in the center of the slip rings.

4. Using a 1/2” wrench, replace the eight bolts securing the two cowlings to the Auxiliary Stator.
5. Perform the ***Welder Separation Procedure***.
6. Perform the ***Case Cover Replacement Procedure***.

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AUXILIARY ROTOR REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Auxiliary Rotor.

MATERIALS NEEDED

1/2” Wrench
Pry Bar
Torque Wrench

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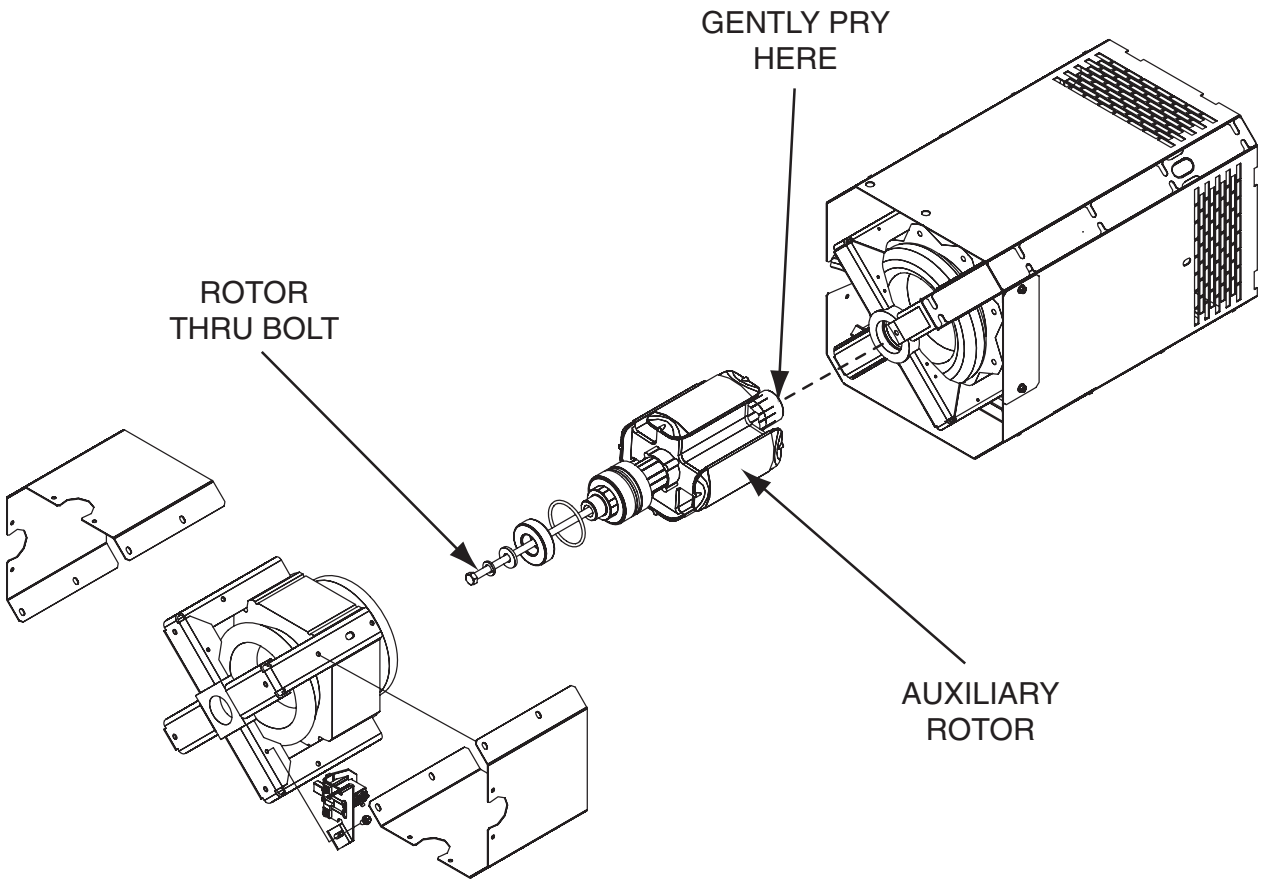
AUXILIARY ROTOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.35 – EXCITOR ROTOR AND THRU BOLT LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Welder Separation Procedure***.
4. Perform the ***Auxiliary Stator Removal Procedure.***
5. Locate the Auxiliary Rotor. See Figure F.35.
6. Using a 1/2" wrench, loosen the thru bolt securing the Auxiliary Rotor to the weld rotor. See Figure F.35.
7. Carefully remove the Auxiliary Rotor from the tapered shaft of the weld rotor, by applying even pressure on the inboard side of the Auxiliary Rotor, and if necessary, tap on the head of the loosened thru bolt. See Figure F.35.
   NOTE: Be careful not to apply pressure to the windings.
8. When the Auxiliary Rotor becomes loose, removing the loosened thru bolt securing the Auxiliary Rotor to the weld rotor. Note washer positioning upon removal. See Figure F.35.
9. Remove the Auxiliary Rotor.

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AUXILIARY ROTOR REMOVAL AND REPLACEMENT (continued)

REPLACEMENT PROCEDURE

1. Replace Auxiliary Rotor.
2. Replace the thru bolt securing the auxiliary rotor to the weld rotor. Hand tighten only.
3. Carefully place the Auxiliary Rotor on to the tapered shaft of the weld rotor.
4. Using a 1/2" torque wrench, tighten the thru bolt securing the auxiliary rotor to the weld rotor to fourteen foot pounds.
5. Perform the ***Auxiliary Stator Replacement Procedure.***
6. Perform the ***Welder Separation Procedure***.
7. Perform the ***Case Cover Replacement Procedure***.

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Return to Master TOC

WELD STATOR REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Weld Stator.

MATERIALS NEEDED

1/2” Wrench
3/8” Wrench
3/4” Wrench
Hoist
Lifting Straps
Blocks/Shims

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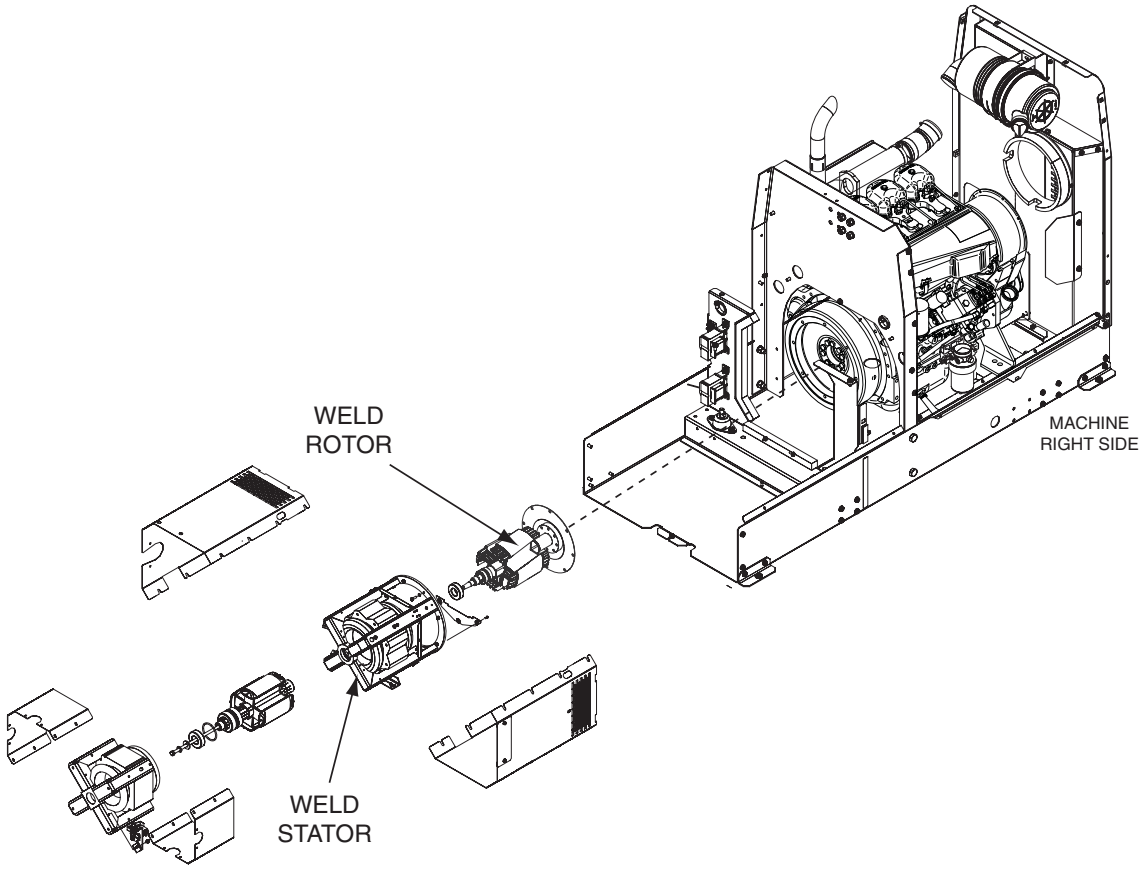
WELD STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.36 – WELD STATOR LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Welder Separation Procedure***.
4. Perform the ***Auxiliary Stator Removal Procedure.***
5. Perform the ***Auxiliary Rotor Removal Procedure.***
6. Locate the Weld Stator. See Figure F.36.
7. Using a 1/2” wrench, remove the two screws (4 total) securing the left and right baffles. ***See Figure F.37***.
8. Using a 3/4” wrench, remove the Weld Stator mounting bolts from the feet of the Weld Stator frame. ***See Figure F.38***.
9. Using a 1/2” wrench, remove all of the bolts securing the Weld Stator cowlings to the Weld Stator frame. ***See Figure F.38***.
10. Install blocking and/or shims beneath engine assembly. **Blocks must be in position before proceeding**.

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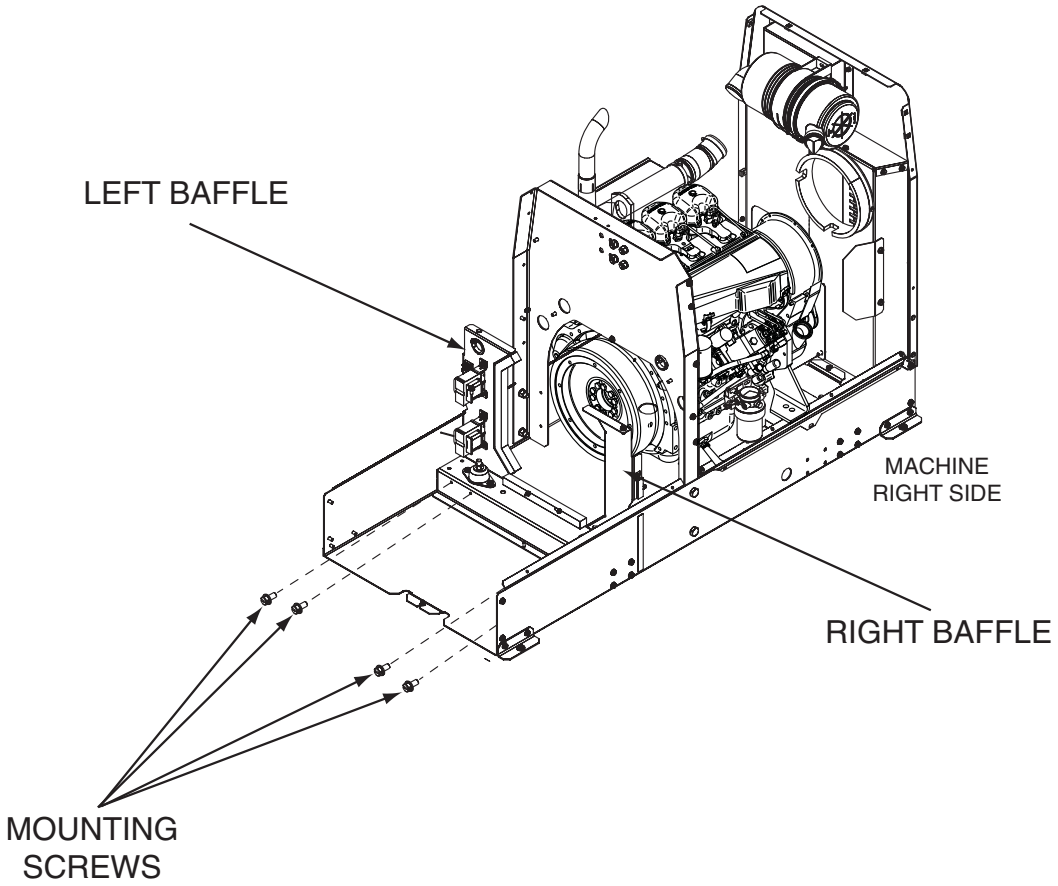
WELD STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.37 – LEFT AND RIGHT BAFFLE MOUNTING SCREW LOCATIONS



11. Using a hoist and lifting straps, elevate the Weld Stator frame about one inch off of the Weld Stator mountings. This will allow access and removal of the Weld Stator cowlings. ***See Figure F.39***.
12. Carefully maneuver the cowlings forward and away from the Weld Stator frame.
13. After cowlings are removed and the engine is blocked, lower the Weld Stator frame and engine assembly onto the blocks.

⚠ WARNING

Blocks must be in position before lowering. Engine damage may occur if blocks are not in position.

14. Prepare Weld Stator for removal by positioning lifting straps in the center of the Weld Stator.
15. Using a 3/8” wrench, remove the brush holder assembly. ***See Figure F.40***.
16. Using a 9/16” wrench, remove the six bolts securing the Weld Stator assembly to the engine assembly. Note bolt and washer placement for reassembly. ***See Figure F.40***.
17. Adjust height on hoist so that the Weld Stator can be carefully and gently maneuvered out and away from the machine. Replace.

WELD STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.38 – STATOR MOUNTING BOLT LOCATIONS

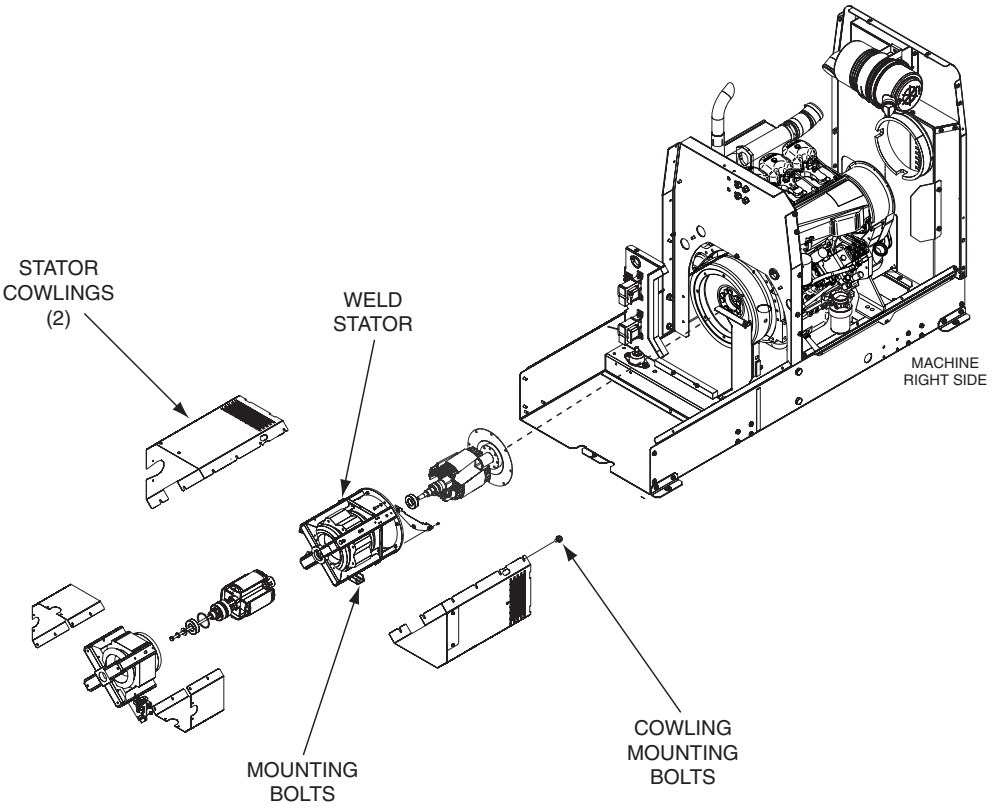
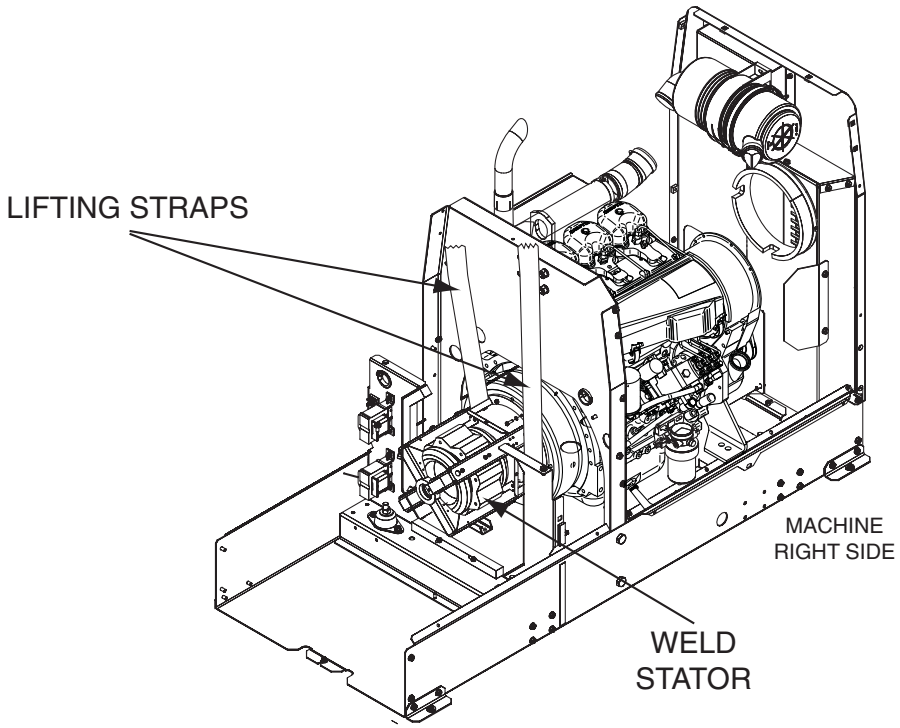


FIGURE F.39 – WELD STATOR BRUSH HOLDER AND STATOR ASSEMBLY MOUNTING BOLTS



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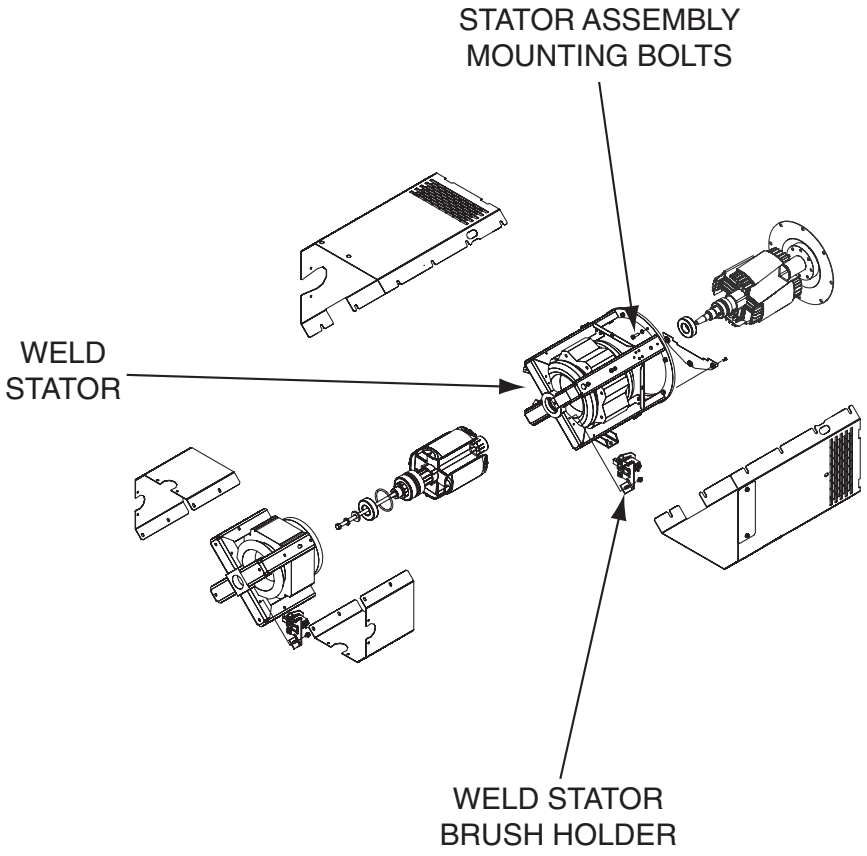
WELD STATOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.40 – WELD STATOR BRUSH HOLDER AND STATOR ASSEMBLY MOUNTING BOLTS



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WELD STATOR REMOVAL AND REPLACEMENT (continued)

REPLACEMENT PROCEDURE

1. Adjust height on hoist so that the Weld Stator can be carefully and gently maneuvered into machine.
2. Using a 9/16” wrench, replace the six bolts to secure the Weld Stator assembly to the engine assembly. Note bolt and washer placement.
3. Using a 3/8” wrench, replace the brush holder assembly. Make sure the brushes are centered in the center of the slip rings.
4. Prepare Weld Stator for replacement by positioning lifting straps in the center of the Weld Stator.
5. Lower the Weld Stator frame and engine assembly.
6. Carefully maneuver the cowlings into position.
7. Lower the Weld Stator frame about one inch from the Weld Stator mountings. This will allow access and replacement of the Weld Stator cowlings.
8. Remove blocking and/or shims from beneath engine assembly. Blocks must be removed before proceeding.
9. Using a 1/2” wrench, replace all of the bolts securing the Weld Stator cowlings to the Weld Stator frame.
10. Using a 3/4” wrench, install the Weld Stator mounting bolts to the feet of the Weld Stator frame.
11. Using a 1/2” wrench, replace the two screws (4 total) securing the left and right baffles.
12. Perform the ***Auxiliary Rotor Replacement Procedure***.
13. Perform the ***Auxiliary Stator Replacement Procedure***.
14. Perform the ***Welder Separation Procedure***.
15. Perform the ***Case Cover Replacement Procedure***.

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WELD ROTOR REMOVAL AND REPLACEMENT

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Weld Rotor.

MATERIALS NEEDED

17mm Wrench
Hoist
Lifting Straps

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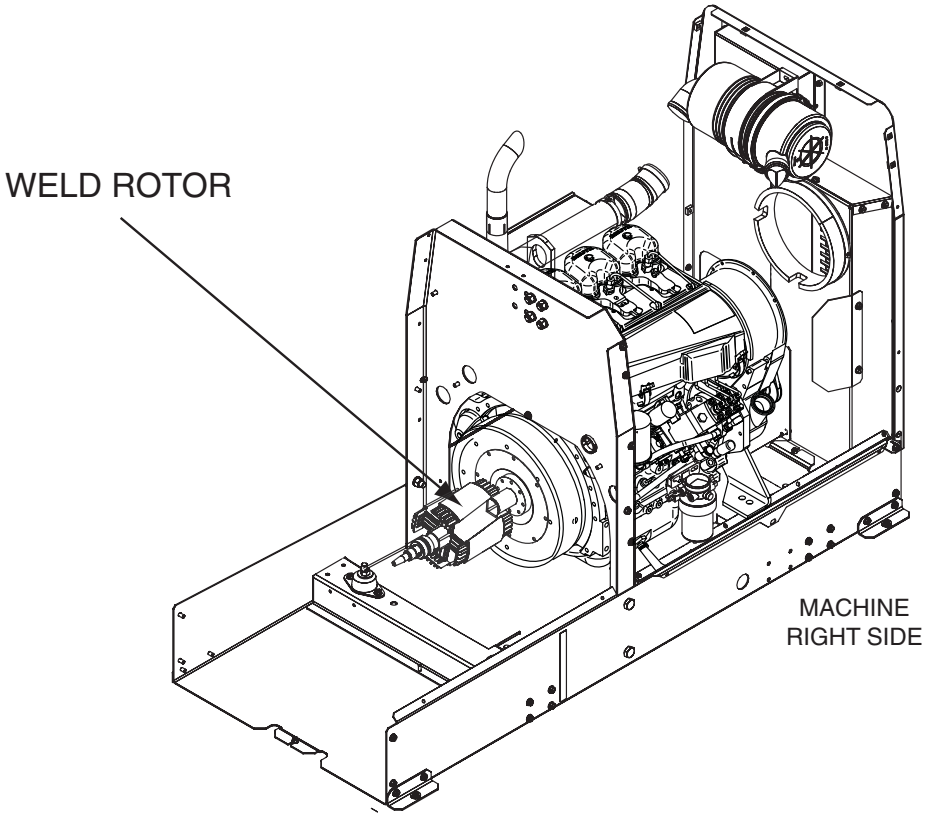
WELD ROTOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.41 – WELD ROTOR LOCATION



PROCEDURE

1. Turn machine off.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Welder Separation Procedure***.
4. Perform the ***Auxiliary Stator Removal Procedure.***
5. Perform the ***Auxiliary Rotor Removal Procedure.***
6. Perform the ***Weld Stator Removal Procedure.***
7. Locate the Weld Rotor. See Figure F.41.
8. Using a hoist and lifting straps, secure and support the weight of the Weld Rotor. ***See Figure F.42***.
9. Using an 17mm wrench, remove the eight bolts securing the blower paddles to the engine flywheel. ***See Figure F.43***.

⚠ WARNING

Prevent engine from turning while loosening blower paddle mounting bolts.

⚠ WARNING

When blower paddles are removed, the Weld Rotor is no longer secured to the engine flywheel. Make sure that a hoist and lifting straps are in position before removal of paddles.

10. Carefully remove Weld Rotor and flexplate assembly from the machine.

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WELD ROTOR REMOVAL AND REPLACEMENT (continued)

FIGURE F.42 – LIFTING STRAP POINTS

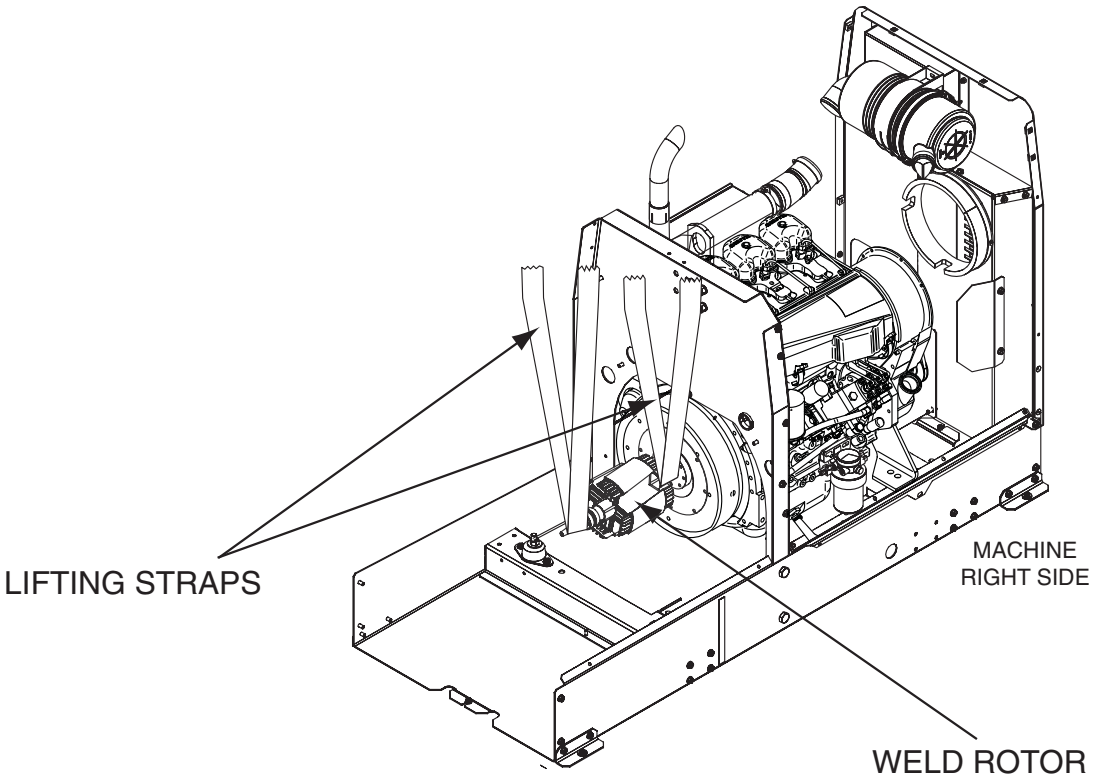
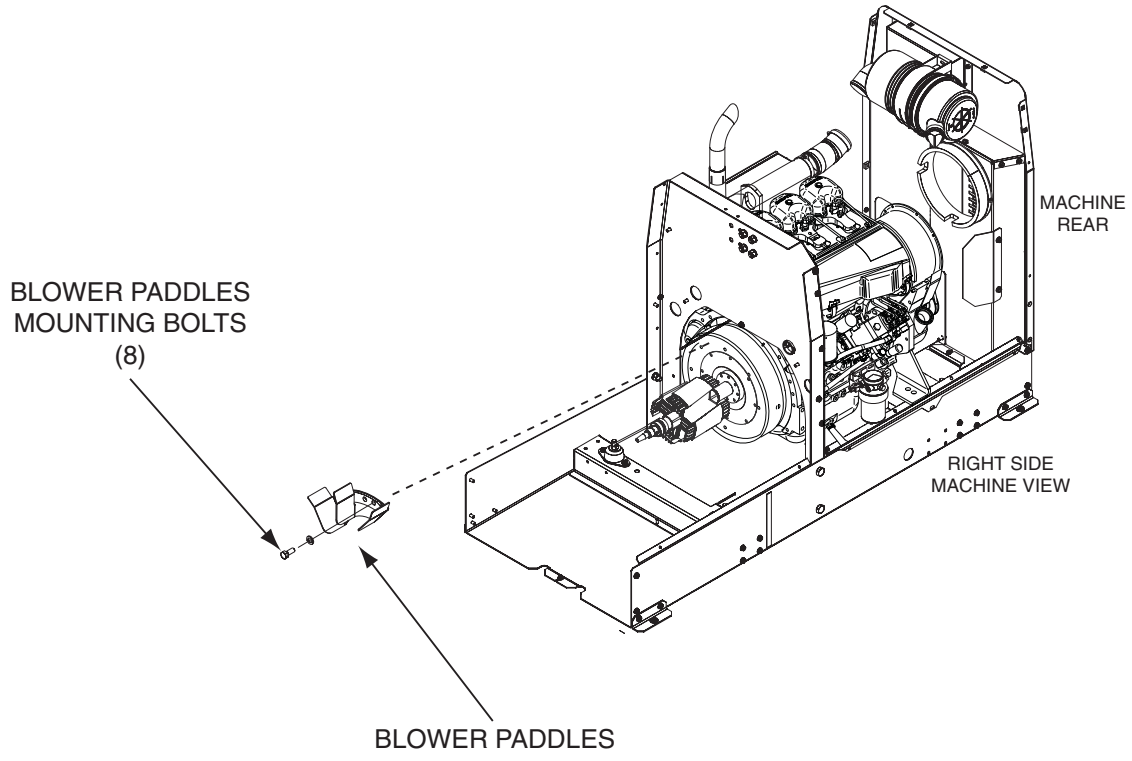


FIGURE F.43 – BLOWER PADDLE LOCATION



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WELD ROTOR REMOVAL AND REPLACEMENT (continued)

REPLACEMENT PROCEDURE

1. Replace the weld rotor and flexplate assembly to the machine.
2. Using a 17mm wrench, replace the eight bolts securing the blower paddles to the engine flywheel.
3. Release the weight of the weld rotor from the lifting straps.
4. Perform the ***Weld Rotor Replacement Procedure***.
5. Perform the ***Auxiliary Rotor Replacement Procedure***.
6. Perform the ***Auxiliary Stator Replacement Procedure***.
7. Perform the ***Welder Separation Procedure***.
8. Perform the ***Case Cover Replacement Procedure***.

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RETEST AFTER REPAIR

RETEST A MACHINE:

- If it is rejected under test for any reason that requires the removal of any mechanical part that could affect the machine's electrical characteristics or performance OR
- If any electrical components are repaired or replaced.

ENGINE OUTPUT

MODEL / ENGINE	NO LOAD RPM	LOAD RPM
Big Red 500 / Deutz D2011Lo3i	1890	1800
Big Red 600 / Deutz FL3 912	1890	1800

RATED WELDER OUTPUT

Model	Welding Process	Fine Current Control Rheostat	Current Selector Switch	Maximum Open Circuit Volts	Maximum Load Current	Load Volts
Big Red 500	DC Constant Current	Maximum	Maximum	90 VDC	500 Amps	30 VDC
Big Red 500	TIG	Maximum	Maximum	75 VDC	250 Amps	20 VDC
Big Red 600	DC Constant Current	Maximum	Maximum	90 VDC	600 Amps	30 VDC
Big Red 600	TIG	Maximum	Maximum	75 VDC	250 Amps	20 VDC

AC AUXILIARY POWER RECEPTACLES OUTPUT

240 Volt Receptacle			120 Volt Receptacle(s)		
Open Circuit Voltage	Load Volts	Load Amps	Open Circuit Voltage	Load Volts	Load Amps
230 - 264	216 - 252	15	115 - 132	108 - 126	15
			115 - 132	108 - 126	20

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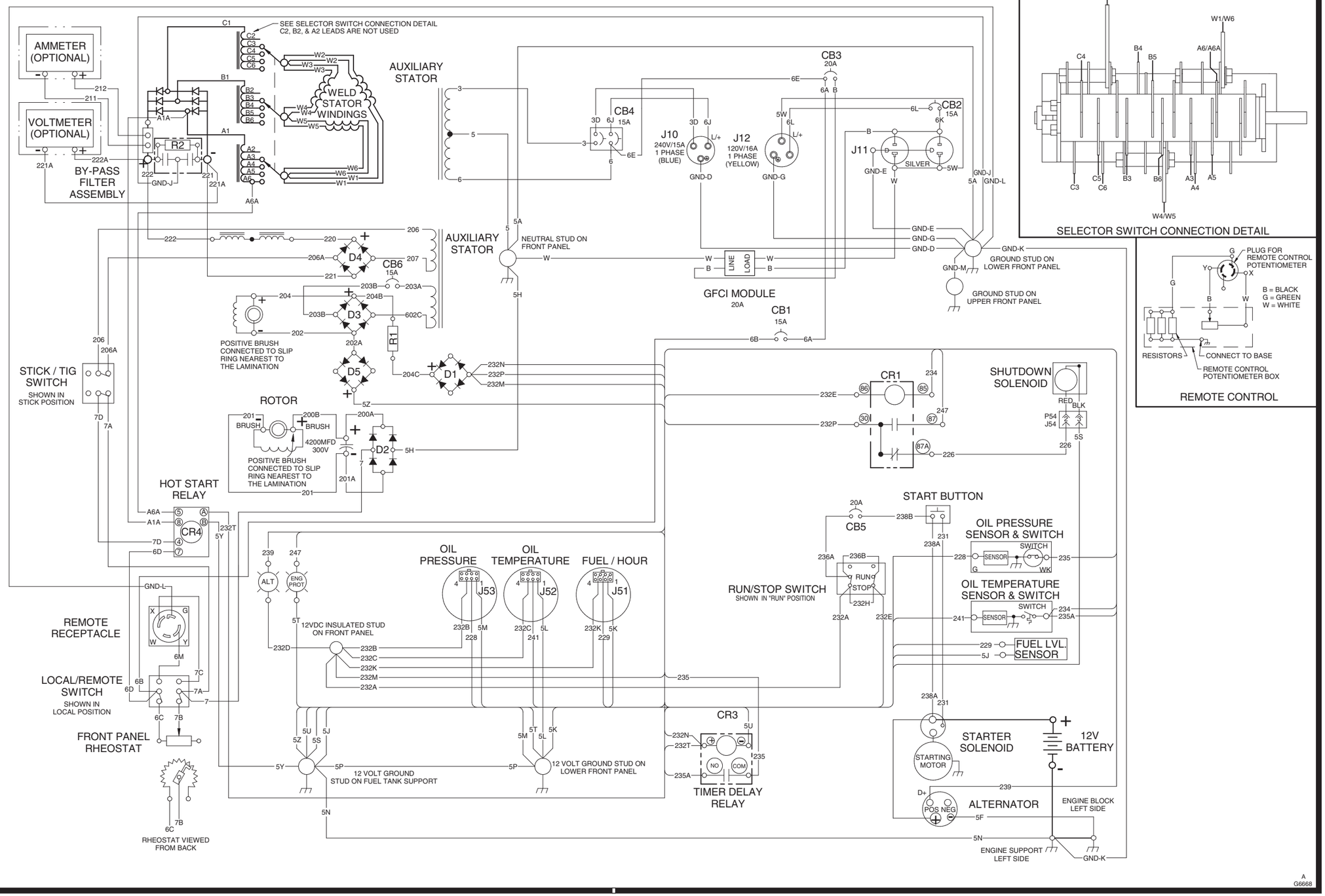
WIRING DIAGRAM - BIG RED® 500 CODE 11599 (G6668)

BIG RED 500 (K2810-1) WIRING DIAGRAM



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

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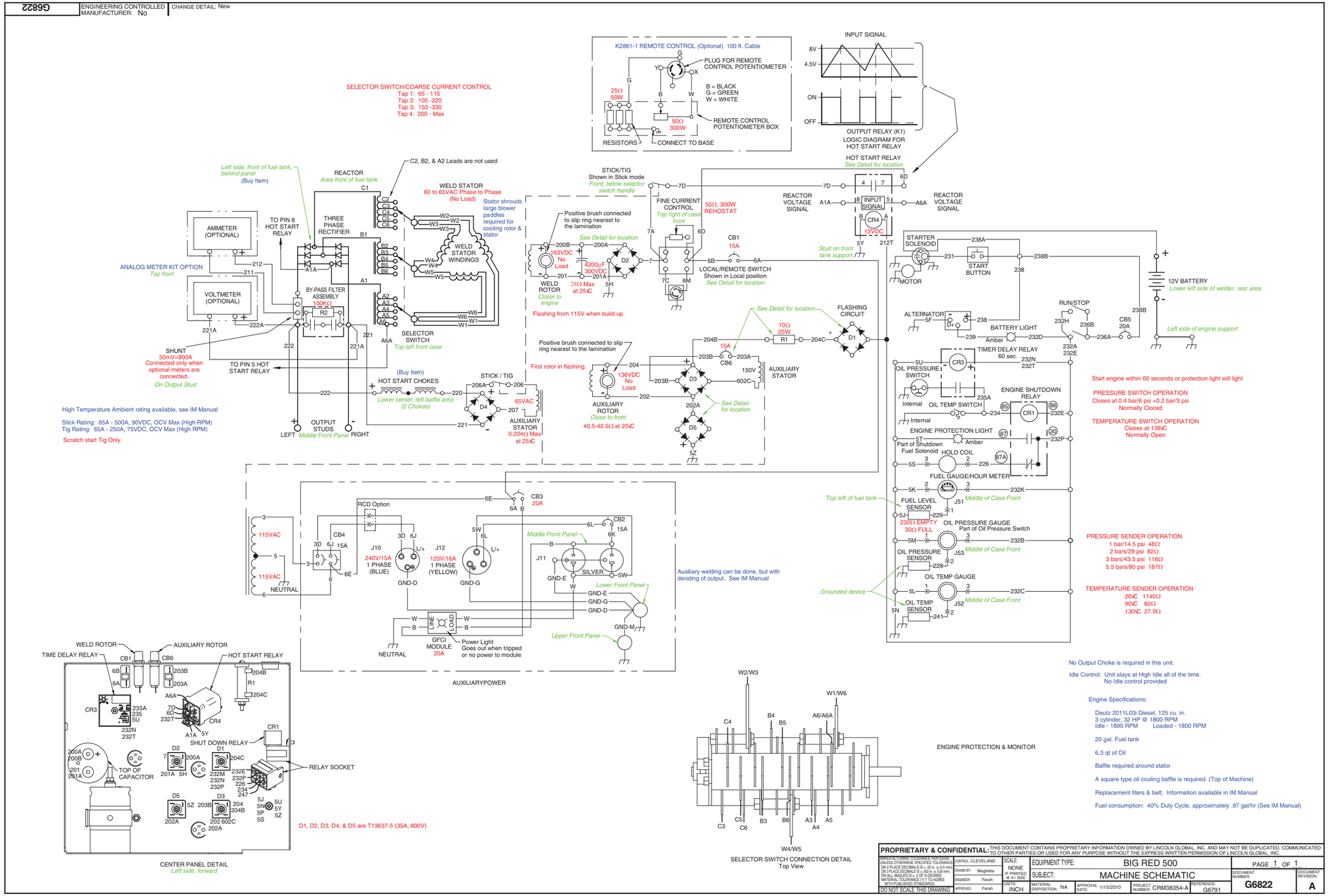
SCHEMATIC - BIG RED® 500 CODE 11599 (G6822)

G6822 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: New



MANUFACTURING TOLERANCE PER ESS02 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (± 0.5 mm) ON 3 PLACE DECIMALS IS ± .005 in. (± 0.05 mm) ON ALL ANGLES IS ± 5 OF A DEGREE MATERIAL TOLERANCE (*1) TO AGREE WITH PUBLISHED STANDARDS	CONTROL: CLEVELAND	SCALE: NONE	EQUIPMENT TYPE: BIG RED 500		PAGE 1 OF 1
DO NOT SCALE THIS DRAWING	DRAWN BY: Magletta	IF PRINTED @ A1 SIZE	SUBJECT: MACHINE SCHEMATIC		DOCUMENT REVISION: A
	ENGINEER: Farah	UNITS: INCH	MATERIAL DISPOSITION: NA	APPROVAL DATE: 1/15/2010	PROJECT NUMBER: CRM38354-A	REFERENCE: G6791	DOCUMENT NUMBER: G6822
	APPROVED: Farah						

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

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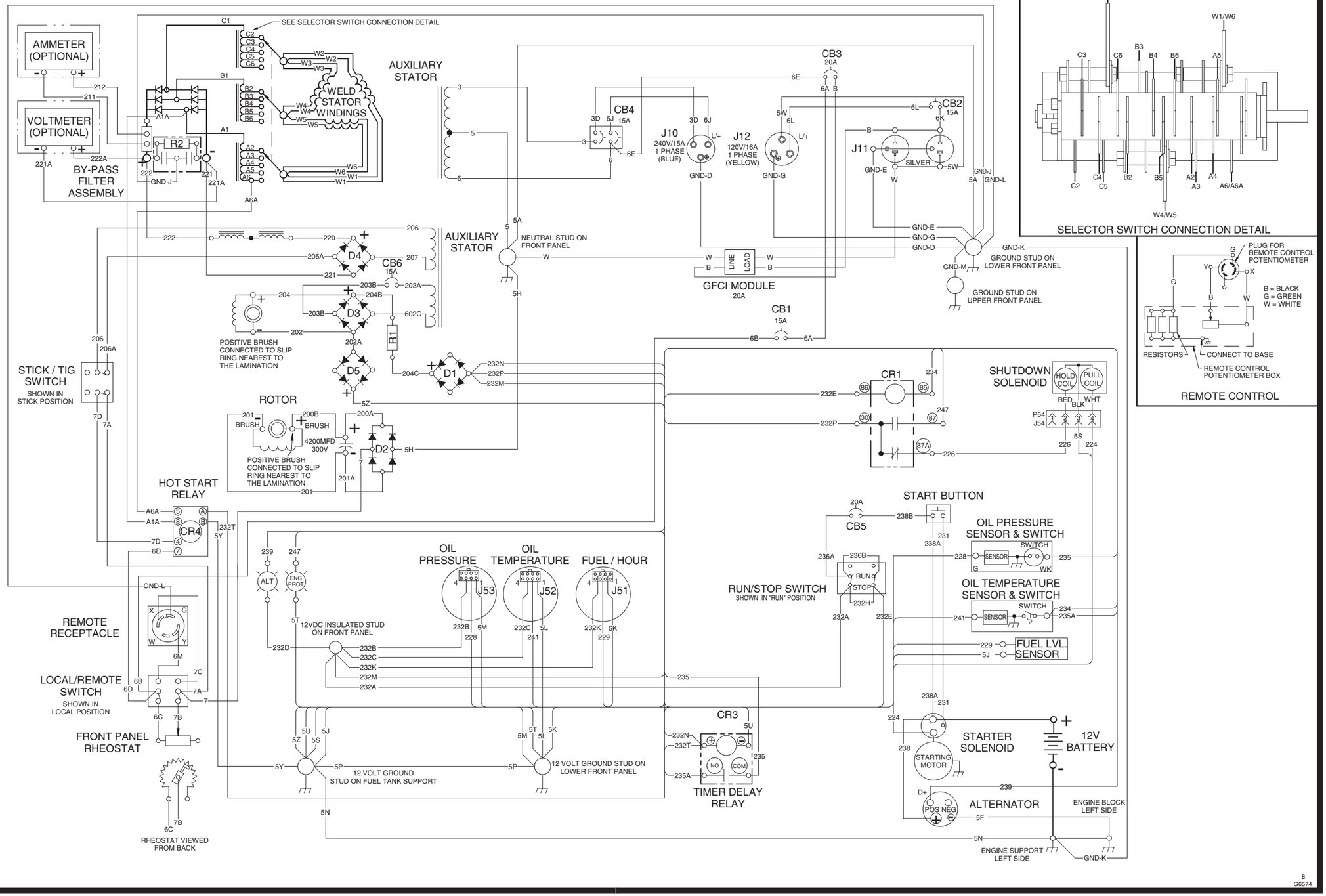
WIRING DIAGRAM - BIG RED® 600 CODE 11585 (G6574)

BIG RED 600 (K2811-1) WIRING DIAGRAM



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

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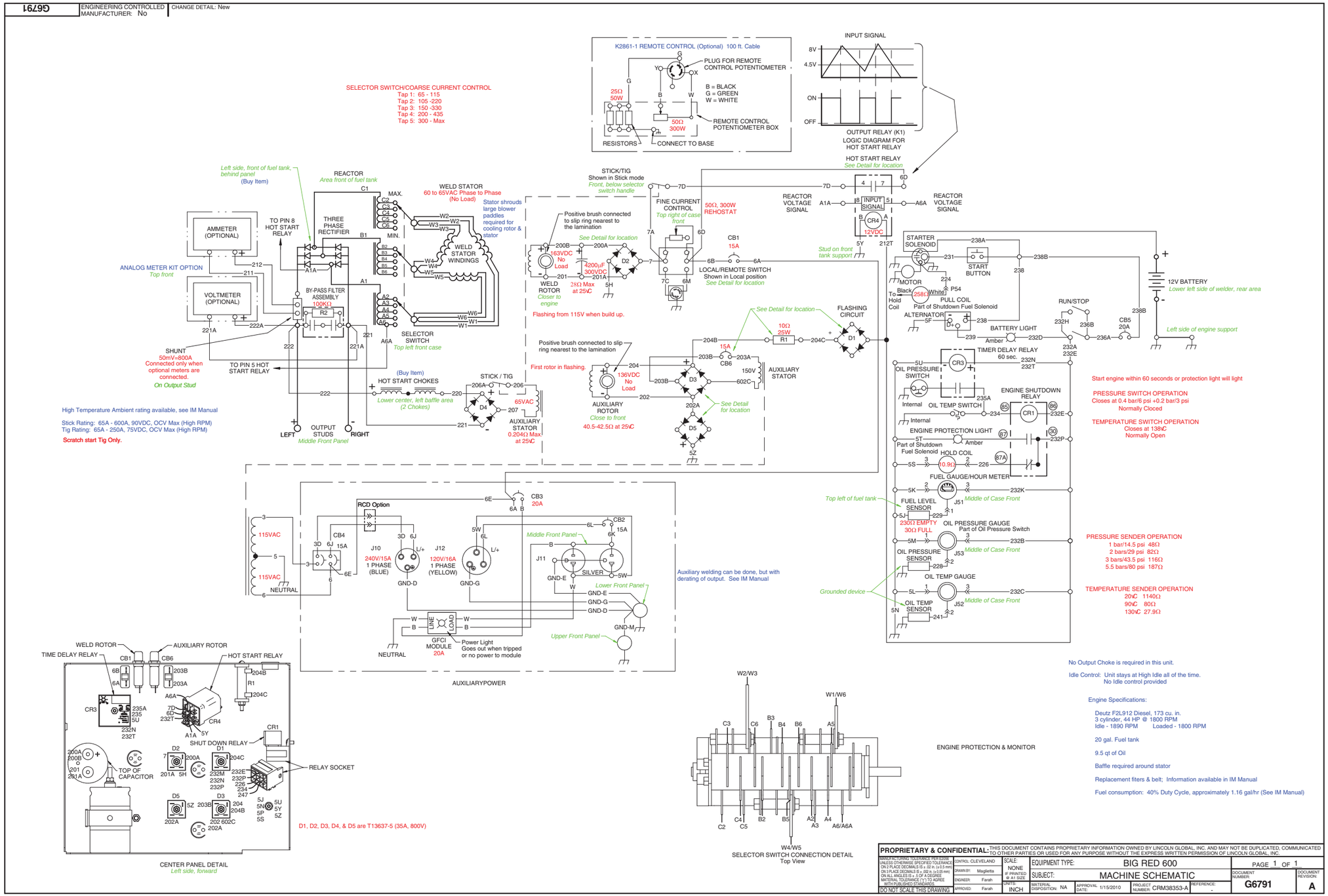
SCHEMATIC - BIG RED® 600 CODE 11585 (G6791)



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