



# CLASSIC I™

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

For use with machines having Code Numbers:

**10068 to 10069**

# SERVICE MANUAL



**⚠ WARNING**

**⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠**

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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



**FOR ENGINE powered equipment.**

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



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



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

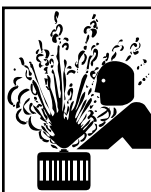


1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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

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

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



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



**ELECTRIC AND MAGNETIC FIELDS may be dangerous**

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

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

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

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

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

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

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

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

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

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### ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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



### ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

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

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



### FUMES AND GASES can be dangerous.

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

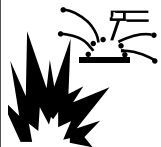
5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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

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

5.e. Also see item 1.b.

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## WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area.

If this is not possible, cover them to prevent the welding sparks from starting a fire.

Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

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

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

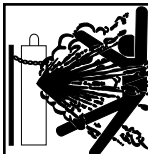
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe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

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

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

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

6.h. Also see item 1.c.



## CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.

- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

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

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

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

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY powered equipment.

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

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

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

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## PRÉCAUTIONS DE SÛRETÉ

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

### Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
  - a. Les circuits à l'électrode et à la pièce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
  - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
  - c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état de fonctionnement.
  - d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
  - e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
  - f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces précautions pour le porte-électrode s'appliquent aussi au pistolet de soudage.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas où on 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 soleil, donc:
  - a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
  - b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
  - c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans latéraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.
7. Quand on ne soude pas, poser la pince à un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (gas fortement toxique) ou autres produits irritants.
11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

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

1. Relier à la terre le châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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# INSTALLATION

## TECHNICAL SPECIFICATIONS - CLASSIC I

INPUT - DIESEL ENGINE					
<u>Manufacturer</u>	<u>Description</u>	<u>Speed</u>	<u>Displacement</u>	<u>Ignition</u>	<u>Capacities</u>
Continental TM27	4 cyl., 4 cycle Water-cooled gasoline 38 HP @ 1450 RPM	1450 RPM Full load  1600 RPM High idle  1000 RPM Low idle	164.7 cu. in. (2700 cc)	Distributor Type Electronic	Fuel: 15 gal. (57 liters)  Oil: 6.0 qt. (5.7 liters)  Coolant: 9.3 qt. (8.8 liters)
RATED OUTPUT - WELDER					
<u>Duty Cycle</u>	<u>Amps</u>		<u>Volts at Rated Amperes</u>		
60% Duty Cycle	200 DC Constant Current		40V <sup>(1)</sup>		
OUTPUT - WELDER AND GENERATOR					
<u>Welding Ranges</u>	<u>Max. Open Circuit Voltage</u>	<u>Auxiliary Power</u>			
40-300 Amps DC	95	1.75 kw 15 Amps @ 120V DC			
PHYSICAL DIMENSIONS					
<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Weight</u>		
40.9 in. 1040 mm	24 in. 610 mm	67.5 in. 1714 mm	1370 lb. 621 kg		

<sup>1</sup> Lincoln rating. Nema rating at 60% duty cycle is 200 DC amps / 28V.

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# INSTALLATION

Read this entire installation section before you start installation.

## SAFETY PRECAUTIONS

### WARNING

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

#### ELECTRIC SHOCK can kill.



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

#### ENGINE EXHAUST can kill.



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

#### MOVING PARTS can injure.



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

See additional safety information at the front of this manual.

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

## LOCATION AND VENTILATION

Always operate the Classic I with the doors closed. Leaving the doors open changes the designed air flow and may cause overheating. Always operate the welder with the case roof on and all machine components completely assembled. This will help protect you from the dangers of moving parts, hot metal surfaces, and live electrical devices.

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

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

## 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 SAE 30 or 40 oil. Run the engine for two 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. See **Battery Maintenance** in the **Maintenance** section of this manual.
4. See your engine operation manual for further information on fuel and engine preservation. See also "short" or "long" term storage in the Engine manual.

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## STACKING

Classic I machines CANNOT be stacked.

## TILTING

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

The gasoline engine is designed to run in a level position for best performance. If you do operate it at a slight angle, be sure to check the oil regularly and keep the oil level at the FULL mark as it would be in its normal level condition. Also, fuel capacity will be a little less at an angle.

## LIFTING

The Classic I weighs 1370 lb./621 kg. A lift bail is provided for lifting with a hoist.

### ⚠ WARNING



#### FALLING EQUIPMENT can cause injury.

Do not lift this machine using lift bail if it is equipped with a heavy accessory such as a trailer.

Lift only with equipment of adequate lifting capacity. Be sure machine is stable when lifting.

## HIGH ALTITUDE OPERATION

It may be necessary to derate welder output at higher altitudes. Some engine adjustment may be required. Contact a Continental Service Representative.

## PRE-OPERATION ENGINE SERVICE

Read and understand the information about the gasoline engine in the **Operation** and **Maintenance** sections of this manual before you operate the Classic I.

### ⚠ WARNING

Keep hands away from the engine muffler or HOT engine parts.

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

## OIL



The Classic I is shipped with the engine filled with SAE 10W-30 oil. This should be fine for most ambient operating temperature conditions. See the engine operation manual for specific recommendations. **CHECK THE OIL LEVEL BEFORE YOU START THE ENGINE.** This is an added precaution. When full, the oil level should be up to but not over the FULL mark on the dipstick. If it is not full, add enough oil to fill it to the full mark. DO NOT overfill.

For more oil fill and service information, see the **Maintenance** section of this manual.

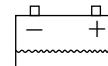
## FUEL



Fill the fuel tank with clean, gasoline only. The Classic I has a 15 gallon (57 liter) fuel tank with a top fill and fuel gauge mounted on the control panel. See the **Operation** and **Maintenance** sections of this manual for more details about fuel.

## BATTERY CONNECTIONS

The Classic I is shipped with the negative battery cable disconnected. Before you operate the machine, make sure the IGNITION switch is in the OFF position and attach the disconnected cable securely to the battery terminal. If the battery is discharged and won't start the engine, see the battery charging instructions in the **Maintenance** section.



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## COOLING SYSTEM

The cooling system has been filled at the factory with a 50-50 mixture of ethylene glycol antifreeze and water. Check the radiator level and add a 50-50 solution as needed. (See the engine manual or antifreeze container for alternate antifreeze recommendations.)

## MUFFLER

This welder is supplied with an adjustable rain cap for the muffler. Install the rain cap using the clamp provided with the outlet facing away from the direction in which this unit will be transported. This will minimize the amount of water and debris that could enter the muffler during transportation.

## EXHAUST SPARK ARRESTER

Some federal, state, or local laws may require that engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard. The standard mufflers included with these welders do not qualify as spark arresters. When required by local regulations, a suitable spark arrester must be installed and properly maintained.

### **▲ CAUTION**

Use of an incorrect arrester may lead to engine damage or performance loss. Contact the engine manufacturer for specific recommendations.

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## TRAILERS

If you use a non-Lincoln trailer, you must assume responsibility that the method of attachment and usage does not result in a safety hazard nor damage the welding equipment. Some of the factors to be considered are as follows:

1. Design capacity of the trailer vs. the weight of the 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 ensure stability side to side and front to back. This includes when being moved and when standing by itself for operation or service.
4. Typical conditions of use, such as travel speed, roughness of the surfaces where the trailer will be used, environmental conditions, likely maintenance.
5. Conformance with federal, state, and local laws. Consult applicable federal, state, and local laws about specific requirements for use on public highways.

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## MACHINE GROUNDING

According to the United States National Electrical Code, the frame of this portable generator is not required to be grounded and is permitted to serve as the grounding means for cord connected equipment plugged into its receptacle.

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

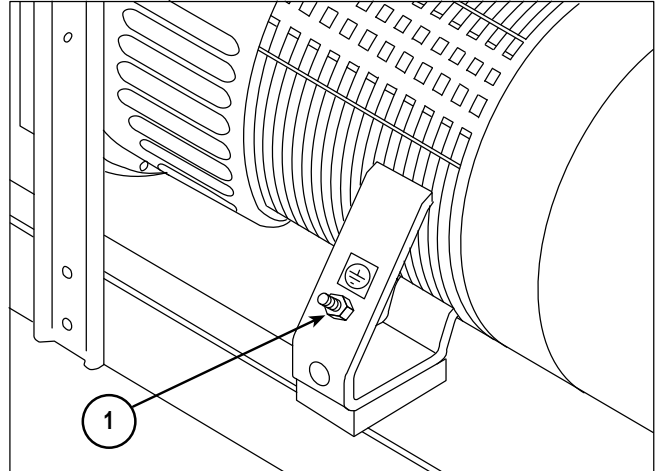
Some state, local, or other codes or unusual operating circumstances may require the machine frame to be grounded. It is recommended that you determine the extent to which such requirements may apply to your particular situation and follow them explicitly. A machine grounding stud marked with the symbol  is provided on the welding generator frame foot. See Figure A.1. (If an older portable welder does not have a grounding stud, connect the ground wire to an unpainted frame screw or bolt).

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 water pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The U.S. National Electrical Code lists a number of alternate means of grounding electrical equipment.

### WARNING

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

FIGURE A.1 - GROUND STUD LOCATION



1. Ground Stud

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**LINCOLN**<sup>®</sup>  
ELECTRIC

# INSTALLATION

## ELECTRICAL OUTPUT CONNECTIONS

See Figure A.2 for the location of the 115V DC volt receptacle, weld output terminals, and ground stud.

## WELDING CABLE CONNECTIONS

### CABLE INSTALLATION AND CABLE SIZES

With the engine off, route the electrode and work cables through the strain relief bracket on the base and connect to the terminals located below the fuel tank mounting rail. (See size recommendations below.) For positive polarity, connect the electrode cable to the terminal marked Positive (+). For Negative polarity, connect the electrode cable to the Negative (-) terminal. These connections should be checked periodically and tightened if necessary.

## ⚠ CAUTION

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

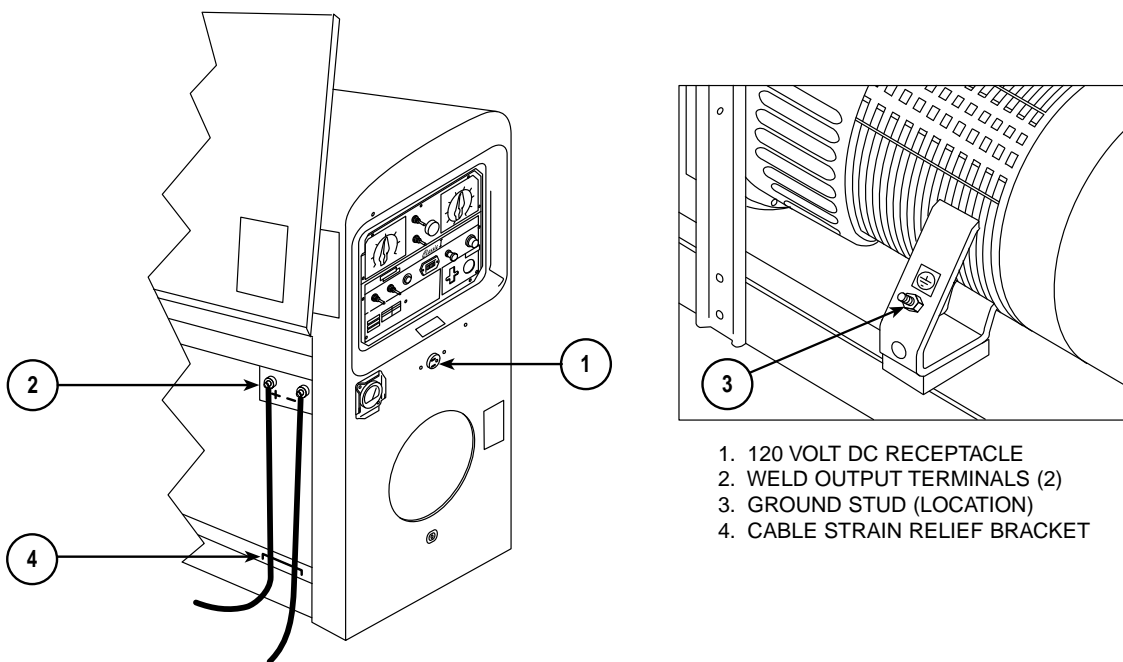
When welding at a considerable distance from the welder, be sure you use ample size welding cables. Table A.1 lists recommended cable sizes and lengths for rated current and duty cycle. Length refers to the distance from the welder to the work and back to the welder. Cable diameters are increased for long cable lengths to reduce voltage drops.

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

## AUXILIARY POWER RECEPTACLE, PLUGS, AND HAND-HELD EQUIPMENT

The DC auxiliary power, supplied as a standard, has a rating of 1.75 kw of 120V DC.

FIGURE A.2 - CLASSIC I OUTPUT CONNECTIONS



1. 120 VOLT DC RECEPTACLE
2. WELD OUTPUT TERMINALS (2)
3. GROUND STUD (LOCATION)
4. CABLE STRAIN RELIEF BRACKET

TABLE A.1 - RECOMMENDED COPPER WELDING CABLE SIZE AND LENGTH  
TOTAL COMBINED LENGTH OF ELECTRODE AND WORK CABLES

		Cable size for combined length of electrode plus work cable	
Amps	Duty Cycle	Up to 200 ft.	200 to 250 ft.
200	60%	1	1/0

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# OPERATION

## OPERATING INSTRUCTIONS

Read and understand this entire section before operating your Classic I.

## SAFETY INSTRUCTIONS

### ⚠ WARNING

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

### ELECTRIC SHOCK can kill.



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

### FUMES AND GASES can be dangerous.



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

### WELDING SPARKS can cause fire or explosion.



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

### ARC RAYS can burn.



- Wear eye, ear, and body protection.

### ⚠ WARNING



### ENGINE EXHAUST can kill.

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



### MOVING PARTS can injure.

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

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

## GENERAL DESCRIPTION

The Classic I is a heavy duty engine driven DC arc welding power source capable of providing DC constant current output for stick welding or DC TIG welding. The Classic I is wound with all copper coils for better arc stability and precise welding control. With the addition of the optional Wire Feed Module or CV adapter, the Classic I will provide constant voltage output for running the LN-25 wire feeder.

The Classic I has a current range of 40-300 DC amps. It provides 1.75 kw of 120V DC auxiliary power.

This unit uses the four cylinder Continental TM27 industrial, water-cooled gasoline engine.

CLASSIC I





# OPERATION

## RECOMMENDED APPLICATIONS

### WELDER

The Classic I provides excellent constant current DC welding output for stick (SMAW) welding and for DC TIG welding. For more details on using the machine as a welder, see **Welding Operation** in the **Operation** section of this manual.

### GENERATOR

The Classic I is also capable of providing 1.75 kw of 115V DC auxiliary power.

## OPERATIONAL FEATURES AND CONTROLS

The Classic I was designed for simplicity. Therefore, it has very few operating controls. Two switches are used for welding operations:

- A five-position CURRENT RANGE SELECTOR switch selects current output ranges for constant current stick or TIG applications and constant voltage wire feed applications (with optional Wire Feed Module - see the **Accessories** section)
- A FINE CURRENT ADJUSTMENT control for fine adjustment of current from minimum to maximum within each range

Controls for the gasoline engine control include a two-position IGNITION ON/OFF toggle switch, a START pushbutton, and a two-position IDLER switch that selects engine speed for welding or auxiliary power applications. See **Engine Operation** in the **Operation** section of this manual for details about starting, running, stopping, and breaking in the gasoline engine.

## DESIGN FEATURES

- Constant current DC Stick welding (SMAW) process capability with output range from 40 - 300 DC amps.
- Work and Electrode welding cable mounting terminals.
- Separate ground stud for safe connection of case to earth ground.
- 115 volt DC auxiliary power receptacle.
- Electric starting.
- Distributor type electronic ignition.
- Battery Charging Ammeter.
- Engine Hour Meter for determining periodic maintenance.
- Top-of-the-line 38 HP Continental gasoline engine.
- Top-mounted 15 gallon (57.0 liter) fuel tank with convenient top fill.
- Automatic engine idler goes to low idle approximately 15 seconds after welding for greater fuel economy; includes high idle switch.

## WELDING CAPABILITY

The Classic I is rated 200 amps, 40 volts constant current DC at 60% duty cycle based on a ten minute time period. Longer duty cycles at lower output currents are possible.

The current is continuously variable from 40 to 300 amps DC.

## LIMITATIONS

The Classic I is not recommended for any processes besides those that are normally performed using DC stick welding (SMAW) and DC TIG welding. Specific limitations on using the Classic I for these processes are described in the **Welding Operation** section of this manual. Constant voltage welding is available with the optional Wire Feed Module.

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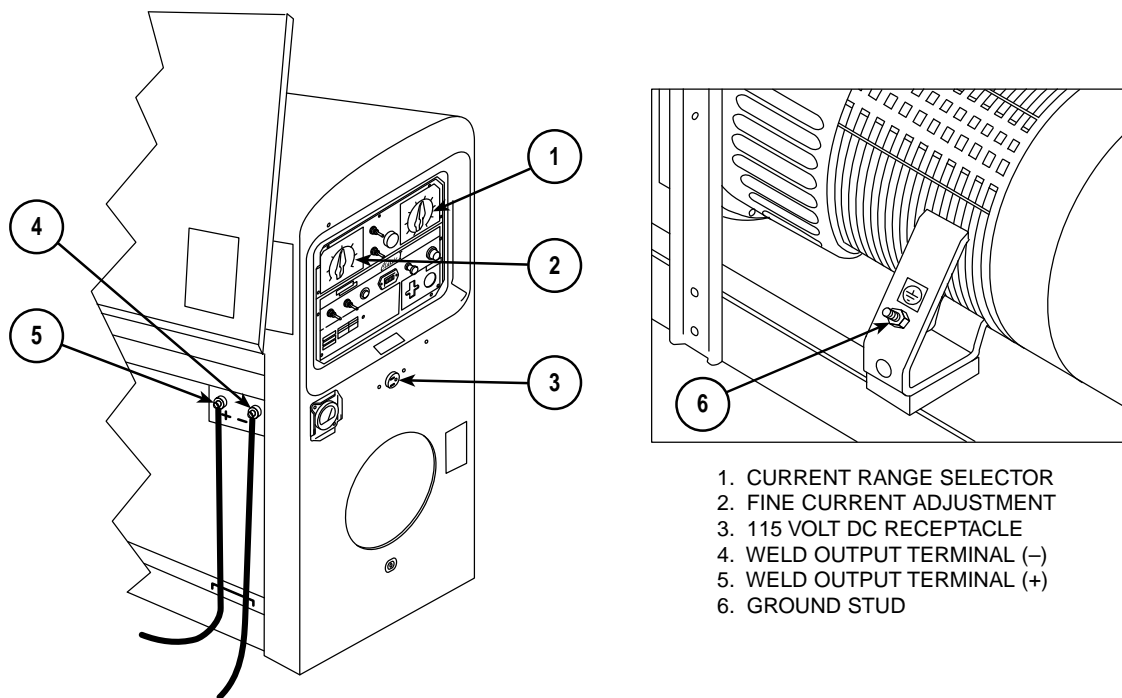
# OPERATION

## CONTROLS AND SETTINGS

The welder/generator controls are located on the Output Control Panel of the machine case front. Engine idler control and start/stop controls are also on

the case front. Welding output terminals and ground stud are located on the machine right side, under the door. See Figure B.1, **B.2** and **B.3** and the explanations that follow.

**FIGURE B.1 – OUTPUT CONTROLS**



1. CURRENT RANGE SELECTOR
2. FINE CURRENT ADJUSTMENT
3. 115 VOLT DC RECEPTACLE
4. WELD OUTPUT TERMINAL (-)
5. WELD OUTPUT TERMINAL (+)
6. GROUND STUD

## WELDER/GENERATOR CONTROLS

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

1. **CURRENT RANGE SELECTOR:** Selects ranges of continuous current output for constant current stick or TIG applications and constant voltage wire feed applications (with optional Wire Feed Module). See *Control of Welding Current* for more information.
2. **FINE CURRENT ADJUSTMENT:** Allows fine adjustment of current within the selected output range. See *Control of Welding Current* for more information.
3. **120 VOLT DC RECEPTACLE:** Connection point for supplying 120V DC power to operate DC electrical devices.
4. **WELD OUTPUT TERMINAL (-) WITH FLANGE NUT:** Provides the connection point for either the electrode holder or the work cable.
5. **WELD OUTPUT TERMINAL (+) WITH FLANGE NUT:** Provides the connection point for either the electrode holder or the work cable.
6. **GROUND STUD:** Provides a connection point for connecting the machine case to earth ground. See *Machine Grounding* in the *Installation* section of this manual.

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# OPERATION

## CONTROL OF WELDING CURRENT

### ⚠ CAUTION

- DO NOT turn the CURRENT RANGE SELECTOR while welding because the current may arc between the contacts and damage the switch.
- DO NOT attempt to set the CURRENT RANGE SELECTOR between the five points designated on the nameplate.

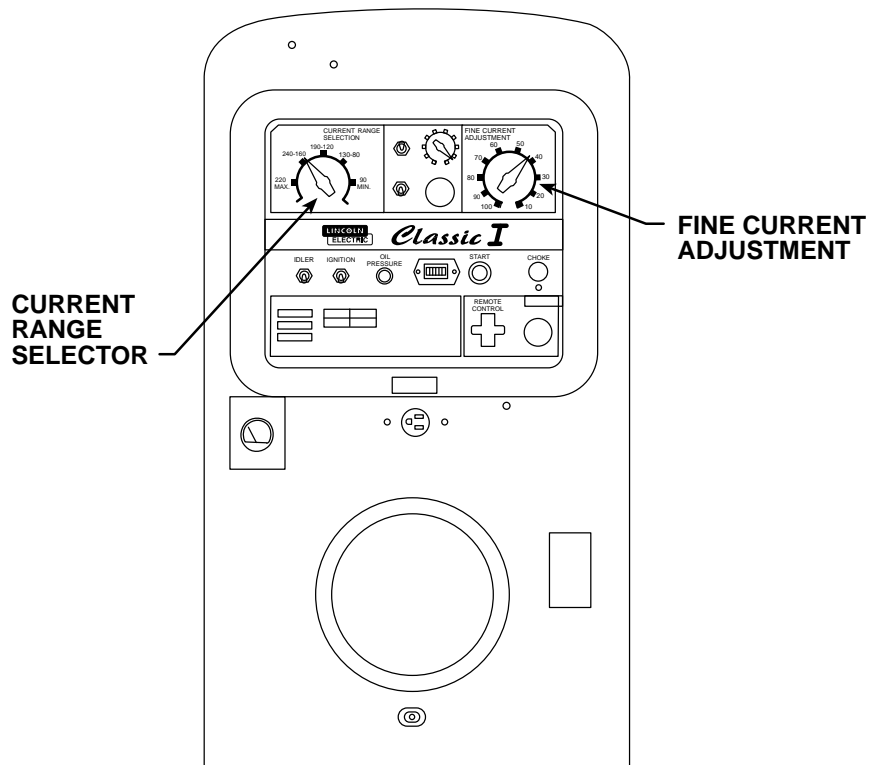
See Figure B.2. The CURRENT RANGE SELECTOR provides five overlapping current ranges. The FINE CURRENT ADJUSTMENT adjusts the current from minimum to maximum within each range. Open circuit voltage is also controlled by the FINE CURRENT ADJUSTMENT, permitting control of the arc characteristics.

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 CURRENT RANGE SELECTOR to the lowest setting that still provides the current you need and set the FINE CURRENT ADJUSTMENT near maximum. For example: to obtain 175 amps and a soft arc, set the CURRENT RANGE SELECTOR to the 190 to 120 position and then adjust the FINE CURRENT ADJUSTMENT for 175 amps.

When a forceful "digging" arc is required, usually for vertical and overhead welding, use a higher CURRENT RANGE SELECTOR setting and lower open circuit voltage. For example: to obtain 175 amps and a forceful arc, set the CURRENT RANGE SELECTOR to 240-160 position and the FINE 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.

FIGURE B.2 – CURRENT CONTROLS



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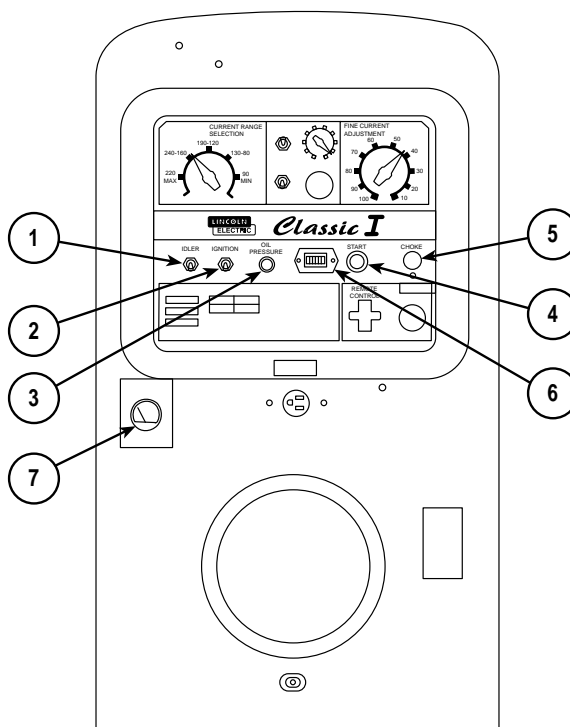
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# OPERATION

## FIGURE B.3 – GASOLINE ENGINE CONTROLS

1. IDLER CONTROL TOGGLE SWITCH
2. IGNITION TOGGLE SWITCH
3. OIL PRESSURE LIGHT
4. START PUSHBUTTON
5. CHOKE CONTROL
6. ENGINE HOUR METER
7. AMMETER



## GASOLINE ENGINE CONTROLS

See Figure B.3 for the location of the following features:

1. **IDLER CONTROL TOGGLE SWITCH:** Adjusts the running speed of the engine. The switch has two positions, "HIGH" and "AUTO." In "HIGH," the engine runs continuously at high idle. In "AUTO," the idler control works as follows:

**Welding:** The engine accelerates to high speed when the electrode touches the work and strikes a welding arc. The engine returns to low idle approximately 15 seconds after welding stops, as long as no auxiliary power is being drawn.

**Auxiliary Power:** The engine accelerates to high speed when power is drawn at the receptacle for lights or tools. The engine returns to low idle approximately 15 seconds after demand for auxiliary power stops.

2. **IGNITION CONTROL TOGGLE SWITCH:** Has two positions, ON and OFF. When the switch is in the ON position, the engine can be started by pressing the START pushbutton. When the switch is placed in the OFF position, the engine stops.
3. **OIL PRESSURE LIGHT:** Lights when the engine oil pressure drops to an unsafe level. If the light comes on within 30 seconds after startup, the engine should be stopped by placing the IGNITION switch in the OFF position.

4. **START PUSHBUTTON:** Press this button to start the gasoline engine. The IGNITION switch must be in the ON position.

**NOTE:** If you press the START pushbutton when the engine is running, you may damage the engine flywheel gear or starter motor.

6. **ENGINE HOUR METER:** Records engine running time. Use the meter to determine when to perform required maintenance.
7. **AMMETER:** Shows whether the charging circuit is performing its job of charging the battery when the engine is running. The meter will register discharge during starting, but then the needle should return to a position slightly toward positive during running. The needle will hold position in the center when the engine stops.

CLASSIC I



# OPERATION

## ENGINE OPERATION

### ⚠ WARNING

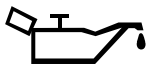
DO NOT RUN THE ENGINE AT EXCESSIVE SPEEDS. The maximum allowable high idle speed for the Classic I is 1550 RPM, no load. Do NOT increase the idle speed on the engine. Severe personal injury and damage to the machine can result if it is operated at speeds above the maximum rated speed.

Read and understand all safety instructions included in the Continental engine instruction manual that is shipped with your Classic I.

## BEFORE STARTING THE ENGINE

### Check and fill the engine oil level:

1. Be sure the machine is on a level surface.
2. Remove the engine oil dipstick and wipe it with a clean cloth. Reinsert the dipstick and check the level on the dipstick. See **Figure D.1** in the Maintenance section of this manual.
3. Add oil (if necessary) to bring the level up to the full mark. Do not overfill.
4. Replace the dipstick.



### Check and fill the engine fuel tank:

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

### ⚠ WARNING

Do not add 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.



**NOTE:** USE GASOLINE ONLY. Purchase gasoline in quantities that will be used within 30 days, to assure freshness.

## STARTING THE ENGINE

**NOTE:** Remove all loads connected to the DC power receptacle before starting the engine. Make sure the fuel valve on the sediment bowl is in the open position.

1. Place the IDLER switch in the "HIGH" position and the IGNITION switch in the ON position. Pull out the choke cable and then press the START button.

**NOTE:** If the engine fails to start in 60 seconds, wait 30 seconds before repeating Step 1.

2. When the engine starts running, observe the oil pressure. If no pressure shows within 30 seconds, stop the engine and consult the engine operating manual.
3. As the engine warms, slowly return the choke control to the in (off) position.
4. Allow the engine to run at high idle speed for several minutes to warm up before welding. Cold engines tend to run at a speed too slow to supply the voltage required for proper idler operation.

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# OPERATION

## STOPPING THE ENGINE

1. Remove all welding and generator power loads and let the engine cool by running it for several minutes at low idle.
2. Place the IGNITION switch in the OFF position.

The engine controls were properly set at the factory and should require no adjusting when received.

At the end of each day's welding, refill the fuel tank to minimize moisture condensation in the tank. Also, running out of fuel tends to draw dirt into the fuel system.

Check the crankcase oil level.

When hauling the welder between job sites, close the fuel feed valve beneath the fuel tank. Failure to turn the fuel off when traveling can cause carburetor flooding and difficult starting at the new job site.

## COLD WEATHER STARTING

Follow the instructions on the nameplate and in the engine manual shipped with the welder. With a fully charged battery and the proper weight oil, the engine should start satisfactorily even when the air temperature is down to about 0°F (-18°C).

It is important to follow the engine manufacturer's recommendations for oil and fuel to obtain satisfactory cold weather performance. Consult the Engine manual and the **Maintenance** section of this manual.

## BREAK-IN PERIOD

Any engine will use a small amount of oil during its break-in period.

Check the oil twice a day during break-in. Change the oil and oil filter cartridge after the first 50 hours of operation. Also change the fuel filter cartridge. For more details, see the **Maintenance** section of this manual. Also see the Engine manual.

### CAUTION

During break-in, subject the Classic I to moderate to heavy loads. Avoid long periods running at idle. Before stopping the engine, remove all loads and allow the engine to cool several minutes.

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CLASSIC I



# OPERATION

## WELDING OPERATION

### TO USE THE CLASSIC I FOR DC CONSTANT CURRENT STICK OR TIG WELDING:

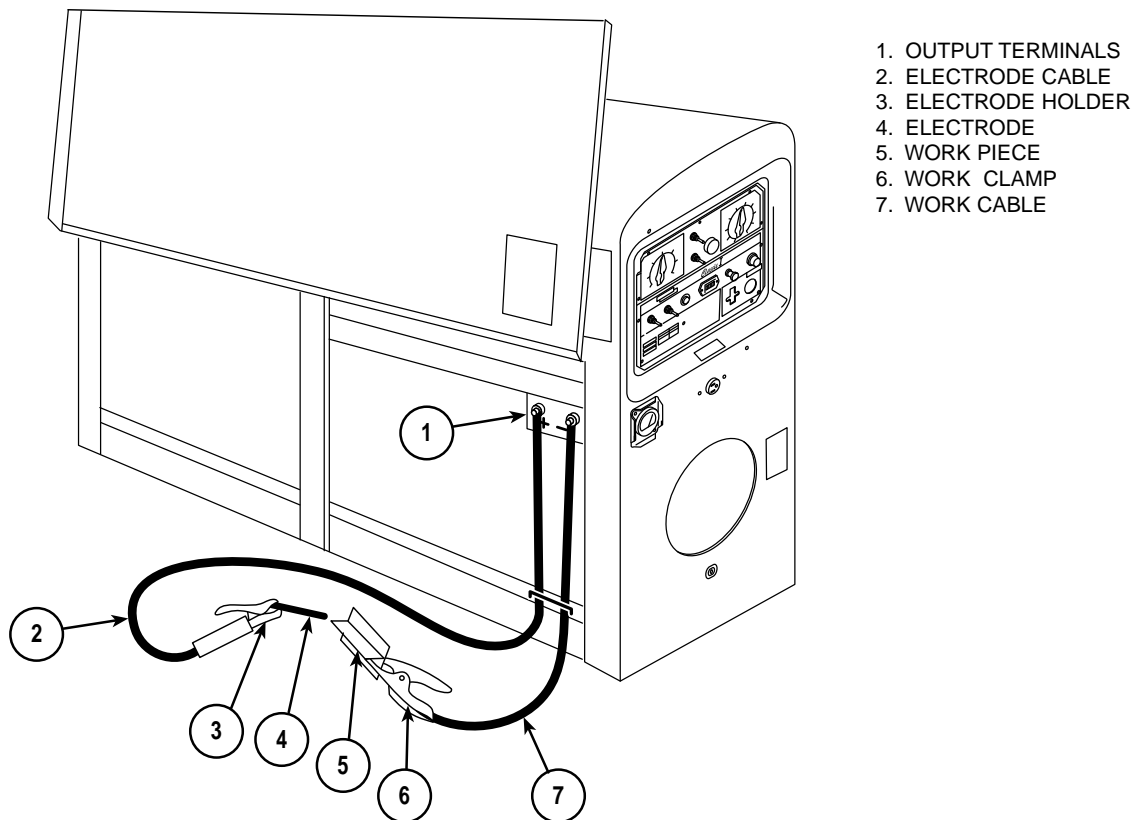
1. Remove the flange nuts from the weld output terminals and place the work and electrode welding cables over the terminals. For positive electrode, connect the electrode cable to the + terminal and the work cable to -. For negative electrode, reverse the electrode and work cables at the welder's output terminals. See Figure B.4. Replace and tighten the flange nuts securely. Be sure the connections are tight.
2. Select the appropriate electrode.
3. Attach the work clamp securely to the work you are welding.
4. Insert the electrode into the electrode holder.
5. Start the engine. See *Engine Operation* in this section of the manual.
6. Set the Idler Switch to "AUTO."

7. Set the CURRENT RANGE SELECTOR to a setting equal to or slightly higher than the desired welding current.
8. Set the FINE CURRENT ADJUSTMENT to the setting that gives the best arc characteristics for the range selected. See *Control of Welding Current* in this section of the manual.
9. Strike an arc and begin welding.

#### After you finish welding:

1. Stop the engine. See *Engine Operation* in this section of the manual.
2. Allow the electrode and work to cool completely.
3. Remove the work clamp from the work.
4. Remove any remaining piece of electrode from the electrode holder.

FIGURE B.4 – WELDING CIRCUIT CONNECTIONS FOR STICK WELDING



CLASSIC I





# OPERATION

## TO USE THE CLASSIC I FOR DC WIRE FEED WELDING (CONSTANT VOLTAGE) WITH WIRE FEED MODULE:

1. Connect the LN-25 Wire Feeder. Follow the installation instructions provided with the wire feeder.
2. Set the wire feeder and Classic I for CV operation.
3. Start the engine. See *Engine Operation* in this section of the manual.
4. Set the Idler Switch to "AUTO."
5. Set the CURRENT RANGE SELECTOR to a setting appropriate for your wire size and wire feed speed. See Table B.1 for recommended settings.
6. Set the VOLTAGE ADJUSTMENT to the setting that gives the best arc characteristics for the range selected.
7. Pull the gun trigger.

**TABLE B.1  
RANGE SETTINGS FOR WIRE SIZE/SPEED**

Diameter (inches)	Wire Speed Range (inches/minute)	Appropriate Current Range
.035	80-110	75 to 120 Amps
.045	70-130	120 to 170 Amps
.068	40-90	125 to 210 Amps

## AUXILIARY POWER

### **⚠ WARNING**

Be sure that any electrical equipment plugged into the generator DC power receptacle can withstand a ±10% voltage variation.

The DC auxiliary power, supplied as a standard, has a rating of 1.75 kw of 120V DC power.

The rating of 1.75 kw permits a maximum continuous current of 15 amps to be drawn from the 120 volt receptacle.

An optional power plug kit is available. See the **Accessories** section of this manual.

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# ACCESSORIES

## OPTIONS/ACCESSORIES

The following options/accessories are available for your Classic I from your local Lincoln Distributor.

**Trailer (K768)** - For in-plant or yard towing at speeds under 10 m.p.h. Not intended for highway towing.

**Trailer (K780)** - Two-wheeled trailer with brakes, lights, and fenders. For highway use, consult applicable federal, state and local laws.

**Trailer (K913)** - Two-wheeled trailer for in-plant and yard towing. For highway use, consult applicable federal, state, and local laws. Various hitches and accessories are available.

**Power Plug Kit (K802-A)** - Provides auxiliary plug for 115VDC receptacle.

**CV Adapter - (K384)** - Provides constant voltage output for semiautomatic welding. (For K6090 through -4 only.)

**Wire Feed Module - (K623-1)** - Provides constant voltage output for semiautomatic welding. For LN-25 wire feeder. (For K6090-5 and above.)

**Linc Thaw™ Control Unit (L2964-1)** - Includes meter and fuses to protect the welder when thawing frozen water pipes.

### **⚠ WARNING**

**PIPE THAWING IS NOT a CSA approved procedure. If not done properly, it can result in fire, explosion, damage to wiring which may make it unsafe, damage to pipes, burning up the welder, or other hazards.**

Do not use a welder to thaw pipe before reviewing Lincoln Bulletin E695.1 (dated October 1987 or later.)

**Accessory Kit (K702)** - Includes the following:

- Electrode cable
- Work cable
- Headshield
- Work clamp
- Insulated electrode holder

**Remote Control - (K888-4)** - Includes a control box with 100 ft. (30.5 meters) of cable. Allows output to be controlled remotely. K888-3 has only 25 ft. (7.6 meters) of cable. (For K6090 through -4 only.)

**Remote Control Kit - (K924-1)** - Includes a control box with 100 ft. (30.5 meters) of cable. Allows output to be controlled remotely. (For K6090-5 and above.)

## SEMI-AUTOMATIC WELDING ACCESSORIES

**LN-25 Wire Feeder** - This portable wire feeder is capable of CC/CV wire feed welding.

**NOTE:** Gas-shielded welding requires a Magnum Gun. Gasless welding requires an Innershield Gun.

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## CONNECTION OF LINCOLN ELECTRIC WIRE FEEDERS

The Lincoln Electric LN-25 wire feeder is recommended for wire feed welding with the Classic I.

### CONNECTION OF THE LN-25 TO THE CLASSIC I “ACROSS THE ARC” WITH WIRE FEED MODULE (SEE FIGURE C.1.)

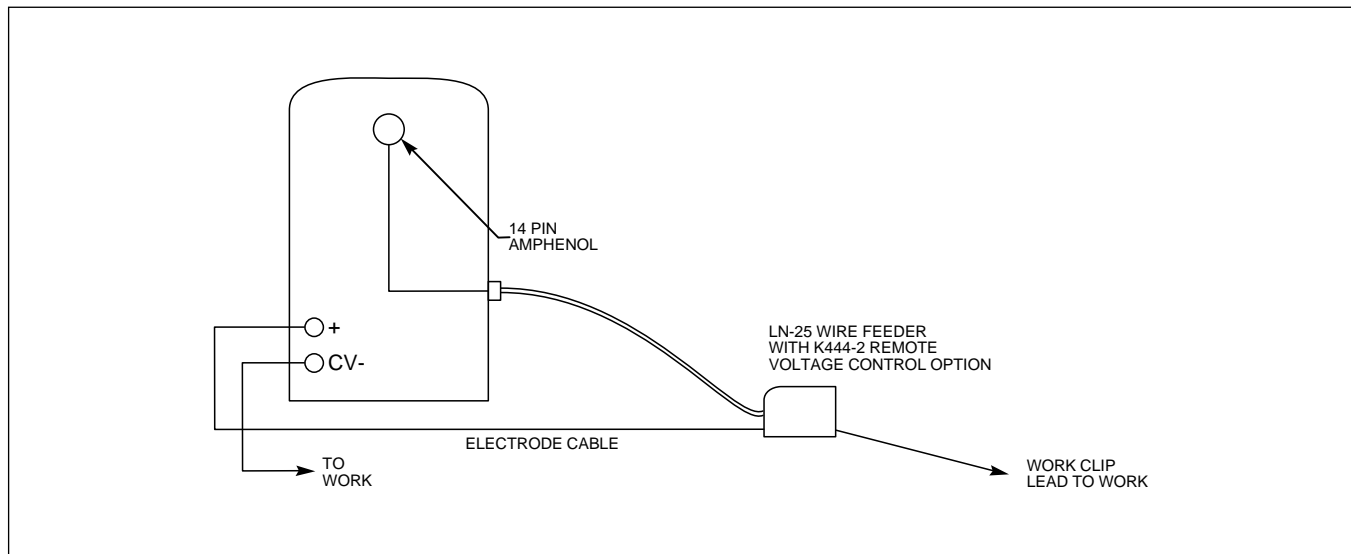
1. Shut the welder off.
2. Connect the electrode cable from the LN-25 to the “+” terminal of the welder. Connect the work cable to the “CV-” terminal of the welder.

**NOTE:** Welding cable must be sized for current and duty cycle of application.

**NOTE:** Figure C.1 shows the electrode connected for positive polarity. To change polarity, shut the welder off and reverse the electrode and work cables at the Classic I output terminals. Reverse the LN-25 polarity switch.

3. Connect the K444-2 remote control cable to the 14 pin amphenol on the Wire Feed Module.
4. Attach the single lead from the LN-25 control box to the work using the spring clip on the end of the lead. This is only a control lead — it carries no welding current.
5. Place the IDLER switch in the “HIGH” position.
6. Adjust wire feed speed and voltage at the LN-25.

**FIGURE C.1  
CLASSIC I/LN-25 ACROSS THE ARC CONNECTION DIAGRAM**



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# MAINTENANCE

## SAFETY PRECAUTIONS

### ⚠ WARNING

- Have qualified personnel do all maintenance and troubleshooting work.
- Turn the engine off before working inside the machine.
- Remove covers or guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete.
- If covers or guards are missing from the machine, get replacements from a Lincoln Distributor.

Read the Safety Precautions in the front of this manual and in the instruction manual for the engine used with your machine before working on the Classic I.

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

## ROUTINE AND PERIODIC MAINTENANCE

### ENGINE MAINTENANCE

### ⚠ CAUTION

To prevent the engine from accidentally starting, disconnect the negative battery cable before servicing the engine.

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

**OIL:** Check the oil level after every 10 hours of operation or daily. **BE SURE TO MAINTAIN THE OIL LEVEL.**



Change the oil the first time after 50 hours of operation. Then, under normal operating conditions, change the oil as specified in Table D.1. If the engine is operated under heavy load or in high ambient temperatures, change the oil more frequently.

**TABLE D.1  
CONTINENTAL ENGINE MAINTENANCE SCHEDULE**

FREQUENCY	MAINTENANCE REQUIRED
<b>Daily or Before Starting Engine</b>	<ul style="list-style-type: none"> <li>• Visual Inspection.</li> <li>• Fill fuel tank.</li> <li>• Check oil level.</li> <li>• Check air cleaner for dirty, loose, or damaged parts.</li> <li>• Check radiator level.</li> </ul>
<b>First 50 Hours</b>	<ul style="list-style-type: none"> <li>• Check air filter.</li> <li>• Change engine oil.</li> <li>• Change oil filter.</li> <li>• Change fuel filter.</li> <li>• Check battery.</li> <li>• Check fan belt.</li> </ul>
<b>Every 50 Hours</b>	<ul style="list-style-type: none"> <li>• Change engine oil and filter.</li> <li>• Service air cleaner (clean element).</li> <li>• Check fan belt tension.</li> <li>• Check battery electrolyte level and connections.</li> </ul>
<b>Every 250 Hours</b>	<ul style="list-style-type: none"> <li>• Repeat 50-hour checks.</li> <li>• Clean spark plugs and check gap.</li> <li>• Check distributor cap.</li> <li>• Check ignition wires.</li> <li>• Replace air cleaner element.</li> </ul>

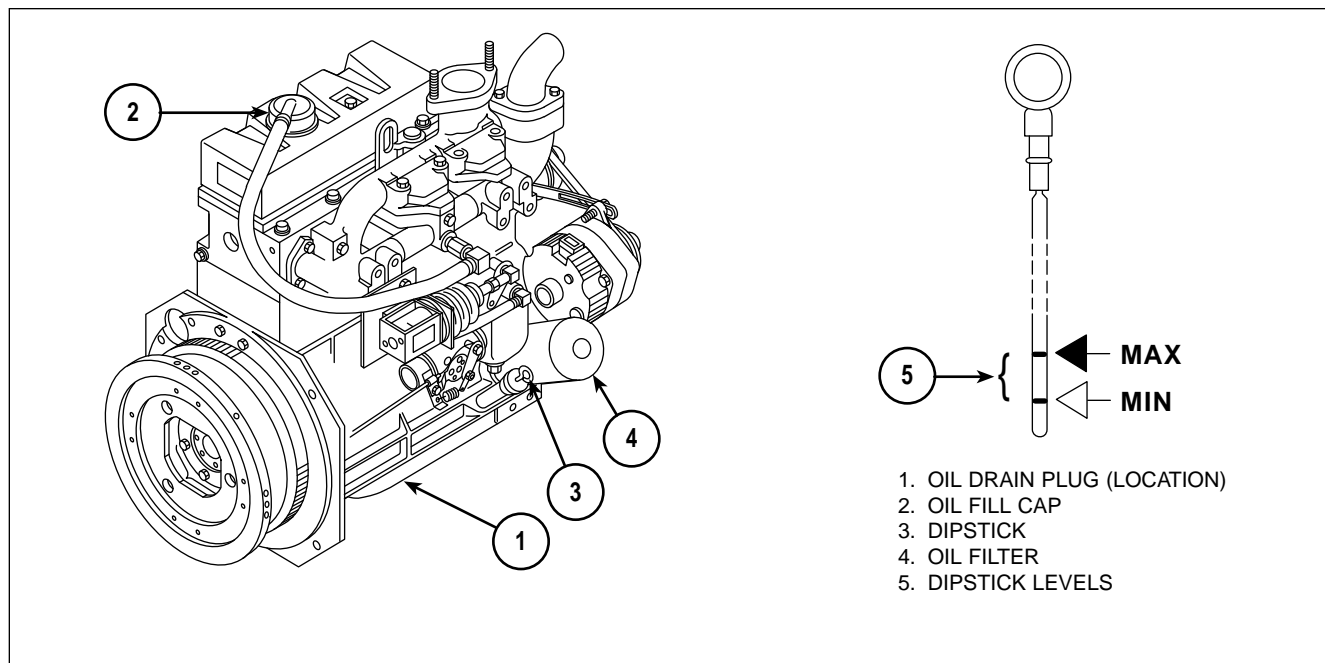
Refer to your engine Owner's Manual for details and periodic maintenance at 500 hours and beyond.

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FIGURE D.1 – OIL DRAIN AND REFILL



**CHANGE THE OIL:** Change the oil, while the engine is still warm, as follows:

1. Drain the oil from the drain plug located on the engine bottom, as shown in Figure D.1.
2. Replace the plug and tighten it securely.
3. Remove the oil fill cap and add oil until the level reaches the upper dash full mark on the dipstick. Use high quality oil viscosity grade 10W30. Consult the engine manual for oil specifications. Always check the level with the dipstick before adding more oil.
4. Reinstall the oil fill cap and the dipstick.

**CHANGE THE OIL FILTER:** Change the oil filter the first time after 50 hours of operation. Then, under normal operating conditions, change the oil filter after every 50 hours of operation. If the engine is operated under heavy load or in high ambient temperatures, change the oil filter more frequently. See **Table D.1** for recommended maintenance intervals. Order Continental oil filters from your local Continental service center.

Change the oil filter as follows:

1. Drain the oil from the engine and allow the oil filter to drain.
2. Remove the old filter (spin it off) and discard it. Wipe off the filter mounting surface and adapter.

3. Apply a thin coat of new oil to the rubber gasket on the new oil filter.
4. Spin the new filter onto the mounting adapter finger tight until the gasket is evenly seated. Then turn it down another 1/2 turn. Do not overtighten the new filter.
5. Refill the engine with the proper amount and type of oil as described in the **Change the Oil** section, above. Start the engine and check for leaks around the filter element. Correct any leaks (usually by retightening the filter, but only enough to stop leaks) before placing the Classic I back in service.
6. If there are no leaks, stop the engine and recheck the oil level. If necessary, add oil to bring the level up to the upper dash mark, but do not overfill.

**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.



Refer to your engine operation manual for recommended grade of fuel.

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**FUEL FILTER:** Inspect the in-line fuel filter daily. When necessary remove the sediment bowl from beneath the gas tank and clean out any accumulated dirt and water. Change the fuel filter after the first 50 hours of operation and every 500 hours thereafter.

**AIR CLEANER:** The Continental engine is equipped with a dry type air filter. Inspect the air cleaner daily - more often in dusty conditions. Never remove the air filter while the engine is running. Never apply oil to the air cleaner. Clean every 50 hours. Every 250 hours (more frequently in extreme dust conditions) replace the air cleaner as follows:

1. Loosen the wing nut and remove the cover and the filter element. Do not allow dirt to fall into the exposed carburetor. Gently tap the element flat on a smooth surface.
2. If dust is sticking to the dust collector element, blow compressed air through it from the inside out. Turn the element as you apply air. Air pressure should be under 2 bar (30 psi).
3. Check the element for damage before reassembling the air cleaner. Replace the element if it appears damaged. The air cleaner element part number is Donaldson #181050 or Nelson #70206N.

**COOLING SYSTEM:** The Continental engine is water cooled. Check the coolant level at the radiator filler daily. Add a 50-50 mixture of water and antifreeze as needed. To drain and refill the system, do the following:

1. Ensure that the machine is on level ground.

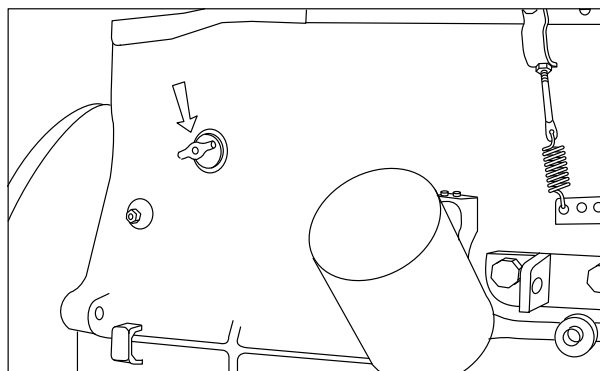
## ⚠ WARNING

To avoid personal injury, never remove the radiator pressure cap nor the reserve tank cap while the engine is running or immediately after it has stopped. Hot water may gush out, which can scald people nearby.

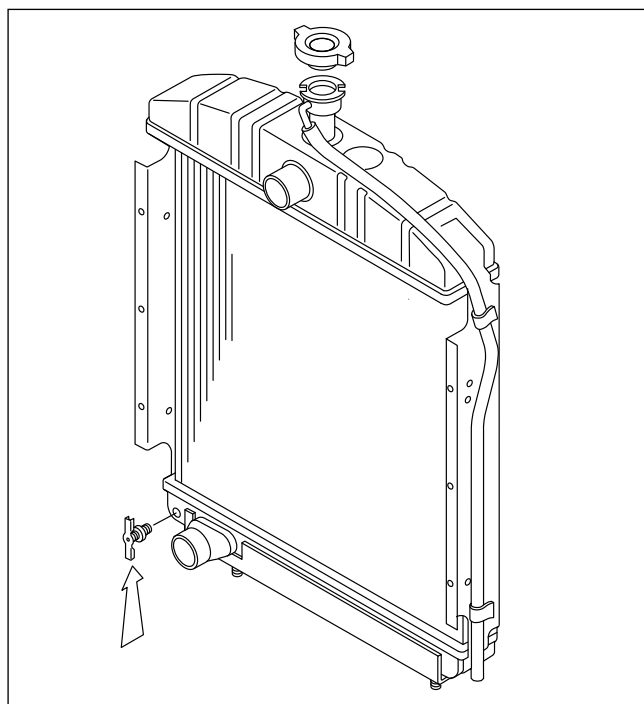
2. Remove the radiator filler cap.
3. Remove the drain plug or cock from the side of the cylinder block in order to drain the engine. Ensure that the drain hole is not restricted. See Figure D.2A.
4. Open the radiator drain cock at the bottom of the radiator in order to drain the radiator. See Figure D.2B.

5. If necessary, flush the system with clean water.
6. Replace the engine drain plug and the radiator drain cock.
7. Fill the cooling system at the radiator filler with a 50-50 mixture of water and antifreeze. (Capacity: 9.3 quarts/8.8 liters.)

**FIGURE D.2A – ENGINE COOLANT DRAIN PLUG**



**FIGURE D.2B – RADIATOR DRAIN COCK**



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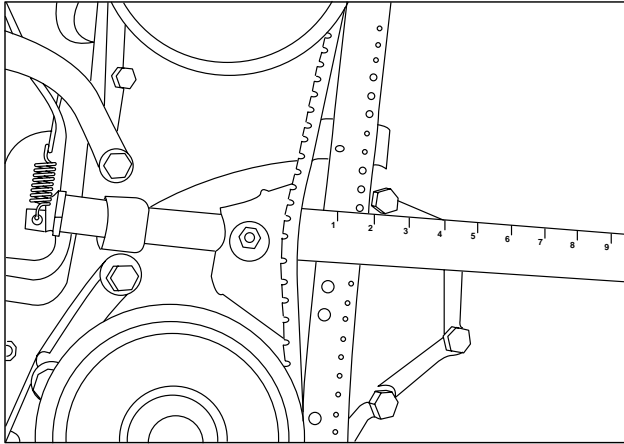


# MAINTENANCE

**FAN BELT:** Fan belts tend to loosen after the first 50 hours of operation. If the fan belt is loose, the engine can overheat and the battery can lose its charge. Check belt tightness by pressing on the belt midway between the pulleys. The belt should deflect no more than 13 mm (0.5 in.). See Figure D.3.

To adjust the fan belt, loosen the alternator bolts, then push the alternator outward until the correct belt tension is achieved. Retighten the alternator bolts. See Figure D.3.

**FIGURE D.3 – TIGHTENING THE FAN BELT**



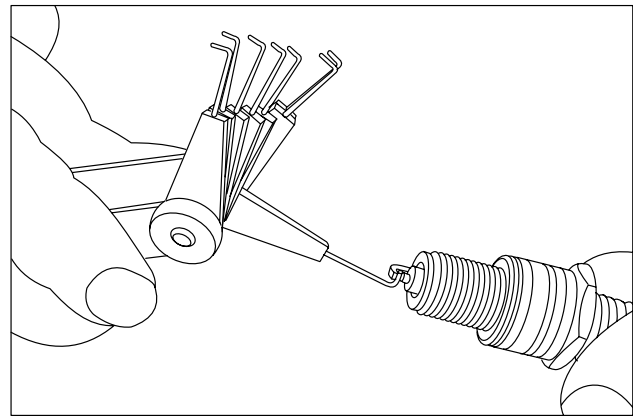
**SPARK PLUGS:** Clean or replace the spark plugs after every 250 hours of operation as follows.

1. Before removing the plugs, clean the base area to keep dirt from falling into the engine through the plug hole.
2. Remove and inspect the plugs. Plugs showing signs of fouling or electrode wear should be replaced. Do not blast the spark plugs clean with an abrasive cleaning device. Clean the plugs by scraping or by using a wire brush. Wash the plugs with a commercial solvent.
3. After cleaning or when installing a new spark plug, set the terminal gap with a feeler gauge or gapping tool. See Figure D.4.

Gap Specifications: 0.032 inch (.8 mm).

4. Tighten plugs to 30 ft-lbs (40 N·m).

**FIGURE D.4 – SET SPARK PLUG GAP**



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## BATTERY MAINTENANCE

### ⚠ WARNING



GASES FROM BATTERY can explode.

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



BATTERY ACID can burn eyes and skin.

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

To prevent EXPLOSION when:

- **INSTALLING A NEW BATTERY** - Disconnect the negative cable from the old battery first and connect to the new battery last.
- **THE CORRECT POLARITY IS NEGATIVE GROUND** - Damage to the engine alternator and the printed circuit board can result from incorrect connection.



- **CONNECTING A BATTERY CHARGER** - Remove the battery from the welder by disconnecting the negative cable first, then the positive cable and battery clamp. When reinstalling, connect the negative cable last. Keep the area well ventilated.

- **USING A BOOSTER** - Connect the positive lead to the battery first, then connect the negative lead to the engine foot.
- To prevent BATTERY BUCKLING, tighten the nuts on the battery clamp until snug.

### CLEANING THE BATTERY

Keep the battery clean by wiping it with a damp cloth when dirty. If the terminals appear corroded, disconnect the battery cables and wash the terminals with an ammonia solution or a solution of 1/4 pound (0.113 kg) of baking soda and 1 quart (0.946 l) of water. Be sure the battery vent plugs (if equipped) are tight so that none of the solution enters the cells.

After cleaning, flush the outside of the battery, the battery compartment, and surrounding areas with clear water. Coat the battery terminals lightly with petroleum jelly or a non-conductive grease to retard corrosion.

Keep the battery clean and dry. Moisture accumulation on the battery can lead to more rapid discharge and early battery failure.

### CHECKING SPECIFIC GRAVITY

Check each battery cell with a hydrometer. A fully charged battery will have a specific gravity of 1.260. Charge the battery if the reading is below 1.215.

**NOTE:** Correct the specific gravity reading by adding four gravity points (0.004) for every five degrees the electrolyte temperature is above 80 degrees F (27 degrees C). Subtract four gravity points (.004) for every five degrees the electrolyte temperature is below 80 degrees F (27 degrees C).

### CHECKING ELECTROLYTE LEVEL

If battery cells are low, fill them to the neck of the filler hole with distilled water and recharge. If one cell is low, check for leaks.

### CHARGING THE BATTERY

The Classic I is equipped with a wet charged battery. The charging current is automatically regulated when the battery is low (after starting the engine) to a trickle current when the battery is fully charged.

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 Classic I charging system is NEGATIVE GROUND.** The 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.

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# MAINTENANCE

## WELDER/GENERATOR MAINTENANCE

**STORAGE:** Store the Classic I 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.

**NAMEPLATES:** 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.

**GENERATOR COMMUTATOR AND BRUSHES:** The generator brushes are properly adjusted when the welder is shipped. They require no particular attention.

### ⚠ CAUTION

DO NOT SHIFT THE BRUSHES or adjust the rocker setting.

Shifting of the brushes may result in:

- Change in machine output
- Commutator damage
- Excessive brush wear

Periodically inspect the commutators and brushes by removing the covers. DO NOT remove these covers while the machine is running.

Commutators and brushes require little attention. However, if they are black or appear uneven, have them cleaned by experienced maintenance personnel using a commutator stone. Never use emery cloth or paper for this purpose.

Replace brushes when they wear within 1/4" of the pig-tail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have experienced maintenance personnel seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low pressure air.

### ⚠ WARNING

Uncovered rotating equipment can be dangerous. Use care so your hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

Arcing or excessive exciter brush wear indicates a possible misaligned shaft. Have an authorized Lincoln Electric Field Service facility check and realign the shaft.

**BEARINGS:** The Classic I is equipped with double-shielded ball bearings having sufficient grease to last indefinitely under normal service. Where the welder is used constantly or in excessively dirty locations, it may be necessary to add one half ounce of grease per year. A pad of grease one inch wide, one inch long, and one inch high weighs approximately one half ounce. Over-greasing is far worse than insufficient greasing.

When greasing the bearings, keep all dirt out of the area. Wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

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# MAINTENANCE

**CURRENT RANGE SELECTOR CONTACTS:** The contacts should not be greased. To keep the contacts clean, rotate the current control handle through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld. Never rotate the handle while the machine is under load.

Put a drop of oil on the CURRENT RANGE SELECTOR shaft at least once every month.

**RECEPTACLE:** Keep the electrical receptacle in good condition. Remove any dirt, oil, or other debris from surfaces and holes.

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

## IDLER MAINTENANCE

### CAUTION

Before doing electrical work on the idler printed circuit board, disconnect the battery.

1. The solenoid plunger must work freely because binding can cause engine surging. If surging occurs, be sure the plunger is properly lined up with the carburetor lever. Dust the plunger about once a year with graphite powder.
2. When any service is done, reassemble the rubber bellows on the solenoid plunger with the vent hole on the lower side.
3. Proper operation of the idler requires good grounding of the printed circuit board (through its mounting). The reed switch and battery must also be grounded properly.
4. If desired, the welder can be used without automatic idling by setting the "Idler" switch to the "High Idle" position.
5. When installing a new battery or using a jumper battery to start the engine, be sure the battery polarity is connected properly. The correct polarity is negative ground. Damage to the engine alternator and the printed circuit board can result from incorrect connection.

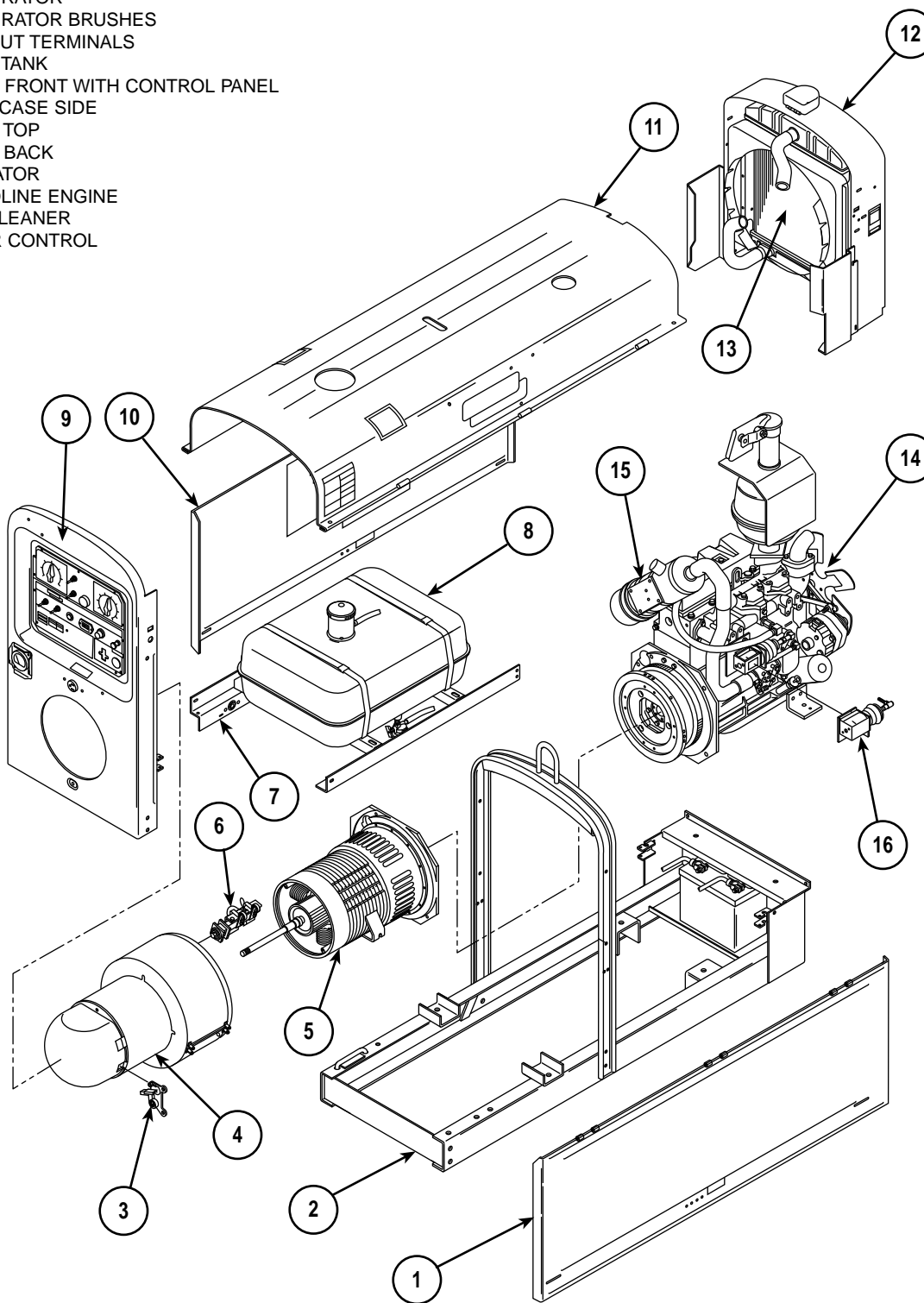
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# MAINTENANCE

## FIGURE D.5 - MAJOR COMPONENT LOCATIONS

1. RIGHT CASE SIDE (DOOR)
2. BASE (WITH BATTERY)
3. EXCITER BRUSHES
4. EXCITER
5. GENERATOR
6. GENERATOR BRUSHES
7. OUTPUT TERMINALS
8. FUEL TANK
9. CASE FRONT WITH CONTROL PANEL
10. LEFT CASE SIDE
11. CASE TOP
12. CASE BACK
13. RADIATOR
14. GASOLINE ENGINE
15. AIR CLEANER
16. IDLER CONTROL



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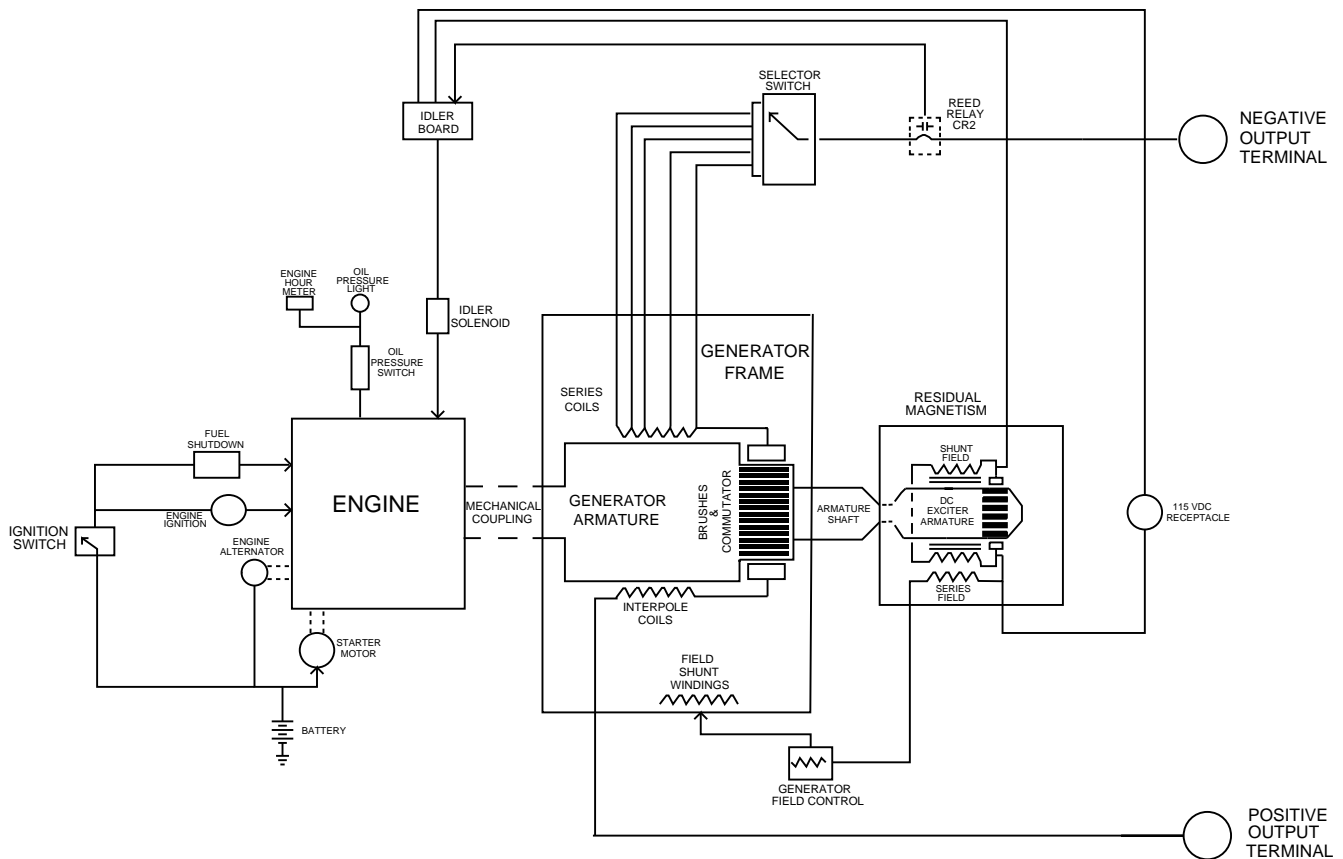
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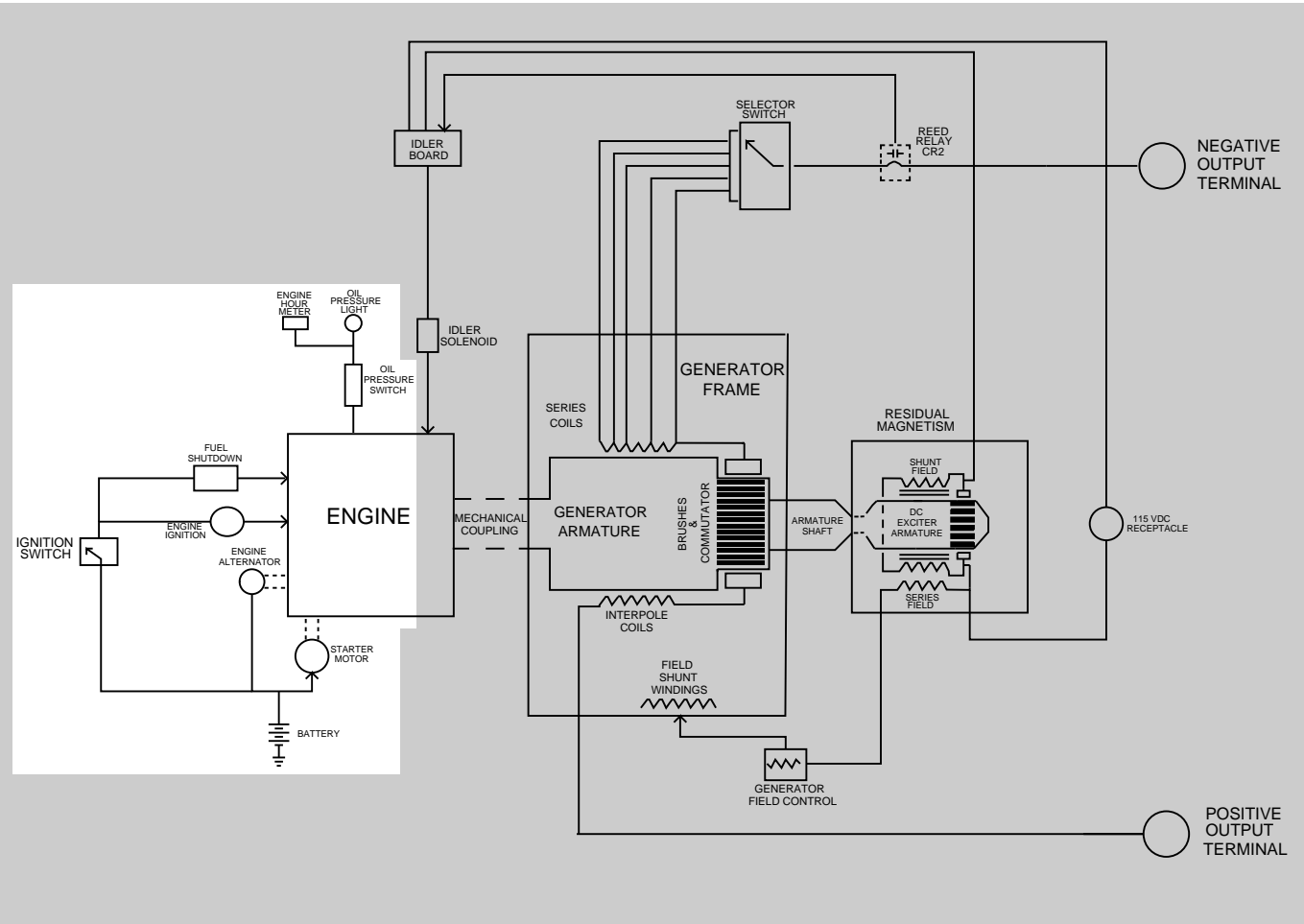
**FIGURE E.1 – CLASSIC I BLOCK LOGIC DIAGRAM**

**CLASSIC I**



# THEORY OF OPERATION

FIGURE E.2 – BATTERY, STARTER, ENGINE ALTERNATOR AND OIL SWITCH CIRCUIT



## GENERAL DESCRIPTION

The Classic I is a heavy duty, engine driven, DC arc welding power source capable of providing constant current output for stick welding or DC TIG welding. Also, a total of 1750 watts of auxiliary power is available at the 115VDC receptacle. The Classic I is manufactured with all copper windings.

## BATTERY, STARTER, ENGINE ALTERNATOR AND OIL SWITCH CIRCUIT

The 12VDC battery powers the starter motor and, through the ignition switch, the engine ignition and fuel shutoff solenoid. The engine alternator supplies "charging" current for the battery circuit. If the oil pressure switch does not close, due to low oil pressure or inadequate oil supply, the oil pressure light will not glow, the hour meter will not operate and the engine alternator will not function.

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

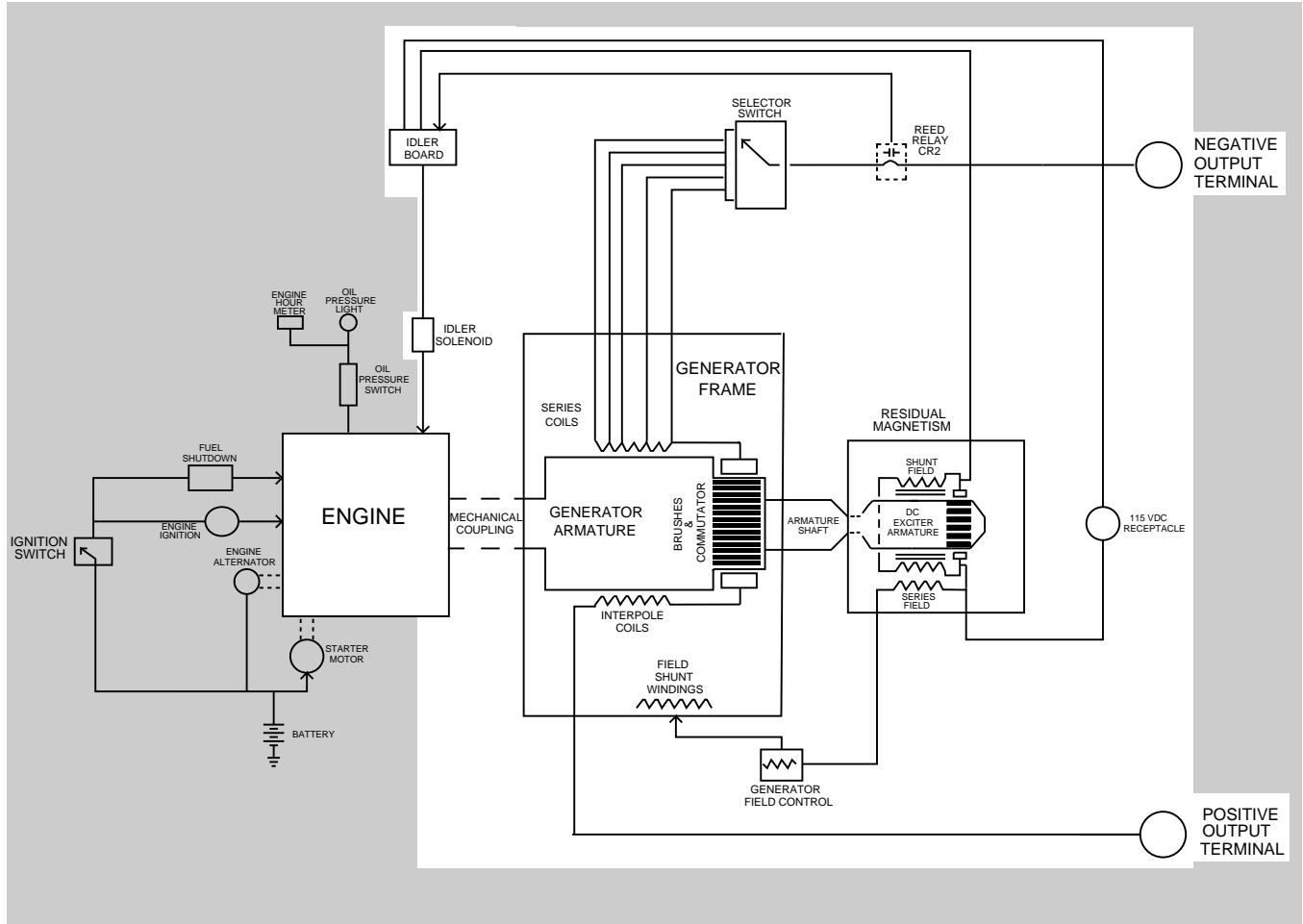
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FIGURE E.3 – ENGINE, MAIN GENERATOR ARMATURE AND FRAME AND DC EXCITER



## ENGINE, MAIN GENERATOR ARMATURE AND FRAME AND DC EXCITER

### EXCITATION (FLASHING)

The main generator armature and the exciter armature are mechanically coupled to the engine. When the engine is started and running, the residual magnetism that is stored in the exciter pole pieces is induced upon the exciter armature. This causes the exciter to "build-up" and produce a DC output voltage. This DC voltage is applied, via the field rheostat control, to the main generator shunt field coils. The exciter output is also connected to the 115VDC receptacle.

### MAIN SHUNT, INTERPOLE AND SERIES COILS

The generator armature rotates within the magnetic field created by the shunt field windings. A DC voltage is induced in the armature and is transferred, through the armature commutator and brushes, to the series and interpole coils. The interpole coils, which are connected in series with the positive output terminal, are located so as to counteract any magnetic influences that could cause mechanical distortion in the rotating armature. The series coils are designed to oppose or "buck" the DC voltage that is generated in the armature.

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

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# THEORY OF OPERATION

## ENGINE, MAIN GENERATOR ARMATURE AND FRAME AND DC EXCITER (CONTINUED)

### CURRENT RANGE SELECTOR

The selector switch acts as a coarse current adjustment by allowing varying amounts of series windings to be included in the welding current path. The series coils and selector switch are connected in series with the negative output terminal.

### FINE CURRENT ADJUSTMENT

The field rheostat control functions as a fine output current adjustment by controlling the current through the shunt windings, thus controlling the amount of magnetism created in the shunt field windings. Open circuit weld voltage can also be controlled by the field rheostat control.

## ENGINE IDLER CIRCUIT

The idler solenoid is mechanically connected to the engine governor linkage. When welding current is being drawn, the reed switch CR2 is closed. This signals the idler PC board to release (deactivate) the idler solenoid, which then lets the machine go to a high speed condition. Also, when auxiliary power (115VDC) is being used, the current is passed through a reed switch coil located on the idler PC board, which signals the PC board to release the idler solenoid.

When welding ceases or the auxiliary load is removed, a preset time delay of about 15 seconds starts. After approximately 15 seconds, the idler PC board activates the idler solenoid, and the machine will return to a low idle speed condition.

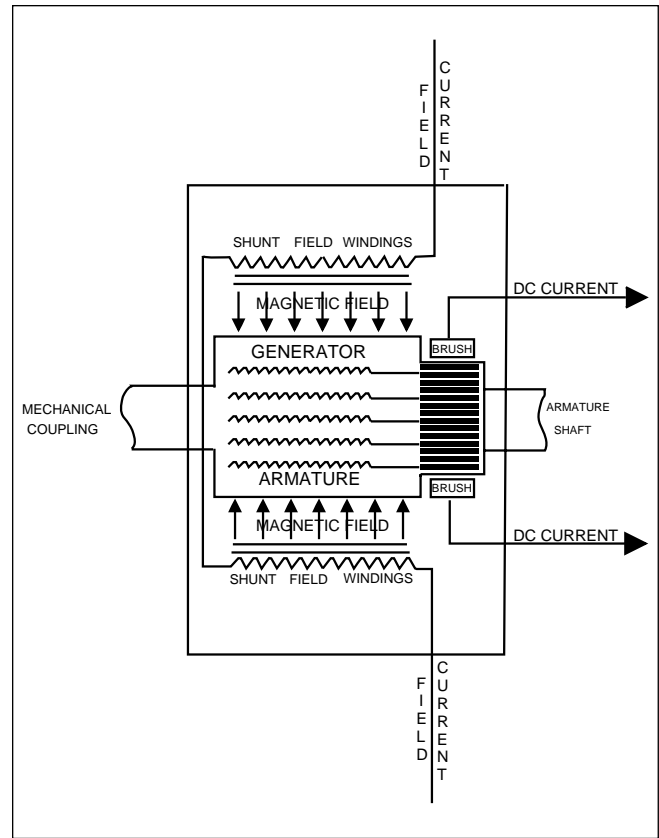
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## DC GENERATOR MACHINES

The armature winding of a DC generator is located on the rotating member. Current is conducted from it by means of carbon brushes. The field winding is located in the stator, which is stationary and excited by direct current.

The armature coil sides are placed at opposite points on the rotating shaft with the conductors parallel to the shaft. The armature assembly is normally turned at a constant speed by a source of mechanical power connected to the shaft. When the armature rotates through the magnetic field produced by the stationary field winding, it induces a coil voltage in the armature winding. The voltage induced in an individual armature coil is an alternating (AC) voltage, which must be rectified. In a conventional DC generator machine, rectification is provided mechanically by means of a commutator. A commutator is a cylinder formed of copper segments insulated from each other and mounted on, but insulated from, the rotating shaft. Stationary carbon brushes held against the commutator surface connect the armature windings to external terminals. The commutator provides full-wave rectification, transforming the voltage waveform between brushes and making available a DC voltage to the external circuit.



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# TROUBLESHOOTING & REPAIR

## HOW TO USE TROUBLESHOOTING GUIDE

### ⚠ WARNING

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

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

**Step 1. LOCATE PROBLEM (SYMPTOM).** Look under the column labeled “PROBLEM (SYMPTOMS)”. This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into four main categories: Output Problems, Function Problems, 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 top and doors assembly.

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

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

### ⚠ CAUTION

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

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# TROUBLESHOOTING & REPAIR

## PC BOARD TROUBLESHOOTING PROCEDURES

### ⚠ WARNING



#### ELECTRIC SHOCK can kill.

Have an electrician install and service this equipment. Turn the machine OFF before working on equipment. Do not touch electrically hot parts.

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

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



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

Reusable  
Container  
Do Not Destroy

#### PC Board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
  - If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC Board must be either conductive, anti-static or static-dissipative.

- Remove the PC Board from the static-shielding bag and place it directly into the equipment. Don't set the PC Board on or near paper, plastic or cloth which could have a static charge. If the PC Board can't be installed immediately, put it back in the static-shielding bag.
  - If the PC Board uses protective shorting jumpers, don't remove them until installation is complete.
  - If you return a PC Board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.
4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

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

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

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

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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The engine starts and runs at correct speed, but there is no, or very low, welder output voltage. There is no DC auxiliary output voltage.</p>	<ol style="list-style-type: none"> <li>1. Check for loose or missing brushes in the DC exciter.</li> <li>2. The exciter may need "flashing." See <b><i>Flashing the Fields</i></b> in this section.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for loose or broken wires between the exciter brushes and the DC receptacle and the fine current control field rheostat. See the Wiring Diagram.</li> <li>2. Perform the <b><i>DC Exciter Test</i></b>.</li> </ol>

**⚠ CAUTION**

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

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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines  
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
<p>The engine starts and runs at the correct speed but there is no, or very low, welder output. The DC auxiliary output voltage is normal.</p>	<ol style="list-style-type: none"> <li>1. Check the welding cables for loose or faulty connections.</li> <li>2. Check for loose or missing brushes in the welding generator.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the fine current control field rheostat for resistance and proper operation. Normal resistance is 64 ohms. Check associated wires for loose or faulty connections. See the Wiring Diagram.</li> <li>2. Perform the <b><i>Main Generator Shunt Field Winding Test.</i></b></li> <li>3. Check the continuity of the interpole coils. They should show continuity from the positive brushholders to the positive output terminal and should NOT be grounded to the generator frame.</li> <li>4. Check the continuity of the series coils. They should show continuity from the negative brushholders, through the current selector switch, to the negative output terminal and should NOT be grounded to the generator frame.</li> <li>5. The main armature may be faulty. Check for grounds and/or shorts.</li> </ol>

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The welding output varies abnormally. The auxiliary output remains constant. The engine is operating correctly.</p>	<ol style="list-style-type: none"> <li>1. Check for loose or faulty welding cables.</li> <li>2. This may be a normal condition. The machine will normally lose some output as the components are heated.</li> <li>3. Check for loose, worn, dirty or poorly seated main DC generator brushes.</li> <li>4. The main armature commutator may need cleaning.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the fine current control field rheostat for resistance and proper operation. Normal resistance is 64 ohms. Check associated wires for loose or faulty connections. See the Wiring Diagram.</li> <li>2. Perform the <b>Main Generator Shunt Field Winding Test</b>.</li> <li>3. Check the current range selector switch and contacts for proper operation.</li> <li>4. While the machine is loaded, check the interpole and series coils for signs of "arcing." This condition would indicate shorted turns in the "arcing" coil.</li> <li>5. The main armature may be faulty. Check for grounds.</li> </ol>

### ⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The engine starts and runs at the correct speed, but there is no DC auxiliary output voltage at the 115VDC receptacle. The welding generator is functioning correctly.</p>	<ol style="list-style-type: none"> <li>1. Check the DC receptacle and plug for loose or faulty connections.</li> <li>2. Check the 15 Amp fuse. CSA machines only.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for loose or faulty connections or wires at the 115 VDC receptacle and associated circuitry. See the Wiring Diagram.</li> </ol>
<p>The actual welding current is much less than is indicated on the dials.</p>	<ol style="list-style-type: none"> <li>1. Check the welding cables for loose or faulty connections.</li> <li>2. The welding cables may be excessively long or coiled.</li> <li>3. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. 1-888-935-3877.</li> </ol>	<ol style="list-style-type: none"> <li>1. The engine RPM may be low. If necessary perform the <b>Engine Throttle Adjustment Test</b>.</li> <li>2. Perform the <b>DC Exciter Test</b>.</li> <li>3. Check the fine current control field rheostat for resistance and proper operation. Normal resistance is 64 ohms. Check associated wires for loose or faulty connections. See the Wiring Diagram.</li> <li>4. Check the current range selector switch and contacts for proper operation.</li> <li>5. Perform the <b>Main Generator Shunt Field Winding Test</b>.</li> <li>6. The main armature may be faulty. Check for grounds.</li> </ol>

### ⚠ CAUTION

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

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# TROUBLESHOOTING & REPAIR

Observe Safety Guidelines detailed in the beginning of this manual.

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The actual welding current is much greater than is indicated on the dials.</p>	<ol style="list-style-type: none"> <li>1. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. 1-888-935-3877.</li> </ol>	<ol style="list-style-type: none"> <li>1. The engine operating speed may be too high. If necessary perform the <b>Engine Throttle Adjustment Test</b>.</li> <li>2. While the machine is loaded, check the series coils for signs of "arcing." This condition could point to shorted turns in the series coils.</li> <li>3. Perform the <b>DC Exciter Test</b>.</li> </ol>

**⚠ CAUTION**

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

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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines  
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
<p>The engine will not return to low idle when the welding and auxiliary loads are removed.</p>	<ol style="list-style-type: none"> <li>1. Make sure the idler control switch is set to the "Auto" position.</li> <li>2. Make sure both welding and auxiliary loads are removed.</li> <li>3. Check for mechanical restrictions in the idler and throttle linkage.</li> <li>4. While the engine is running, if the oil pressure light is NOT lit, the oil pressure switch may be faulty. See the Wiring Diagram.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the idler control switch and associated leads for loose or faulty connections. See the Wiring Diagram.</li> <li>2. Check the reed switch CR2. It may be stuck closed. Replace if necessary.</li> <li>3. Perform the <b><i>Idler Solenoid Test</i></b>.</li> <li>4. Check for loose or faulty connections at the idler PC board.</li> <li>5. The idler PC board may be faulty. Replace.</li> </ol>

**⚠ CAUTION**

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

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# TROUBLESHOOTING & REPAIR

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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
<b>FUNCTION PROBLEMS</b>		
<p>The engine will NOT go to high speed when a load is applied to the welding output terminals. The engine does go to high speed when a load is applied to the DC auxiliary power receptacle.</p>	<ol style="list-style-type: none"> <li>1. Check welding cables for loose or faulty connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the reed switch (CR2) for proper operation. The reed switch should close when there is current flow in the welding circuit.</li> <li>2. Locate the red lead connected to the idler PC board. While leaving the red lead connected, jumper the red lead to frame ground. If the engine goes to high speed, the fault is in the reed switch or associated leads. See the Wiring Diagram.</li> <li>3. If the engine does NOT go to high speed (in step 2), the idler PC board may be faulty.</li> </ol>
<p>The engine will NOT go to high speed when a load is applied to the DC auxiliary receptacle. The engine does go to high speed when a load is applied to the welding output terminals.</p>	<ol style="list-style-type: none"> <li>1. Check the auxiliary power plug and associated leads for loose or faulty connections.</li> <li>2. The load may be too small. The load must be above 150 watts.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the black "B" leads connected to the idler PC board and associated connections. See the Wiring Diagram.</li> <li>2. The idler PC board may be faulty.</li> </ol>

### CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>ENGINE PROBLEMS</b>		
The engine "cranks" but will not start.	<ol style="list-style-type: none"> <li>1. Make sure the ignition switch is in the ON position.</li> <li>2. Check for adequate fuel supply.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the ignition switch for proper operation. Check the associated leads for loose or faulty connections. See the Wiring Diagram.</li> <li>2. Check the fuel solenoid. Make sure it is opening when +12VDC is applied to the red lead. See the Wiring Diagram.</li> <li>3. The engine distributor or carburetor may need servicing.</li> </ol>
The oil pressure light does not light while the engine is running.	<ol style="list-style-type: none"> <li>1. Make sure the correct grade and amount of oil is in the engine crankcase. See the <b>Maintenance Section</b> of this manual.</li> </ol>	<ol style="list-style-type: none"> <li>1. The oil pressure switch may be faulty. Replace.</li> <li>2. If the engine hour meter and alternator function properly, the oil pressure switch is closing. The oil pressure light may be faulty. See the Wiring Diagram.</li> <li>3. The engine may not have adequate oil pressure and may be in need of repair.</li> </ol>

### ⚠ CAUTION

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

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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>WELDING PROBLEMS</b>		
The welding arc is loud and spatters excessively.	<ol style="list-style-type: none"> <li>1. The current setting may be too high for the electrode and process.</li> <li>2. The polarity may be wrong for the electrode and process.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the engine speed. High idle speed should be 1600 RPM. If necessary perform the <b>Engine Throttle Adjustment Test</b>.</li> <li>2. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. at 1-888-935-3877.</li> </ol>
The welding arc frequently "pops out."	<ol style="list-style-type: none"> <li>1. The fine current control field rheostat may be set too low for the process and electrode.</li> <li>2. Check the welding cables for loose or faulty connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the engine speed. High idle speed should be 1600 RPM. If necessary perform the <b>Engine Throttle Adjustment Test</b>.</li> <li>2. The current range selector switch may be faulty. Check for proper operation and contact.</li> <li>3. Check the DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. at 1-888-935-3877.</li> </ol>

### ⚠ CAUTION

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

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# TROUBLESHOOTING & REPAIR

## DC EXCITER TEST

### **⚠ WARNING**

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

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

### **TEST DESCRIPTION**

This test will help determine whether or not the DC exciter is operating correctly. If operation is not correct, the test will also determine what component(s) may be faulty.

### **MATERIALS NEEDED**

3/8" Nut driver  
Volt/ohmmeter (Multimeter)  
Wiring Diagram

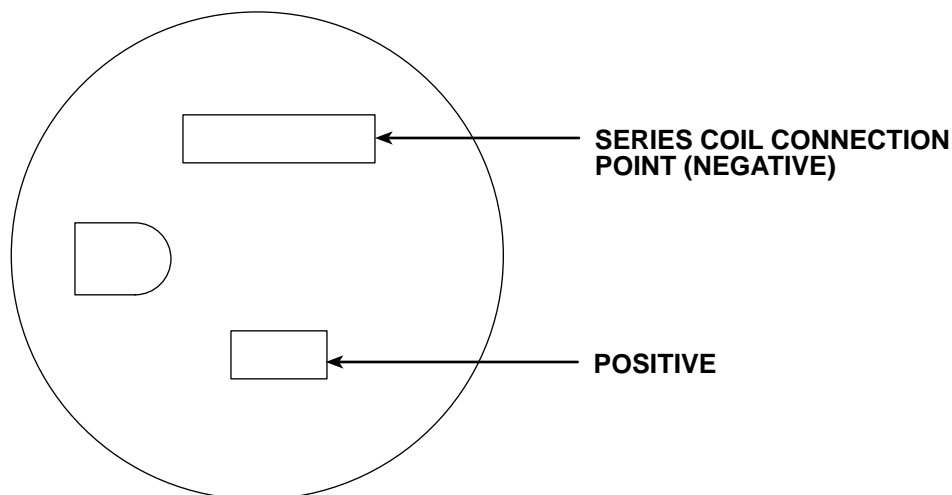
**This procedure takes approximately 30 minutes to perform.**

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DC EXCITER TEST (*continued*)

FIGURE F.1 – 120VDC RECEPTACLE



## TEST PROCEDURE

1. Turn off the engine and remove all external loads to the welder terminals and auxiliary receptacle.
2. Start the engine and put the idler switch in the HIGH idle position.

**⚠ WARNING**

## MOVING PARTS can injure.



- Remove guards only when necessary to perform service, and replace them when the service requiring their removal is complete.
- Keep hands, hair, clothing and tools away from V-belts, gears, fans, and all other moving parts when starting, operating, or repairing equipment.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See Parts List.) Always use greatest care when working near moving parts.

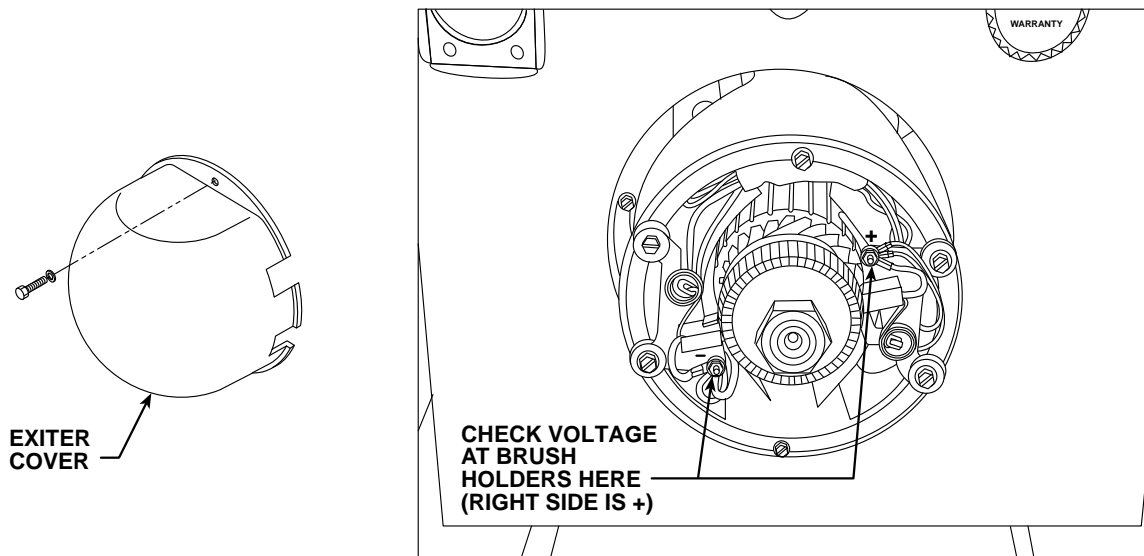
3. Using the volt/ohmmeter, carefully check the DC voltage at the 120V receptacle. (Observe proper polarity. The large slot of the receptacle is negative. See Figure F.1.) Normal voltage is 125 - 135VDC, no load, with the engine at the high idle speed of 1600 RPM. If the voltage is normal, the DC exciter is functioning correctly. If the voltage is low or not present, proceed to the next step.

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DC EXCITER TEST (*continued*)

FIGURE F.2 – EXCITER COVER REMOVAL



4. Turn off the engine. Using the 3/8" nut driver, remove the exciter cover. See Figure F.2.

**⚠ WARNING**

**MOVING PARTS can injure.**



- Remove guards only when necessary to perform service, and replace them when the service requiring their removal is complete.
- Keep hands, hair, clothing and tools away from V-belts, gears, fans, and all other moving parts when starting, operating, or repairing equipment.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See Parts List.) Always use greatest care when working near moving parts.

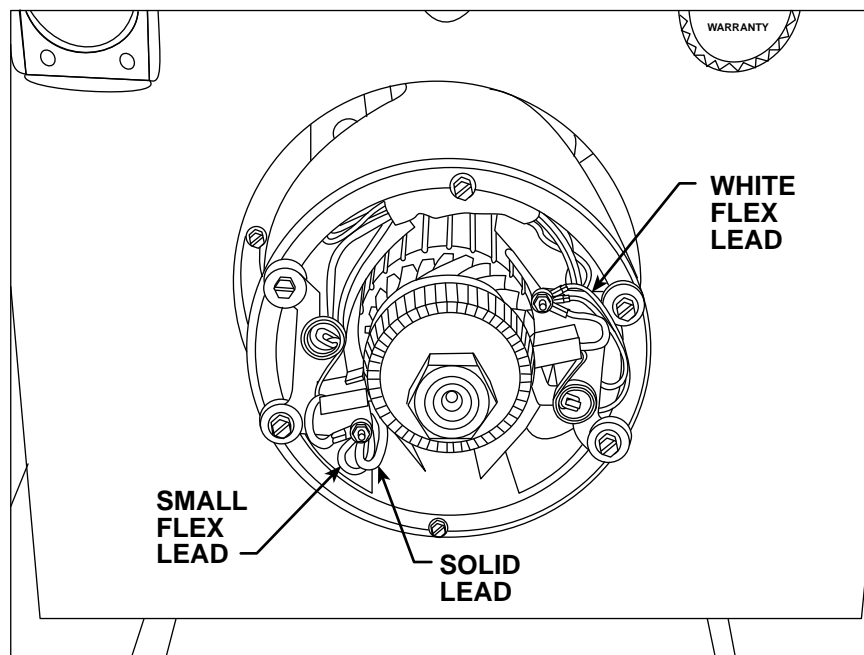
5. Start the engine. Using the volt/ohmmeter, carefully check the DC voltage at the brush holders. See Figure F.2. The right side brush holder is positive polarity. Normal DC voltage is 125 - 135VDC with the engine at the high idle speed of 1600 RPM.
6. If the DC voltage is normal at the brush holders, the DC exciter armature and shunt coils are OK.
  - a. If the voltage is low or not present, proceed with the shunt coil and series coil resistance tests.
  - b. If the correct DC voltage is present at the brush holders but not at the 120VDC receptacle, the series coil or associated leads may be faulty. See the Wiring Diagram. Proceed with the shunt coil and series coil resistance tests.

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## DC EXCITER TEST (*continued*)

FIGURE F.3 – BRUSH HOLDER LEADS



### Shunt Coil and Series Coil Resistance Tests

7. Turn the engine OFF.
8. Using the 3/8" nut driver, disconnect the two leads from the left side brush holder. See Figure F.3. Separate the two leads. One will be a larger "solid" lead (series coil). The other will be a smaller flex lead (shunt coil).
9. Using the 3/8" nut driver, remove the two flex leads from the right side brush holder. Note lead placement for reassembly. Using the volt/ohmmeter, check the shunt coil resistance. Check from the left side small flex lead to the right side white flex lead. See Figure F.3. Normal resistance is 120 - 130 ohms. If the resistance is very high or "open," the shunt coils are faulty. Replace them. If the resistance is very low, the shunt coils are "shorted." Replace them.  
  
Also measure the resistance from either lead to machine ground. This resistance should be very high - at least 500,000 ohms.
10. Using the volt/ohmmeter, check the series coil resistance.
  - a. Check from the larger solid lead (left side) to the 120VDC receptacle. (Check at the longer slot opening. See **Figure F.1.**) Normal resistance is less than 1 ohm.
  - b. Also measure the resistance from the solid lead (left side) to machine ground. See Figure F.3. This resistance should be very high - at least 500,000 ohms. It may be necessary to disconnect the series coil from the 120VDC receptacle to isolate the series coil from the rest of the circuitry. See the Wiring Diagram.
11. If the shunt and series coils are good, and the exciter is not operating properly, the exciter armature may be faulty. Replace the exciter armature.
12. After the test and repairs are completed, install the exciter cover using the 3/8" nut driver.

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## IDLER SOLENOID TEST

### WARNING

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

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

### TEST DESCRIPTION

This test will determine whether or not the idler solenoid can function when it is energized with 12VDC.

### MATERIALS NEEDED

- External 12VDC supply
- Wiring Diagram
- Volt/ohmmeter (Multimeter)

This procedure takes approximately 15 minutes to perform.

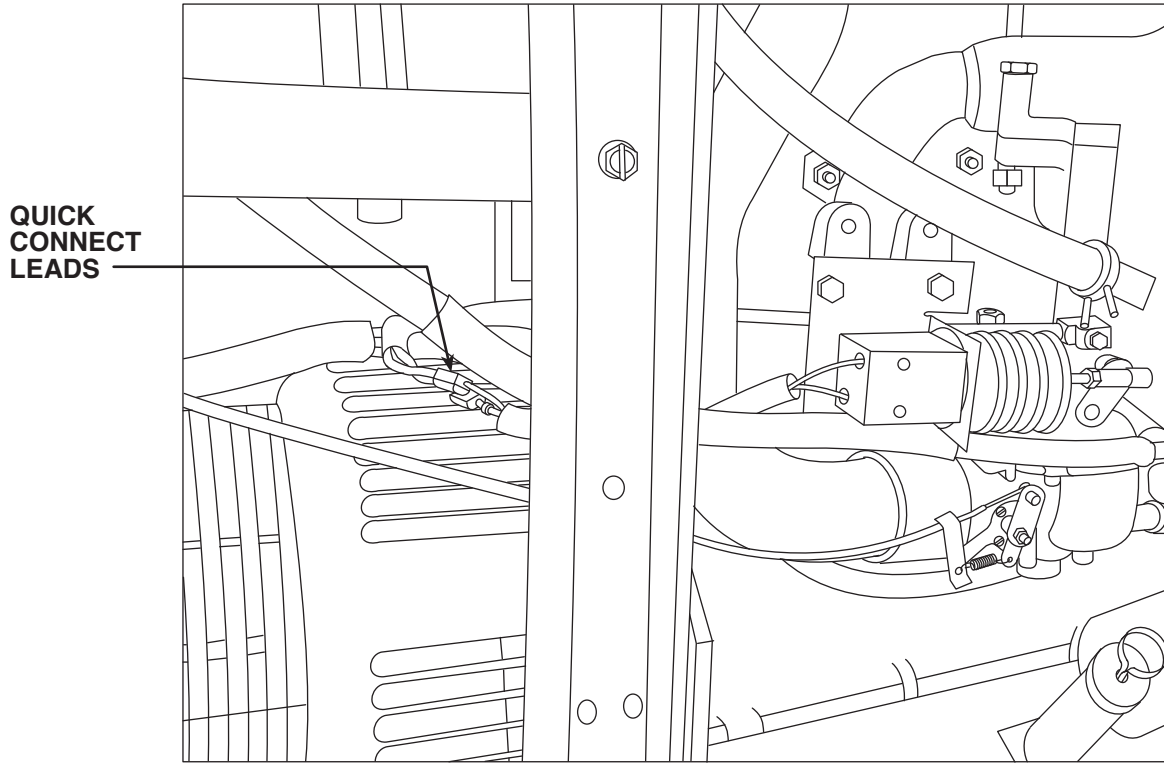
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# TROUBLESHOOTING & REPAIR

## IDLER SOLENOID TEST *(continued)*

FIGURE F.4 – IDLER SOLENOID CONNECTIONS



### TEST PROCEDURE

1. Turn the engine OFF.
2. Unlatch and secure the right side door.
3. Locate the idler solenoid and the two leads with quick connects. See Figure F.4.
4. Disconnect the two solenoid leads at the quick connection splices.
5. Using the external power supply, apply 12VDC to the idler solenoid leads. The solenoid should activate.
6. The solenoid should deactivate when the 12VDC is removed.
7. If the solenoid does not operate properly, check for a mechanical restriction in the linkage or for a missing spring.
8. If the linkage is intact and the solenoid does not operate correctly when 12VDC is applied, the idler solenoid may be faulty. Replace the idler solenoid.

**NOTE:** Normal solenoid coil resistance is approximately 25 ohms.

9. After the test and repairs are completed, close and latch the right side door.

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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR SHUNT FIELD WINDING TEST

### **⚠ WARNING**

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

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

### **TEST DESCRIPTION**

This test will help determine whether or not the main shunt field coils are shorted, open, or grounded.

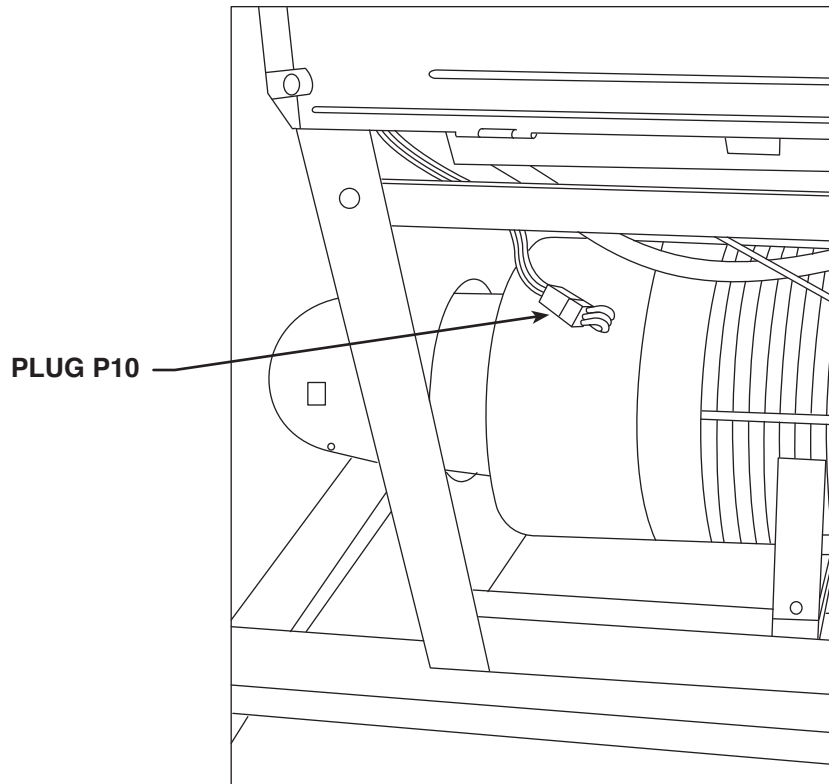
### **MATERIALS NEEDED**

Volt/ohmmeter (Multimeter)  
Wiring Diagram

**This procedure takes approximately 25 minutes to perform.**

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**MAIN GENERATOR SHUNT FIELD WINDING TEST (*continued*)****FIGURE F.5 – PLUG P10 LOCATION****TEST PROCEDURE**

1. Turn the engine OFF.
2. Unlatch, lift and secure the right side door.
3. Locate plug P10. See Figure F.5.
4. Remove plug P10.

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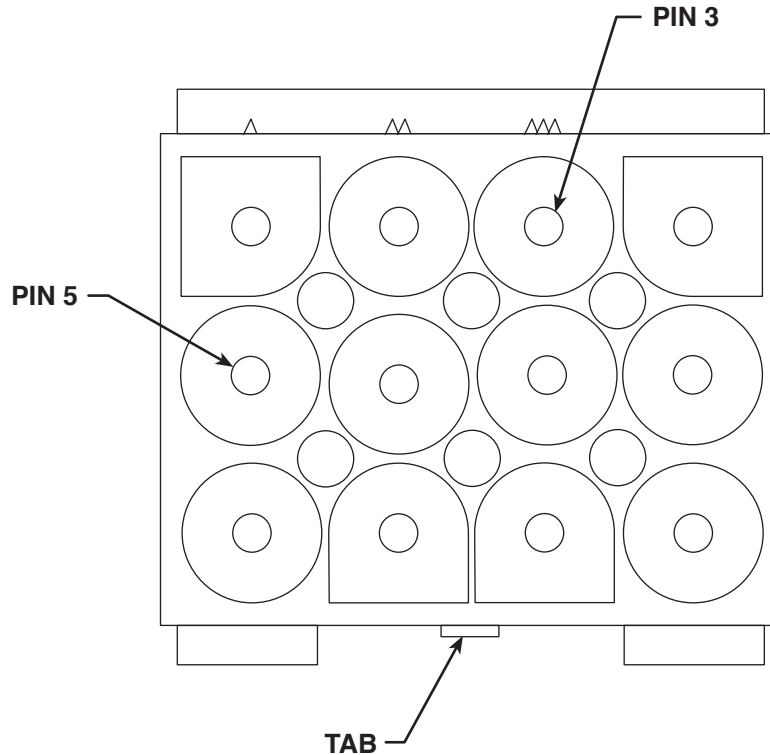
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR SHUNT FIELD WINDING TEST (*continued*)

FIGURE F.6 – PLUG P10 PIN ASSIGNMENTS



5. Locate the blue (U) (pin 3) and the brown (N) (pin 5) leads in the harness plug. See Figure F.6.
6. Using the volt/ohmmeter, measure the resistance between the blue and the brown lead. Normal resistance is approximately 40 ohms.
7. Also measure the resistance from either lead (blue or brown) to ground. This resistance should be at least 500,000 ohms.
8. If the test does not meet the resistance specifications, then check the harness plug for loose connections or shorted leads.
9. If the plug and associated leads are okay, the shunt field coils may be faulty. Replace the shunt field coils.
10. If the test does meet the resistance specifications, the main shunt coils are okay.
11. Replace plug P10, making sure the leads and plug are secure.
12. After the test and repairs are completed, close and latch the right side door.

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# TROUBLESHOOTING & REPAIR

## ENGINE THROTTLE ADJUSTMENT TEST

### **WARNING**

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

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

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### TEST DESCRIPTION

If the machine output is low or high, this test will determine whether or not the engine is operating at the correct speed (RPM) during both HIGH and LOW idle conditions. Directions for adjusting the throttle to the correct RPM are given.

### MATERIALS NEEDED

White or red marking pencil  
7/16" Wrench  
3/8" Wrench

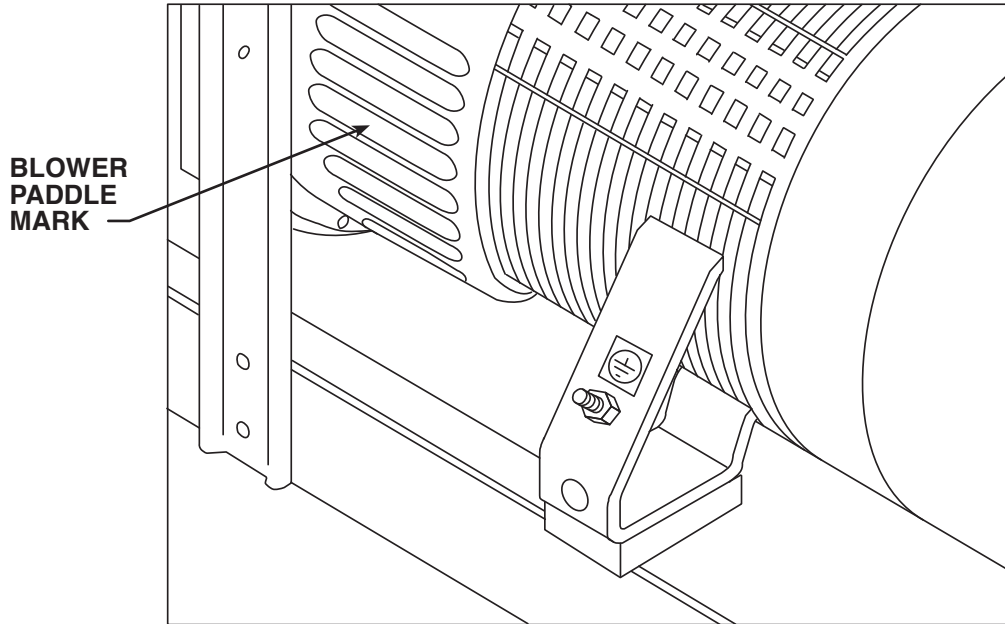
**This procedure takes approximately 35 minutes to perform.**

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## ENGINE THROTTLE ADJUSTMENT TEST *(continued)*

FIGURE F.7 – BLOWER PADDLE MARK LOCATION



### TEST PROCEDURE

#### Strobe Tach Method

1. Conduct this procedure with the engine OFF.
2. Unlatch, lift, and secure the right and left side doors.
3. With the white or red marking pencil, place a mark on one of the blower paddles. See Figure F.7.
4. Connect the strobe-tach according to the manufacturer's instructions.
5. Start the engine and direct the strobe-tach light on the blower paddle and synchronize it to the rotating mark.
6. With the machine at HIGH IDLE, the tach should read between 1550 and 1650 RPM. With the machine at LOW IDLE, the tach should read between 1000 and 1050 RPM.

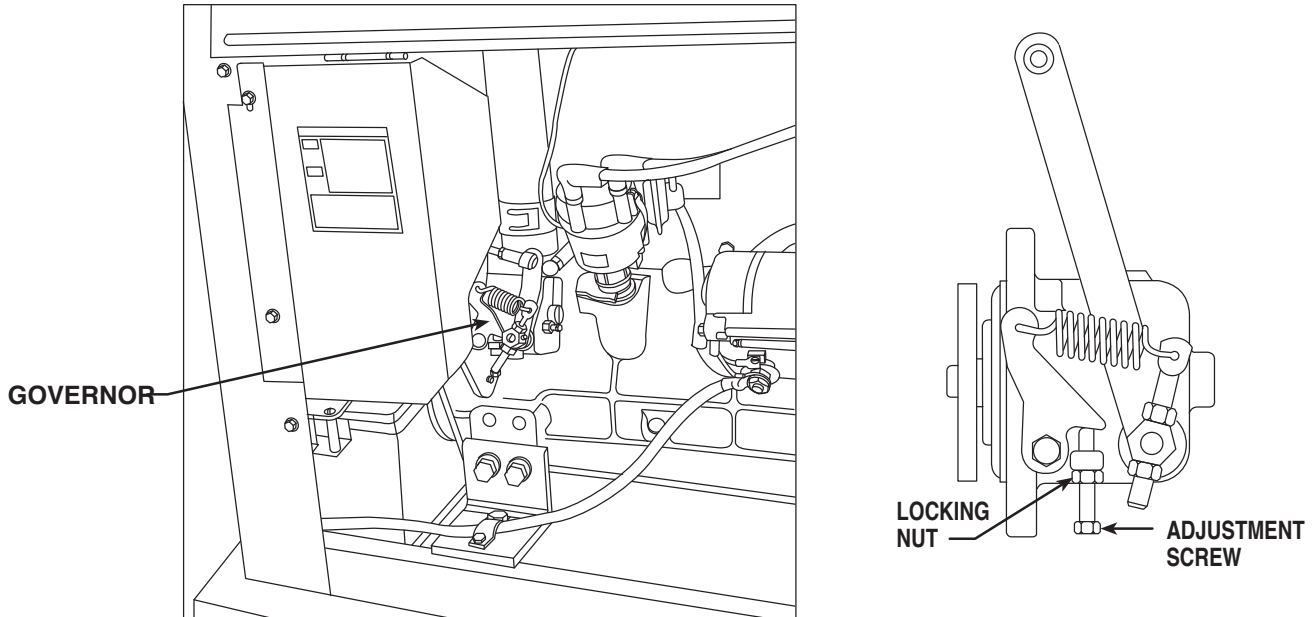
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# TROUBLESHOOTING & REPAIR

## ENGINE THROTTLE ADJUSTMENT TEST *(continued)*

FIGURE F.8 – HIGH IDLE ADJUSTMENT



### Adjust High Idle

- Make sure there is no load on the machine.
- Set the Idler switch to the HIGH position.
- Locate the governor on the left side of the engine. See Figure F.8.
- Using the 3/8" wrench to turn the adjustment screw and locking nut, adjust the high idle speed to between 1550 - 1650 RPM. It may not be necessary to remove the seal. See Figure F.8.
- If further adjustments are necessary, consult the Engine Manual.

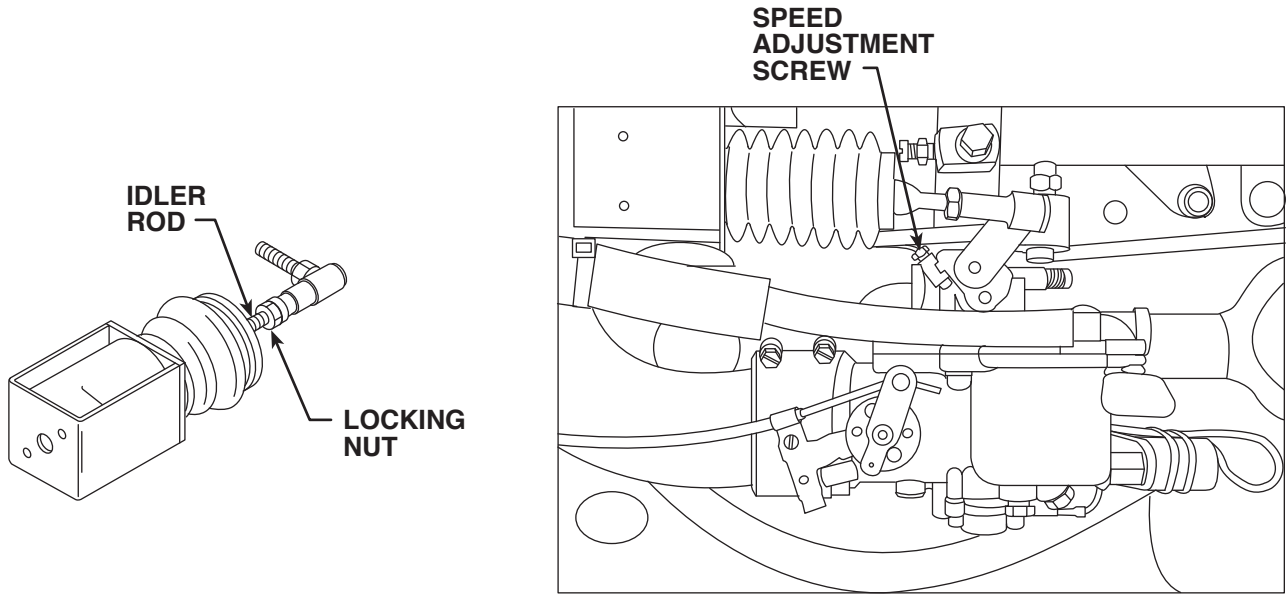
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# TROUBLESHOOTING & REPAIR

## ENGINE THROTTLE ADJUSTMENT TEST (continued)

FIGURE F.9 – LOW IDLE ADJUSTMENT



### Adjust Low Idle

- Make sure there is no load on the machine.
- Set the Idler switch to AUTO and wait for the engine to change to low idle speed.
- Check the alignment of the idler rod so that the plunger can move freely.
- Using the 7/16" wrench, loosen the idler rod locking nut. This is located on the idler rod between the carburetor ball joint and the idler solenoid. See Figure F.9.
- Adjust the idler rod stickout from the ball joint to set the low idle speed to the bottom of the range (1000 RPM). The flattened portion of the idler rod must be vertical. This ensures free pivoting of the idler rod in the idler solenoid plunger. To achieve this, turn the idler rod into the ball joint (no more than one-half turn).
- Tighten the locking nut to the ball joint. The low idle RPM should now be slightly less than the bottom value of the range.
- Using the speed adjustment screw on the carburetor, set the low RPM to within the range (1000 - 1050 RPM). See Figure F.9.

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## FLASHING THE FIELDS

### **⚠ WARNING**

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

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

---

### DESCRIPTION

This procedure will magnetize the exciter pole pieces. The exciter can then “build-up” when the engine is started.

### MATERIALS NEEDED

- 12-volt battery
- Two jumper wires with alligator clips on each end
- Wiring Diagram
- 3/8” Wrench

**This procedure takes approximately 15 minutes to perform.**

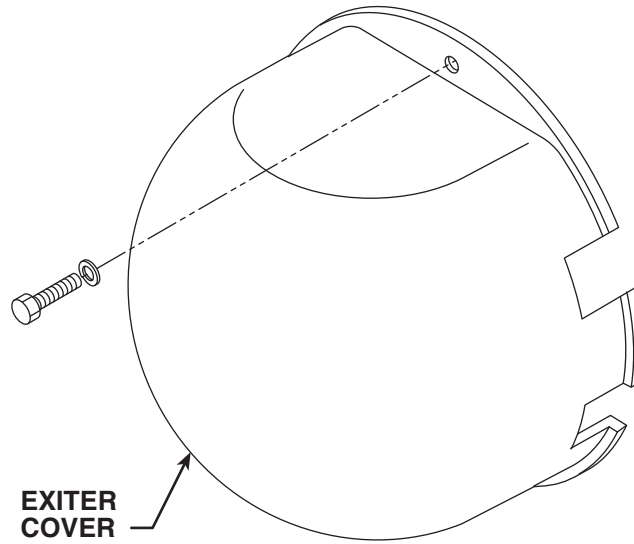
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# TROUBLESHOOTING & REPAIR

## FLASHING THE FIELDS *(continued)*

FIGURE F.10 – EXCITER COVER REMOVAL



### PROCEDURE

1. Turn the engine OFF.
2. Using the 3/8" wrench, remove the exciter cover. See Figure F.10.

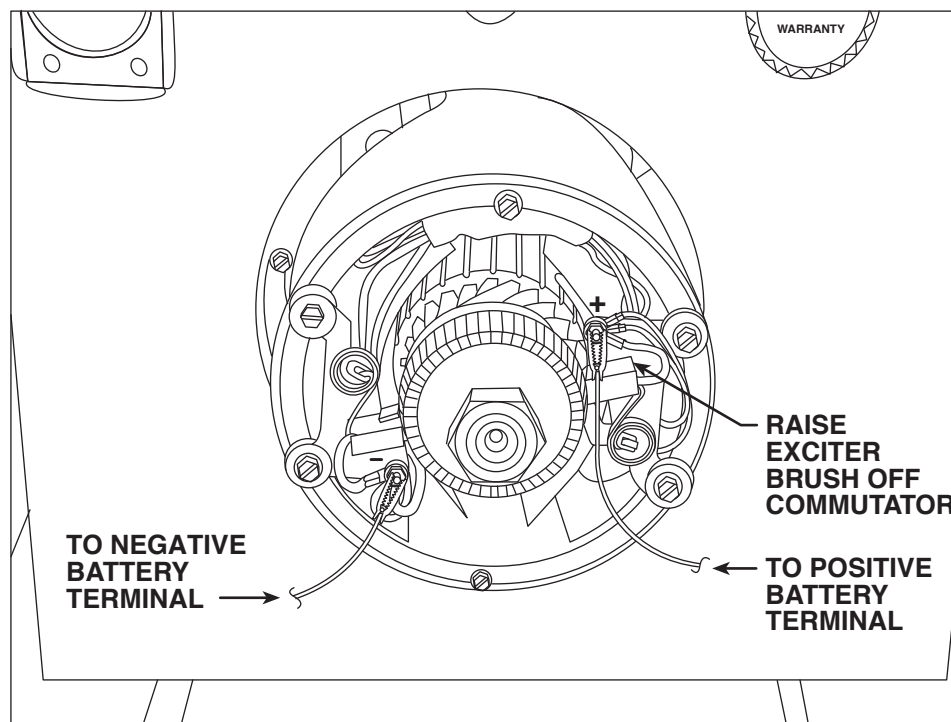
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# TROUBLESHOOTING & REPAIR

## FLASHING THE FIELDS *(continued)*

FIGURE F.11 - BRUSH HOLDER/BATTERY JUMPER CONNECTIONS



3. Raise one exciter brush off the armature commutator.
4. Using the jumper leads and the 12VDC battery, first attach the clip of one lead to the POSITIVE terminal of the battery. Attach the other end of this same lead to the right side brush holder. See Figure F.11.
5. Carefully attach one clip of the other lead to the NEGATIVE terminal of the battery. Attach the other end of the same lead to the left side brush holder for approximately five seconds. Pull the lead away quickly to minimize arcing. See Figure F.11.
6. Remove both leads from the brush holders and the battery.
7. Install the brush removed in step 3.
8. Install the exciter cover using the 3/8" nut driver.
9. Start the engine. The exciter should produce DC output voltage.

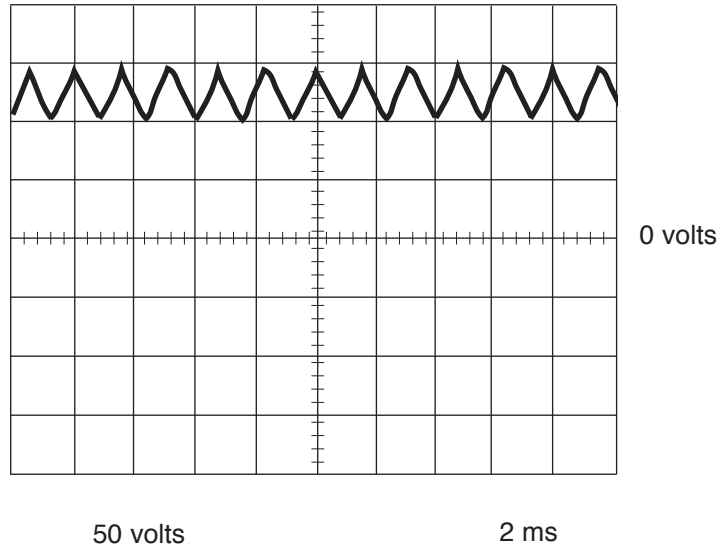
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# TROUBLESHOOTING & REPAIR

## NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (115VDC SUPPLY) HIGH IDLE – NO LOAD – FINE CURRENT CONTROL RHEOSTAT 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 2 milliseconds in time.

Note: Scope probes connected at machine 115VDC receptacle.

### SCOPE SETTINGS

Volts/Div .....	50V/Div.
Horizontal Sweep .....	2 ms/Div.
Coupling .....	DC
Trigger .....	Internal

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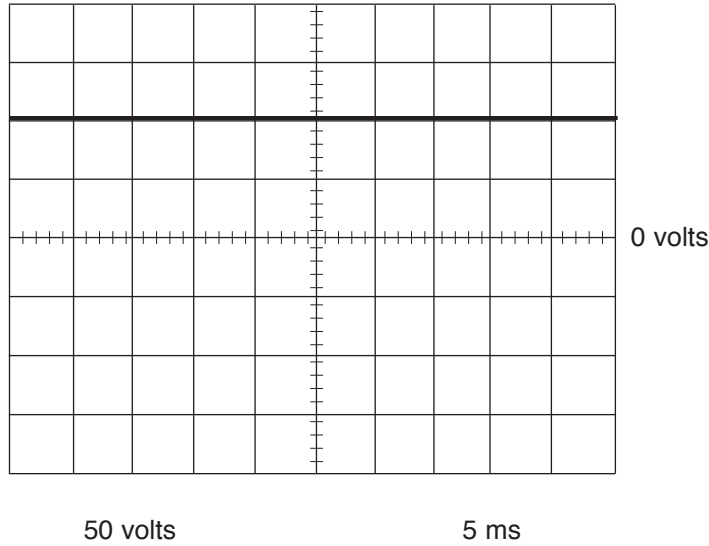
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# TROUBLESHOOTING & REPAIR

## NORMAL OPEN CIRCUIT DC WELD VOLTAGE WAVEFORM HIGH IDLE – NO LOAD – FINE CURRENT CONTROL RHEOSTAT AND SELECTOR SWITCH AT MAXIMUM



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

Note: Scope probes connected at machine output terminals.

### SCOPE SETTINGS

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

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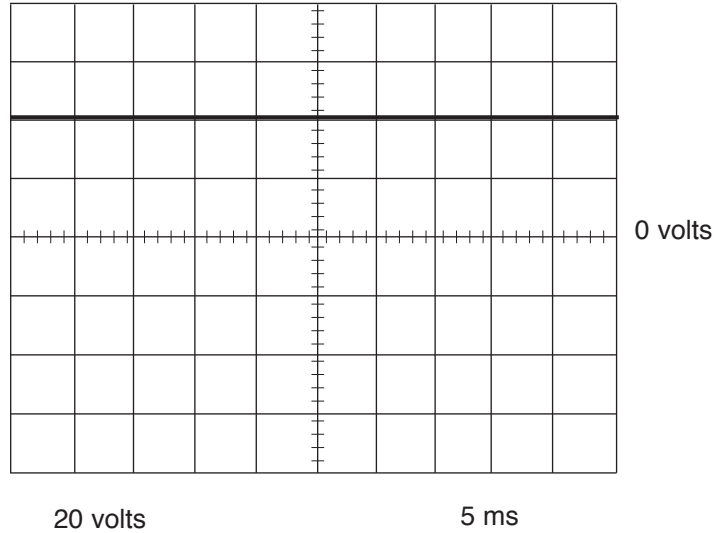
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# TROUBLESHOOTING & REPAIR

## TYPICAL DC WELD VOLTAGE WAVEFORM MACHINE LOADED – SELECTOR SWITCH AT MAXIMUM



### MACHINE LOADED TO 200 AMPS AT 40VDC

This is the typical DC welding output voltage generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 5 milliseconds in time. The machine was loaded with a resistance grid bank.

Note: Scope probes connected at machine output terminals.

### SCOPE SETTINGS

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

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# TROUBLESHOOTING & REPAIR

## DC EXCITER ARMATURE AND FIELD COILS REMOVAL AND REPLACEMENT

### **WARNING**

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

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

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### DESCRIPTION

This procedure will aid the technician in the removal and replacement of the exciter armature and field coils.

### MATERIALS NEEDED

- 3/8" Wrench
- 1/2" Wrench
- 1-5/8" Socket wrench
- Wiring Diagram

**This procedure takes approximately 1.5 hours to perform.**

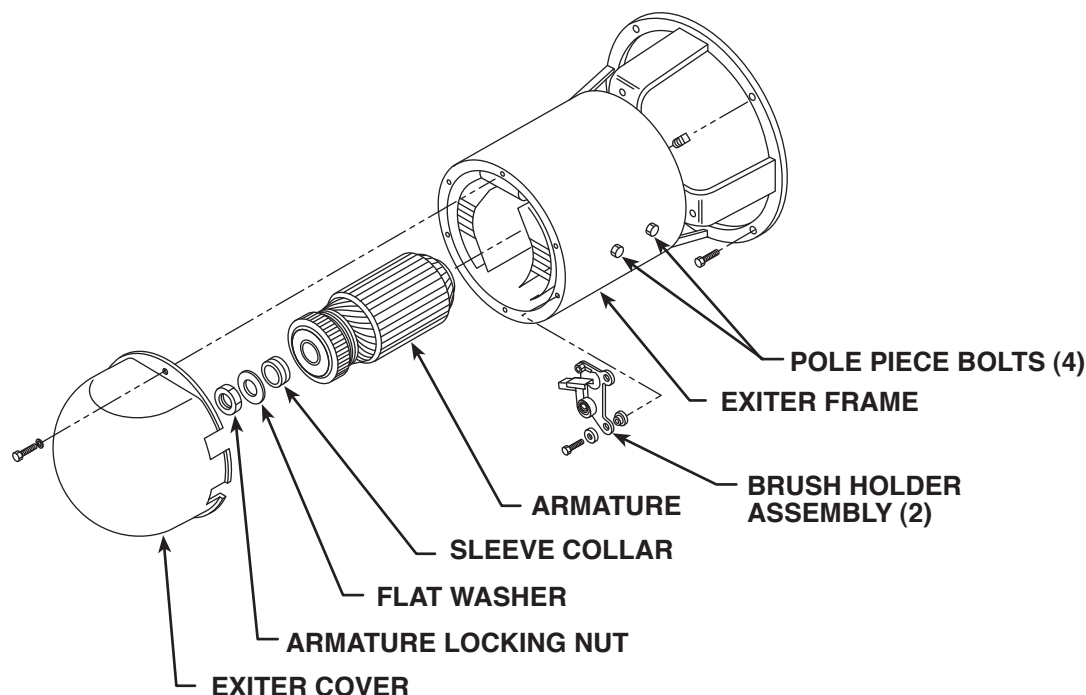
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# TROUBLESHOOTING & REPAIR

## DC EXCITER ARMATURE AND FIELD COILS REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.12 – EXCITER COVER REMOVAL



### PROCEDURE

#### DC Exciter Armature Removal Procedure

1. Turn the engine OFF.
2. Using the 3/8" nut driver, remove the exciter cover. See Figure F.12.
3. Using the 3/8" wrench, remove the two brush holder assemblies. Note insulator placement for reassembly.
4. Bend the flat washer away from the armature locking nut.
5. Using the 1-5/8" socket wrench, remove the armature locking nut, washer, and sleeve collar.
6. Carefully remove the armature by sliding it from the shaft.

**NOTE:** The sleeve collar may have to be removed with a gear puller. Be careful not to damage the armature commutator.

#### Reassembly:

7. Upon reassembly, the armature locking nut should be torqued to 170 ft.-lbs. Install a new sleeve collar if necessary (Part number T5345). Bend the flat washer against the locking nut.
8. Install the brush holder assemblies. Note insulator placement.
9. Check the armature air gap. Minimum gap should be .025".
10. Install the exciter cover.

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## TROUBLESHOOTING & REPAIR

### DC EXCITER ARMATURE AND FIELD COILS REMOVAL AND REPLACEMENT *(continued)*

#### Field Coils Removal Procedure

1. Perform the ***DC Exciter Armature Removal Procedure***.
2. Using the 3/8" wrench, remove the leads from the brush holder. Note lead placement for reassembly.
3. Using the 1/2" wrench, remove the four bolts (two on each side) holding the pole pieces to the exciter frame. ***See Figure F.12.***
4. Label and remove the tape and splices from the black and red leads that go to the idler board and 115VDC receptacle. See the Wiring Diagram.
5. Carefully slide the coils and pole pieces from the exciter frame.
6. Remove the coils from the pole pieces.

#### Reassembly:

7. Assemble the new coils to their respective pole pieces.
8. Assemble the coil and pole pieces to the exciter frame with four bolts.
9. Make the necessary lead connections to the idler board and 115VDC receptacle. Wrap the slices with tape.
10. Assemble the armature and brushes. See the ***DC Exciter Armature Removal Procedure***.

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## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT

### **⚠ WARNING**

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

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

### **DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the main DC generator frame.

### **MATERIALS NEEDED**

- Rope sling
- Wood or steel blocks
- Pry bars
- 9/16" Wrench
- 1/2" Wrench
- 7/16" Wrench
- 3/4" Wrench
- Slot head screw driver
- Wiring Diagram

**This procedure takes approximately 8 hours to perform.**

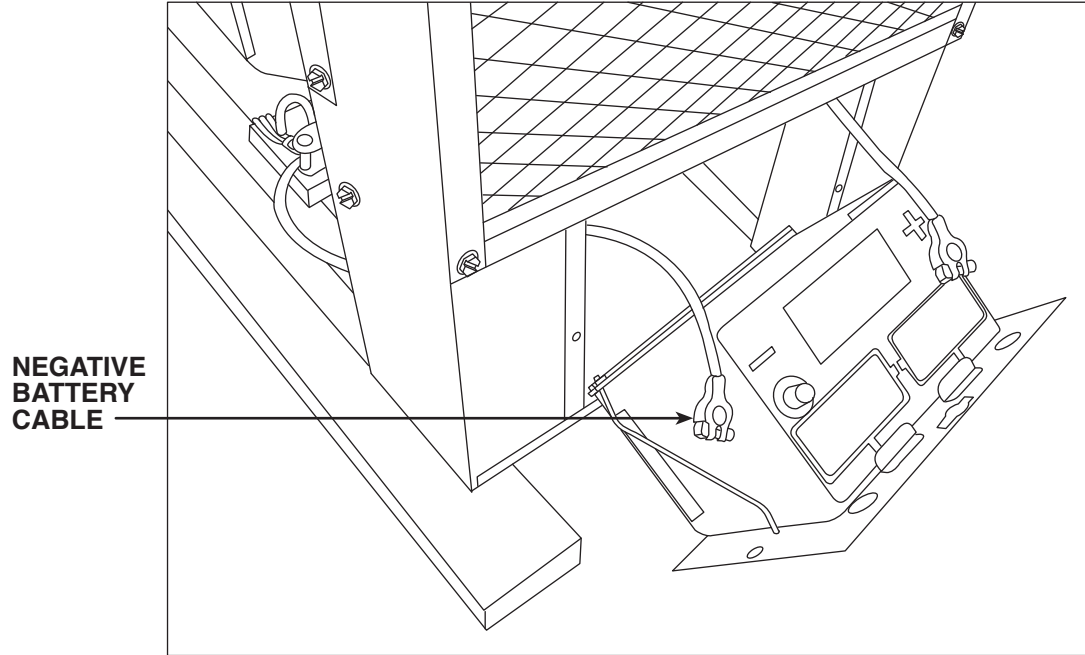
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.13 – BATTERY PANEL REMOVAL



### PROCEDURE

1. Turn the engine OFF.
2. Using the 7/16" wrench, remove the two bolts and washers and partially slide out the battery mounting panel. See Figure F.13.
3. Using the 1/2" wrench, remove the negative battery cable.

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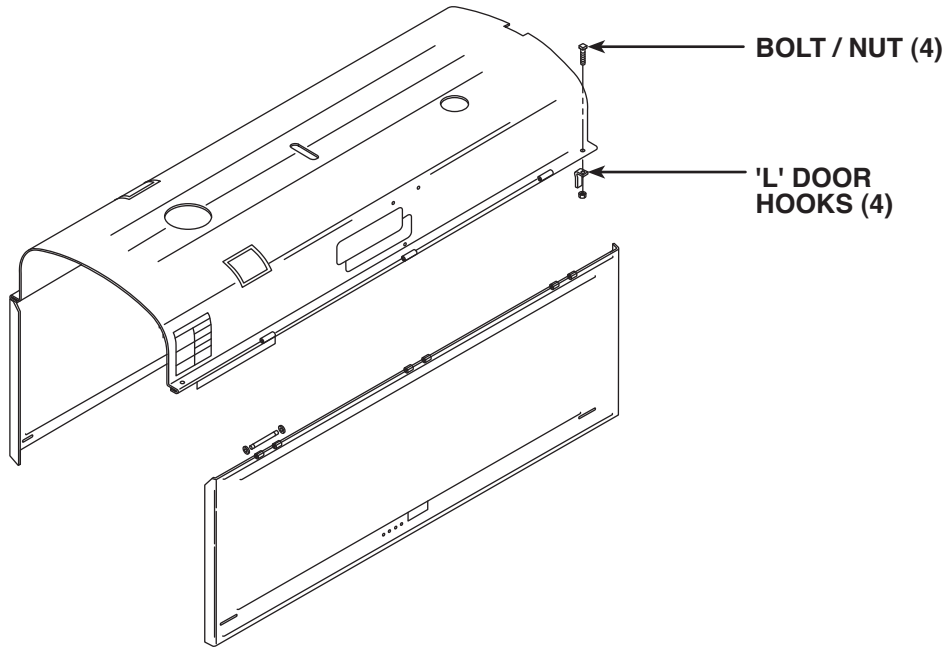
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.14 – TOP AND DOORS ASSEMBLY DETAILS



4. Using the 1/2" wrench, remove the four nuts and bolts holding the case top and doors assembly to the welder frame. Remove the rubber gasket from the top. Carefully lift up and remove the top and doors assembly. Carefully remove the "L" shaped door hooks. See Figure F.14.

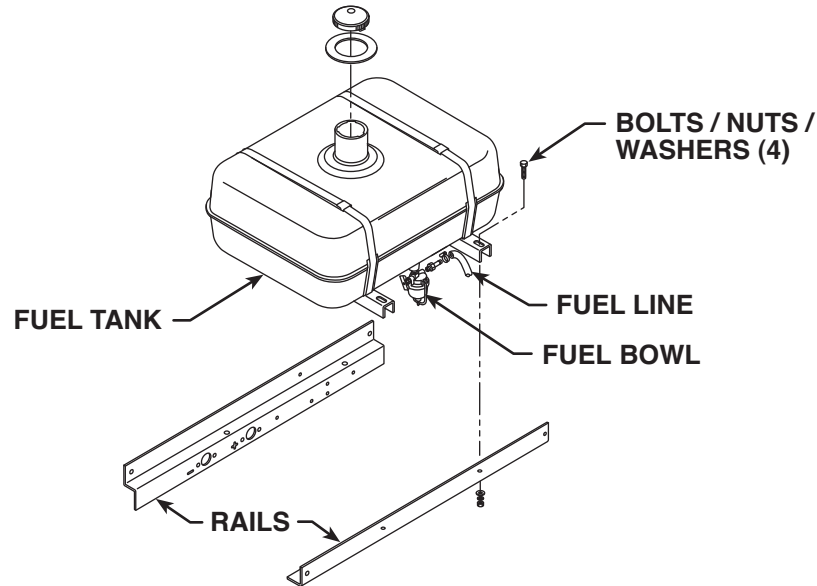
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.15 – FUEL TANK MOUNTING DETAILS



5. Perform the ***DC Exciter Armature Removal Procedure.***
6. Turn off the fuel supply at the fuel bowl and remove the fuel line. Plug the line to avoid spillage.
7. Using the 9/16" wrench, remove the four nuts, bolts, and washers holding the fuel tank assembly to the rails. See Figure F.15.
8. Carefully remove the fuel tank and set it aside in a safe area.

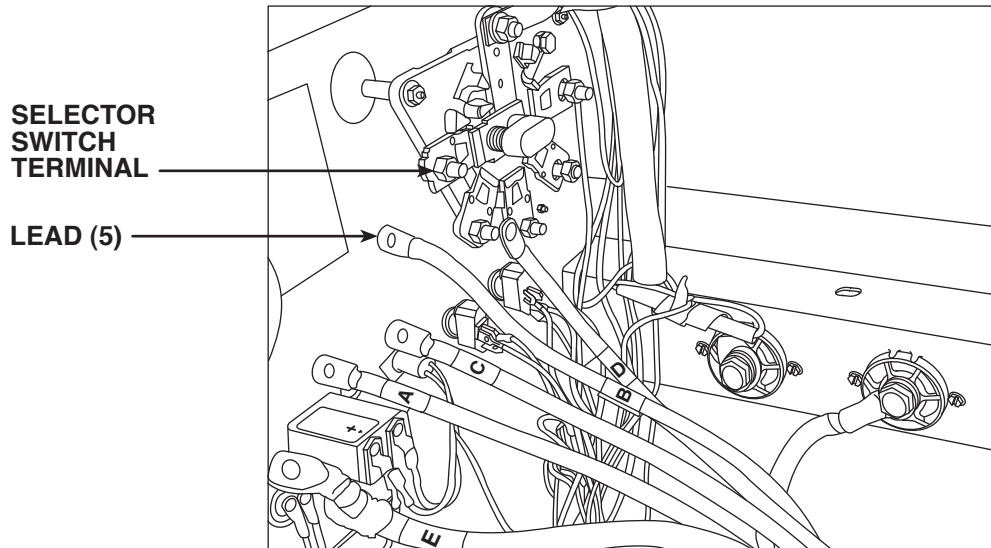
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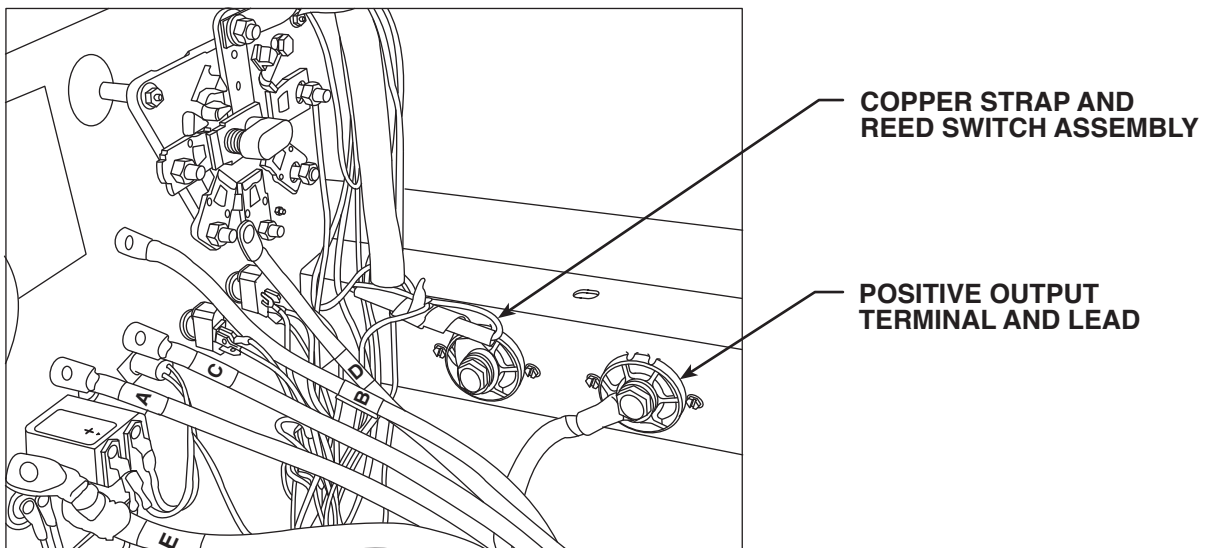
## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.16 – SELECTOR SWITCH LEAD REMOVAL



- Using the 1/2" wrench, remove the five heavy flex leads from the selector switch terminals. Label the leads for reassembly. See Figure F.16.

FIGURE F.17 – OUTPUT TERMINAL LEAD REMOVAL



- Using the 3/4" wrench, remove the copper strap lead and reed switch assembly from the negative output terminal. See Figure F.17.
- Using the 3/4" wrench, remove the heavy lead from the positive output terminal. See Figure F. 17.

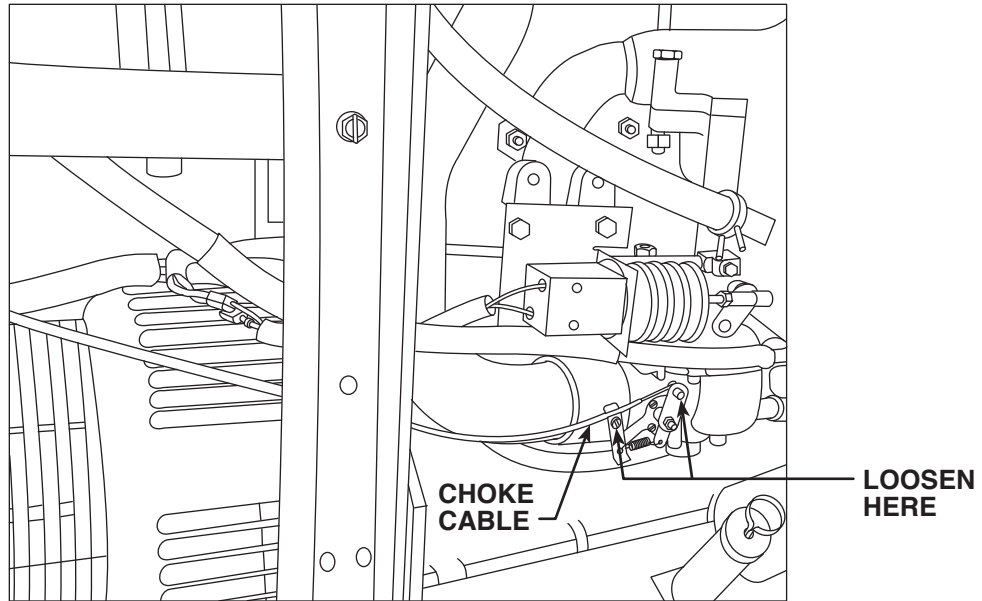
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.18 - CHOKE CONTROL CABLE REMOVAL



- Using the slot head screw driver, remove the choke control cable from the engine carburetor assembly. Mark cable replacement for reassembly. See Figure F.18.

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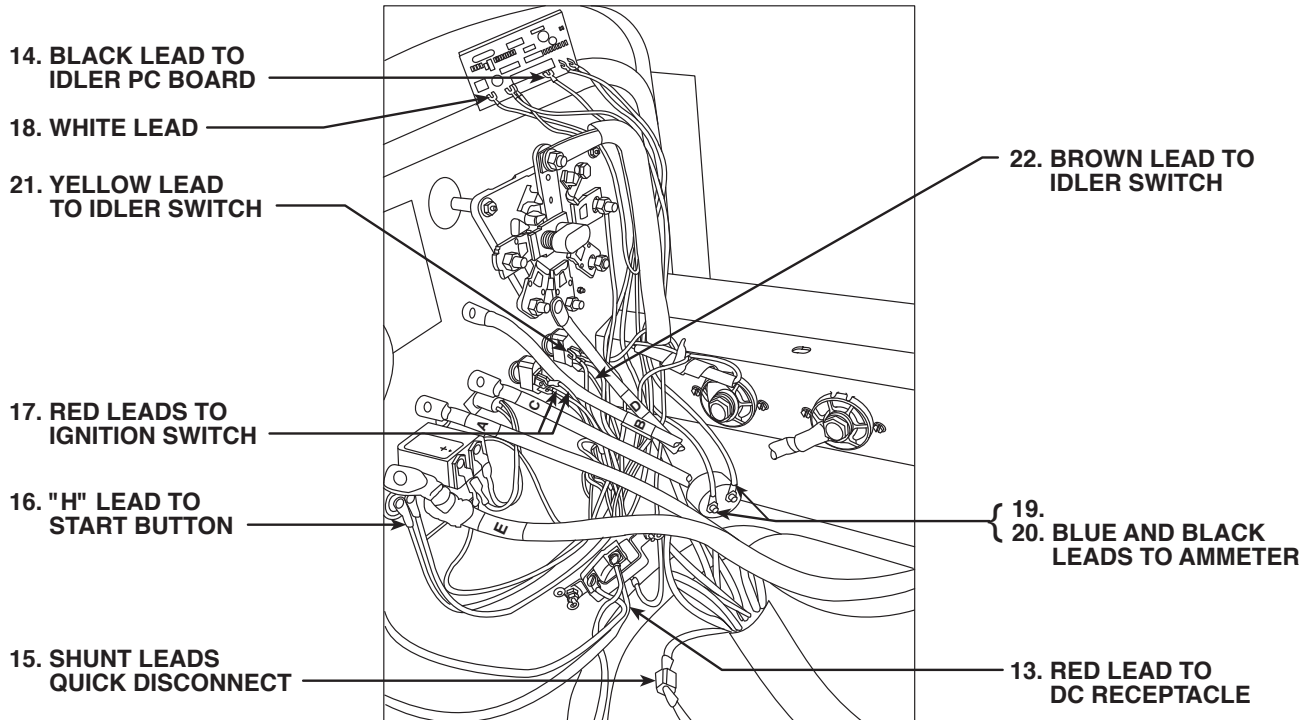
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.19 – FRONT PANEL WIRING CONNECTIONS



13. Using the slot head screw driver, remove the red lead connecting the 115VDC receptacle to the DC exciter. See Figure F.19 and the Wiring Diagram. Cut any necessary cable ties.
14. Remove the black lead connecting the idler PC board to the DC exciter. See Figure F.19 and the Wiring Diagram. Cut any necessary cable ties.
15. Disconnect the blue and brown main shunt leads from their quick disconnect splices. See the Wiring Diagram.
16. Disconnect the "H" lead from the START button switch. See Figure F.19 and the Wiring Diagram.
17. Remove the two red leads from the ignition switch. Label for reassembly. See Figure F.19 and the Wiring Diagram.
18. Remove the white lead from the idler PC board. See Figure F.19 and the Wiring Diagram.
19. Using the 3/8" nut driver, remove the blue lead from the ammeter. Label for reassembly. See Figure F.19 and the Wiring Diagram.
20. Using the 3/8" nut driver, remove the black lead from the ammeter. Label for reassembly. See Figure F.19 and the Wiring Diagram.
21. Label and remove the yellow lead from the idler switch. The yellow lead connects the idler switch to the oil pressure switch. See Figure F.19 and the Wiring Diagram.
22. Label and remove the brown lead from the idler switch. The brown lead connects the idler switch to the idler solenoid. See Figure F.19 and the Wiring Diagram.

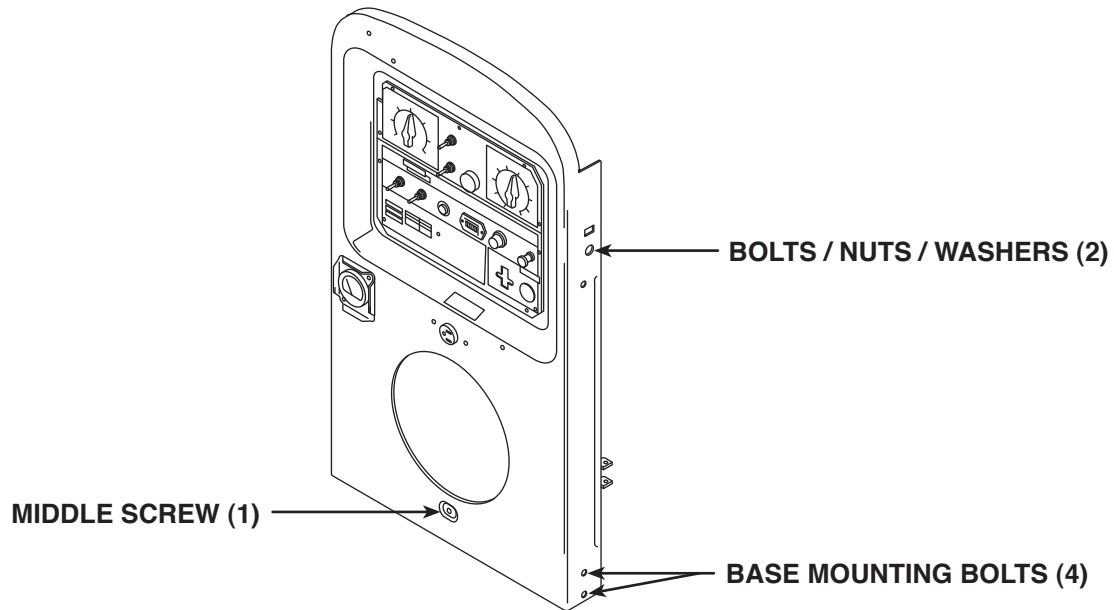
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## TROUBLESHOOTING & REPAIR

### MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.20 – FRONT PANEL FASTENER REMOVAL



23. Using the 1/2" wrench, remove the two bolts, nuts, and washers that hold the front panel assembly to the horizontal rails. (There is one on each side.) See Figure F.20.
24. Using the 9/16" wrench, remove the four bolts, nuts, and washers from the bottom of the front panel assembly. These four bolts mount the front to the base. (There are two on each side.) See Figure F.20.
25. Using the 3/8" nut driver, remove the screw from the lower middle of the front panel. See Figure F.20.
26. Carefully remove the front panel assembly.

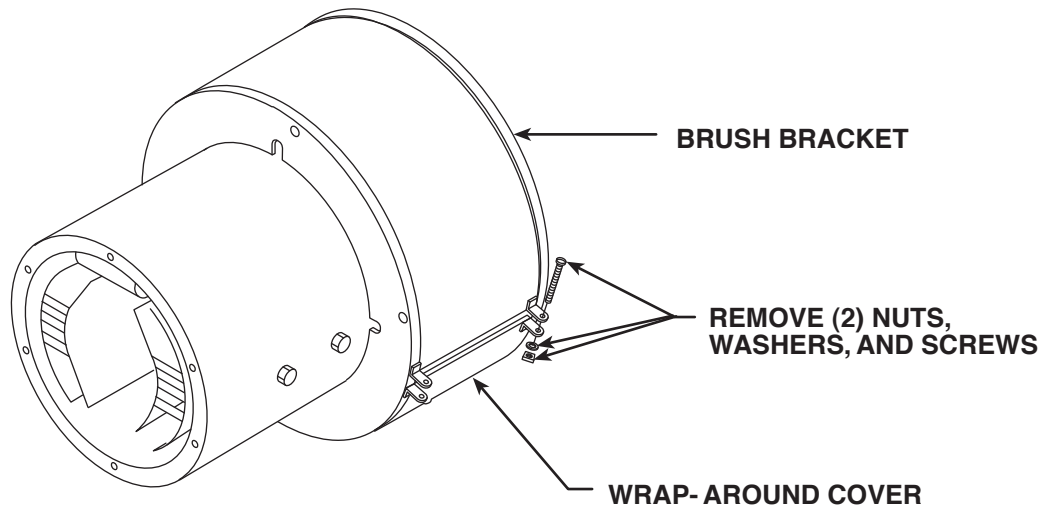
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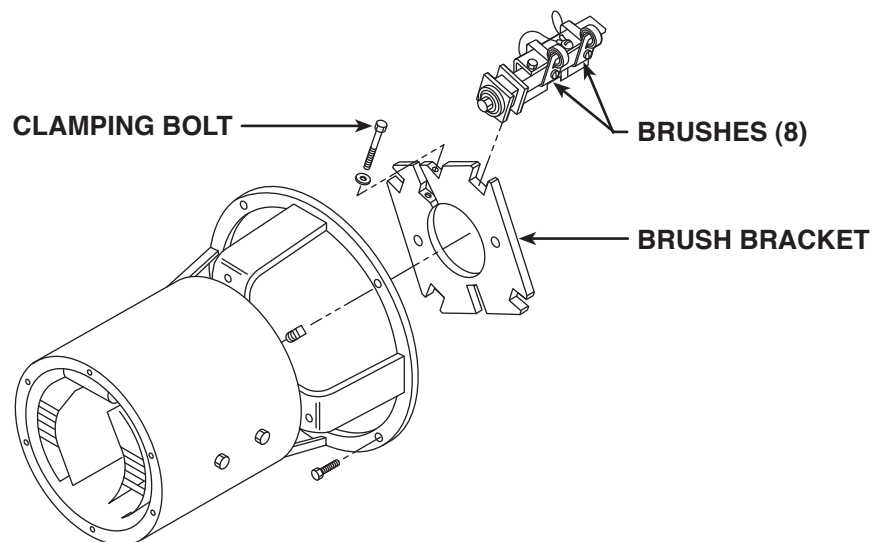
## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.21 – BRUSH BRACKET WRAP-AROUND COVER



27. Using the slot head screw driver, remove the two screws and nuts from the brush bracket wrap-around cover. Remove the cover. See Figure F.21.

FIGURE F.22 – MAIN GENERATOR BRUSH BRACKET CLAMPING BOLT



28. Lift the eight brushes from the main commutator. Note their positions for reassembly.
29. Using the 7/16" wrench, loosen (do not remove) the main generator brush bracket clamping bolt. Note the position of the drill spot for reassembly. See Figure F.22.

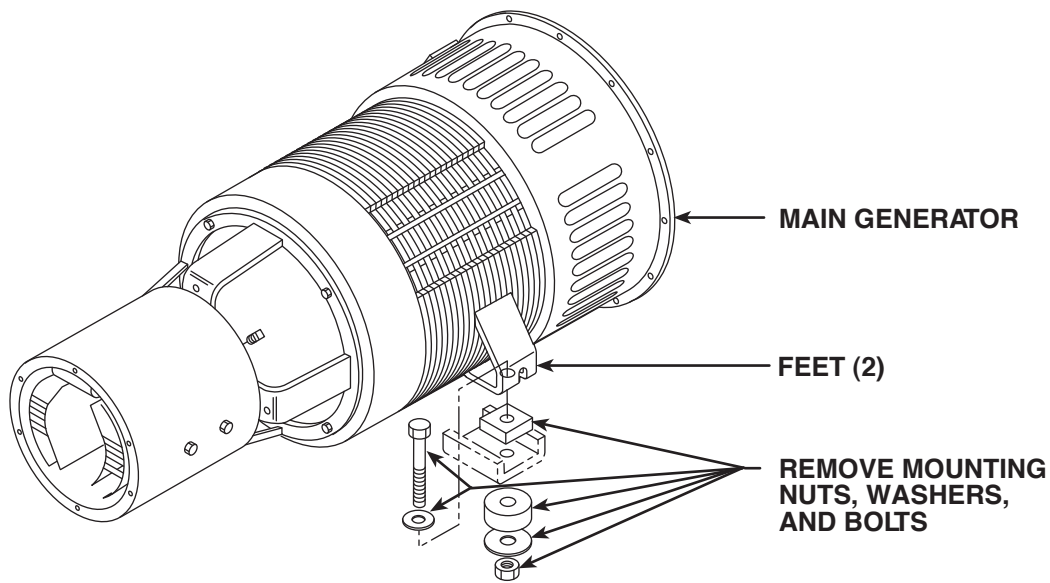
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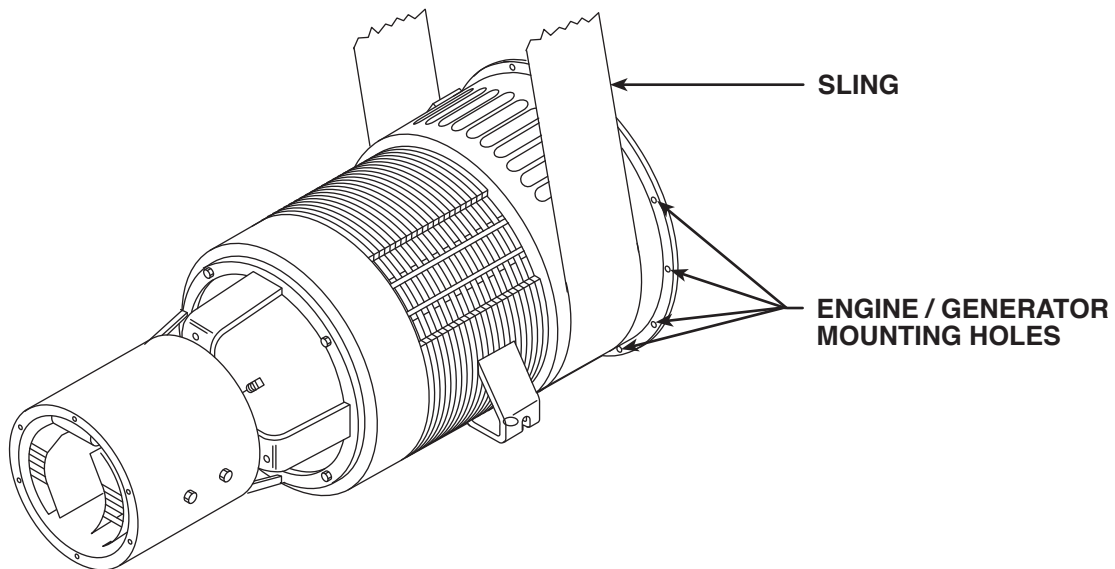
### MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.23 – MAIN GENERATOR FEET MOUNTING



30. Using the 3/4" wrench, remove the frame mounting bolts, nuts, and washers from the feet of the main generator. See Figure F.23.

FIGURE F.24 – MAIN GENERATOR ENGINE MOUNTING



31. With the rope sling around the main generator frame, carefully lift the frame a small distance. Slide the wood or steel blocks under the engine. See Figure F.24.
32. Using the 9/16" wrench, remove the bolts and lock washers mounting the generator frame to the engine. See Figure F.24.

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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT (*continued*)

33. Using the rope sling and pry bars, carefully lift and “wiggle” the generator frame away from the engine and armature assembly. Be careful to support the generator frame as you remove it.

**NOTE:** The exciter frame is also removed with the main generator frame.

**Reassembly:** Refer to **Figures F.13 - F.24** as needed.

1. Using the rope sling, carefully lift and “wiggle” the generator frame onto the engine and armature assembly. Be careful to support the generator frame as you position it.
2. Using the 9/16” wrench, install the bolts and lock washers mounting the generator frame to the engine. Using the 3/4” wrench, install the frame mounting bolts, nuts, and washers to the feet of the main generator. Check air gap – min. .035” for main generator.
3. Using the 7/16” wrench, tighten the main generator brush bracket clamping bolt. Note the position of the drill spot.
4. Install the eight brushes against the main commutator. Observe the positions you noted during disassembly.
5. Using the slot head screw driver, install the brush bracket wrap-around cover with two nuts and screws.
6. Carefully set the front panel assembly into position. Using the 3/8” nut driver, install the screw for the lower middle of the front panel. Using the 9/16” wrench, install the four bolts, nuts, and washers for the bottom of the front panel assembly. Then install the two bolts, nuts, and washers that hold the front panel assembly to the horizontal rails.
7. Using the 3/8” nut driver, connect the yellow wire from the oil pressure switch and the brown wire from the idler solenoid to the idler switch. Connect the blue wire and the black wire to the ammeter. See the Wiring Diagram.
8. Connect the white wire to the idler PC board. Connect the two red wires to the ignition switch. Connect the “H” lead to the START button switch. Connect the blue and brown main shunt leads at their quick disconnect splices. Connect the black lead between the idler PC board and the DC exciter.
9. Using the slot head screw driver, connect the red lead between the 115VDC receptacle and the DC exciter. Replace any cable ties cut during disassembly.
10. Using the slot head screw driver, install the choke control cable to the engine carburetor assembly, noting placement mark.
11. Using the 3/4” wrench, install the heavy lead to the positive output terminal and the copper strap lead and reed switch assembly to the negative output terminal.
12. Using the 1/2” wrench, install the five heavy flex leads to the selector switch as labeled during disassembly.
13. Carefully position the fuel tank to the mounting rails. Using the 9/16” wrench, install the four nuts, bolts, and washers holding the fuel tank assembly to the rails. Remove the plug from the fuel line and attach it to the fuel bowl.
14. Perform the **DC Exciter Armature Reassembly Procedure**.
15. Carefully set the top and doors assembly into place. Install the “L” shaped door hooks. Using the 1/2” wrench, install the four nuts and bolts holding the case top and doors assembly to the welder frame. Install the rubber gasket to the top.
16. Using the 1/2” wrench, install the negative battery cable. Slide the battery mounting panel back into place and, using the 7/16” wrench, install the two bolts and washers that secure the panel.

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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT

### **WARNING**

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

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

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### DESCRIPTION

This procedure will aid the technician in the removal and replacement of the main armature.

### MATERIALS NEEDED

- Rope sling
- 5/8" Wrench
- Wood or steel blocks

**This procedure takes approximately 1.5 hours to perform.**

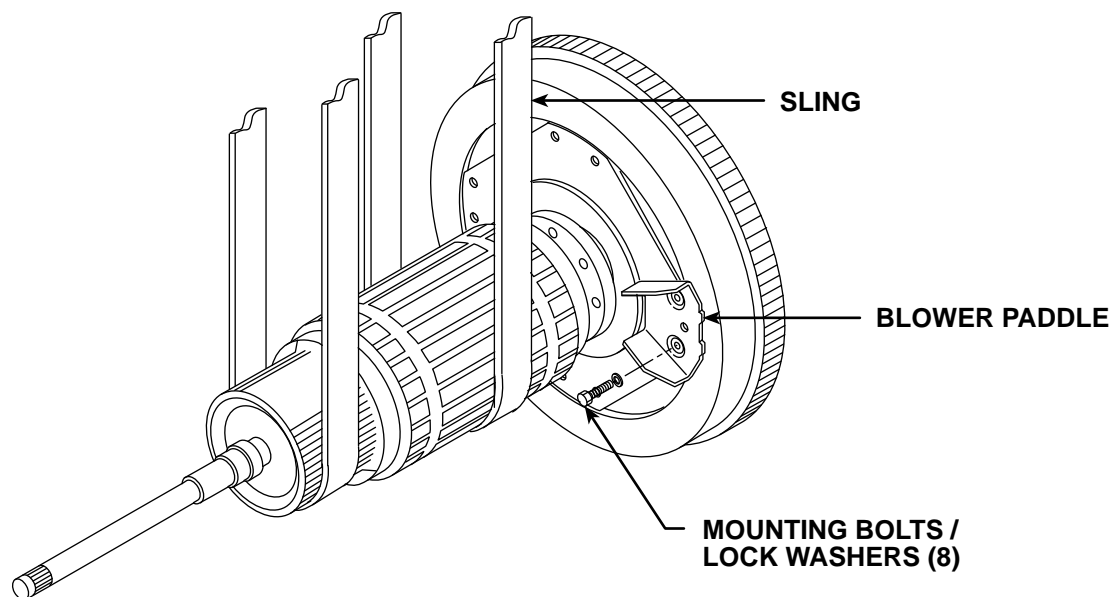
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# TROUBLESHOOTING & REPAIR

## MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.25 – MAIN GENERATOR ARMATURE MOUNTING



### PROCEDURE

1. Turn the engine OFF.
2. Perform the **DC Exciter Armature Removal** procedure.
3. Perform the **Main Generator Frame Removal** procedure.
4. Using the rope sling, support the armature.
5. Make sure the engine supported with the wood or steel blocks.
6. Using the 5/8" wrench, remove the eight bolts and lock washers holding the blower paddles and the armature to the engine flywheel. See Figure F.25.
7. With the armature supported and "balanced" in the rope sling, carefully rotate the armature 1/8 turn in either direction to release it.

**Replacement:** Refer to Figure F.25

1. Support the armature with the rope sling. Mount the armature to the engine, rotating it 1/8 turn in either direction to achieve attachment. Before removing the rope sling, be careful to support the armature with the wood or steel blocks under the engine. With the 5/8" wrench, install the eight bolts and lock washers that attach the blower paddles and the armature to the engine flywheel.
2. Perform other replacement procedures according to each of the following:

**Generator Frame Removal and Replacement**

**DC Exciter Armature Removal and Replacement**

### ⚠ CAUTION

The armature is now free to be removed from the engine.

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# TROUBLESHOOTING & REPAIR

## RETEST AFTER REPAIR

Retest a machine:

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

OR

- If you repair or replace any electrical components.

### ENGINE OUTPUT

Mode	No Load RPM	Load RPM
Low Idle	1000-1050	NA
High Idle	1550-1650	1440-1500

### WELDER DC OUTPUT

Current Control Rheostat	Current Selector Switch	Open Circuit Voltage	Load Volts	Load Amps
Maximum	Maximum	88-95	33-39	300

### DC AUXILIARY POWER RECEPTACLE OUTPUT

Open Circuit Voltage	Load Volts	Load Amps
123-132	115-125	15.0

### FIELD AMPS AND VOLTS (Current Rheostat at Maximum)

Exciter DC Volts	Main Shunt Field Amps	RPM
123 - 132	2.35-2.65	1440-1560

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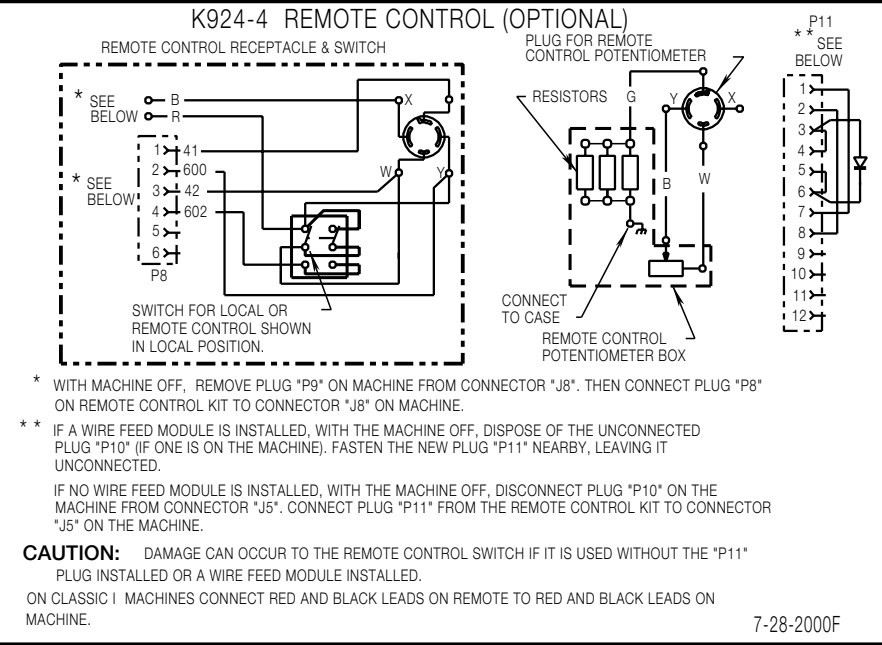
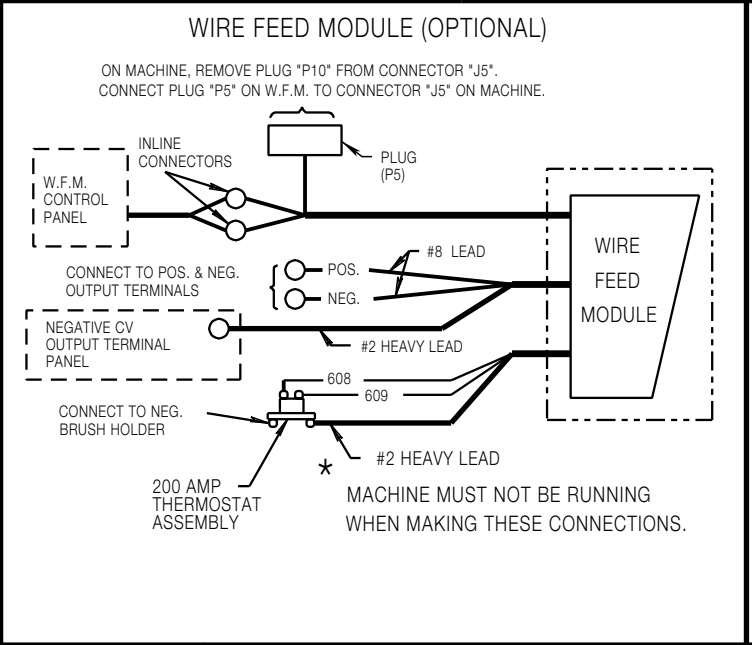
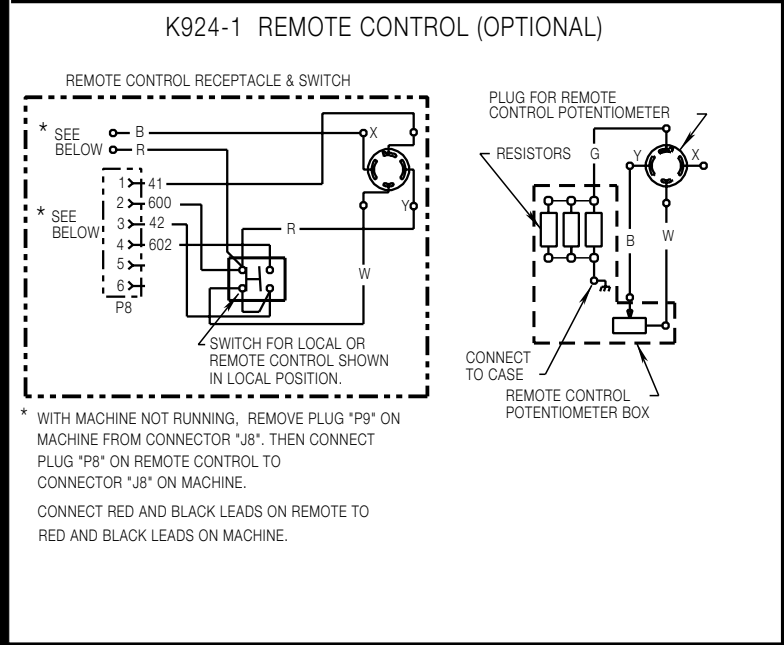
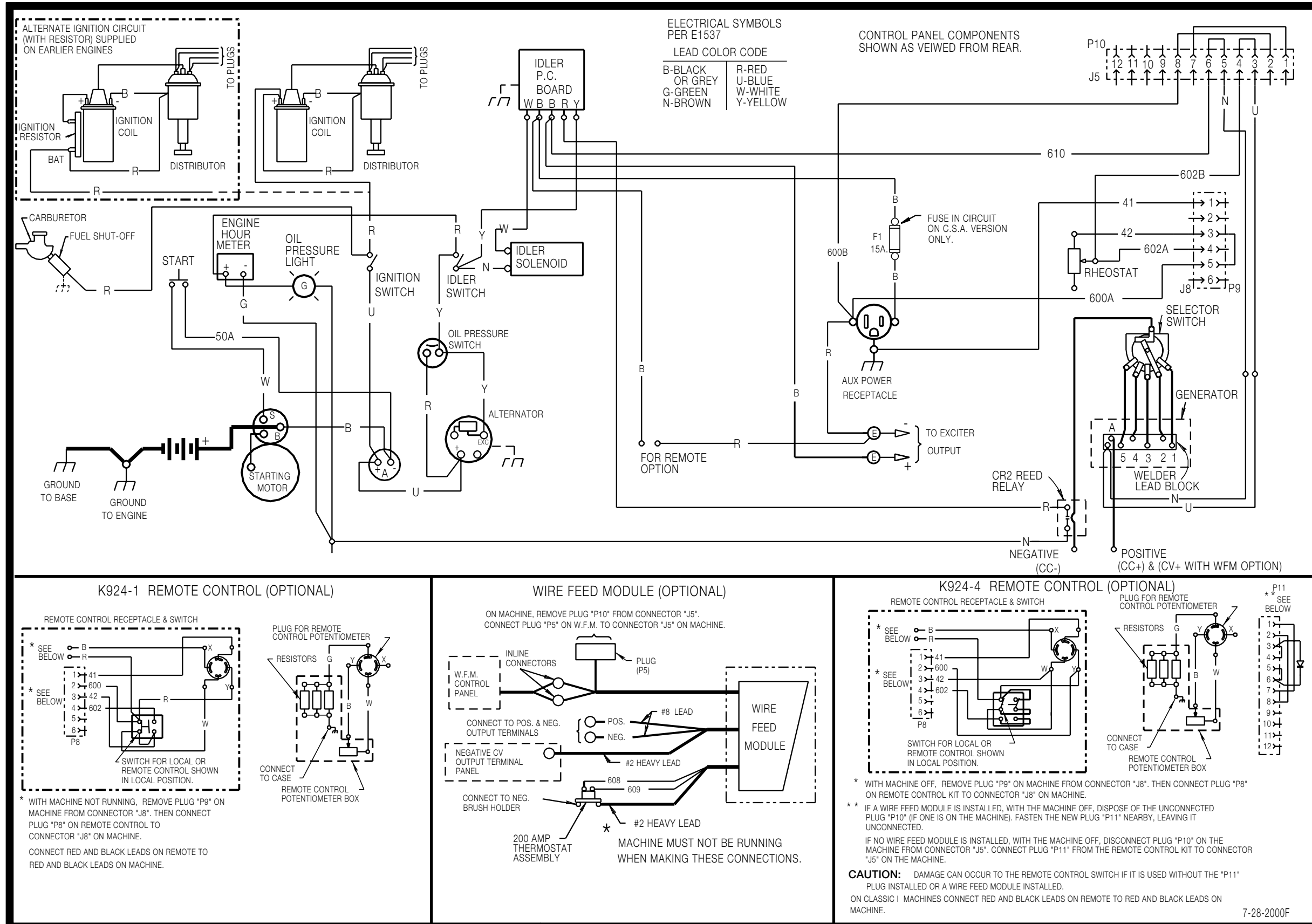
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CLASSIC I



CLASSIC I - WIRING DIAGRAM



7-28-2000F

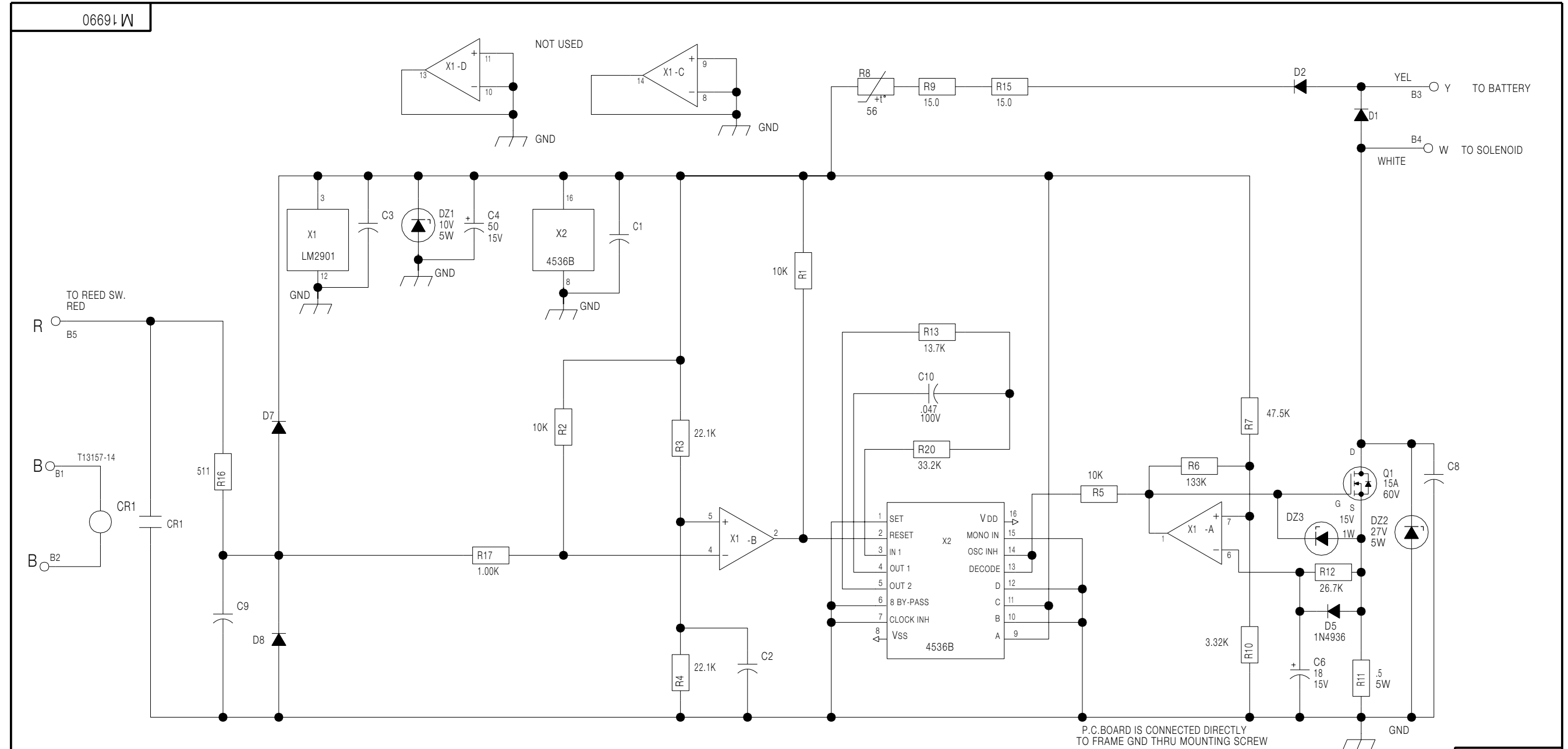
L9262

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.





SCHEMATIC - IDLER PC BOARD



M16990-2BA

LEAD COLOR CODE

- B BLACK
- Y YELLOW
- R RED
- W WHITE

NOTES :

N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537  
 CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)  
 RESISTORS = Ohms ( 1/4W UNLESS OTHERWISE SPECIFIED)  
 DIODES = 1A, 400V (UNLESS OTHERWISE SPECIFIED)

LABELS

- ▲ SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- ▽ COMMON CONNECTION
- ⏏ FRAME CONNECTION
- ⏏ EARTH GROUND CONNECTION

LAST NO. USED
R- 20
C- 10
D- 8

AUSTRALIA \_\_\_\_\_ CANADA \_\_\_\_\_ FRANCE \_\_\_\_\_

UNLESS OTHERWISE SPECIFIED TOLERANCE  
 ON HOLES SIZES PER E-2056  
 ON 2 PLACE DECIMALS IS + .02 -  
 ON 3 PLACE DECIMALS IS + .002 -  
 ON ALL ANGLES IS + .5 OF A DEGREE  
 MATERIAL TOLERANCE ("I") TO AGREE  
 WITH PUBLISHED STANDARDS

Ch'ge. Sht. No.				
10-29-93A				

THE LINCOLN ELECTRIC CO.  
 CLEVELAND, OHIO U.S.A.  
 SCALE NONE

EQUIP. TYPE CLASSIC SA200  
 SUBJECT IDLER PCB SCHEMATIC  
 DR. J.E.B. DATE 2/10/93 CHK. SUP'S'D'G. S20334 SHT. NO. M 16990

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





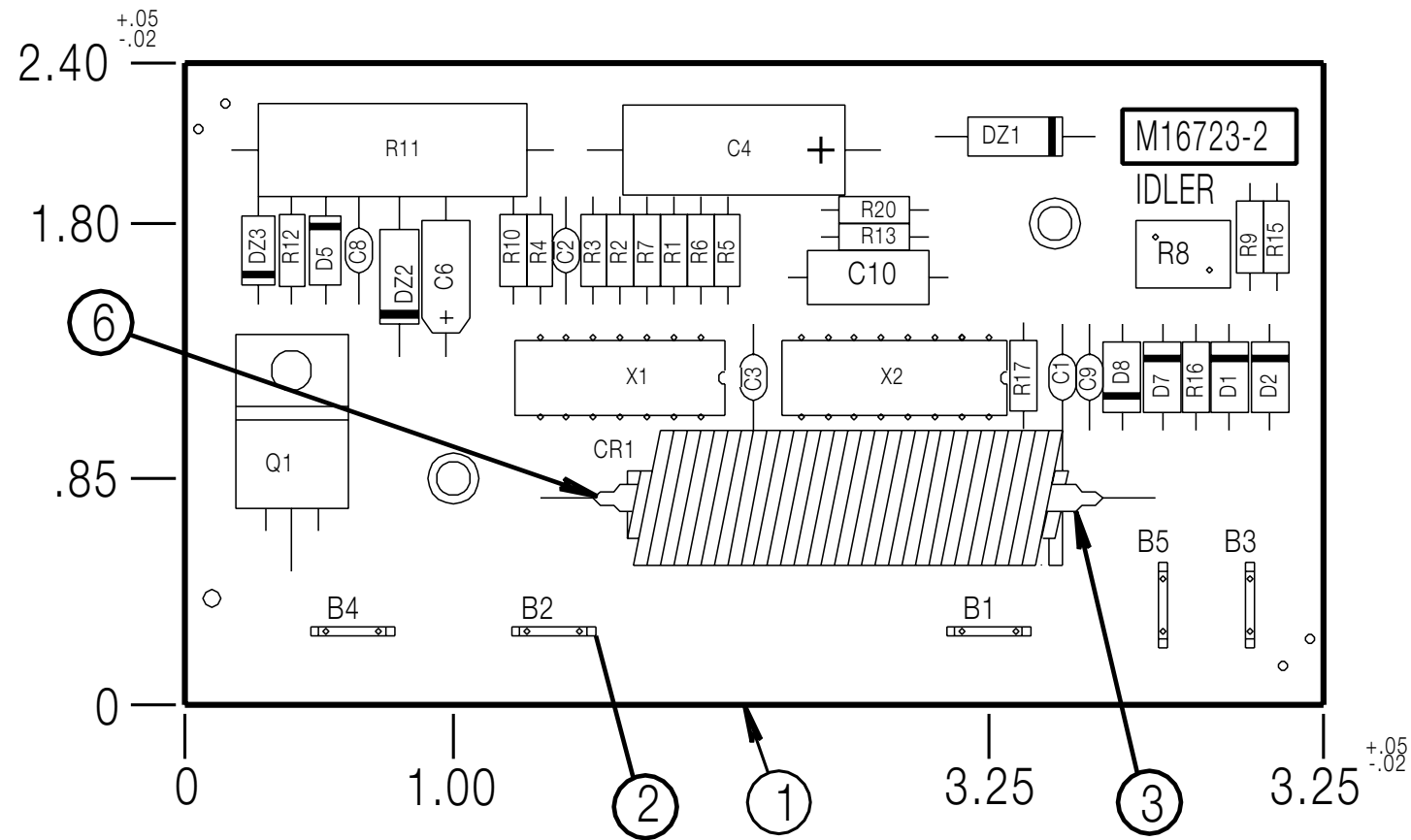
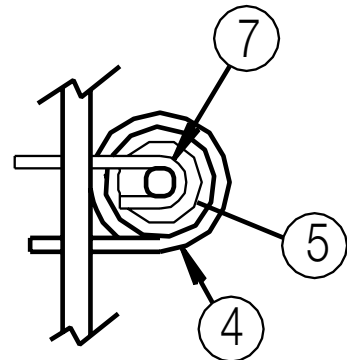
PC BOARD ASSEMBLY - IDLER PC BOARD

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC

Return to Section TOC  
Return to Master TOC



ITEM	REQ'D	PART NO	DESCRIPTION
C 1, C 2, C 3, C 8, C 9	5	S 16668-5	.022/50
C 4	1	S 13490-35	50/16
C 6	1	S 13490-39	18/15
C 10	1	S 13490-102	.047/100
D 1, D 2, D 7, D 8	4	T 12199-1	1N4004
D 5	1	T 12705-34	1N4936
DZ 1	1	T 12702-33	1N5347B
DZ 2	1	T 12702-17	1N5361B ZENER DIODE
DZ 3	1	T 12702-29	1N4744A
Q 1	1	T 12704-54	N-CHANNEL FET (SS)
R 1, R 2, R 5	3	S 19400-1002	10K 1/4W
R 3, R 4	2	S 19400-2212	22.1K 1/4W
R 6	1	S 19400-1333	133K 1/4W
R 7	1	S 19400-4752	47.5K 1/4W
R 8	1	S 18380-1	PTC THERMISTOR
R 9, R 15	2	S 19400-15R0	15 1/4W
R 10	1	S 19400-3321	3.32K 1/4W
R 11	1	T 12300-80	5 WATT 0.5 OHM RESISTOR
R 12	1	S 19400-2672	26.7K 1/4W
R 13	1	S 19400-1372	13.7K 1/4W
R 16	1	S 19400-5110	511 1/4W
R 17	1	S 19400-1001	1K 1/4W
R 20	1	S 19400-3322	33.2K 1/4W
X 1	1	S 15128-11	14 PIN QUAD COMPARATOR
X 2	1	S 15018-13	16 PIN I.C. (SS)

ITEM	REQ'D	PART NO.	DESCRIPTION
1	1	M16723-B	P.C. BOARD BLANK
2	5	T13157-14	TAB TERMINAL
3	1	CS000290	E1724-#10-2.10
4	1	T13344-3	REED SWITCH COIL
5	1	T13344-2	REED SWITCH COIL
6	1	T12012-4	REED SWITCH
7	2	CJ000015	E2387-#20-1.50

5-5-95A  
M16723-2

**NOTE:** Lincoln Electric assumes no responsibility for liabilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

