LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

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.

PIPELINER® 200

For use with machines having Code Numbers:

11114, 11316, 11471, 11498, 11591, 11644
10929, 10660, 10913, 11136

SERVICE MANUAL

SVM193-A | Issue Date 09-Jul

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

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⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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

FOR ENGINE powered equipment.

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

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

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

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

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

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

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

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

ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

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

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

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

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ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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

ARC RAYS can burn.

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

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

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

FUMES AND GASES can be dangerous.

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

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

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

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

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

5.f. Also see item 1.b.

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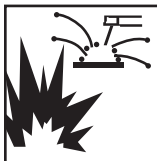

WELDING and CUTTING SPARKS can cause fire or explosion.

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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER may explode if damaged.

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

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

7.c. Cylinders should be located:

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

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

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

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

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

FOR ELECTRICALLY powered equipment.

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

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

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

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

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PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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TECHNICAL SPECIFICATIONS - PIPELINER® 200D KUBOTA (K6090-11)

INPUT - DIESEL ENGINE

Make/Model	Description	Speed (RPM)	Displacement	Starting System	Capacities
Kubota V2203M	4 Cylinder 4 Cycle Naturally Aspirated Water-Cooled Diesel Engine Cast Iron Cylinder, Block/Crankcase	High Idle 1600 Low Idle 1400 Full Load 1600	134.1 cu. in (2.2 ltrs) **Bore x Stroke** 3.43" x 3.64" 27.8HP @1600 RPM	12VDC battery (Group 45, 650 cold crank amps) 1.4 KW Starter 40 A. Alternator w/ built in reg.	Fuel: 15 gal 57 L Oil: 8.0 Qts. 7.6 L 9.5 Qts. 9.0 L

RATED OUTPUT @ 104°F(40°C) - WELDER

DESCRIPTION	RATED DC OUTPUT VOLTS @ RATED AMPS	Duty CYCLE	DC CURRENT RANGE Fine Adjustments in each Range
200 Amp DC Welder All Copper Windings Pure DC Power Generator	LINCOLN PLUS RATING 40V @ 200A NEMA RATING 28V @ 200A	60%	40-300 Amps

RATED OUTPUT @ 104°F(40°C) - GENERATOR

Auxiliary Power (1)
1.75 kW 15 Amps @ 120V DC @ 35% Duty Cycle

PHYSICAL DIMENSIONS

HEIGHT	WIDTH	DEPTH	WEIGHT
45.50(2) in. (1156 mm)	24.00 in. (610 mm)	68.00 in. (1727 mm)	1302 lbs. (592 kg)

(1) Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within ± 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.

(2) Height is to the top of exhaust elbow. Case height is 40.9 in.(1039mm).

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GENERAL DESCRIPTION

The Pipeliner® 200D is a heavy duty engine driven DC arc welding power source capable of providing DC constant current output for stick welding and DC TIG welding. With the addition of the optional Wire Feed Module the Pipeliner® 200D will provide constant voltage output for running the LN-25 wire feeder.

The optional Remote Control Kit provides a remote control rheostat for remote fine current and open circuit voltage adjustment.

The Pipeliner® 200D KUBOTA has Diesel Engine Protection. In the event of sudden low oil pressure or high coolant temperature, the engine immediately shuts down.

The Pipeliner® 200D KUBOTA has a current range of 40-300 DC amps with output ratings as follows:

The unit is also capable of providing 1.75 kw of 120V DC auxiliary power.

This unit uses the Kubota V2203M Industrial water cooled diesel engine.

DESIGN FEATURES

CONTROL PANEL
Both the engine and the welder controls are located on one recessed panel at the exciter end of the machine. The welder controls consist of a five step “Current Range Selector” switch and a “Fine Current Adjustment” rheostat. The welder is equipped with a “Start” button,”Glow Plug” button, “Ignition” switch, “Idler” control switch, hour meter, “Engine Protection” indicator light, “Remote / Local Switch and Receptacle.

The control panel also contains a three prong grounding type receptacle for auxiliary power, an engine temperature gauge, a battery charging ammeter an oil pressure gauge and a high idle RPM adjustment knob.

WELDING GENERATOR
The Pipeliner® 200D KUBOTA uses the old style, round, all copper FJW Generator frame which provides the customer with the original “Classic” pipe welding arc.

ENGINE IDLER
The Pipeliner® 200D KUBOTA is equipped with an electronic automatic engine idler. It automatically increases and decreases engine speed when starting and stopping welding or using auxiliary power. A built-in time delay permits changing electrodes before the engine slows to its low idle speed. The “Idler” control switch on the panel locks the idler in the full speed position when desired.

AUXILIARY POWER
1.75 kw of nominal 120V DC. Output voltage is maintained within ± 10% at all loads up to rated capacity.

WELDER ENCLOSURE
The complete welder is rubber mounted on a rugged steel “C” channel base.

The output terminals are placed at the side of the machine so that they are protected by the door. The output terminals are labeled (+) and (-).

CRANKING SYSTEM
A 12V electric starter is standard.

AIR CLEANER
Heavy duty two-stage dry type

MUFFLER
A muffler and stainless steel exhaust outlet pipe are standard.

ENGINE HOUR METER
A meter to record the hours of operation.

ENGINE PROTECTION - The system shuts the engine down in the event of sudden low oil pressure or high coolant temperature. A warning light on the control panel will indicate such a fault. To reset the engine for restarting, turn the ignition switch off then on. Refer to Troubleshooting section for all warning light fault codes.

CUSTOM ARC™ HIGH IDLE RPM (OCV) ADJUSTMENT - A Potentiometer is mounted on the Control Panel that allows the operator to adjust the high idle engine speed between 1450 and 1600 RPM’S. This is to allow further adjustment of the OCV. Total OCV adjustment range is about 15 volts.

OIL DRAIN VALVE- A ball valve, hose and clamp are standard.

REMOTE CONTROL- The Remote/Local switch and Receptacle are standard.

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PRE-OPERATION INSTALLATION

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

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 muffler included with this welder does not qualify as a spark arrester. 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.

LOCATION/VENTILATION

Always operate the welder with the doors closed. Leaving the doors open changes the designed air flow and may cause overheating.

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

⚠ CAUTION

DO NOT MOUNT OVER COMBUSTIBLE SURFACES.

Where there is a combustible surface directly under stationary or fixed electrical equipment, the surface shall be covered with a steel plate at least .06"(1.6mm) thick, which shall extend not more than 5.90"(150mm) beyond the equipment on all sides.

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.

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. 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 Code lists a number of alternate means of grounding electrical equipment.

LIFT BAIL

A lift bail is provided for lifting with a hoist.

⚠ WARNING

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

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TRAILER (See *Accessories Section*)

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

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

VEHICLE MOUNTING

⚠ WARNING

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

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

POLARITY CONTROL 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 studs located below the fuel tank mounting rail. (See size recommendations below.) For **positive** polarity, connect the electrode cable to the terminal marked **"+"**. For **Negative** polarity, connect the electrode cable to the **"-"** stud. These connections should be checked periodically and tightened if necessary.

When welding at a considerable distance from the welder, be sure you use ample sized welding cables.

RECOMMENDED COPPER CABLE SIZES			
		Cables Sizes for Combined Length of Electrode Plus Work Cable	
Amps	Duty Cycle	Up to 200ft.(61m)	200 to 250ft. (61 to 76m)
200	60%	1	1/0

PRE-OPERATION SERVICE

⚠ CAUTION

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

⚠ WARNING

DIESEL FUEL can cause fire

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

DIESEL FUEL ONLY

OIL

This unit is supplied from the factory with the engine crankcase filled with a high quality SAE 10W/30 oil. This oil should be acceptable for most typical ambient temperatures. Consult the engine operation manual for specific engine manufacturer's recommendations. Upon receipt of the welder, check the engine dipstick to be sure the oil is at the "full" mark. DO NOT overfill.

FUEL

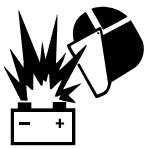
Fill the fuel tank with the grade of fuel recommended in the Engine Operator's manual. Make sure the valve on the water separator is in the open position.

COOLING SYSTEM

The radiator 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 engine manual or antifreeze container for alternate antifreeze recommendations).

Battery Charging

⚠ WARNING



GASES FROM BATTERY can explode.
- **Keep sparks, flame and cigarettes away.**

BATTERY ACID can burn eyes and skin.
- **Wear gloves and eye protection and be careful when boosting, charging or working near battery.**

To prevent EXPLOSION when:

a) **Installing a new battery - disconnect the negative cable from the old battery first and connect the negative cable to the new battery last**

b) **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.**

c) **Using a booster - connect the positive lead to the battery first, then connect the negative lead to the ground lead on the base.**

To prevent ELECTRICAL DAMAGE when:

a) **Installing a new battery.**

b) **Using a booster.**

Use correct polarity - Negative Ground.

- **To prevent BATTERY DISCHARGE, if you have an ignition switch, turn it off when engine is not running.**

- **To prevent BATTERY BUCKLING, tighten nuts on battery clamp until snug.**

The PIPELINER® 200D KUBOTA 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 replacing, jumping or otherwise connecting the battery to the battery cables, the proper polarity must be observed. This system is **NEGATIVE GROUND**.

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ENGINE OPERATION

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

Operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

STARTING THE PIPELINER® 200D KUBOTA V2203M DIESEL ENGINE

1. Turn the "IDLER" switch to "HIGH".
2. Turn the "IGNITION" switch to "ON".
3. Press the Glow Plug button for 20 to 30 seconds. (maximum 60 seconds).
4. Press the Glow Plug button and the Start button at the same time. When the engine starts running, release both buttons. If the engine fails to start in 20 seconds, wait 30 seconds and repeat the above procedure.
5. Observe the oil pressure. If no pressure shows within 30 seconds, stop the engine and consult the engine operating manual. To stop the engine, turn the "IGNITION" switch to "OFF".
6. If the engine protection warning light comes on during cranking or after start up, the "IGNITION" switch must be turned "OFF" to reset the engine protection system.
7. Allow the engine to run at high idle speed for several minutes to warm the engine. Stop the engine and recheck the oil level, after allowing sufficient time for the oil to drain into the pan. If the level is down, fill it to the full mark again. The engine controls were properly set at the factory and should require no adjusting when received.

COLD WEATHER STARTING:

With a fully charged battery and the proper weight oil, the engine should start satisfactorily even down to about -5°F (-20°C), it maybe desirable to install cold-starting aides.

Note: Extreme cold weather staring may require longer glow plug operation.

⚠ WARNING

Under NO conditions should ether or other starting fluids be used!

HIGH ALTITUDE OPERATION:

At higher altitudes, output derating may be necessary. For maximum rating, derate the welder 4% for every 300 meters (984 ft.) above 1500 meters (4920 ft.).

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

STOPPING THE ENGINE

1. Turn the "IGNITION" switch to "OFF"

At the end of each day's welding, check the crankcase oil level, drain accumulated dirt and water from the water separator and refill the fuel tank to minimize moisture condensation in the tank. Also, running out of fuel tends to draw dirt into the fuel system.

When hauling the welder between job sites, close the valve on the water separator.

If the fuel supply is cut off or runs out while the fuel pump is operating, air may be entrapped in the fuel distribution system. If this happens, bleeding of the fuel system may be necessary. Use qualified personnel to do this per the instructions in the ***MAINTENANCE*** section of this manual.

ENGINE BREAK-IN

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

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

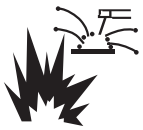
1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator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

WELDER OPERATION

⚠ WARNING

ELECTRIC SHOCK can kill.
- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground.**

FUMES & GASES can be dangerous.
- **Keep your head out of the fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**



WELDING SPARKS can cause fire or explosion.
- **Keep flammable material away.**

ARC RAYS can burn.
- **Wear eye, ear, and body protection.**

DUTY CYCLE

The NEMA output rating of the PIPELINER® 200D KUBOTA is 200 amperes at 28 arc volts on a 60% duty cycle (consult Specifications in this manual for alternate ratings). Duty cycle is based on a ten minute period; thus, the welder can be loaded at rated output for six minutes out of every ten minute period.

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.

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 190-120 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 the 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.

⚠ CAUTION

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

These switches have a spring loaded cam which almost eliminates the possibility of setting this switch between the designated points.

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IDLER OPERATION

Start the engine with the "Idler" switch in the "High" position. Allow it to run at high idle speed for several minutes to warm the engine. See Specifications for operating speeds.

The idler is controlled by the "Idler" toggle switch on the welder control panel. The switch has two positions as follows:

1. In the "High"  position, the engine control unit increases the engine to high idle speed.

2. In the "Auto"  /  position, the idler operates as follows:

   a. When welding or drawing power for lights or tools (approximately 100 watts minimum) from the receptacles, the engine operates at high idle speed.

   b. When welding ceases or the power load is turned off, a preset time delay of about 15 seconds starts. This time delay cannot be adjusted.

   c. If the welding or power load is not re-started before the end of the time delay, the engine control unit reduces the engine to low idle speed.

AUXILIARY POWER

1.75 kVA of 120 V DC auxiliary power is availiable at the receptacle located on the control panel.

When the High Speed Adjustment knob is in the MIN position, the voltage of the DC auxiliary output may be reduced to below the rating on the nameplate of the machine. It is recommended that the High Idle Speed Adjustment knob should be in the MAX position when using the DC auxiliary output.

Always replace blown fuse with type rated for DC voltage (i.e. Cooper Bussmann Inc. Model LP-CC-15 or Littlefuse Model CCMR-15.

PIPELINER® 200D WITH KUBOTA V2203M DIESEL ENGINE TYPICAL FUEL CONSUMPTION DATA

Low idle (1400 RPM) No Load	.32gal/hr (1.21ltrs/hr)
High idle (1600 Rpm) No load	.37gal/hr (1.40ltrs/hr)
200 Amps @ 28 Volts	.85gal/hr (3.22ltrs/hr)
Auxiliary Power 1,750 Watts	.50gal/hr (1.89ltrs/hr)

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OPTIONAL FEATURES (Field Installed)

GENERAL OPTIONS

⚠ WARNING

Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.

Spark Arrestor Kit (K903-1) - Includes a heavy gage steel, approved spark arrestor, clamp and adapter for mounting to the muffler exhaust pipe.

TRAILER (K953-1) - Two-wheeled trailer with optional fender and light package. For highway use, consult applicable federal, state, and local laws regarding possible additional requirements. There is a choice of 2 hitches, a fender & a light package.

K953-1 Trailer
K958-1 Ball Hitch
K958-2 Lunette Eye Hitch
K959-1 Fender & Light Kit
K965-1 Cable Rack

K1858-1 AIR CLEANER SERVICE INDICATOR

STICK OPTIONS

K704 ACCESSORY SET - Includes 35 ft.(10 m) of electrode cable and 30 ft.(9 m) of work cable, headshield, work clamp and electrode holder. Cable is rated at 500 amps, 60% duty cycle.

Remote Control Kit (K924-5) - Contains remote control rheostat and 100 ft.(30.5 m) cable for adjusting the OCV at the welding site. (For Codes 10910 and above.)

Remote Control Kit (K2464-1) - Contains a remote control rheostat (for adjusting the CC "STICK" OCV), remote control potentiometer (for adjusting the CV "WIRE" OCV), and 100ft.(30.5m) cable.

WIRE FEED OPTIONS

Wire Feed Module (K623-1) - Provides constant voltage (CV) output with improved arc stability for Innershield welding. Excellent for MIG welding. Recommended wire feeders are the LN-7, LN-23P and LN-25. (Factory installed on the K1643-6).

LN-15 Wire Feeder (K1870-1,-2)-Portable CC/CV unit for flux-cored and MIG welding.

LN-23P Wire Feeder (K316L-1)-Portable CV unit for Innershield pipe welding. Control cable operates contactor inside Wire Feed Module for "cold" electrode. Requires LN-23P Adapter Kit (K350-1) and Gun and Cable Assembly.

LN-23P Adapter Kit (K350-1)-Required to adapt LN-23P to any Lincoln power source. Makes 14 pin connection at power source.

Magnum® 250 Innershield Gun (for LN-23P) (K355-10)- For lighter weight and easier handling. Rated 250 amps, 60% duty cycle. For .068 through 5/64" (1.7 through 2.0 mm) Innershield wire and includes reduced speed switch. For pipewelding, an M11476 62° gun tube is recommended.

LN-25 Wire Feeder (K449)-Portable CC/CV unit for flux-cored and MIG welding. Includes Gas Solenoid & Internal Contactor. Requires Wire Feed Module.

Remote Voltage Control Kit for LN-25 (K444-2) Provides 25 ft. (7.5m) of remote output voltage control and output jumper (2 and 4) for machines having 14 pin MS-type connector.

Magnum® 350 Innershield Gun (for LN-25)(K126-2)- For self-shielded wire with 15 ft. (4.5m) cable. For .062-3/32" (1.6-2.8mm) wire.

Magnum® 200 MIG Gun (for LN-25)(K497-3)-With 15 ft. (4.5m) cable. For .025 (0.6m) wire.

Magnum Gun Connector KiT (K466-1) Connects Magnum 200 MIG gun to LN-25 Wire Feeder.

62° gun tube for Pipe Welding (KP1909-1)- Recommended modification for K355-X or K345-X guns with 90° gun tubes. Compatible with K126-1,-2 K264-8 and K355-10.

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SAFETY PRECAUTIONS

⚠ WARNING

Have qualified personnel do the maintenance work. Turn the engine off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

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

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

GENERAL INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months. In particularly dirty locations, this cleaning may be necessary once a week. Use low pressure air to avoid driving dirt into the insulation.

2. "Current Range Selector" contacts should not be greased. To keep the contacts clean, rotate the current control through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld.

3. Put a drop of oil on the "Current Range Selector" shaft at least once every month.

4. When necessary, remove the sediment bowl, if so equipped, from beneath the fuel tank and clean out any accumulated dirt and water.

5. Follow the engine service schedule in this manual and the detailed maintenance and troubleshooting in the engine manufacturer's manual.

COOLING SYSTEM

The PIPELINER® 200D KUBOTA is equipped with a pressure radiator. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passage and overheating the engine. When antifreeze is needed, always use the permanent type.

BEARINGS

This welder is equipped with a double-shielded ball bearing 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. Overgreasing 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.

COMMUTATOR AND BRUSHES

⚠ 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.

Shifting of the commutator brushes may result in:
- Change in machine output
- Commutator damage
- Excessive brush wear

Periodically inspect the commutator, slip rings, and brushes by removing the covers. DO NOT remove or replace these covers while the machine is running. Commutators and slip rings require little attention. However, if they are black or appear uneven, have them cleaned by an experienced maintenance man using fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

Replace brushes when they wear within 1/4”(3.5mm) of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have an experienced maintenance man 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.

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

IDLER MAINTENANCE

⚠ CAUTION

Before doing electrical work, disconnect the battery.

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 Engine Control Unit can result from incorrect connection.

1. Proper operation of the idler requires good grounding of the Engine Control Unit, current sensing printed circuit board and battery.

2. If desired, the welder can be used without automatic idling by setting the “Idler” switch to the “High” position.

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.

PURGING AIR FROM FUEL SYSTEM (KUBOTA V2203M ENGINE)

⚠ WARNING

Keep fuel clear of open flames or arcs, allow engine to cool before working on the fuel system. Wipe up any spilled fuel and do not start engine until fumes clear.

If the engine is running rough and you suspect air has been trapped in the fuel system, (e.g. the engine was allowed to run out of fuel) perform the following steps using qualified personnel:

1. Fully open the air bleeding valve by turning it counter clockwise, it is located on top of the fuel injection pump next to the oil filler. (see figure D.1)

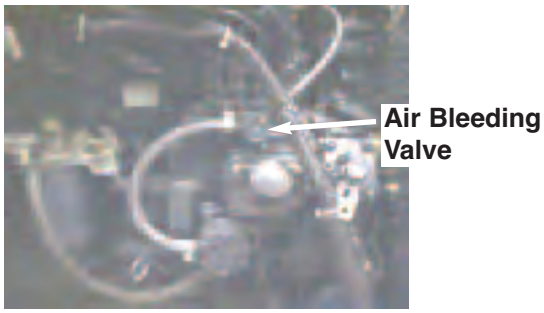

FIGURE D.1

2. Turn the engine by pressing the start button until the engine runs smoothly (this should take approximately 10 seconds).

3. Fully close the air bleeding valve by turning it clockwise.

Contact your Kubota Engine repair facility if problems persist.

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ENGINE SERVICE

EVERY DAY OR EVERY 8 HOURS	FIRST SERVICE (50 HOURS)	EVERY 100 HOURS OR 3 MONTHS	EVERY 150 HOURS OR 4 MONTHS	EVERY 30O HOURS OR 9 MONTHS	EVERY 400 HOURS OR 12 MONTHS	EVERY 500 HOURS OR 15 MONTHS	EVERY 600 HOURS OR 18 MONTHS	ENGINE SERVICE (NOTE 2)	
								MAINTENANCE ITEM	TYPE OR QUANTITY
I								Coolant level	
					I			Concentration of antifreeze	50/50 Water/Ethylene Glycol
							R	Coolant (NOTE 3)	9.5 qrts., 9.0L
I								Engine oil level (NOTE 1)	
	R		R					Engine oil (NOTE 1 & 3)	8.0 qrts., 7.6L (including filter)
	R			R				Engine oil filter	
		C						Drain water separator & fuel strainer	
					R			Fuel filter canister	
		I						Tension of alternator drive belt	
		I						Alternator drive belt wear	
						R		Alternator drive belt	Kubota # 17480-97010
		C						Air filter (earlier check may be req'd)	
					R			Air filter element	Donaldson # P821575
							I	Valve clearances	Intake .0071"-.0086", Exhaust .0071"-.0086"
							I	Electrical systems	
							I	All nuts and bolts for tightness	
I								Leaks or engine damage	
		I						Battery	

I = Inspect C = Clean R = Replace

Notes:

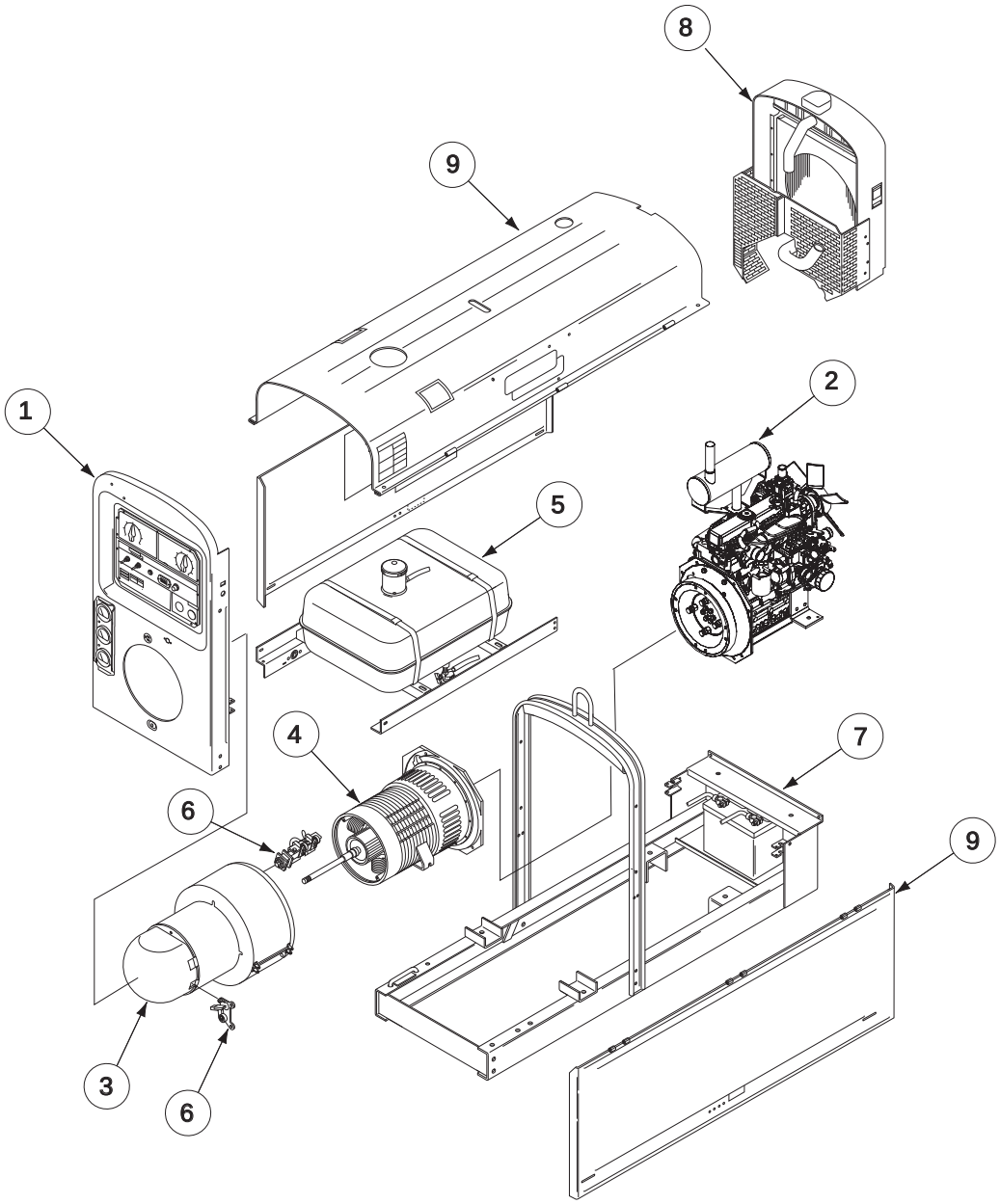
(1) Consult Engine Operators Manual for oil recommendations.
(2) Consult Engine Operators Manual for additional maintenance schedule information.
(3) Fill slowly! Ensure correct quantity is used.

Above operations to be carried out by trained personnel with reference to the workshop manual where necessary.
These preventive maintenance periods apply to average conditions of operation.
If necessary use shorter periods.

S25833

1. Case Front Assembly
2. Engine Assembly
3. Exciter Frame, Armature Assembly
4. Generator Frame, Armature & Coupling
5. Fuel Tank Assembly
6. Generator & Exciter Brush Holder Assemblies
7. Base & Lift Bale Assembly
8. Radiator Assembly
9. Roof & Doors

Figure D.2 - Major Component Location



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TECHNICAL SPECIFICATIONS - Pipeliner® 200D (K6090-9)

INPUT - DIESEL ENGINE

Make/Model	Description	Horsepower	Operating Speed	Displacement cu. in.(ltrs)	Starting System	Capacities
Perkins 104.22	4 Cylinder 4 Stroke Naturally Aspirated Water Cooled Engine	28.2 HP @ 1600RPM	High 1600RPM Full Load 1550RPM Low Idle 1400RPM	135.6 (2.2)	12VDC Battery and starter Push Button Starter (650 Cold crank amps)	Fuel: 15gal.(57L) Oil: 8.7 qts. (8.2L) Radiator Coolant 9.5 qts. (9.0L)

RATED OUTPUT @ 104°F(40C°) - WELDER

DESCRIPTION	RATED DC OUTPUT VOLTS @ RATED AMPS	DUTY CYCLE*	DC CURRENT RANGE Fine Adjustment in each Range
200 Amp DC Welder All Copper Windings Pure DC Power Generator	Lincoln Plus Rating 40V @ 200A NEMA Rating 28V @ 200A	60%	40-300 Amps

RATED OUTPUT @ 104°F(40C°) - GENERATOR

Auxiliary Power [1]*
1.80 kW, 15 Amps @ 120V DC @ 35% Duty Cycle

ENGINE COMPONENTS

LUBRICATION	FUEL SYSTEM	GOVERNOR
Full Pressure with Full Flow Filter	Indirect Fuel Injector Electrical Shutoff Solenoid Mechanical Fuel Pump	Mechanical Governor

AIR CLEANER	ENGINE IDLER	MUFFLER	ENGINE PROTECTION
Single Element	Automatic Idler	Low noise Muffler: Made from long life, aluminized steel.	Shutdown on low oil pressure and engine temperature.

PHYSICAL DIMENSIONS

HEIGHT	WIDTH	DEPTH	WEIGHT
40.94** in. 1039.9 mm	24.00 in. 609.6 mm	66.50in. 1689.1 mm	1318 lbs. (598 kg.)
**Top of enclosure, add 8.0" (203.2mm) for exhaust			

1. Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within ± 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.

* Based on a 10 minute period.

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SAFETY PRECAUTIONS

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

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, 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.

LOCATION / VENTILATION

Always operate the welder with the doors closed. Leaving the doors open changes the designed air flow and may cause overheating.

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

⚠ CAUTION

DO NOT MOUNT OVER COMBUSTIBLE SURFACES.

Where there is a combustible surface directly under stationary or fixed electrical equipment, the surface shall be covered with a steel plate at least .06"(1.6mm) thick, which shall extend not more than 5.90"(150mm) beyond the equipment on all side.

MACHINE GROUNDING

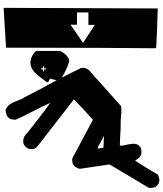
According to the United States National Electrical Code, the frame of this portable generator is not required to be grounded and is permitted to serve as the grounding means for cord connected equipment plugged into its receptacle.

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. 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.

LIFT BAIL

A lift bail is provided for lifting with a hoist.

⚠ WARNING



FALLING EQUIPMENT can cause injury.

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

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TRAILERS (See *ACCESSORIES SECTION*)

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

1. Design capacity of trailer vs. weight of Lincoln equipment and likely additional attachments.

2. Proper support of, and attachment to, the base of the welding equipment so there will be no undue stress to the framework.

3. Proper placement of the equipment on the trailer to ensure stability side to side and front to back when being moved and when standing by itself while being operated or serviced.

4. Typical conditions of use, i.e., travel speed; roughness of surface on which the trailer will be operated; environmental conditions; likely maintenance.

5. Conformance with federal, state, and local laws. (1)

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

VEHICLE MOUNTING

⚠ WARNING

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

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

POLARITY CONTROL 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 studs 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"** stud. These connections should be checked periodically and tightened if necessary.

When welding at a considerable distance from the welder, be sure you use ample size welding cables.

RECOMMENDED COPPER CABLE SIZES			
		Cable Sizes for Combined Length of Electrode Plus Work Cable	
Amps	Duty Cycle	Up to 200 ft	200-250 ft
200	60%	1	1/0

PRE-OPERATION SERVICE

⚠ CAUTION

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

⚠ WARNING

DIESEL FUEL can cause fire

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

DIESEL FUEL ONLY

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OIL

This unit is supplied from the factory with the engine crankcase filled with a high quality SAE 10W/30 oil. This oil should be acceptable for most typical ambient temperatures. Consult the engine operation manual for specific engine manufacturers recommendations. Upon receipt of the welder, check the engine dipstick to be sure the oil is at the "full" mark. Add if required. **DO NOT OVERFILL.**

FUEL

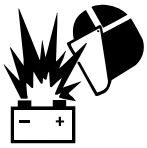
Fill the fuel tank with the grade of fuel recommended in the Engine Operator's Manual. Make sure fuel valve on the sediment bowl and water separator are in the open position.

COOLING SYSTEM

The radiator 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 engine manual or antifreeze container for alternate antifreeze recommendations.)

BATTERY CHARGING

⚠ WARNING



GASES FROM BATTERY can explode.
- **Keep sparks, flame and cigarettes away.**

BATTERY ACID can burn eyes and skin.
- **Wear gloves and eye protection and be careful when boosting, charging or working near battery.**

To prevent EXPLOSION when:

a) Installing a new battery - disconnect the negative cable from the old battery first and connect the negative cable to the new battery last

b) 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.

c) Using a booster - connect the positive lead to the battery first, then connect the negative lead to the ground lead on the base.

To prevent ELECTRICAL DAMAGE when:

a) Installing a new battery.

b) Using a booster.

Use correct polarity - Negative Ground.

- **To prevent BATTERY DISCHARGE, if you have an ignition switch, turn it off when engine is not running.**

- **To prevent BATTERY BUCKLING, tighten nuts on battery clamp until snug.**

The Pipeliner® 200D 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 replacing, jumping, or otherwise connecting the battery to the battery cables the proper polarity must be observed. The correct polarity is **NEGATIVE GROUND.**

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SAFETY PRECAUTIONS

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

Operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

GENERAL DESCRIPTION

The Pipeliner® 200D is a heavy duty engine driven DC arc welding power source capable of providing DC constant current output for stick welding and DC TIG welding. With the addition of the optional Wire Feed Module the Pipeliner® 200D will provide constant voltage output for running the LN-25 wire feeder.

The optional Remote Control Kit provides a remote control rheostat for remote fine current and open circuit voltage adjustment.

The Pipeliner® 200D has Diesel Engine Protection. In the event of sudden low oil pressure or high coolant temperature, the engine immediately shuts down.

The Pipeliner® 200D has a current range of 40-300 DC amps with output ratings as follows:

RATED OUTPUT	DUTY CYCLE
200A @ 28V	60%
200A @ 40V	60%

The unit is also capable of providing 1.80 kw of 120V DC auxiliary power at 35% duty cycle maximum.

This unit uses the PERKINS 104.22 Industrial water cooled diesel engine.

DESIGN SUMMARY

Control Panel

Both the engine and the welder controls are located on one recessed panel at the exciter end of the machine. The welder controls consist of a five step "Current Range Selector" switch and a "Fine Current Adjustment" rheostat. The welder is equipped with a "Start" button,"Glow Plug" button, "Ignition" switch, "Idler" control switch, hour meter, "Engine Protection" indicator light, "Remote / Local Switch and Receptacle a battery charging ammeter, an oil pressure gauge and engine coolant temperature gauge.

The control panel also contains a three prong grounding type receptacle for auxiliary power.

Welding Generator

The Pipeliner® 200D uses the old style, round, all copper FJW Generator frame which provides the customer with the original "Classic" pipe welding arc.

Engine Idler

The Pipeliner® 200D is equipped with an electronic automatic engine idler. It automatically increases and decreases engine speed when starting and stopping welding or using auxiliary power. A built-in time delay permits changing electrodes before the engine slows to its low idle speed. The "Idler" control switch on the panel locks the idler in the full speed position when desired.

Auxiliary Power

1.80 kw of nominal 120V DC auxiliary power at 35% duty cycle maximum. Output voltage is maintained within ± 10% at all loads up to rated capacity.

Welder Enclosure

The complete welder is rubber mounted on a rugged steel "C" channel base.

The output terminals are placed at the side of the machine so that they are protected by the door. The output terminals are labeled (+) and (-).

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Cranking System
A 12V electric starter is standard.

Air Cleaner
Heavy duty two-stage dry type

Exhaust
A muffler and stainless steel exhaust outlet pipe are standard.

Engine Hour Meter
A meter to record the hours of operation.

ENGINE OPERATION

Operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

STARTING THE PIPELINER® 200D PERKINS 104.22 DIESEL ENGINE

1. Turn the "IDLER" switch to "HIGH".

2. Turn the "IGNITION" switch to "ON".

3. Press the Glow Plug button for 20 to 30 seconds. (maximum 60 seconds).

4. Press the Start button. When the engine starts running, release both buttons. If the engine fails to start in 20 seconds, wait 30 seconds and repeat the above procedure.

5. Observe the oil pressure. If no pressure shows within 30 seconds, stop the engine and consult the engine operating manual. To stop the engine, turn the "IGNITION" switch to "OFF".

6. If the engine protection warning light comes on during cranking or after start up, the "IGNITION" switch must be turned "OFF" to reset the engine protection system.

7. Allow the engine to run at high idle speed for several minutes to warm the engine. Stop the engine and recheck the oil level after allowing sufficient time for the oil drain into the pan. If the level is down, fill it to the full mark again. The engine controls were properly set at the factory and should require no adjusting when received.

COLD WEATHER STARTING

With a fully charged battery and a proper weight oil, the engine should start satisfactorily even down to about -15°F -(26°C). If the engine must be frequently started at or below -15°F -(26°C), it may be desirable to install cold-starting aides.
Note: Extreme cold weather starting may require longer glow plug operation

⚠ WARNING

Under NO conditions should ether or other starting fluids be used!

STOPPING the ENGINE
1. Turn the "IGNITION" switch to "OFF"

At the end of each day's welding, check the crankcase oil level, drain accumulated dirt and water from the sediment bowl under the fuel tank and refill the fuel tank to minimize moisture condensation in the tank. Also, running out of fuel tends to draw dirt into the fuel system.

When hauling the welder between job sites, close the fuel feed valve beneath the fuel tank.

If the fuel supply is cut off or runs out while the fuel pump is operating, air may be entrapped in the fuel distribution system. If this happens, bleeding of the fuel system may be necessary. Use qualified personnel to do this per the instructions in the ***MAINTENANCE*** section of this manual.

PIPELINER® 200D WITH PERKINS 104.22 DIESEL ENGINE
TYPICAL FUEL CONSUMPTION DATA

Low idle (1400 RPM) No Load	.33gal/hr (1.25ltrs/hr)
High idle (1800 Rpm) No load	.39gal/hr (1.48ltrs/hr)
200 Amps @ 28 Volts	.67gal/hr (2.54ltrs/hr)
200 Amps @ 40 Volts	.75gal/hr (2.84ltrs/hr)
Auxiliary Power 15 Amps @ 120 Volts	.50gal/hr (1.89ltrs/hr)

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ENGINE BREAK-IN

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

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

1. Connect the welder output studs to a suitable resistive load bank. Note that any attempt to short the output studs by connecting the welding leads together, direct shorting of the output studs, or connecting the output leads to a length of steel will result in catastrophic damage to the generator and voids the warranty.

2. Set the welder controls for an output current and voltage within the welder rating and duty cycle. Note that any attempt to exceed the welder rating or duty cycle for any period of time will result in catastrophic damage to the generator and voids the warranty.

3. Periodically shut off the engine and check the crankcase oil level.

WELDER OPERATION

⚠ WARNING

ELECTRIC SHOCK can kill.
- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground.**

FUMES & GASES can be dangerous.
- **Keep your head out of the fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**

WELDING SPARKS can cause fire or explosion.
- **Keep flammable material away.**

ARC RAYS can burn.
- **Wear eye, ear, and body protection.**

DUTY CYCLE

The NEMA output rating of the Pipeliner® 200D is 200 amperes at 28(1) arc volts on a 60% duty cycle. Duty cycle is based on a ten minute period; thus, the welder can be loaded at rated output for six minutes out of every ten minute period.

(1) The "Lincoln Plus" output rating at 60% duty cycle is 200 amperes at 40 Volts.

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.

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 the 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 190-120 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 the 240-160 position and the “Fine Current Adjustment” setting to get 175 amps.

⚠ CAUTION

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

These switches have a spring loaded cam which almost eliminates the possibility of setting this switch between the designated points.

IDLER OPERATION

Start the engine with the “Idler” switch in the “High” position. Allow it to run at high idle speed for several minutes to warm the engine. See Specifications for operating speeds.

The idler is controlled by the “Idler” toggle switch on the welder control panel. The switch has two positions as follows:

1. In the “High”  position, the idler solenoid activates, and the engine goes to high idle speed. The speed is controlled by the governor.

2. In the “Auto”  /  position, the idler operates as follows:

- When welding or drawing power for lights or tools (approximately 100-150 watts minimum) from the receptacle, the idler solenoid activates and the engine operates at high idle speed.
- When welding ceases or the power load is turned off, a preset time delay of about 15 seconds starts. This time delay cannot be adjusted.
- If the welding or power load is not re-started before the end of the time delay, the idler solenoid deactivates and reduces the engine to low idle speed.

AUXILIARY POWER

1.80 kW of 120V DC auxiliary power at 35% duty cycle maximum is available at the receptacle located on the control panel.

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OPTIONAL FEATURES (Field Installed)

Accessory Set (K704) - Includes electrode and work cables, headshield, work clamp and electrode holder.

Remote Control Kit (K924-5) - Contains a remote control rheostat and 100 ft (30.5m) cable for adjusting the OCV at the welding site.

Remote Control Kit (K2464-1) - Contains a remote control rheostat (for adjusting CC "STICK" OCV), remote control potentiometer (for adjusting CV "STICK" OCV) and 100ft. (30.5m) cable.
(See Wiring/Connection Diagram Section)

Trailer (K957-1) - Two-wheeled trailer for in-plant and yard towing at speeds under 20 mph only.

Trailer (K953-1) - Two-wheeled trailer with optional fender and light package. For highway use, consult applicable federal, state, and local laws regarding possible additional requirements. Choice of 2 hitches and add on fender & light package. **Order: K953-1 Trailer, K958-1 Ball Hitch, K958-2 Lunette Eye Hitch, K959-1 Fender & Light Kit.**

⚠ WARNING

Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.

Wire Feed Module (K623-1) - Provides constant voltage (CV) output with improved arc stability for Innershield welding. Excellent for MIG welding. Recommended wire feeders are the LN-7, LN-23P and LN-25.

Spark Arrestor Kit (K903-1) - Includes a heavy gage steel, approved spark arrestor, clamp and adapter for mounting to the muffler exhaust pipe.

Oil Drain Kit (K1586-1) - Includes ball valve, hose and clamp.

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SAFETY PRECAUTIONS

⚠ WARNING

Have qualified personnel do the maintenance work. Turn the engine off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

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

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

GENERAL INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months. In particularly dirty locations, this cleaning may be necessary once a week. Use low pressure air to avoid driving dirt into the insulation.

2. "Current Range Selector" contacts should not be greased. To keep the contacts clean, rotate the current control through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld.

3. Put a drop of oil on the "Current Range Selector" shaft at least once every month.

4. When necessary, remove the sediment bowl from beneath the gas tank and clean out any accumulated dirt and water. Replace the fuel filter in the fuel line as needed.

5. See the engine manufacturers operation manual for detailed engine maintenance and troubleshooting instructions.

COOLING SYSTEM

The Pipeliner® 200D is equipped with a pressure radiator. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passage and overheating the engine. When antifreeze is needed, always use the permanent type.

ENGINE MAINTENANCE

Refer to the Engine's operation and maintenance manual for additional information on the engine.

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BEARINGS

This welder is equipped with a double-shielded ball bearing 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. Overgreasing 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.

COMMUTATOR AND BRUSHES

⚠ 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.

The generator brushes are properly adjusted when the welder is shipped. They require no particular attention. 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 commutator and brushes by removing the covers. DO NOT remove or replace these covers while the machine is running.

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

Replace brushes when they wear within 1/4” of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have an experienced maintenance man 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.

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

IDLER MAINTENANCE

⚠ CAUTION

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

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.

1. The solenoid plunger must work freely and not bind. Dust the plunger about once a year with graphite powder.

2. Proper operation of the idler requires good grounding of the printed circuit board, current sensor and battery.

3. Idler solenoid is activated for high idle.

4. If desired, the welder can be used without automatic idling by setting the “Idler” switch to the “High” position.

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.

PURGING AIR from FUEL SYSTEM (Perkins 104.22 Engine)

Keep fuel clear of open flames or arcs, allow engine to cool before working on the fuel system. Wipe up any spilled fuel and do not start engine until fumes clear.

If the engine is running rough and you suspect air has been trapped in the fuel system, (EG. the engine was allowed to run out of fuel) perform the following steps using qualified personnel:

1. Loosen by two or three turns, the vent screw (Figure DD.1) on the fuel inlet connection.

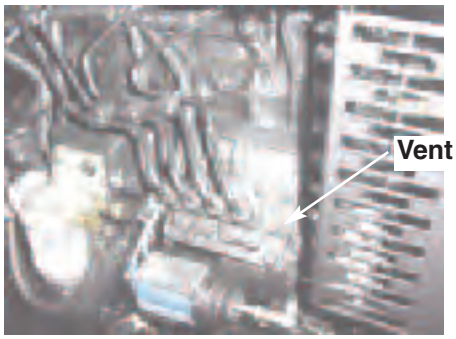

FIGURE DD.1

2. Operate the electric fuel pump by turning the "Ignition" switch "ON" until fuel, free of air, flows from the vent point. Tighten the vent screw.

3. Contact your Perkins Engine repair facility if problems persist.

ENGINE SERVICE

EVERY DAY OR EVERY 8 HOURS
FIRST SERVICE-(20 / 50 HOURS)
EVERY 100 HOURS OR 3 MONTHS
EVERY 200 HOURS OR 6 MONTHS
EVERY 400 HOURS OR 12 MONTHS
EVERY 600 HOURS OR 18 MONTHS
ENGINE SERVICE (NOTE 2)

						MAINTENANCE ITEM	TYPE OR QUANTITY
I						Coolant level	
				I		Concentration of antifreeze	50/50 Water/Ethylene Glycol
					R	Coolant (NOTE 3)	9.5qrts., 9.0L
I						Engine oil level (NOTE 1)	
	R	R				Engine oil (NOTE 1 & 3)	8.7qrts, 8.2L (including filter)
	R	R				Engine oil filter	Perkins #140517000
	C	C				Drain water separator & fuel strainer	
				R		Fuel filter canister	Perkins #26560017
I						Tension of alternator drive belt	
				I		Alternator drive belt wear	
					R	Alternator drive belt	Perkins #080109080
	C	C				Air filter (earlier check may be req'd.)	
				R		Air filter element	Donaldson #P181050, Nelson #70206N
		I				Check and adjust idle speed	
					I	Tighten cylinder head	
					I	Valve clearances	Intake .008", exhaust .008"
					I	Electrical systems	
					I	All nuts and bolts for tightness	
				I		Injector performance	Contact Perkins
I						Leaks or engine damage	
				I		Battery	

I = Inspect C = Clean R = Replace

Notes:
(1) Consult Engine Operators Manual for oil recommendations.
(2) Consult Engine Operators Manual for additional maintenance schedule information.
(3) Fill slowly! Ensure correct quantity is used.

Above operations to be carried out by trained personnel with reference to the workshop manual where necessary.
These preventive maintenance periods apply to average conditions of operation.
If necessary use shorter periods.

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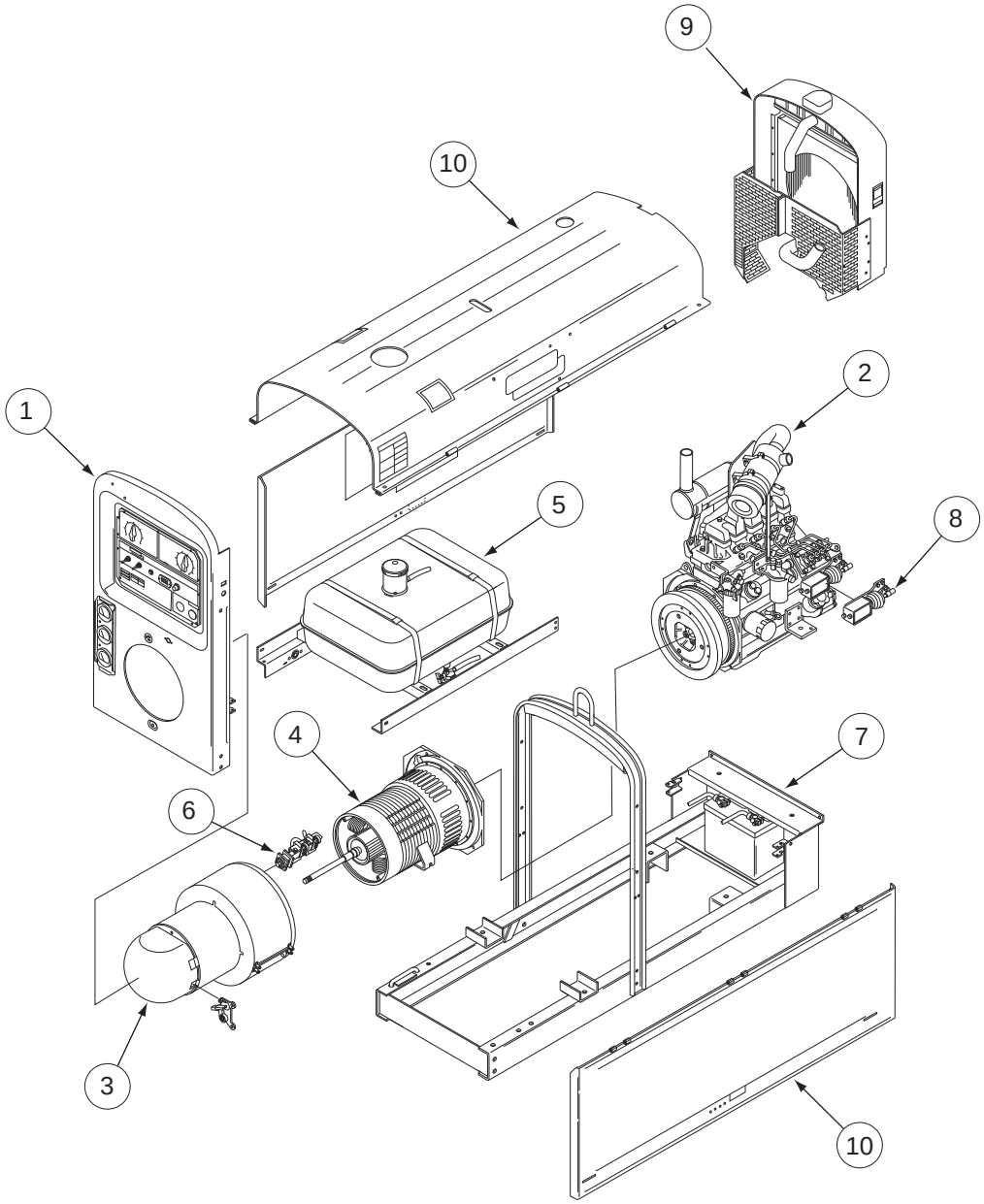
1. Case Front Assembly
2. Engine Assembly
3. Exciter Frame, Armature Assembly
4. Generator Frame, Armature & Coupling
5. Fuel Tank Assembly
6. Generator & Exciter Brush Holder Assemblies
7. Base & Lift Bale Assembly
8. Idler Solenoid Assembly
9. Radiator Assembly
10. Roof & Doors

Figure DD.2 - Major Component Location



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TECHNICAL SPECIFICATIONS - Pipeliner® 200G (K6090-7)

INPUT - GASOLINE ENGINE

Make/Model	Description	Speed (RPM)	Displacement cu. in. (Ltrs.)	Ignition System	Capacities
GM 3.0 Liter Pipeliner® 200G (K6090-7)	4 Cylinder 4 Cycle 46 HP @ 1600 RPM	High Idle 1600 Full Load 1600 Low Idle 1360	183.0(3.0)	Delco Voyager High Energy Distributor Type Electronic	Fuel: 15gal.(57L) Oil: 4.5Qts.(4.3L) Coolant: 9.9 Qts. (9.4L)

RATED OUTPUT - WELDER

DESCRIPTION	RATED DC OUTPUT* VOLTS @ RATED AMPS	DUTY CYCLE	DC CURRENT RANGE Fine Adjustment in each Range
200 Amp DC Welder All Copper Windings Pure DC Power Generator	Lincoln Plus Rating 40V @ 200A NEMA Rating 28V @ 200A	60% 60%	40-300 Amps

OUTPUT - GENERATOR

Auxiliary Power [1]
1.75 kW, 15 Amps @ 120V DC

ENGINE OPERATING LOAD	FUEL CONSUMPTION
Low Idle (1360 RPM)-No Load	.7 gal/hr (2.8 ltrs/hr)
High Idle (1600 RPM)-No Load	.8 gal/hr (3.1 ltrs/hr)
DC Auxiliary-128 Volts-15 Amps-1600 RPM	1.1 gal/hr (4.0 ltrs/hr)
50 Amps @ 38 Volts @ 60% Duty Cycle	1.04 gal/hr (3.94 ltrs/hr)
100 Amps @ 34 Volts @ 60 % Duty Cycle	1.12 gal/hr (4.25 ltrs/hr)
150 Amps @ 29 Volts @ 60% Duty Cycle	1.15 gal/hr (4.37 ltrs/hr)
200 Amps @ 40 Volts @ 60 % Duty Cycle	1.34 gal/hr (5.07 ltrs/hr)

PHYSICAL DIMENSIONS

HEIGHT	WIDTH	DEPTH	WEIGHT
40.94** in. 1039.9 mm	24.00 in. 609.6 mm	68.16in. 1731.0 mm	1295.0 lbs. (587kg.)
**Top of enclosure, add 4.6" (116.8mm) for exhaust			

1. Output rating in watts is equivalent to volt-amperes at unity power factor. Output voltage is within ± 10% at all loads up to rated capacity. When welding, available auxiliary power will be reduced.

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SAFETY PRECAUTIONS

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

PRE-OPERATION INSTALLATION

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, 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.

LOCATION / VENTILATION

Always operate the welder with the doors closed. Leaving the doors open changes the designed air flow and may cause overheating.

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

⚠ CAUTION

DO NOT MOUNT OVER COMBUSTIBLE SURFACES.
Where there is a combustible surface directly under stationary or fixed electrical equipment, the surface shall be covered with a steel plate at least .06"(1.6mm) thick, which shall extend not more than 5.90"(150mm) beyond the equipment on all sides.

MACHINE GROUNDING

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

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

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

or

- be double insulated.

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

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. A machine grounding stud marked with the ⏚ symbol is provided on the front of the welder.

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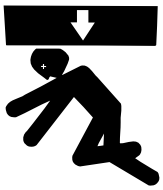
ANGLE OF OPERATION

To achieve optimum engine performance the Pipeliner® 200G should be run in a level position. The maximum angle of operation for the engine is 60 degrees in a direction to cause the air intake manifold to be angled up, 45 degrees for the air intake manifold to be angled down; and 50 degrees for the welder control panel to be angled up or down. If the engine is to be operated at an angle, provisions must be made for checking and maintaining the oil level at the normal (FULL) oil capacity in the crankcase. When operating the welder at an angle, the effective fuel capacity will be slightly less than the specified 15 gallons.

LIFT BAIL

A lift bail is provided for lifting with a hoist.

⚠ WARNING



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

TRAILERS (See *ACCESSORIES SECTION*)

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

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

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

VEHICLE MOUNTING

⚠ WARNING

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

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

POLARITY CONTROL 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 studs 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"** stud. These connections should be checked periodically and tightened if necessary.

When welding at a considerable distance from the welder, be sure you use ample size welding cables.

RECOMMENDED COPPER CABLE SIZES

		Cable Sizes for Combined Length of Electrode Plus Work Cable	
Amps	Duty Cycle	Up to 200 ft (61.0m)	200-250 ft (61.0-72.2m)
200	60%	1	1/0

PRE-OPERATION SERVICE

⚠ CAUTION

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

⚠ WARNING

GASOLINE can cause fire or explosion.

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

GASOLINE FUEL ONLY

OIL

This unit is supplied from the factory with the engine crankcase filled with a high quality SAE 10W/30 oil. This oil should be acceptable for most typical ambient temperatures. Consult the engine operation manual for specific engine manufacturers recommendations. Upon receipt of the welder, check the engine dipstick to be sure the oil is at the "full" mark. Add if required. **DO NOT OVERFILL.**

FUEL

Fill the fuel tank with the grade of fuel recommended in the Engine Operator's Manual. Make sure fuel valve on the sediment bowl is in the open position.

COOLING SYSTEM

The radiator 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 engine manual or antifreeze container for alternate antifreeze recommendations.)

⚠ WARNING

GASES FROM BATTERY can explode.
• Keep sparks, flame and cigarettes away.

BATTERY ACID can burn eyes and skin.
• Wear gloves and eye protection and be careful when boosting, charging or working near battery.

To prevent EXPLOSION when:

a) Installing a new battery - disconnect the negative cable from the old battery first and connect the negative cable to the new battery last.
b) 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.
c) Using a booster - connect the positive lead to the battery first, then connect the negative lead to the ground lead on the base.

To prevent ELECTRICAL DAMAGE when:

a) Installing a new battery.
b) Using a booster.

Use correct polarity - **Negative Ground**.

To prevent BATTERY DISCHARGE, turn ignition switch off when engine is not running.

- To prevent BATTERY BUCKLING, tighten nuts on battery clamp until snug.

BATTERY CHARGING

The Pipeliner® 200G 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 replacing, jumping, or otherwise connecting the battery to the battery cables the proper polarity must be observed. The correct polarity is **NEGATIVE GROUND.**

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SAFETY PRECAUTIONS

⚠ WARNING

Do not attempt to use this equipment until you have thoroughly read the engine manufacturer's manual supplied with your welder. It includes important safety precautions, detailed engine starting, operating and maintenance instructions, and parts lists.

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

Operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

GENERAL DESCRIPTION

The Pipeliner® 200G is a heavy duty engine driven DC arc welding power source capable of providing DC constant current output for stick welding and DC TIG welding. With the addition of the optional K623-1 Wire Feed Module the Pipeliner® 200G will provide constant voltage output for running the LN-25 wire feeder.

The Pipeliner® 200G has a current range of 40-300 DC amps with output ratings as follows:

RATED OUTPUT	DUTY CYCLE
200A @ 28V	60%
200A @ 40V	60%

The units are also capable of providing 1.75 kw of 115V DC auxiliary power.
This unit uses the GM 3.0L industrial water- cooled gasoline engine.

DESIGN SUMMARY

Control Panel

Both the engine and the welder controls are located on one recessed panel at the exciter end of the machine. The welder controls consist of a five step "Current Range Selector" switch and a "Fine Current Adjustment" rheostat. The welder is equipped with a "Start" button, "Ignition" switch, "Idler" control switch, hour meter, a battery charging ammeter, an oil pressure gauge and engine coolant temperature gauge.

The control panel also contains a three prong grounding type receptacle for auxiliary power.

Welding Generator

The Pipeliner® 200G uses the old style, round, all copper FJW Generator frame which provides the customer with the original "Classic" pipe welding arc.

Engine Idler

The Pipeliner® 200G is equipped with an electronic automatic engine idler. It automatically increases and decreases engine speed when starting and stopping welding or using auxiliary power. A built-in time delay permits changing electrodes before the engine slows to its low idle speed. The "Idler" control switch on the panel locks the idler in the full speed position when desired.

Auxiliary Power

1.75 kw of nominal 120V DC. Output voltage is maintained within ± 10% at all loads up to rated capacity. (See Optional Features for power plug kits).

Welder Enclosure

The complete welder is rubber mounted on a rugged steel "C" channel base.

The output terminals are placed at the side of the machine so that they are protected by the door. The output terminals are labeled (+) and (-).

Ignition System

A High Energy Distributor Type electronic ignition is standard.

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Cranking System

A 12V electric starter is standard.

Air Cleaner

Heavy duty two-stage dry type

Exhaust

A muffler and stainless steel exhaust outlet pipe are standard.

Engine Hour Meter

A meter to record the hours of operation.

High Idle RPM (OCV) Adjustment- A potentiometer is mounted on the output rail that allows the operator to adjust the high idle engine speed between 1500 and 1600 RPM in 20 RPM increments. This is to allow further adjustment of the OCV. Total OCV adjustment range is about 10 Volts.

ENGINE OPERATION

STARTING THE GM 3.0L ENGINE

- Turn the Idler control switch to “HIGH”. (Optional)
- Turn the Ignition switch to “ON”.
- Press the “Start” button.
- If the engine fails to start in 20 seconds, wait 30 seconds before repeating the above procedure.
- Allow the engine to run at high idle speed for several minutes to warm up. If idle control switch is left in “Auto” position , engine will run at 1600 RPM until engine coolant temperature reaches 130°F.

STOPPING THE ENGINE

- Turn the Ignition switch to “OFF”.

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.

When hauling the welder between job sites, close the fuel feed valve beneath the fuel tank. Refer to engine “Operation and Maintenance manual” for additional information on the engine supplied with this welder.

WELDER OPERATION

⚠ WARNING

ELECTRIC SHOCK can kill.
- **Do not touch electrically live parts or electrode with skin or wet clothing.**
- **Insulate yourself from work and ground.**

FUMES & GASES can be dangerous.
- **Keep your head out of the fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**

WELDING SPARKS can cause fire or explosion.
- **Keep flammable material away.**

ARC RAYS can burn.
- **Wear eye, ear, and body protection.**

DUTY CYCLE

The NEMA output rating of the Pipeliner® 200G is 200 amperes at 28(1) arc volts on a 60% duty cycle. Duty cycle is based on a ten minute period; thus, the welder can be loaded at rated output for six minutes out of every ten minute period.

(1) The Lincoln “plus output” rating at 60% duty cycle is 200 amperes at 40 Volts.

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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.

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 the 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 190-120 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 the 240-160 position and the "Fine Current Adjustment" setting to get 175 amps.

⚠ CAUTION

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

These switches have a spring loaded cam which almost eliminates the possibility of setting this switch between the designated points.

TBI DEICING SYSTEM

The welder has been designed to allow continuous year-round operation. Engine coolant is channeled through the TBI housing to prevent the build up of ice on the TBI throat around the throttle plate. the electronic controller is programmed to automatically compensate for the build up of ice on the throttle plate. There will be no noticeable change in the operation of the welder should icing develop. On start-up, there is a possibility for the engine to overspeed (to a maximum of 2000 RPM) for up to 10 seconds after throttle body icing conditions have occurred. The electronic governor will correct itself for the new operating conditions and normal operation will resume.

IDLER OPERATION

The operating speeds are as follows:

ORDERING INFO.	ENGINE	FULL LOAD	HIGH IDLE	LOW IDLE
K6090-7	GM 3.0L	1600-1500	1600-1500	1360

The idler is controlled by the "Idler" toggle switch on the welder control panel. The switch has two positions as follows:

1. In the "High"  position, the idler is off, and the engine runs at the high speed controlled by the governor. This speed can be adjusted between 1500 and 1600 RPM using the RPM dial on the output rail.

2. In the "Automatic"  /  position, the idler operates as follows:

   - When welding or drawing power for lights or tools (approximately 100-150 watts minimum) from the receptacle, the engine operates at the speed, set by the RPM dial.

   - When welding ceases or the power load is turned off, a preset time delay of 10 seconds starts. This time delay cannot be adjusted.

   - If the welding or power load is not re-started before the end of the time delay, the idler reduces the engine to low idle speed.

AUXILIARY POWER

1.75 kw of 120V DC auxiliary power is available at the receptacle located on the control panel.

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OPTIONAL EQUIPMENT (FIELD INSTALLED)

(K704) Accessory Set

Includes 35 ft (10.7m) electrode and 30 ft (9.1m) work cables, headshield, work clamp, and electrode holder.

⚠ WARNING

Pipe Thawing with an arc welder can cause fire, explosion, damage to electric wiring or to the arc welder if done improperly. The use of an arc welder for pipe thawing is not approved by the CSA, nor is it recommended or supported by Lincoln Electric.

(K924-4) REMOTE CONTROL

For machines having Code Number 10660:
For "Stick" operation which contains switch, remote control rheostat and 100 ft (30.5m) or 25 ft (7.6m) cable. Easy Installation.

(K924-5) REMOTE CONTROL

For machines having Code Number 10913:
For "Stick" operation containing remote control rheostat and 100 ft (30.5m) cable. Easy Installation.

REMOTE CONTROL (K2464-1) - Contains remote control rheostat (for adjusting the CC "STICK" OCV), remote control potentiometer (for adjusting the CV "WIRE" OCV), and 100 ft. (30.5m) cable. Easy Installation.

(K953-1) TRAILER - Two-wheeled trailer with optional fender and light package. For highway use, consult applicable federal, state, and local laws regarding possible additional requirements. There is a choice of 2 hitches, a fender & a light package. **Order:**
K953-1 Trailer
K958-1 Ball Hitch
K958-2 Lunette Eye Hitch
K959-1 Fender & Light Kit
K965-1 Cable Rack

(K623-1) WIRE FEED MODULE -Provides constant voltage (CV) output with improved arc stability for Innershield welding. Also, excellent for MIG welding. Easy Installation. Recommended wire feeder is the LN-25.

(K2261-1) OIL DRAIN KIT-Includes ball valve, hose and clamp.

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SAFETY PRECAUTIONS

⚠ WARNING

Have qualified personnel do the maintenance work. Turn the engine off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

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

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

ENGINE EXHAUST can kill.
- **Use in open, well ventilated areas or vent exhaust outside.**

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

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

GENERAL INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months. In particularly dirty locations, this cleaning may be necessary once a week. Use low pressure air to avoid driving dirt into the insulation.

2. "Current Range Selector" contacts should not be greased. To keep the contacts clean, rotate the current control through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld.

3. Change the crankcase oil and oil filter after the first 50 hours of operation and thereafter at regular intervals using the proper grade of oil. See the recommendations in the engine operation manual.

4. Inspect the air filter daily - - more often in dusty conditions when necessary clean or replace. The air filter should never be removed while the engine is running. The air filter element part number is Donaldson #181050 or Nelson #70206N.

5. When necessary, remove the sediment bowl from beneath the gas tank and clean out any accumulated dirt and water. Replace the fuel filter in the fuel line as needed. In an emergency, the fuel filter can be back-flushed for continued use until a replacement can be obtained.

6. Fan belts tend to loosen after the first 50 hours of operation. Check engine operation manual and tighten if necessary. DO NOT OVERTIGHTEN.

7. Put a drop of oil on the "Current Range Selector" shaft at least once every month.

8. See the engine manufacturers operation manual for detailed engine maintenance and troubleshooting instructions.

COOLING SYSTEM

The Pipeliner® 200G is equipped with a pressure radiator. Keep the radiator cap tight to prevent loss of coolant. Clean and flush the cooling system periodically to prevent clogging the passage and overheating the engine. When antifreeze is needed, always use the permanent type. Capacity = 9.9 Qty. (9.4 liter) Consult the engine owners manual for the proper frequency and procedure.

ENGINE MAINTENANCE

Refer to the Engine's operation and maintenance manual for additional information on the engine.

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BEARINGS

This welder is equipped with a double-shielded ball bearing 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. Overgreasing 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.

COMMUTATOR AND BRUSHES

⚠ 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.

The generator brushes are properly adjusted when the welder is shipped. They require no particular attention. 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 commutator and brushes by removing the covers. DO NOT remove or replace these covers while the machine is running.

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

Replace brushes when they wear within 1/4" of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Have an experienced maintenance man 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.

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

IDLE CONTROL MAINTENANCE

⚠ CAUTION

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

1. Proper operation of the idler requires good grounding of the battery and TBI controller.

2. If desired, the welder can be used without automatic idling by setting the "Idler" switch to the "High Idle" position.

3. 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 TBI controller board can result from incorrect connection.

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.

PURGING AIR FROM FUEL SYSTEM

The fuel system operates as follows: The fuel pump will operate for a maximum of 3 seconds when the ignition switch is turned "ON". The pump will restart once the start button is pushed and continue when the engine starts. To purge the system of air if fuel lines have been removed, the ignition switch can be toggled "ON" and "OFF" (at 3 second intervals) until fuel flows through the fuel return line in the neck of the fuel line.

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ENGINE SERVICE

EVERY DAY OR EVERY 8 HOURS	FIRST SERVICE-(50 HOURS)	EVERY 100 HOURS OR 3 MONTHS	EVERY 200 HOURS OR 6 MONTHS	EVERY 600 HOURS OR 12 MONTHS	MAINTENANCE ITEM	TYPE OR QUANTITY
					ENGINE SERVICE (NOTE 2)	
I					Coolant level	
				I	Concentration of antifreeze	50 / 50 water glycol mixture
			I		Radiator for contamination or blockage	
				R	Coolant (NOTE 3)	9.9qrts, (9.4L)
I					Engine oil level (NOTE 1)	
	R		R		Engine oil (NOTE 1 & 3)	4.5qrts, (4.3L) (including filter)
	R		R		Engine oil filter	AC PF25
	C	C			Drain fuel bowl	
				R	Fuel filter canister	PSI #32500292
I					Tension of alternator / Fan belt	
			I		Alternator / fan belt wear	
				R	Alternator belt	Good Year 11AV0955
				R	Fan belt	Good Year 11AV1220
				I	Tighten cylinder head	
				R	Spark Plugs (Gap = 0.040")	4 - AC R46TS
				I	Electrical systems	
				I	All nuts and bolts for tightness	
4	C	C			Air filter (earlier check may be req'd.)	
				R	Air filter element	Donaldson #P181050 or Nelson #70206N
I					Leaks or engine damage	
			I		Battery	BCI GROUP 45

I = Inspect C = Clean R = Replace

NOTES:

(1) Consult Engine Operators Manual for oil recommendations.

(2) Consult Engine Operators Manual for additional maintenance schedule information.

(3) Fill slowly! Ensure correct quantity is used.

(4) Clean the air filter if the engine is operating in very dusty conditions.

Above operations to be carried out by trained personnel with reference to the workshop manual where necessary.
These preventive maintenance periods apply to average conditions of operation.
If necessary use shorter periods.

S20919-3

1. Case Front Assembly
2. Engine Assembly
3. Exciter Frame, Armature Assembly
4. Generator Frame, Armature & Coupling
5. Fuel Tank Assembly
6. Generator & Exciter Brush Holder Assemblies
7. Base & Lift Bale Assembly
8. Radiator Assembly
9. Roof & Doors

Figure DDD.1 - Major Component Location

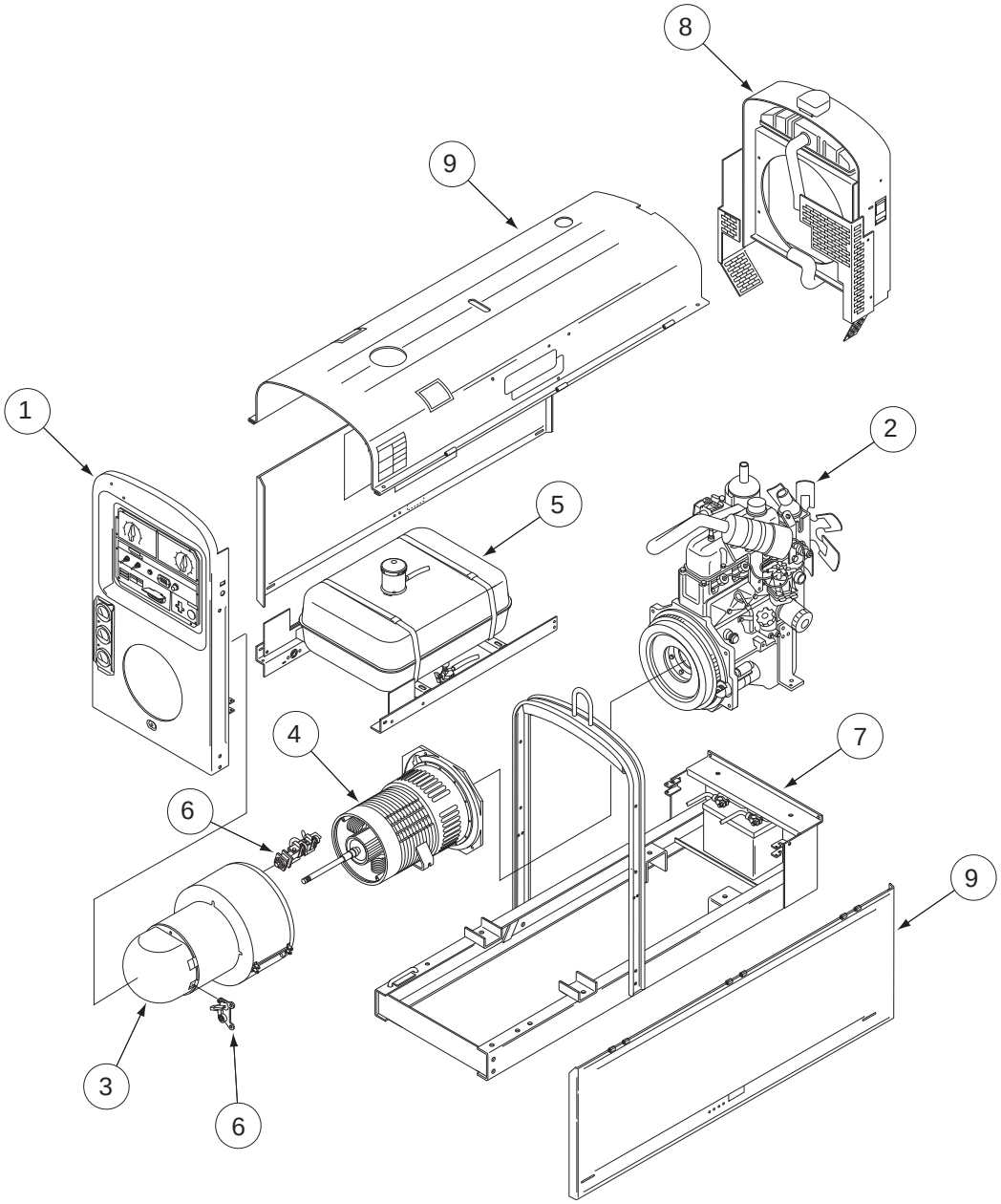

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FIGURE E.1 — BLOCK LOGIC DIAGRAM

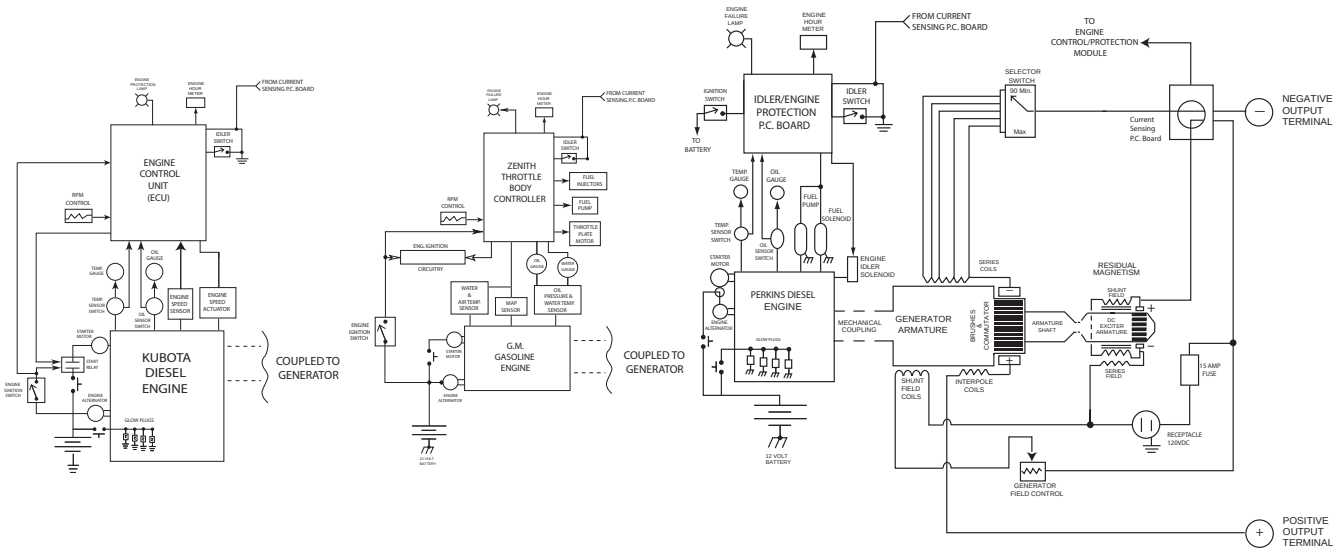
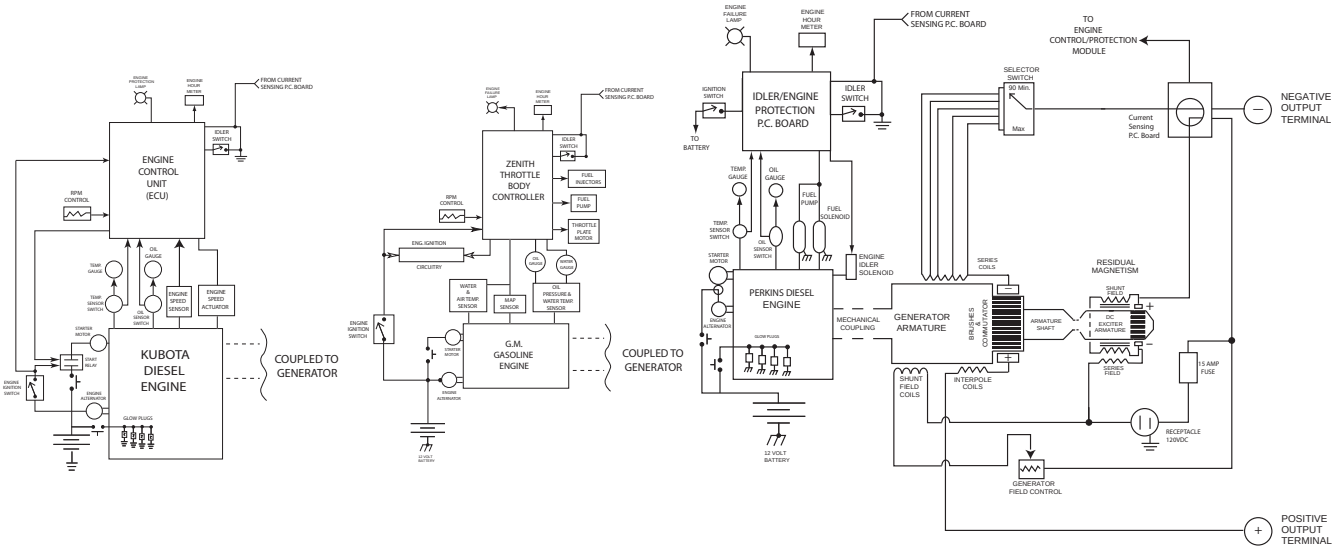


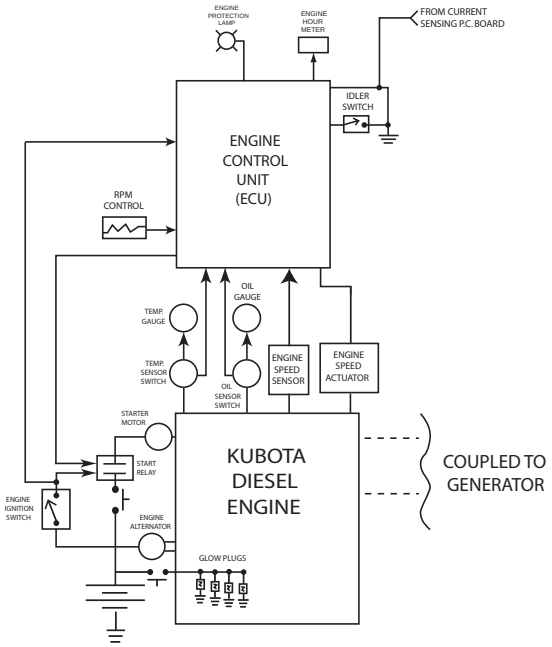
FIGURE E.2 — GENERAL DESCRIPTION



GENERAL DESCRIPTION

The PIPELINER® 200 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 120VDC receptacle. The PIPELINER® 200 is manufactured with all copper windings.

FIGURE E.3 — ENGINE CONTROL



BATTERY, STARTER, ENGINE ALTERNATOR, OIL, & TEMPERATURE SWITCH CIRCUITS

The 12VDC battery powers the starter motor and, through the ignition switch, the engine ignition circuitry (gas models only), the engine alternator, the engine control protection modules and associated circuits. See the appropriate block diagram. These engine control and protection modules monitor engine oil pressure, coolant temperature and engine RPM. The system shuts the engine down in the event of a sudden low oil pressure or high coolant temperature. A warning light on the control panel provides fault codes, or on some models the engine fault light will glow.

The engine idle control (solenoid, throttle plates or actuator) is mechanically connected to the engine. When welding current or auxiliary power (120VDC) is drawn through the current sensing P.C. board a small voltage signal is sent to the engine control circuitry. This signals the engine control circuitry to increase the engine RPM. This is accomplished in a variety of methods depending upon the engine and control/protection being used.

When the welding or auxiliary load is removed a preset time delay of about 15 seconds starts. After approximately 15 seconds of “no load” the engine control/protection circuitry returns the engine to low idle RPM.

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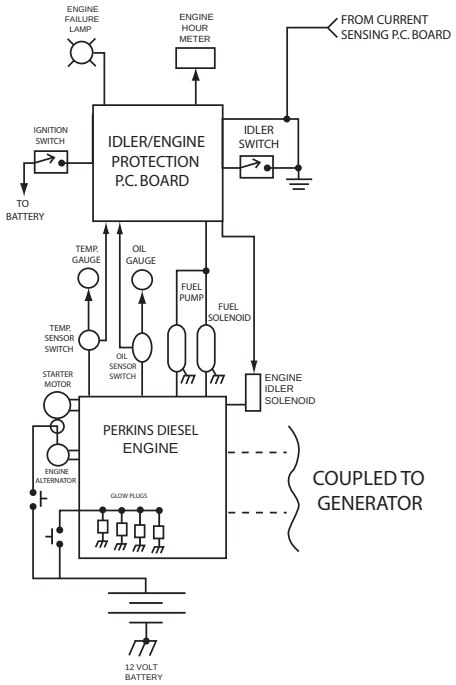
FIGURE E.4 — ENGINE CONTROL



BATTERY, STARTER, ENGINE ALTERNATOR, OIL, & TEMPERATURE SWITCH CIRCUITS

The 12VDC battery powers the starter motor and, through the ignition switch, the engine ignition circuitry (gas models only), the engine alternator, the engine control protection modules and associated circuits. See the appropriate block diagram. These engine control and protection modules monitor engine oil pressure, coolant temperature and engine RPM. The system shuts the engine down in the event of a sudden low oil pressure or high coolant temperature. A warning light on the control panel provides fault codes, or on some models the engine fault light will glow.

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When the welding or auxiliary load is removed a preset time delay of about 15 seconds starts. After approximately 15 seconds of “no load” the engine control/protection circuitry returns the engine to low idle RPM.

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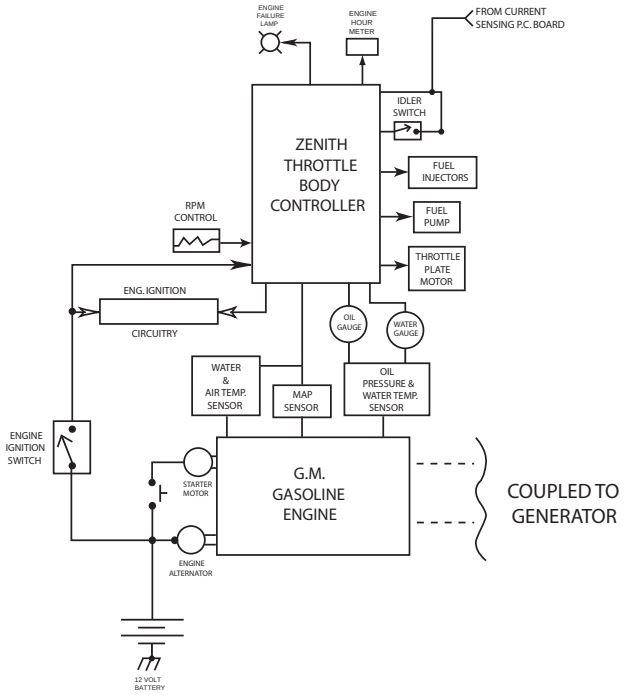
FIGURE E.5 — ENGINE CONTROL



BATTERY, STARTER, ENGINE ALTERNATOR, OIL, & TEMPERATURE SWITCH CIRCUITS

The 12VDC battery powers the starter motor and, through the ignition switch, the engine ignition circuitry (gas models only), the engine alternator, the engine control protection modules and associated circuits. See the appropriate block diagram. These engine control and protection modules monitor engine oil pressure, coolant temperature and engine RPM. The system shuts the engine down in the event of a sudden low oil pressure or high coolant temperature. A warning light on the control panel provides fault codes, or on some models the engine fault light will glow.

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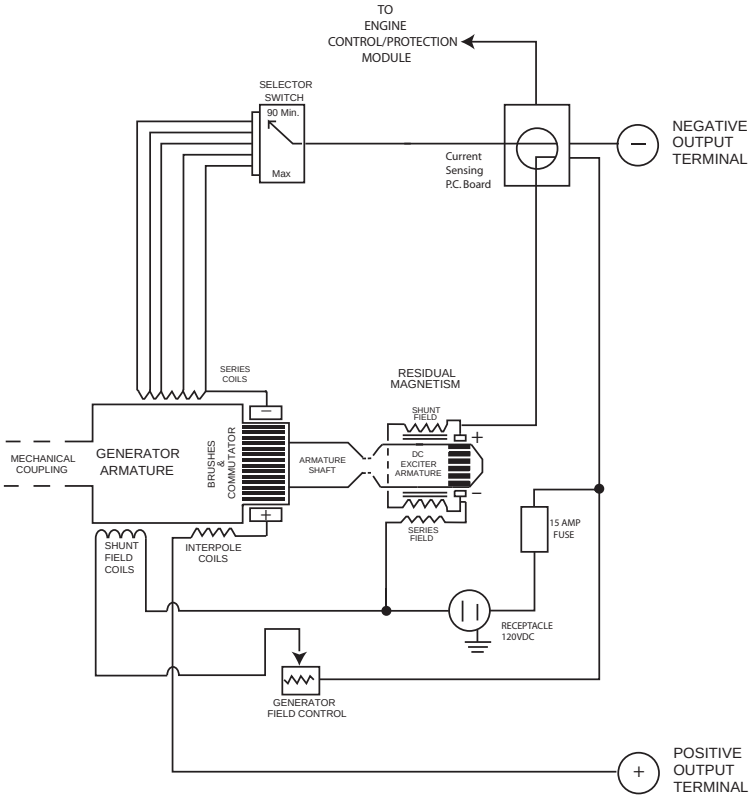
When the welding or auxiliary load is removed a preset time delay of about 15 seconds starts. After approximately 15 seconds of “no load” the engine control/protection circuitry returns the engine to low idle RPM.

FIGURE E.6 — GENERATOR & EXCITER



ENGINE, MAIN GENERATOR ARMATURE & 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 is applied, via the field rheostat control, to the main generator shunt field coils. The exciter output is also connected to the 120VDC receptacle.

MAIN SHUNT, INTERPOLE & 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.

ENGINE, MAIN GENERATOR ARMATURE, FRAME & DC EXCITER

CURRENT RANGE SELECTOR

The selector switch acts as a course 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 field windings. Open circuit weld voltage can also be controlled by the field rheostat control.

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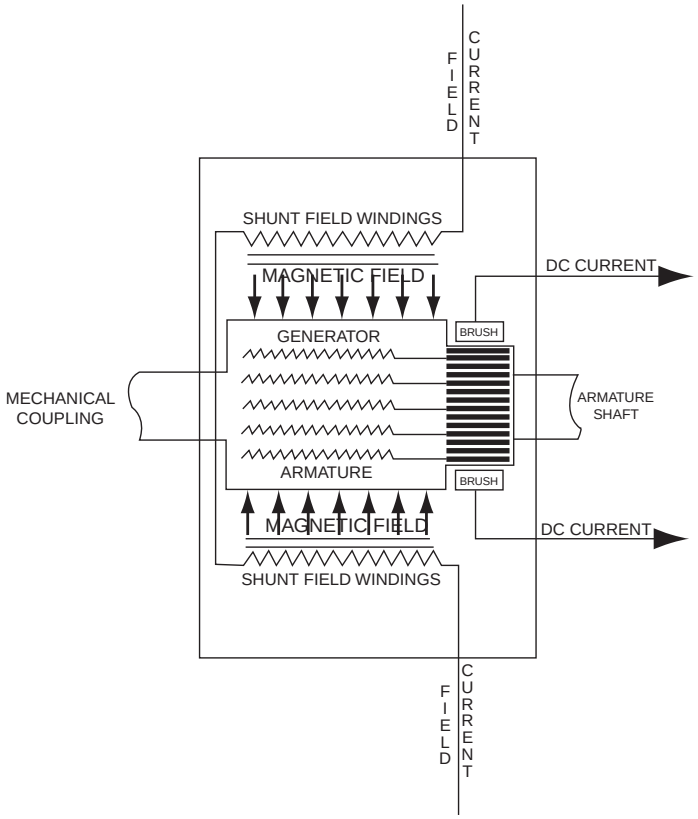
FIGURE E.7 — DC GENERATOR THEORY



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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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

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

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

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

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

⚠ CAUTION

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

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PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

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

⚠ CAUTION

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

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

PC board can be damaged by static electricity.

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

- 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 un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

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

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

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

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

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

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

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

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

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
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.	1. Check for loose or missing brushes in the DC exciter. 2. The exciter may need "flashing." See ***Flashing the Fields*** in this section.	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. 2. Perform the ***DC Exciter Test***.
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.	1. Check the welding cables for loose or faulty connections. 2. Check for loose or missing brushes in the welding generator. 3. Check for open circuit voltage at weld studs, check heavy current carrying leads for loose or corroded connections	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. 2. Perform the ***Main Generator Shunt Field Winding Test***. 3. Check the continuity of the interpole coils. They should show continuity from the positive brusholders to the positive output terminal and should NOT be grounded to the generator frame. 4. Check the continuity of the series coils. They should show continuity from the negative brusholders, through the current selector switch, to the negative output terminal and should NOT be grounded to the generator frame. 5. The main armature may be faulty. Check for grounds and/or shorts.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The welding output varies abnormally. The auxiliary output remains constant. The engine is operating correctly.	1. Check for loose or faulty welding cables. 2. This may be a normal condition. The machine will normally lose some output as the components are heated. 3. Check for loose, worn, dirty or poorly seated main DC generator brushes. 4. The main armature commutator may need cleaning.	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. 2. Perform the ***Main Generator Shunt Field Winding Test.*** 3. Check the current range selector switch and contacts for proper operation. 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. 5. The main armature may be faulty. Check for grounds.
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.	1. Check the DC receptacle and plug for loose or faulty connections. 2. Check the 15 Amp fuse. (Not on GM 3.0L gas)	1. Check for loose or faulty connections or wires at the 120 VDC receptacle and associated circuitry. See the Wiring Diagram.

⚠ CAUTION

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The actual welding current is much less than is indicated on the dials.	1. Check the welding cables for loose or faulty connections. 2. The welding cables may be excessively long or coiled. 3. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. 1-888-935-3877.	1. The engine RPM may be low. If necessary perform the ***Engine Throttle Adjustment Test. (PERKINS code 10929 ONLY)*** 2. Perform the ***DC Exciter Test***. 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. 4. Check the current range selector switch and contacts for proper operation. 5. Perform the ***Main Generator Shunt Field Winding Test.*** 6. The main armature may be faulty. Check for grounds.
The actual welding current is much greater than is indicated on the dials.	1. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. 1-888-935-3877.	1. The engine operating speed may be too high. If necessary perform the ***Engine Throttle Adjustment Test. (PERKINS code 10929 ONLY)*** 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. 3. Perform the ***DC Exciter Test***.

⚠ CAUTION

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The engine will not return to low idle when the welding and auxiliary loads are removed.	1. Make sure the idler control switch is set to the “Auto” position. 2. Make sure both welding and auxiliary loads are removed. 3. Check for mechanical restrictions in the idler and throttle linkage (PERKINS code 10929 ONLY) There may be a problem with the ECU or Throttle Body Controller or associated engine control components on Kubota Diesel (1114, 11316) and GM Gas(10660, 10913, 11136)Contact the Lincoln Electric Service Dept. 1-888-935-3877.	1. Check the idler control switch and associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check the CURRENT SENSING PC BOARD ***Perform the Current Sense Board Test***. Replace if necessary. 3. Perform the ***Idler Solenoid Test. (PERKINS 10929 ONLY)*** 4. Check for loose or faulty connections at the idler PC board (PERKINS) ECU in Kubota and Throttle Body Controller GM 3.0 liter. 5. The idler PC board (PERKINS) ECU in Kubota or Throttle Body Controller -GM 3.0 liter may be faulty. Contact the Lincoln Electric Service Dept. 1-888-935-3877.

⚠ CAUTION

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

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The engine 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. When the engine is operating in the high RPM condition, both welding output and DC auxiliary are normal.	1. Check welding cables for loose or faulty connections.	1. Check the idler control switch and associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check the CURRENT SENSING PC BOARD. ***Perform the Current Sense Board Test***. Replace if necessary. 3. Perform the ***Idler Solenoid Test. (PERKINS 10929 ONLY)*** 4. Check for loose or faulty connections at the idler PC board (PERKINS) ECU in Kubota and Throttle Body Controller GM 3.0 liter. 5. The idler PC board (PERKINS) ECU in Kubota or Throttle Body Controller -GM 3.0 liter may be faulty. Contact the Lincoln Electric Service Dept. 1-888-935-3877.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The engine 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. When the engine is operating in the high RPM condition, both welding output and DC auxiliary are normal.	1. Check the auxiliary power plug and associated leads for loose or faulty connections. 2. The load may be too small. The load must be above 150 watts.	1. Check the idler control switch and associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check the CURRENT SENSING PC BOARD. ***Perform the Current Sense Board Test.*** Replace if necessary. 3. Perform the ***Idler Solenoid Test. (PERKINS 10929 ONLY)*** 4. Check for loose or faulty connections at the idler PC board (PERKINS) ECU in Kubota and Throttle Body Controller GM 3.0 liter. 5. The idler PC board (PERKINS) ECU in Kubota or Throttle Body Controller -GM 3.0 liter may be faulty. Contact the Lincoln Electric Service Dept. 1-888-935-3877.
The engine “cranks” but will not start.	1. Make sure the ignition switch is in the ON position. 2. Check for adequate fuel supply.	1. Check the ignition switch for proper operation. Check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check the fuel solenoid. Make sure it is opening when +12VDC is applied.(Except Kubota) See the Wiring Diagram. 3. The idler PC board may be faulty (Perkins 10929) Replace, OR The ECU Kubota or Throttle Body Controller GM 3.0 Liter may be faulty. Contact the Lincoln Electric Service Dept. 1-888-935-3877.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The engine "cranks" AND starts, but runs only about 30-60 seconds and shuts down.	1. Make sure the correct grade and amount of oil is in the engine crankcase. See the ***Maintenance Section*** of this manual. 2. Make sure the engine is not overheating. 3. Make sure the engine alternator is operating properly.	1. The oil pressure switch may be faulty. Perform the ***Oil Pressure Switch Test.*** 2. The Temperature Switch may be fault. Perform the ***Temperature Switch Test.*** 3. The alternator may be faulty. Perform the ***Alternator Test.*** 4. The Idler/Engine Protection Board may be faulty (PERKINS) The ECU (KUBO11:29 AMA) or Throttle Body Controller (GM 3.0 Liter) may be faulty. Contact the Lincoln Electric Service Dept. 1-888-935-3877.
The welding arc is loud and spatters excessively.	1. The current setting may be too high for the electrode and process. 2. The polarity may be wrong for the electrode and process.	1. Check the engine speed. High idle speed should be 1800 RPM. If Necessary, perform the ***Engine Throttle Adjustment Test. (PERKINS ONLY 10929)*** 2. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. at 1-888-935-3877.
The welding arc frequently "pops out".	1. The fine current control field rheostat may be set too low for the process and electrode. 2. Check the welding cables for loose or faulty connections.	1. Check the engine speed. High idle speed should be 1800 RPM. If Necessary, perform the ***Engine Throttle Adjustment Test. (PERKINS ONLY 10929)*** 2. The Current Range Selector Switch may be faulty. Check for proper operation and contact. 3. Check the DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. at 1-888-935-3877.

⚠ CAUTION

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

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Observe all Safety Guidelines detailed throughout this manual

Kubota - EUC - Codes

LIGHT CODE	FAILURE DETECTED	POSSIBLE CAUSE - CORRECTIVE MEASURE
LONG 1, SHORT 1	RPM IS OVER 115% OF RATED RPM (2070 RPM)	ACTUATOR IS STUCK - REMOVE ACTUATOR AND VERIFY PLUNGER PULLS IN WHEN ENERGIZED
LONG 1, SHORT 2	LOW OIL PRESSURE DETECTED FOR 1 SECOND	LOW OIL - CHECK OIL LEVEL ON DIPSTICK FAULTY OIL PRESSURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS RUNNING LEAD TO OIL PRESSURE SWITCH "WK" STUD MAY BE GROUNDED - CHECK
LONG 1, SHORT 3	"L" TERMINAL IS GROUNDED ON ALTERNATOR FOR 1 SECOND	BROKEN OR LOOSE BELT LEAD TO "L" TERMINAL ON ALTERNATOR MAYBE SHORTED TO GROUND- CHECK FAULTY ALTERNATOR - CHECK
LONG 1, SHORT 4	HIGH WATER TEMPERATURE DETECTED FOR 1 SECOND	AMOUNT OR QUALITY OF COOLANT INCORRECT - CHECK FAULTY WATER TEMPERATURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS NOT RUNNING LEAD TO WATER TEMPERATURE SWITCH MAY BE GROUNDED - CHECK
LONG 1, SHORT 5	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT 1	0 RPM IS DETECTED AND 12V IS DETECTED FROM "L" TERMINAL ON ALTERNATOR	FAULTY RPM SENSOR-CHECK FOR GOOD CONNECTION FAULTY ECU - CHECK FOR 12 VOLTS ON SUPPLY LEAD TO RPM SENSOR FROM ECU
LONG 2, SHORT 2	CURRENT TO ACTUATOR IS OUT OF LIMIT	FAULTY ACTUATOR - CHECK FOR PROPER COIL RESISTANCE LEADS TO ACTUATOR MAY BE OPEN OR GROUNDED - CHECK
LONG 2, SHORT 3	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT 4	-50C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE LEAD TO WATER TEMPERATURE SENSOR MAY BE OPEN - CHECK FOR CONTINUITY
LONG 2, SHORT 5	150C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE LEAD TO WATER TEMPERATURE SENSOR MAY BE GROUNDED - CHECK
LONG 2, SHORT 6	0 VOLTS DETECTED FROM "L" TERMINAL ON ALTERNATOR FOR 1 SECOND	LEAD TO "L" TERMINAL ON ALTERNATOR MAY BE OPEN - CHECK FOR CONTINUITY BROKEN OR LOOSE BELT - INSPECT FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 7	OVER 18 VOLTS DETECTED FROM ALTERNATOR	INCORRECT BATTERY - INSPECT FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 8	LESS THAN 4 VOLTS TO RPM SENSOR AND/OR ACTUATOR SENSED BY ECU	FAULTY ECU -CHECK FOR 12 VOLTS ON LEADS TO RPM SENSOR AND ACTUATOR FROM ECU

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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

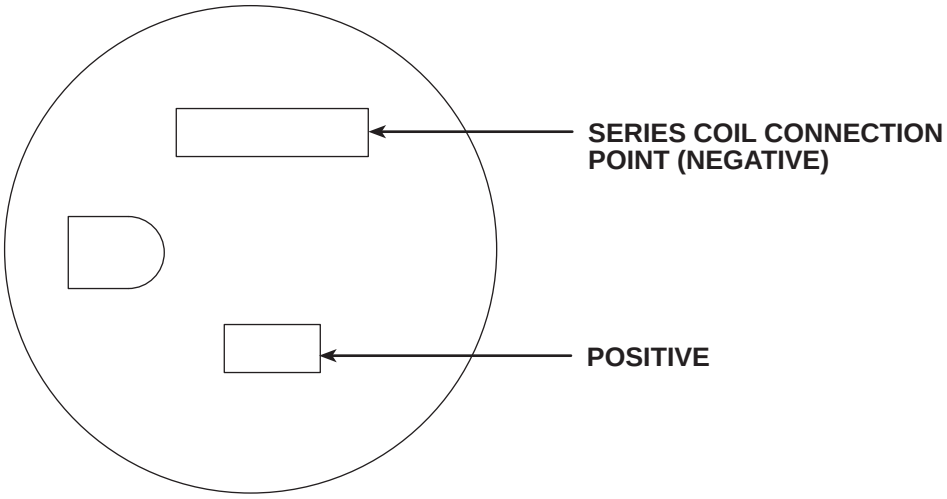
This test will help determine whether or not the DC exciter is operating correctly. If operation is not correct , the test will also determine what component(s) may be faulty.

MATERIALS NEEDED

3/8" wrench
Volt/Ohmmeter (Multimeter)
Wiring Diagram

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.

⚠ 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.

2. Start the engine and put the idler switch in the HIGH idle position.
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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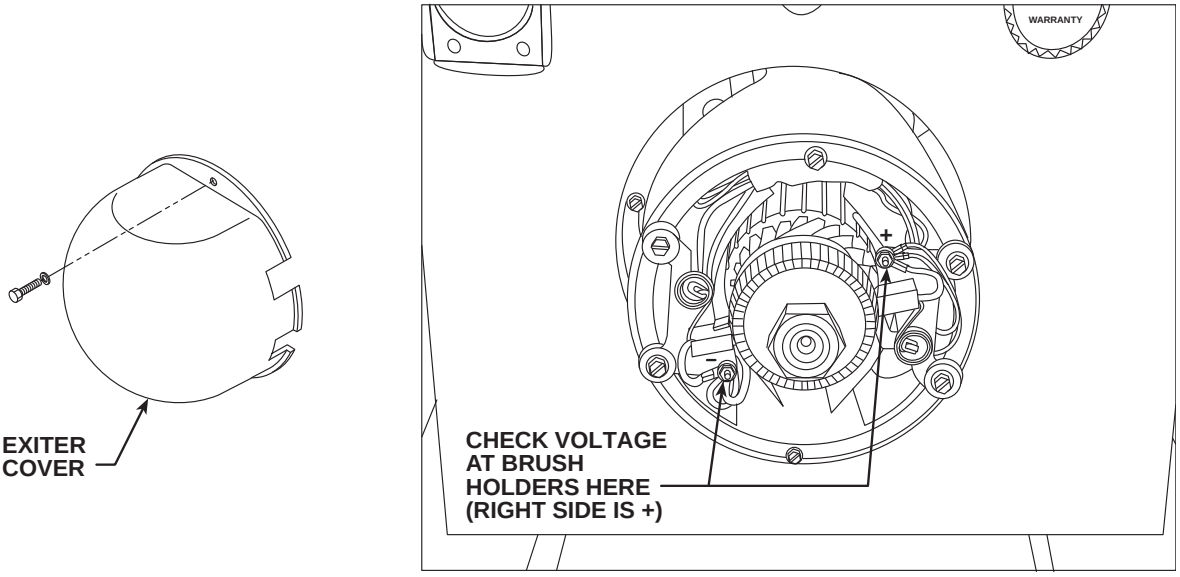
DC EXCITER TEST *(CONTINUED)*

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.
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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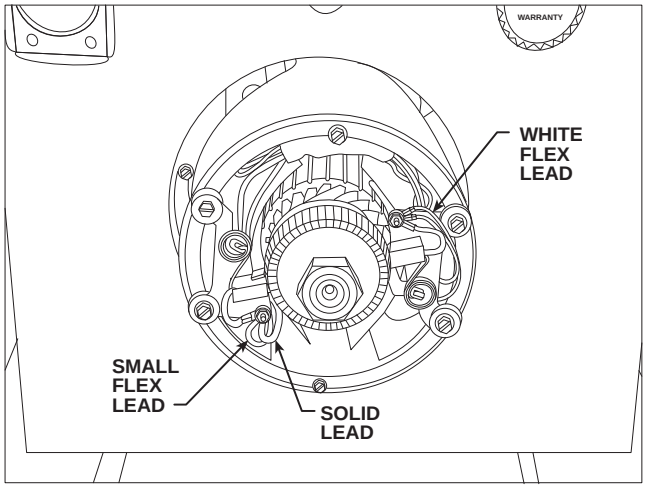
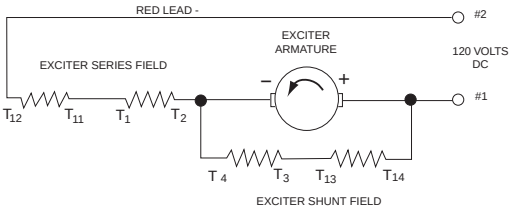
DC EXCITER TEST *(continued)*

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: Two coils make up a set (L8707), and each coil consists of two coils, wound together. An Exciter Shunt Field Coil and an Exciter Series Coil.

10. The coil leads should be disconnected from the positive and negative brush holder and also the bolted connection within the exciter bracket that connects T12 to the RED lead.
11. Using the Ohmmeter, measure the Exciter Series Coils from the T12 and T2 (heavy stiff magnet wire) and the Exciter Shunt Field Coils from T4 and T14 (fine stranded wire) to a good frame ground. The resistance should be very high (500k Ohms or higher). This indicates that the coils are not grounded. If the resistance reading is less than 500k Ohms, this indicates a grounded condition and replacement should be considered.
12. Using the Ohmmeter, measure Exciter Series Field Coils from connection T12 to connection T2. The resistance should be .276 to .296 Ohms. Measure with the Ohmmeter the Exciter Shunt Field Coils between T4 and T14, The resistance should be 127.0 to 133.0 Ohms. If resistance is very low, the coils are shorted. If coils are warmer or colder than 25 degrees Celsius, the resistance will be considerably higher or lower. If coil resistances vary significantly, REPLACEMENT MAY BE NECESSARY.
13. 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.
14. After the test and repairs are completed, install the exciter cover using the 3/8” nut driver.

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

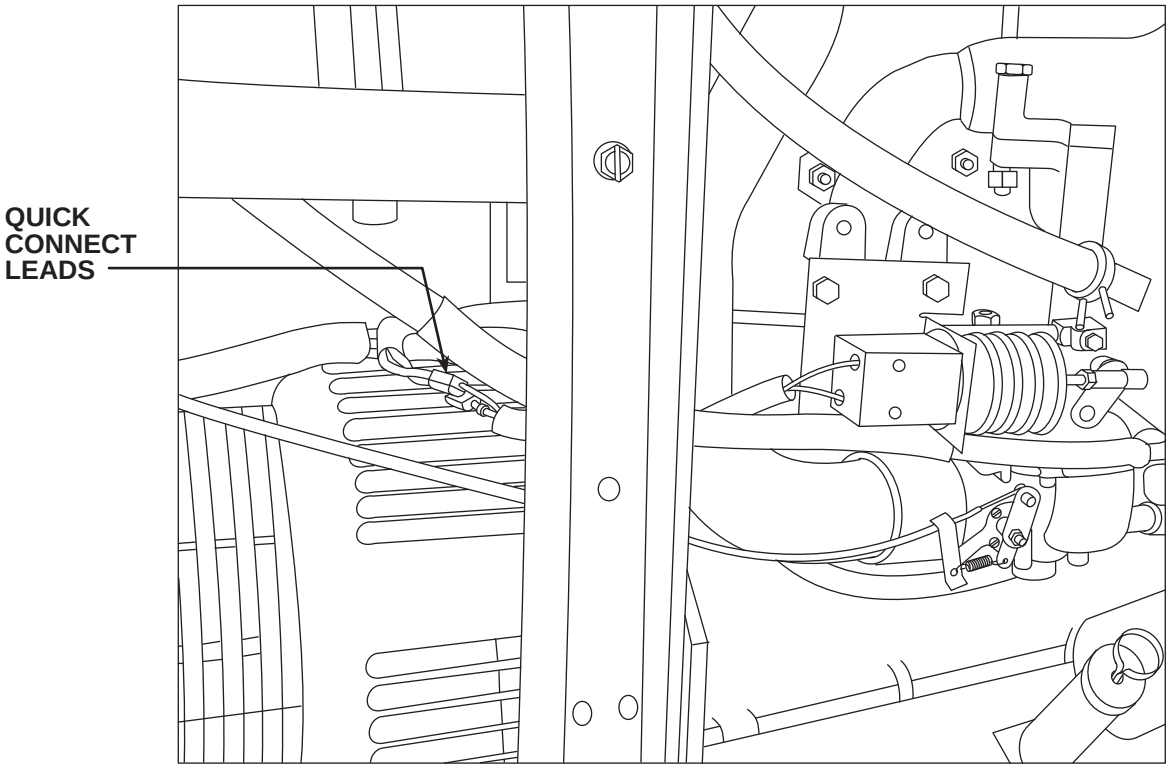
This test will determine whether or not the idler solenoid can function when it is energized with 12VDC.

MATERIALS NEEDED

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

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 9 ohms.

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

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

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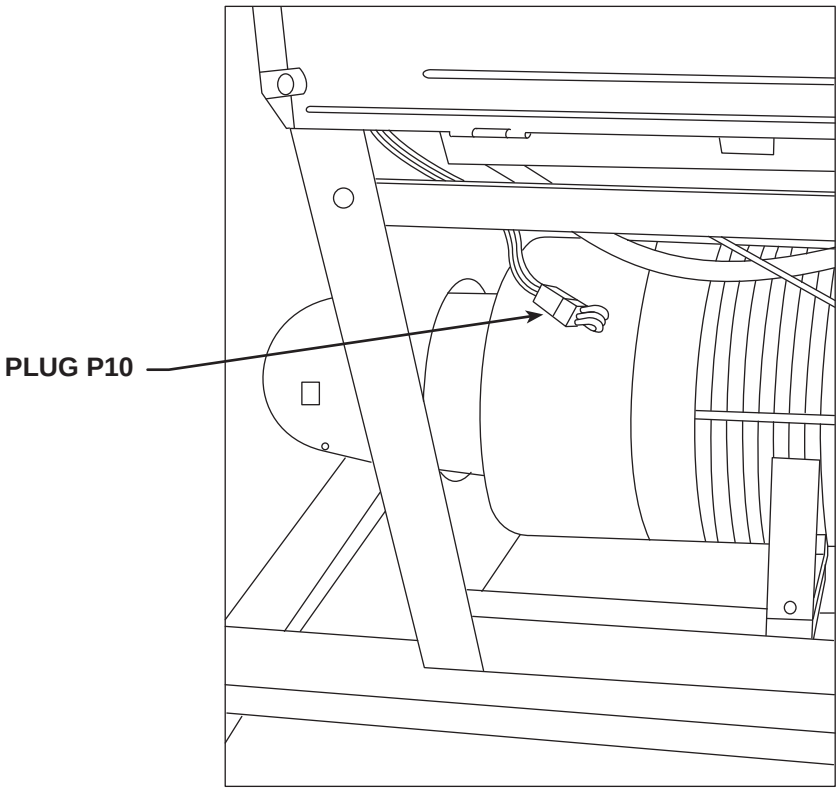
MAIN GENERATOR SHUNT FIELD WINDING TEST *(continued)*

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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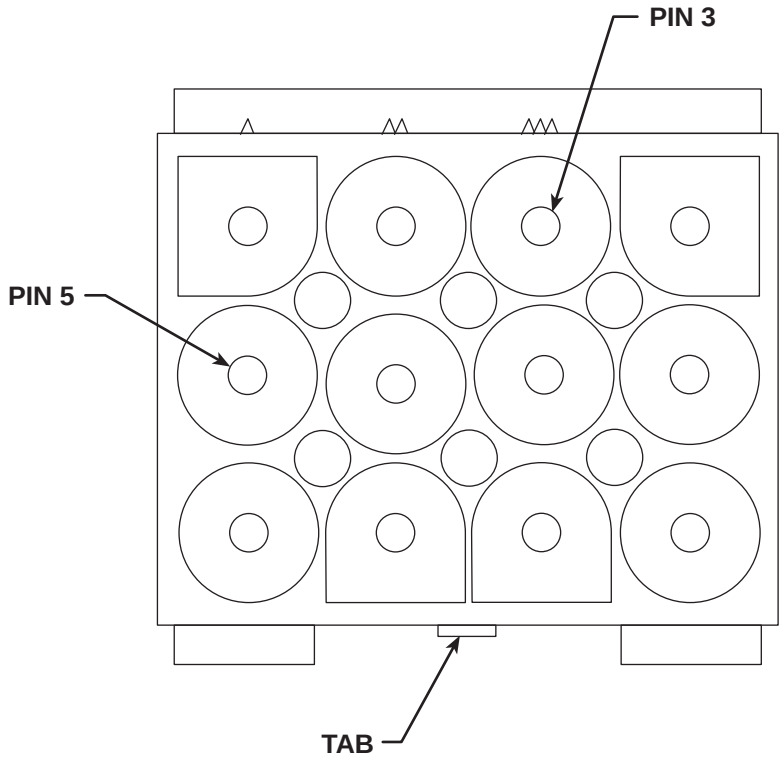
MAIN GENERATOR SHUNT FIELD WINDING TEST *(continued)*

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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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.

TEST 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” Nutdriver

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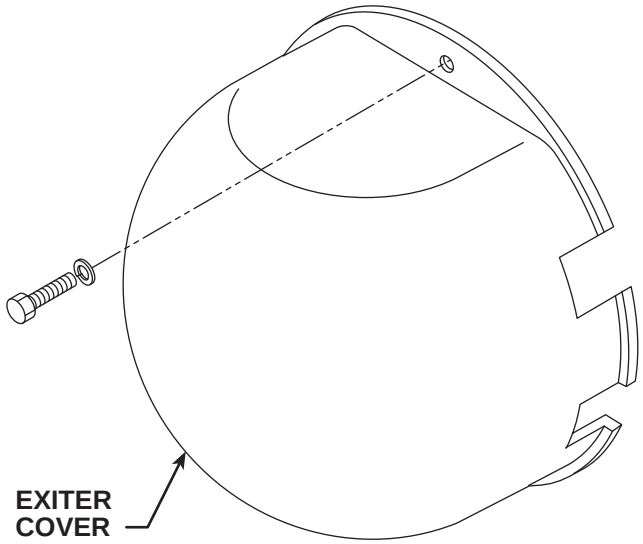
FLASHING THE FIELDS *(continued)*

FIGURE F.7 – EXCITER COVER REMOVAL



PROCEDURE

1. Turn the engine OFF.
2. Using a 3/8” Nutdriver, remove the exciter cover. See Figure F.7.

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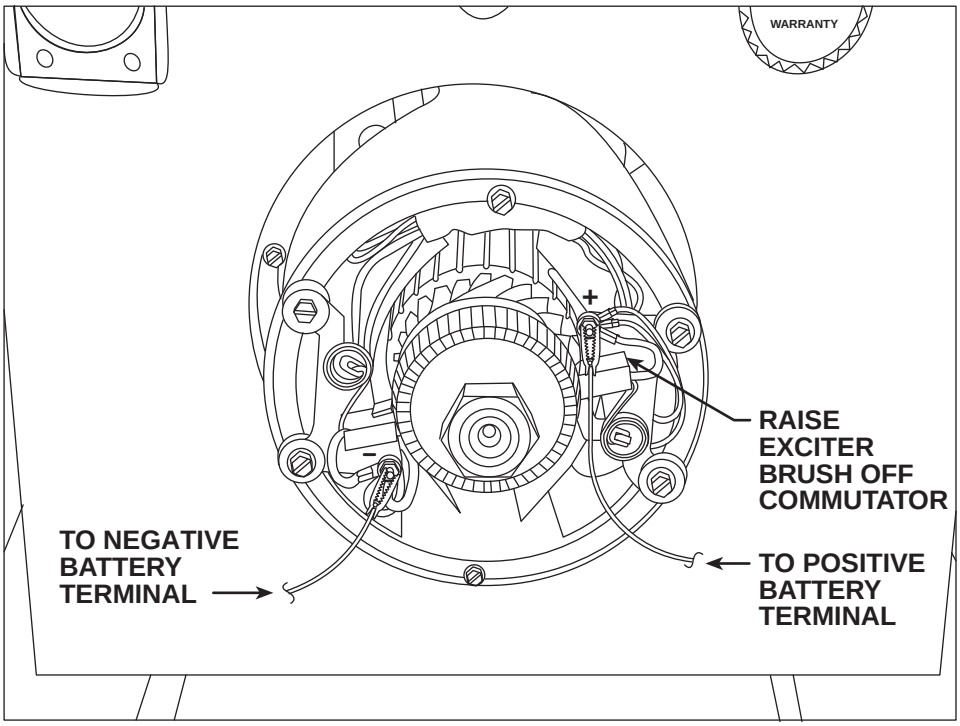
FLASHING THE FIELDS *(continued)*

FIGURE F.8 - 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.8.
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.8.
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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ENGINE ALTERNATOR TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will determine if the engine alternator is properly charging the battery.

MATERIALS NEEDED

Miscellaneous Hand Tools
Volt/Ohm Meter
Wiring Diagram

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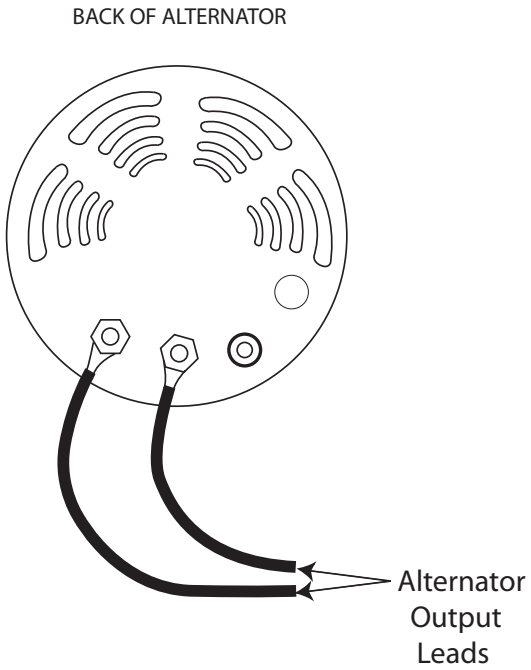
ENGINE ALTERNATOR TEST *(CONTINUED)*

FIGURE F.9 - ALTERNATOR LEAD LOCATIONS



TEST PROCEDURE

1. Turn the engine off.
2. Open the engine access door and check the voltage at the battery terminals. It should be approximately 12 volts DC.
3. Attach the meter leads to the battery terminals, being careful to position them so they stay clear of moving parts while the engine is running.
4. Place the idle switch in the “HIGH IDLE” position, start the engine, and allow it to run at high idle speed for about 15 to 30 seconds.
5. The meter should read about 13.7 to 14.2 VDC.
6. If the meter reads correctly the engine alternator is producing adequate power to charge the battery and this test is complete.
6. If the voltage is significantly higher than the above values, the alternator is not properly regulating the battery charging voltage and should be replaced. If the voltage reads the same or less than the measurement taken when the engine was not running, proceed with the following tests.
7. Turn off the engine, disconnect the meter from the battery, and open the engine access door on the left side of the machine.
8. Make sure the idle switch is still in the “high” position, start the engine, and allow it to run at high idle speed for about 15 to 30 seconds.
9. Place the negative meter probe on a good chassis ground, or the negative battery terminal. Place the positive meter probe on the battery terminal on the back of the alternator. (Lead #51). See Wiring Diagram.
10. The meter should read about 13.7 to 14.2 VDC.
11. Move the positive probe to the DT terminal on the back of the alternator. See Wiring Diagram.
12. The meter should read about 13.7 to 14.2 VDC.
13. If the meter reads correctly, check the connections between the alternator and the battery. See wiring diagram.
14. If the voltage at both of the above test points reads the same or less than the battery voltage measurement taken when the engine was not running, the alternator is defective. Repair or replace it.

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OIL PRESSURE - TEMPERATURE SWITCH TEST

⚠ WARNING

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

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

TEST DESCRIPTION

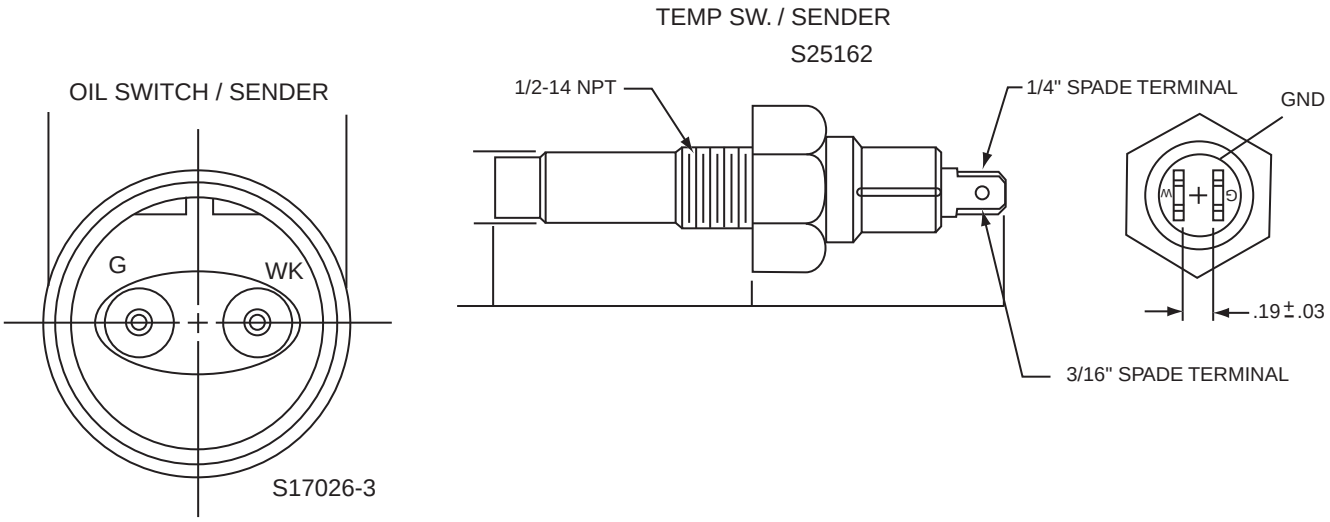
This test will determine if the Oil Pressure and/or Temperature Switch is functioning properly.

MATERIALS NEEDED

OhmMeter

OIL PRESSURE - TEMPERATURE SWITCH TEST *(CONTINUED)*

FIGURE F.10 - SWITCH



WK TERMINAL TO GROUND TO CASE AT 6 +/-2 PSI. OTHERWISE TERMINAL TO BE OPEN

Oil Pressure Switch/Sender Resistance Test. S17026-3 (Kubota and Perkins Only)

PROCEDURE

1. With the engine not running locate the Oil Pressure Switch/Sender.
2. Remove the two leads from the switch.
3. Using the ohmmeter check the resistance from terminal WK to case ground. This is a normally closed switch and should be at a very low resistance. (Less than 1 ohm)
4. Using the ohmmeter check the resistance from terminal G to case ground. This resistance should be approximately 10 ohms with zero PSI oil pressure.
5. With the engine running and an oil pressure of 6 PSI or greater the resistance from terminal WK to case ground should be very high. (open). While the engine is running if the oil pressure should drop below 6 PSI the switch would close and shut off the engine.
6. With the engine running the resistance from terminal G to case ground should be as follows.

- 0 PSI equals approximately 10 ohms
- 40 PSI equals approximately 105 ohms
- 80 PSI equals approximately 187 ohms

8. Replace the two leads previously removed.

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OIL PRESSURE - TEMPERATURE SWITCH TEST *(CONTINUED)*

Temperature Switch/Sender Resistance Test. S25162 (Kubota and Perkins Only)

PROCEDURE

1. With the engine not running, and at room temperature, locate the Temperature Switch/Sender.
2. Remove the two leads from the switch.
3. Using the ohmmeter check the resistance from terminal WK to case ground. This is a normally open switch and should read a very high resistance.
4. This switch should close at approximately 230F. This over temperature condition would shut off the engine.
5. Using the ohmmeter check the resistance from terminal G to case ground. At room temperature this resistance should be approximately 520 ohms.
6. With engine running the resistance from terminal G to case ground should be as follows.
   - 140F equals approximately 134 ohms
   - 194F equals approximately 51 ohms
   - 212F equals approximately 39 ohms
7. Replace the two leads previously removed.

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CURRENT SENSOR PCB 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

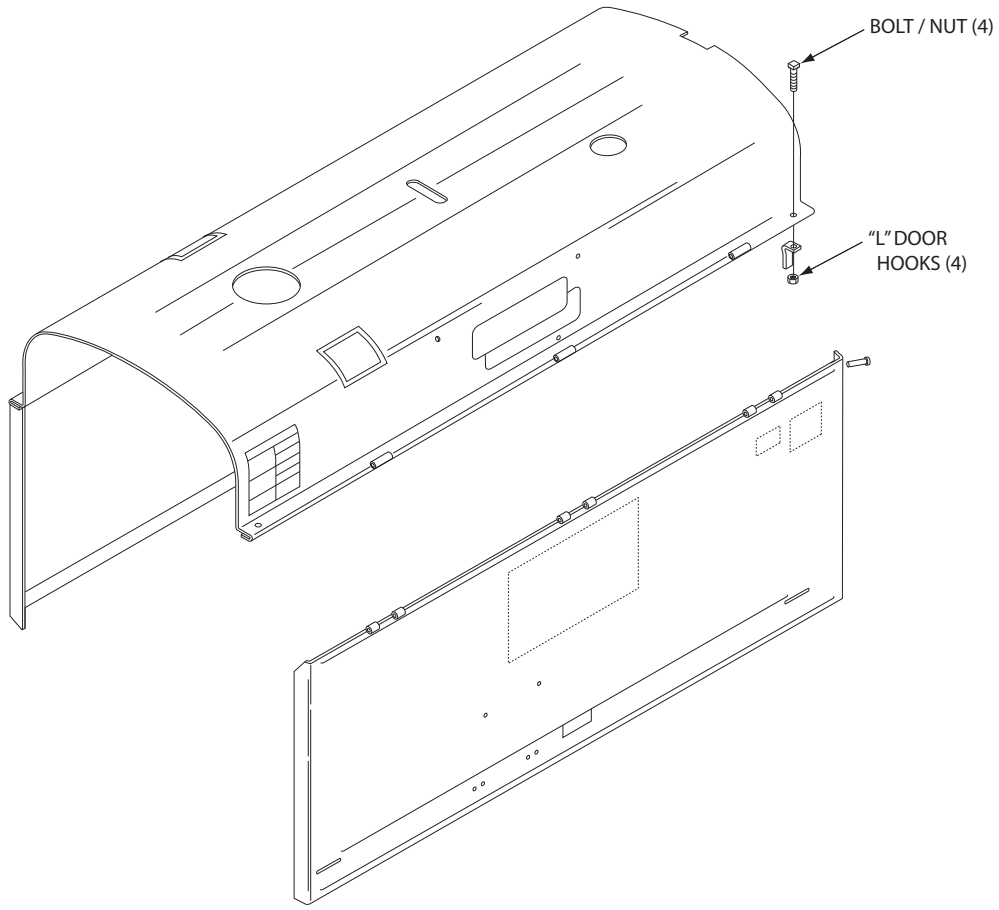
This test is used to quickly determine if the current sensor PCB is defective.

MATERIALS NEEDED

Volt/Ohm Meter
Wiring Diagram (See ***Electrical Diagrams*** section of this manual)

CURRENT SENSOR PCB TEST *(CONTINUED)*

FIGURE F.11 - CASE COVERS



PROCEDURE

1. Turn the engine off.
2. Remove the four nuts and bolts holding the case top and doors assembly to the welder frame. See Figure F.11.
3. Remove the rubber gasket from the top. Carefully lift up and remove the "L" shaped door hooks. Locate the Current Sensing P.C. Board on the inside of the front panel. ***See Figure F.12.***
4. Turn the engine on and record the voltage between pins 1 and 2 of J1. See Wiring Diagram. This voltage should be approximately 12 VDC (battery voltage).
5. Turn the engine back OFF and locate pins 4 and 2 on J1 of the Current Sensor PCB and place the Volt/Ohm Meter leads into the back of the molex plug.
6. Turn the engine on and record the voltage between pins 4 and 2 on J1. The Idler Switch must be in the "Auto" position. This voltage should be approximately 12 VDC (battery voltage). With the engine running load the 115 VDC auxiliary receptacle or strike an arc using either a load bank or the welding leads. Observe the Volt/Ohm Meter; the 12 VDC should drop to zero. If the 12 VDC drops to zero the current sensor PCB is operating correctly. If the voltage does not drop to zero replace the current sensor PCB.

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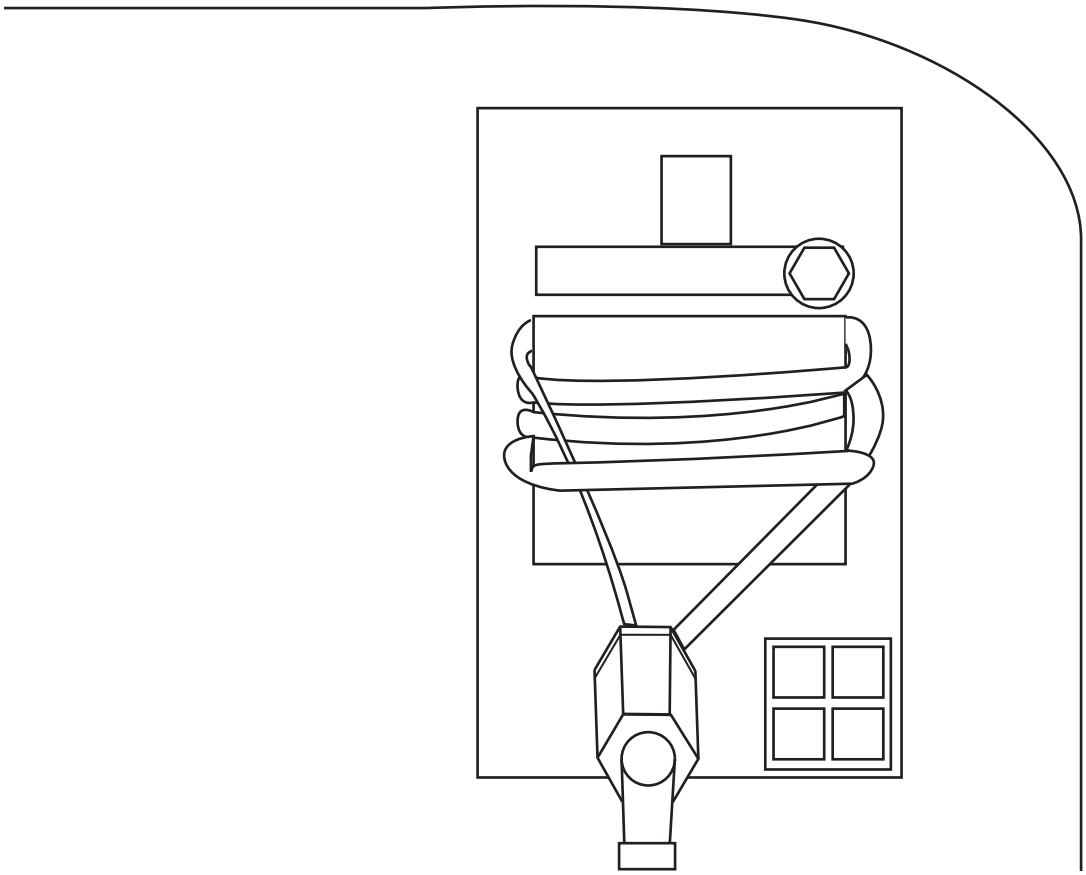
CURRENT SENSOR PCB TEST *(CONTINUED)*

FIGURE F.12 - CURRENT SENSING PCB



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ENGINE THROTTLE ADJUSTMENT TEST (PERKINS ONLY)

⚠ 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

If the machine output is low, or high, this test will determine whether 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

Miscellaneous Hand Tools
Strobe-tach, frequency counter, oscilloscope, white or red marking pencil

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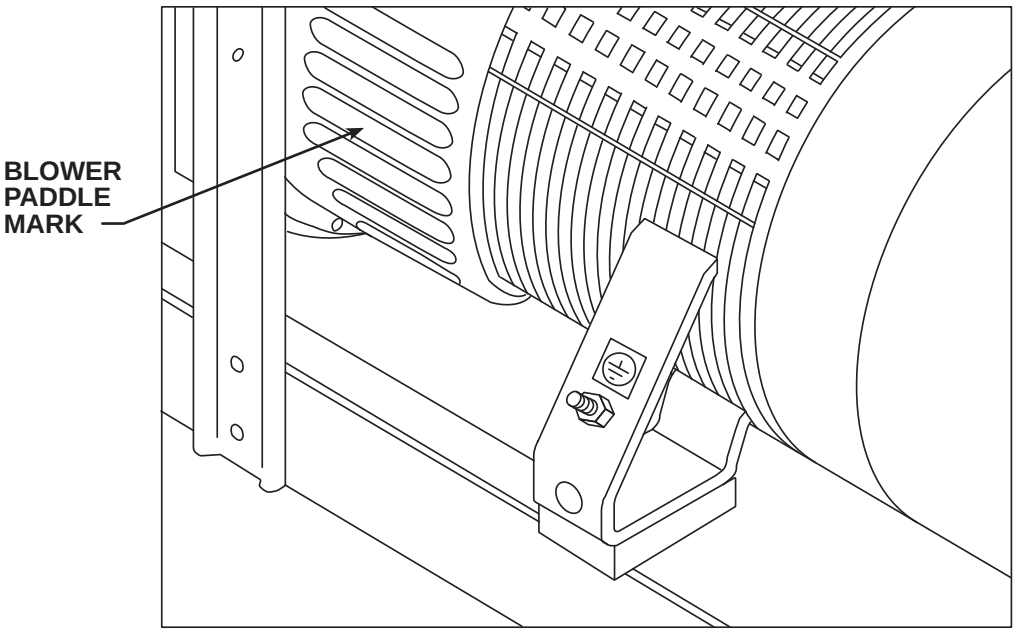
ENGINE THROTTLE ADJUSTMENT TEST *(CONTINUED)* (PERKINS ONLY)

FIGURE F.13 - BLOWER PADDLE MARK LOCATION



PROCEDURE

Strobe Tach Method

1. Turn the engine off.
2. Unlatch, lift and secure the right side door.

   Note: Latches are located at both ends of the door.
3. Using a white or red marking pencil, place a mark on one of the blower paddles or on the side of the flywheel. See Figure F.13 for location.
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. Synchronize it to the rotating mark.

   With the machine at HIGH IDLE the tach should read between 1540 and 1650 RPM.

   With the machine at LOW IDLE the tach should read between 1375 and 1425 RPM.

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ENGINE THROTTLE ADJUSTMENT TEST *(CONTINUED)* (PERKINS ONLY)

PROCEDURE

6. If either of the readings is incorrect, adjust the throttle as follows:

Adjust HIGH IDLE:

The Engine is Preset at factory. Contact Perkins @ 1-888-737-5364 or www.perkins.com

Adjust LOW IDLE:

First make sure there is no load on the machine. Set the IDLE switch to AUTO and wait for the engine to change to low idle speed.

Use the 7/16" wrench to loosen the solenoid idle rod locking nut. See ***Figures F.13 & F.14*** Turn the rod to change the amount of throw in the lever arm, until the tach reads between 1375 and 1425 RPM. Retighten the locking nut. Make sure the lever arm does not contact low speed adjustment stop. Back stop out if necessary.

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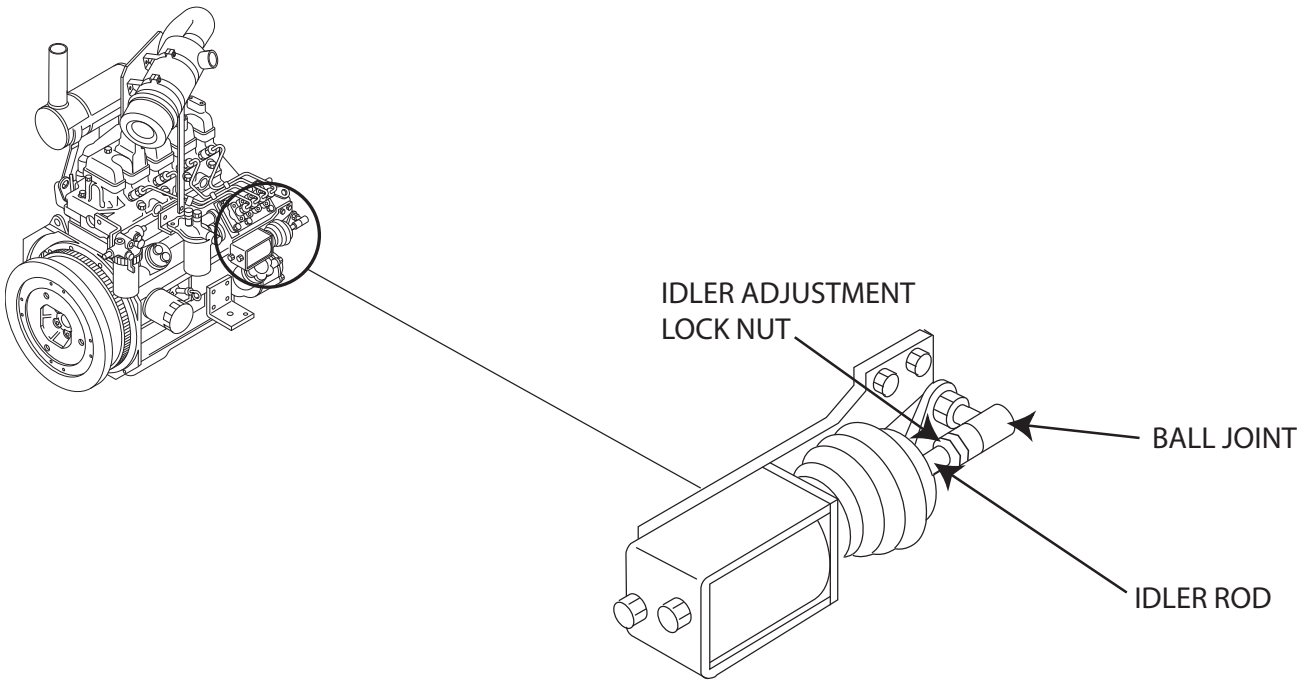
ENGINE THROTTLE ADJUSTMENT TEST *(CONTINUED)*
(PERKINS ONLY)

FIGURE F.14 – SOLENOID LOCATION



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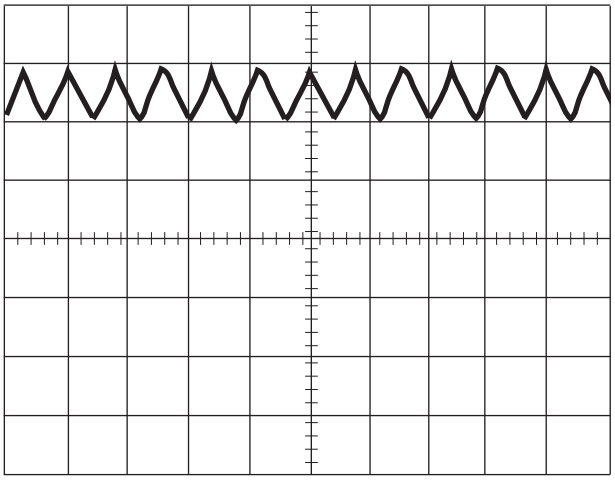
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (115VDC SUPPLY)

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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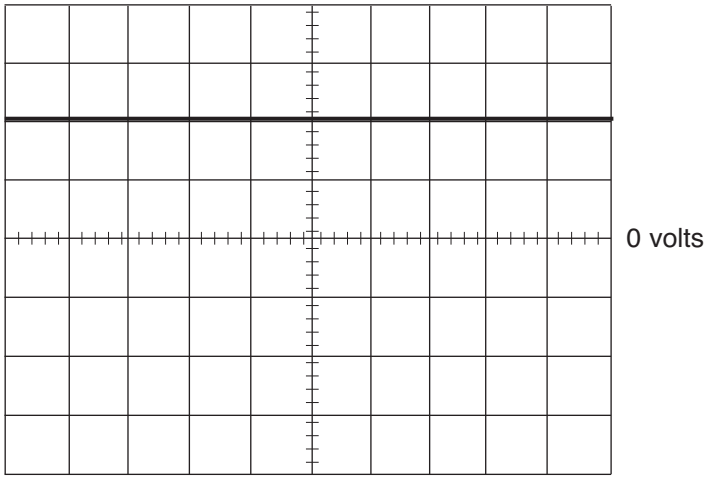
NORMAL OPEN CIRCUIT DC WELD VOLTAGE WAVEFORM

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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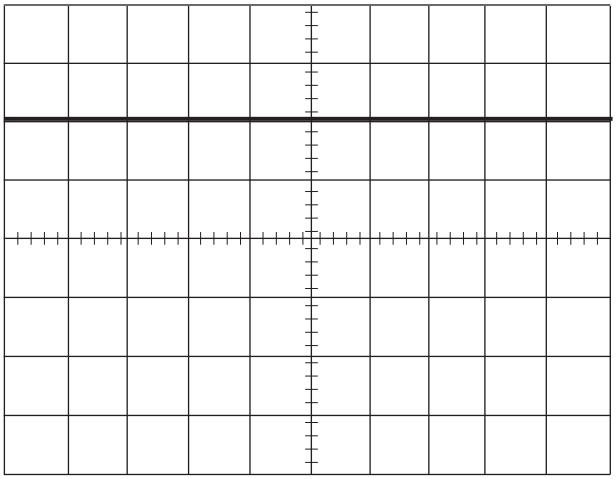
TYPICAL DC WELD VOLTAGE WAVEFORM

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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DC EXCITER ARMATURE & FIELD COILS REMOVAL AND REPLACEMENT PROCEDURE

⚠ 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 exciter armature and field coils.

MATERIALS NEEDED

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

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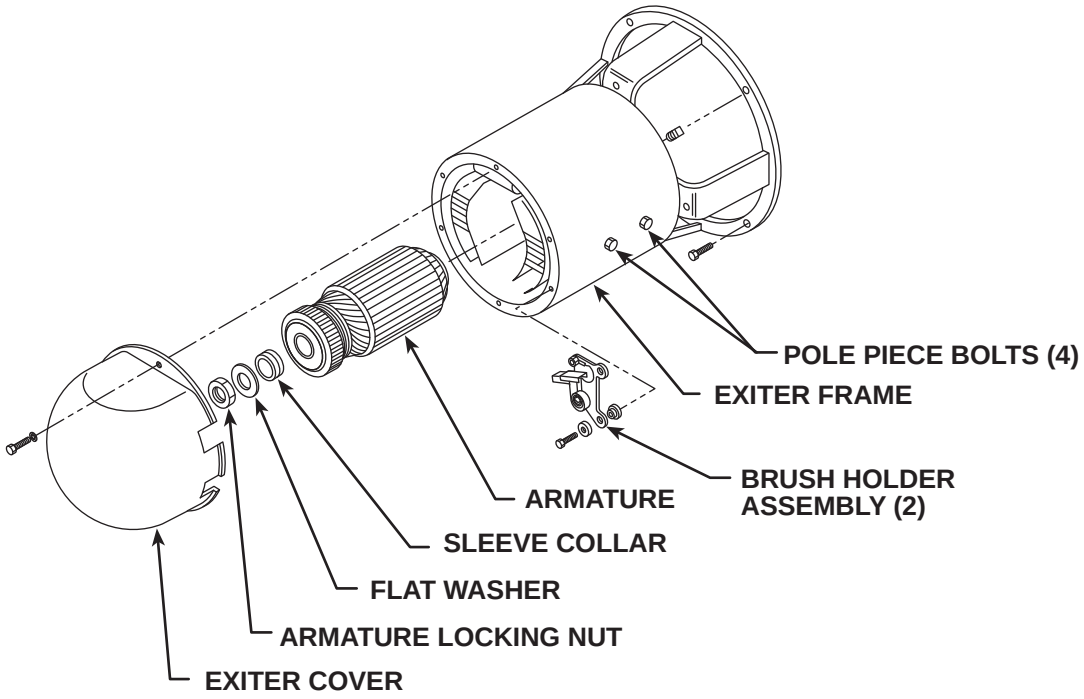
DC EXCITER ARMATURE & FIELD COILS REMOVAL AND REPLACEMENT PROCEDURE

FIGURE F.15 – 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.15.
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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DC EXCITER ARMATURE & FIELD COILS REMOVAL AND REPLACEMENT PROCEDURE

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.15.***
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 PROCEDURE

⚠ 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

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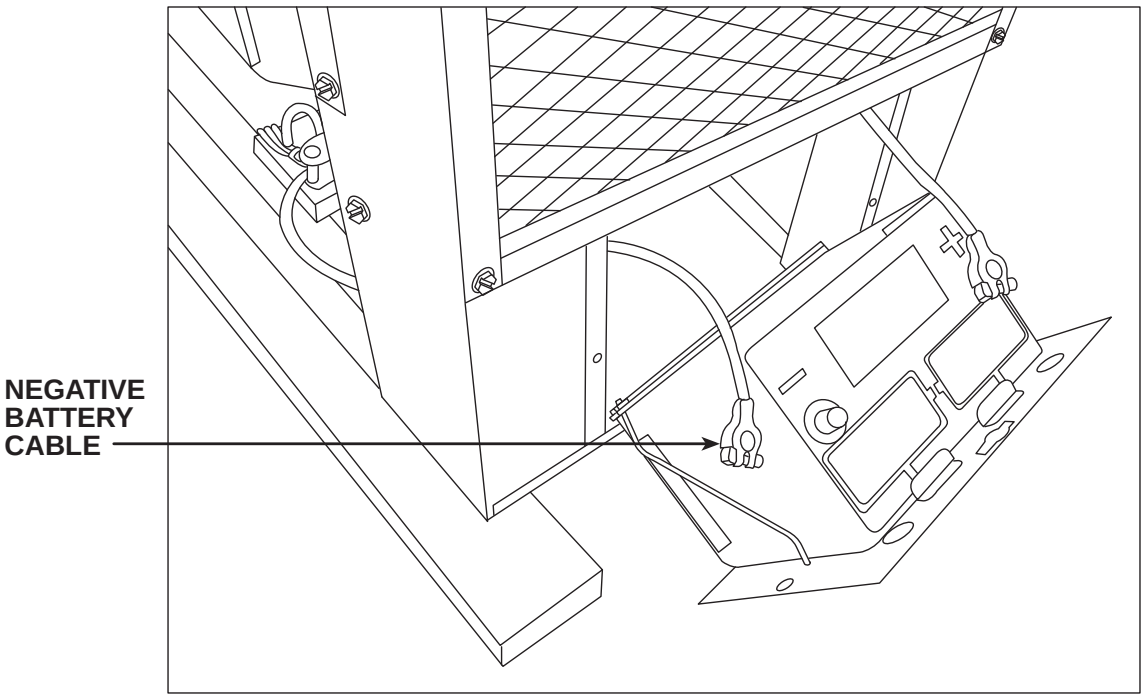
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.16 – 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.16.
3. Using the 1/2” wrench, remove the negative battery cable.

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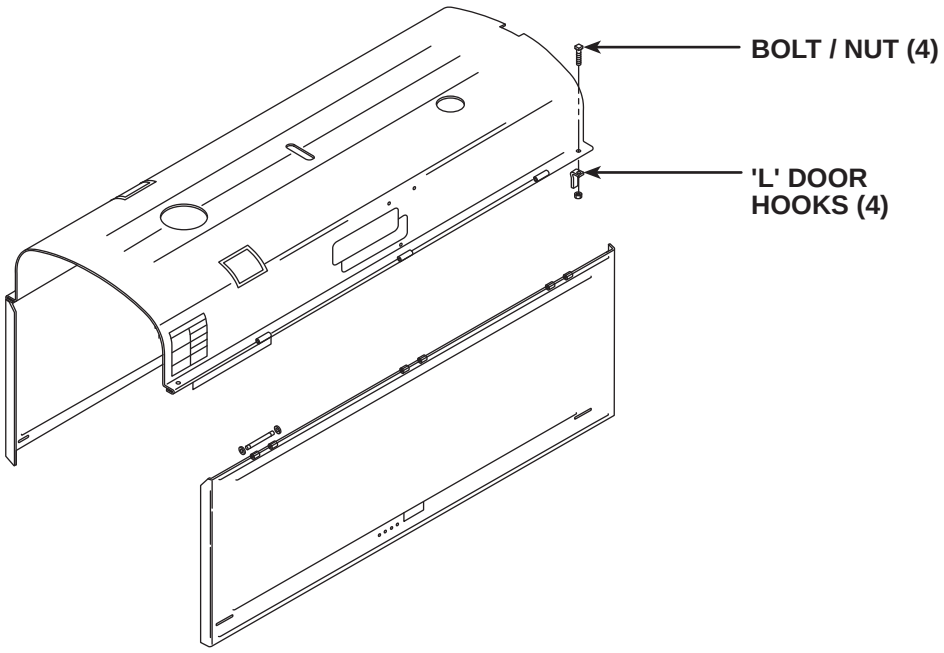
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.17 – 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.17.

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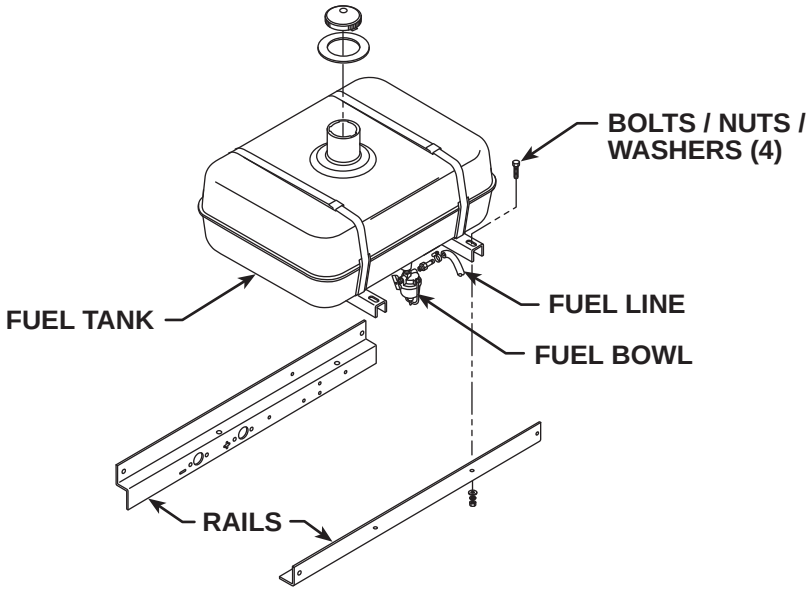
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.18 – 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.18.
8. Carefully remove the fuel tank and set it aside in a safe area.

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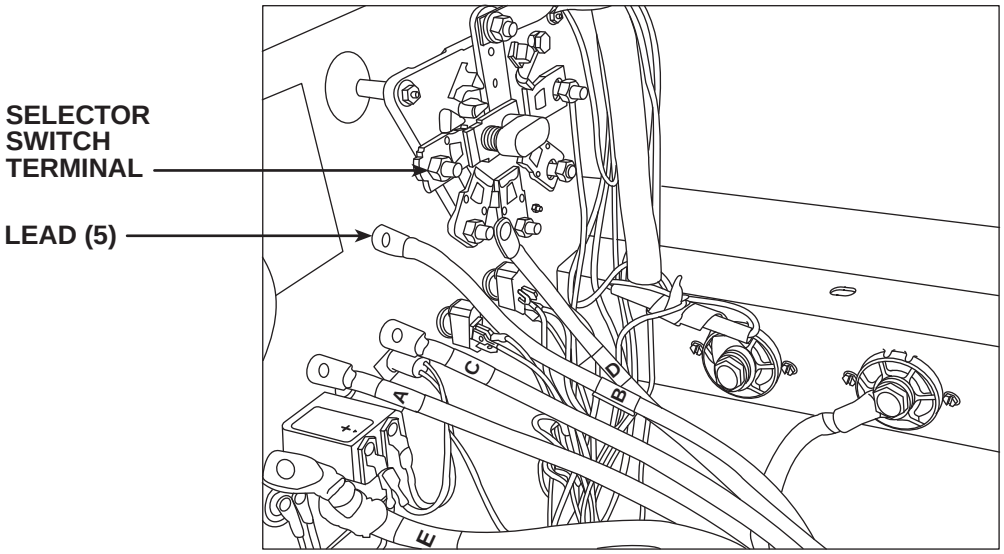
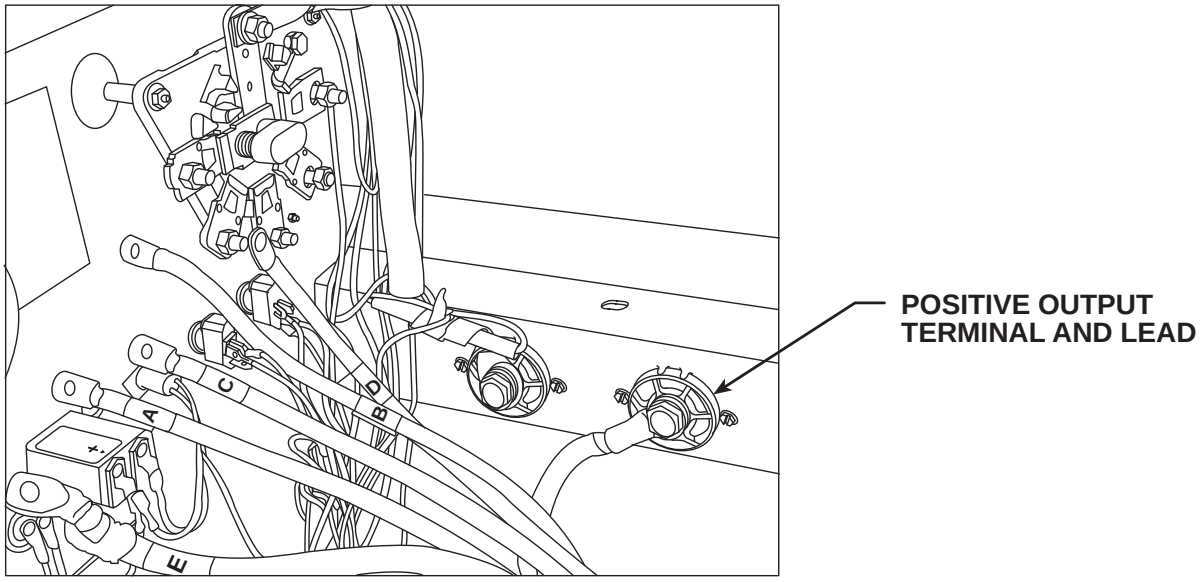
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.19 – SELECTOR SWITCH LEAD REMOVAL



9. Using the 1/2” wrench, remove the five heavy flex leads from the selector switch terminals. Label the leads for reassembly. See Figure F.19.

FIGURE F.20 – OUTPUT TERMINAL LEAD REMOVAL



10. Using the 3/4” wrench, remove the copper strap from the negative output terminal. See Figure F.20.

11. Using the 3/4” wrench, remove the heavy lead from the positive output terminal. See Figure F. 20.

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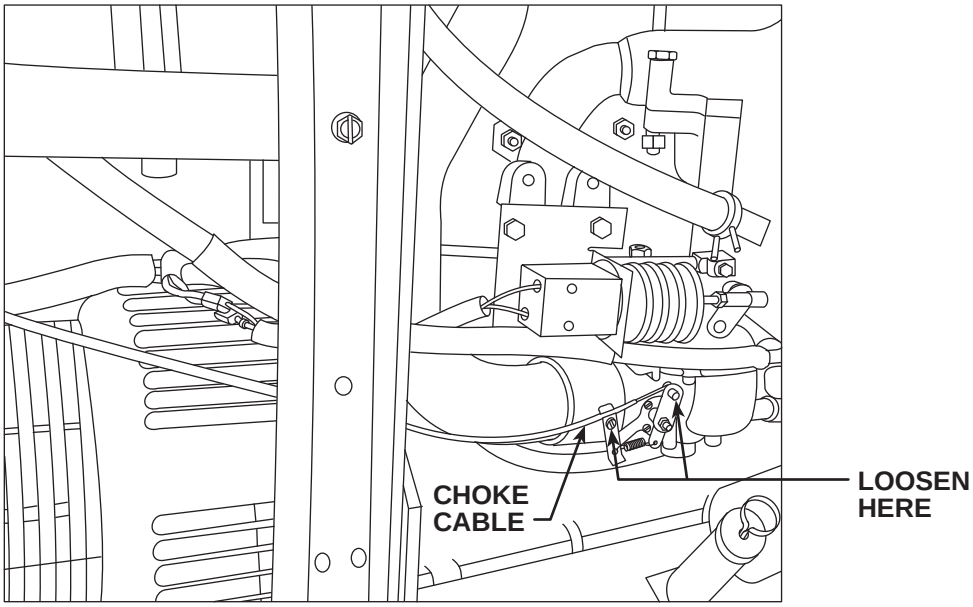
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

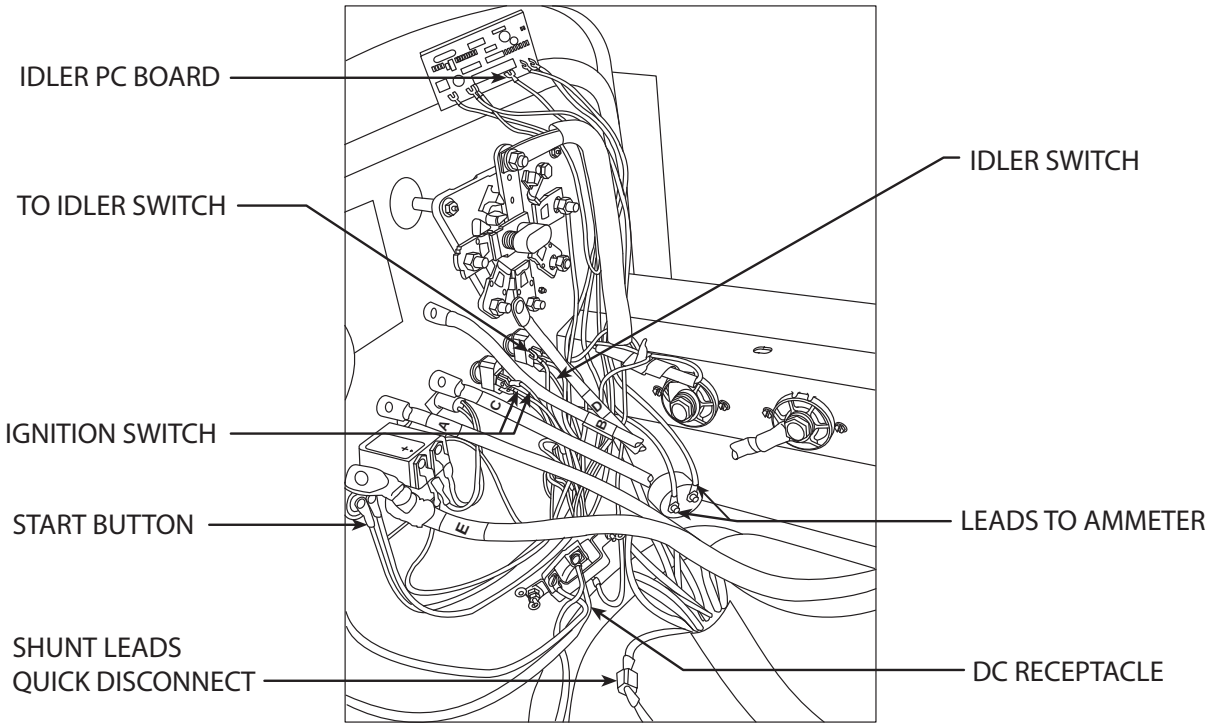
FIGURE F.21 – CHOKE CONTROL CABLE REMOVAL



12. Using the slot head screw driver, remove the choke control cable from the engine carburetor assembly. Mark cable replacement for reassembly. See Figure F.21.

MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.22 – 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.22 and the Wiring Diagram. Cut any necessary cable ties.
14. Remove the leads connecting the idler PC board to the DC exciter. See Figure F.22 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 leads from the START button switch. See Figure F.22 and the Wiring Diagram.
17. Remove the leads from the ignition switch. Label for reassembly. See Figure F.22 and the Wiring Diagram.
18. Using the 3/8” nut driver, remove the leads from the ammeter. Label for reassembly. See Figure F.22 and the Wiring Diagram.
19. Label and remove the leads from the idler switch. See Figure F.22 and the Wiring Diagram.
20. Remove leads from the Idler Solenoid. See Wiring Diagram.

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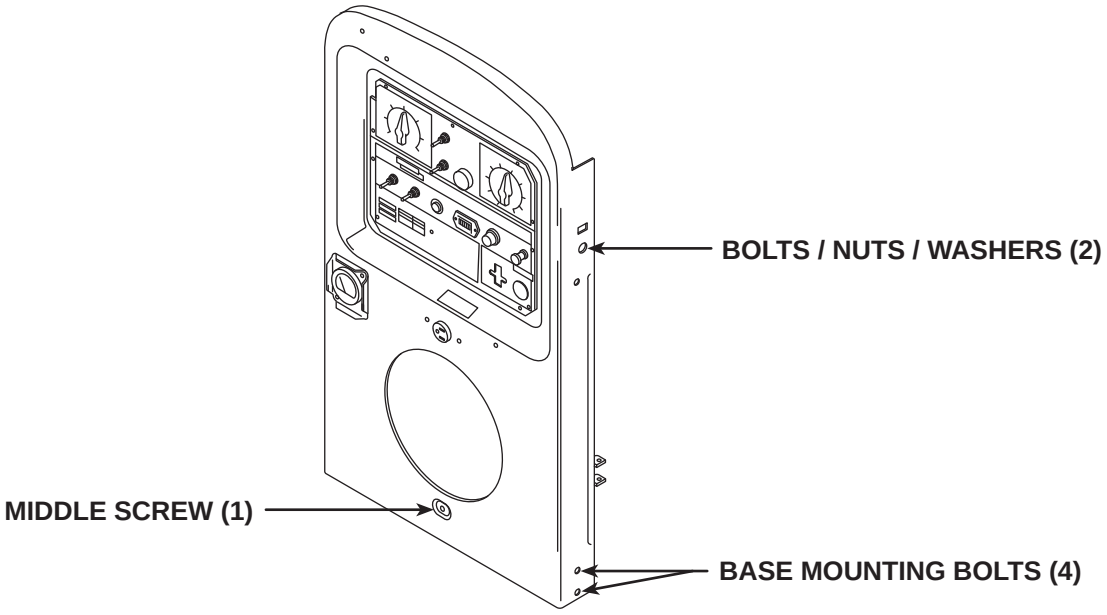
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.23 – 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.23.
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.23.
25. Using the 3/8” nut driver, remove the screw from the lower middle of the front panel. See Figure F.23.
26. Carefully remove the front panel assembly.

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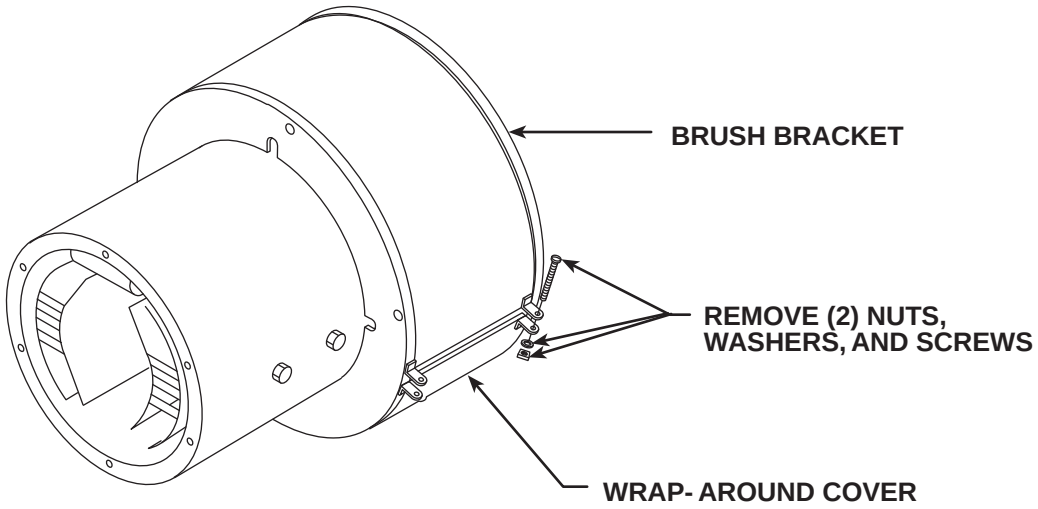
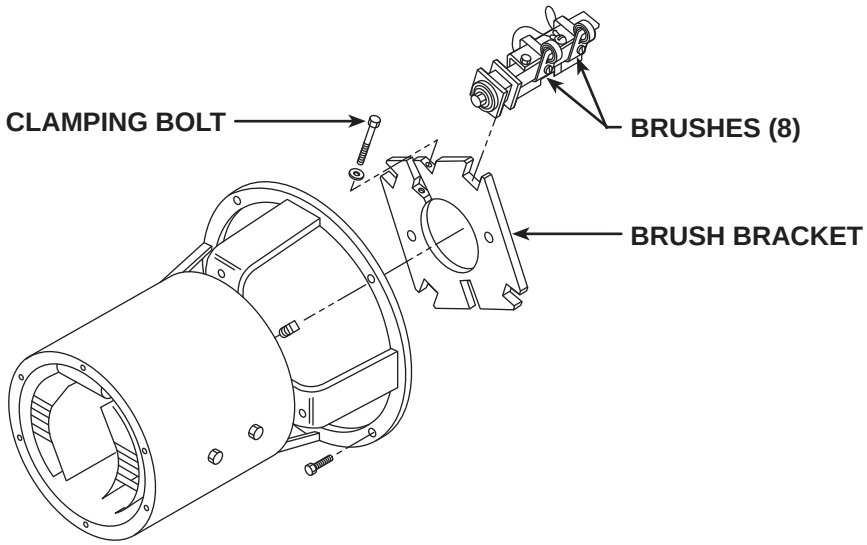
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.24 – 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.24.

FIGURE F.25 – 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.25.

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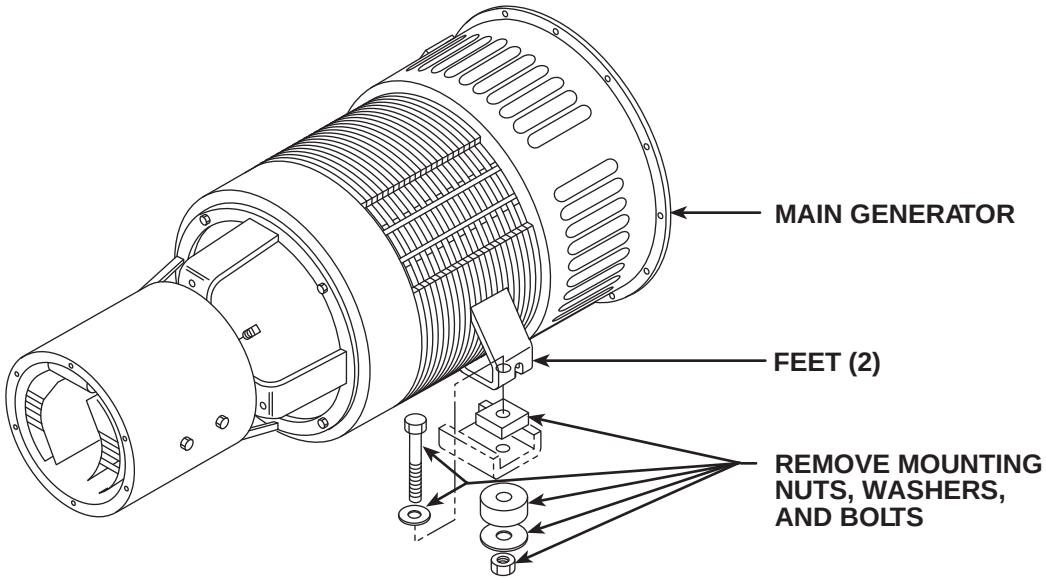
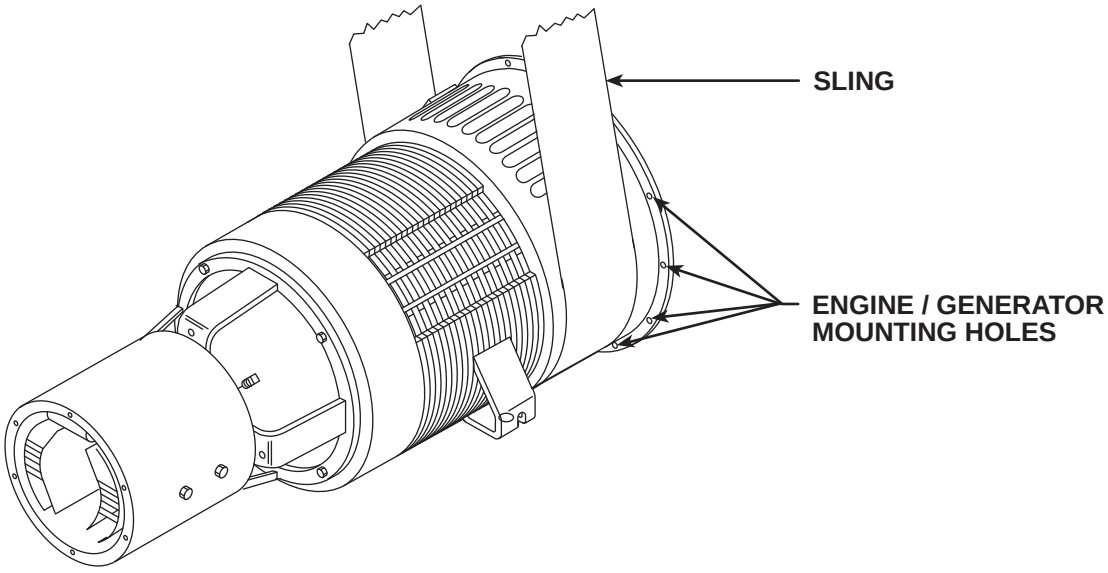
MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.26 – 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.26.

FIGURE F.27 – 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.27.

32. Using the 9/16" wrench, remove the bolts and lock washers mounting the generator frame to the engine. See Figure F.27.

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MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE *(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.26 & F.27*** *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. Reconnect all leads previously removed. See the Wiring Diagram.
8. 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.
9. Perform the ***DC Exciter Armature Reassembly Procedure.***
10. 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.
11. 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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MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT PROCEDURE

⚠ 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

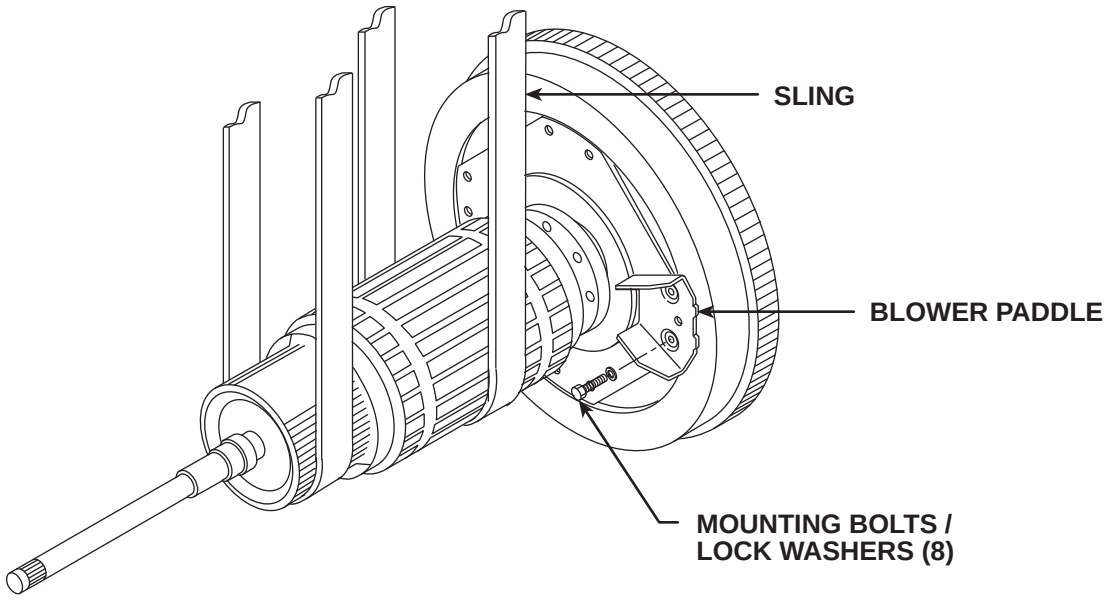
This procedure will aid the technician in the removal and replacement of the main armature.

MATERIALS NEEDED

Rope sling
5/8” Wrench
Wood or steel blocks

MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT PROCEDURE

FIGURE F.28 – 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.28.
7. With the armature supported and “balanced” in the rope sling, carefully rotate the armature 1/8 turn in either direction to release it.

⚠ CAUTION

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

Replacement: *Refer to Figure F.28*

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

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RETEST AFTER REPAIR

Retest a machine:

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

OR

- If you repair or replace any electrical components.

ENGINE OUTPUT

Engine	Mode	No Load RPM	Load RPM
Perkins	Low Idle	1375-1425	NA
Perkins	High Idle	1540-1650	1450-1600
Kubota	Low Idle	1390-1410	NA
Kubota	High Idle	1580-1600	1550-1600
GM (Gas)	Low Idle	1340-1360	NA
GM (Gas)	High Idle	1580-1600	1550-1600

WELDER DC OUTPUT

Current Control Rheostat	Current Selector Switch	Open Circuit Voltage	Load Volts	Load Amps
Maximum	Maximum	88-98	33-39	300

DC AUXILIARY POWER RECEPTACLE OUTPUT

Open Circuit Voltage	Load Volts	Load Amps
124-138	115-130	15.0

FIELD AMPS AND VOLTS (Current Rheostat at Maximum)

Exciter DC Volts	Main Shunt Field Amps	RPM
123 - 137	2.10-2.70	1540-1600

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*** NOTE:** Many PC Board Assemblies are now totally encapsulated, surface mounted and or multi-layered and are therefore considered to be unserviceable. Assembly drawings of these boards are no longer provided.

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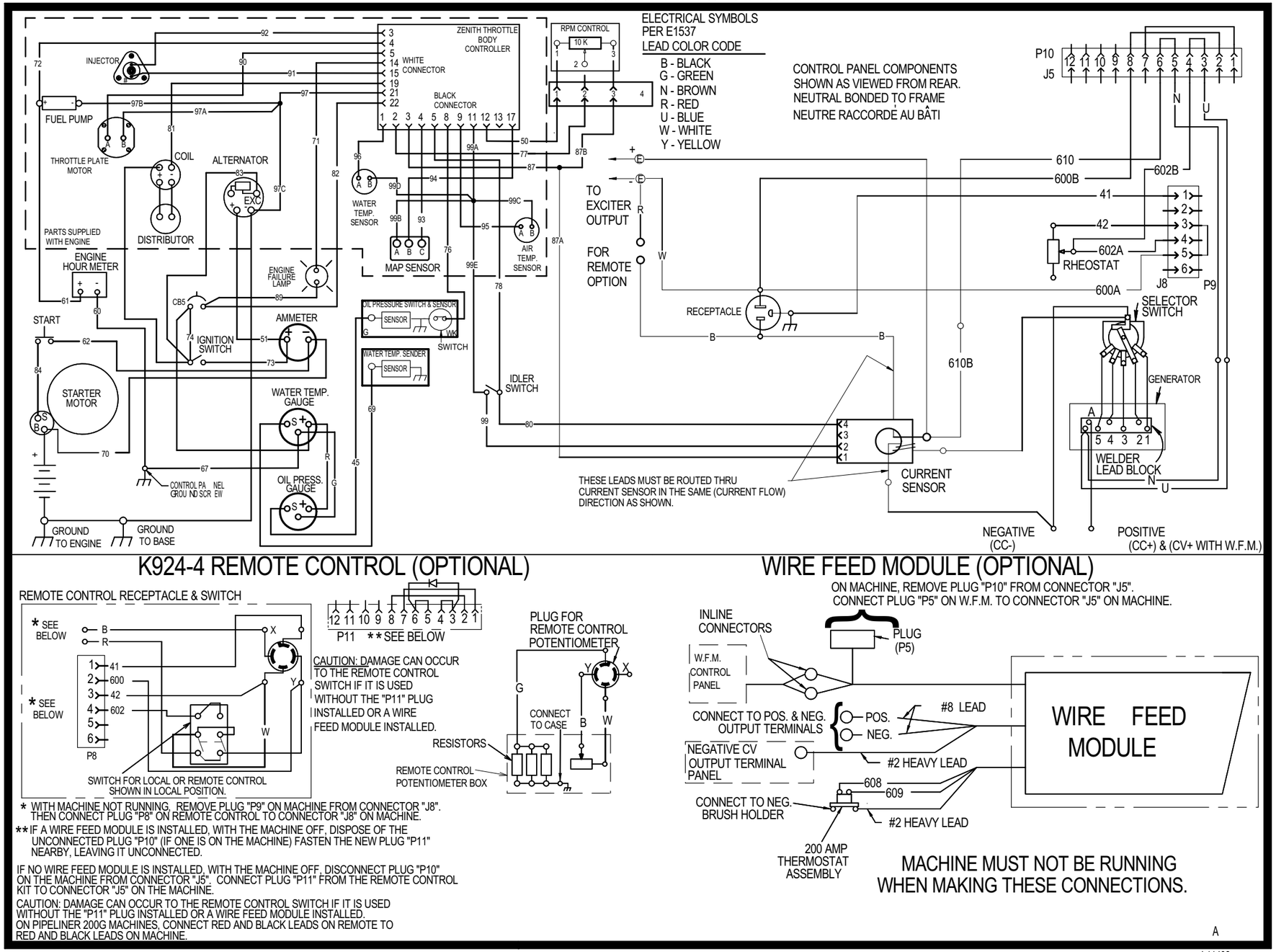
WIRING DIAGRAM - CODE 10660 - (L11402)

PIPELINER 200G WIRING DIAGRAM



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

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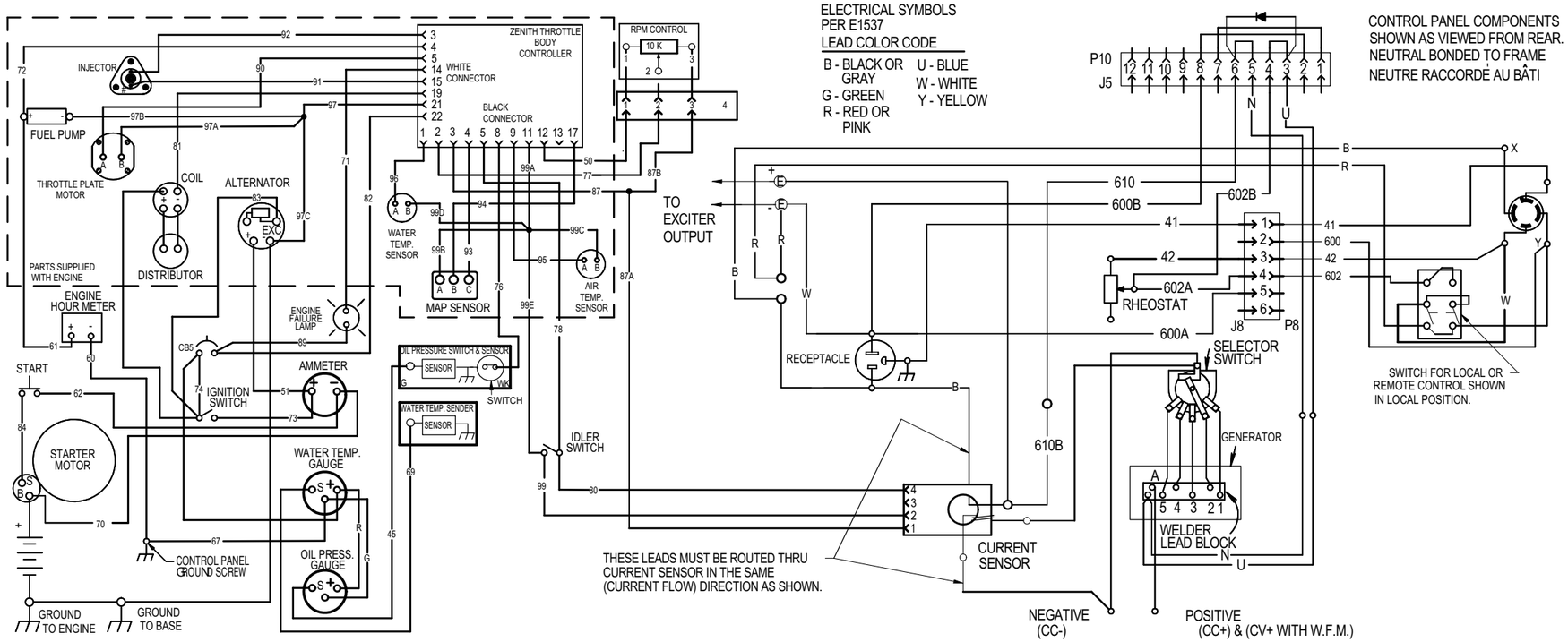
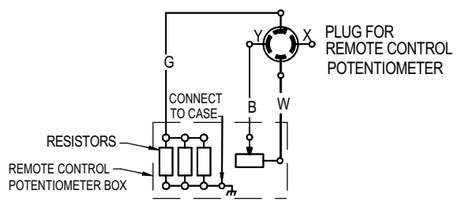
WIRING DIAGRAM - CODE 10913, 11136 - (L11864)

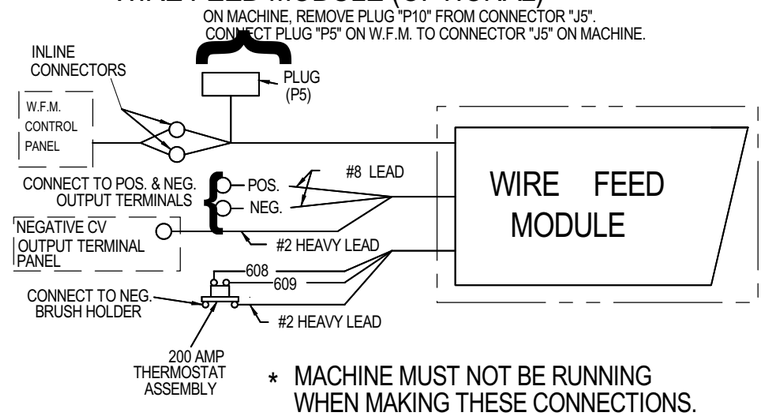
PIPELINER 200G WIRING DIAGRAM



K924-5 REMOTE CONTROL (OPTIONAL)



WIRE FEED MODULE (OPTIONAL)



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L11864

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

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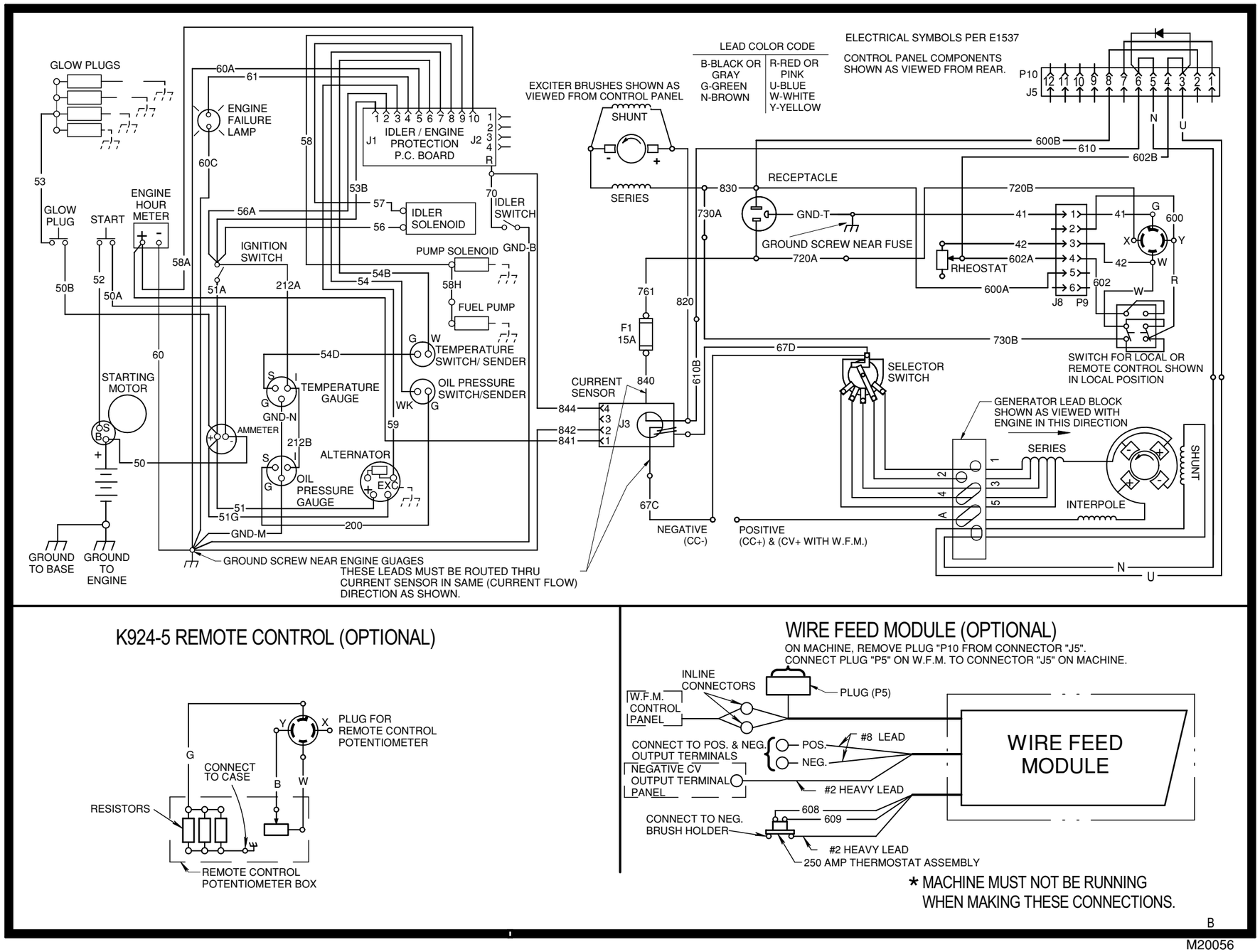
WIRING DIAGRAM - CODE 10929 - (M20056)

PIPELINER 200D WIRING DIAGRAM



K924-5 REMOTE CONTROL (OPTIONAL)

WIRE FEED MODULE (OPTIONAL)

ON MACHINE, REMOVE PLUG "P10 FROM CONNECTOR "J5".
CONNECT PLUG "P5" ON W.F.M. TO CONNECTOR "J5" ON MACHINE.

* MACHINE MUST NOT BE RUNNING WHEN MAKING THESE CONNECTIONS.

B

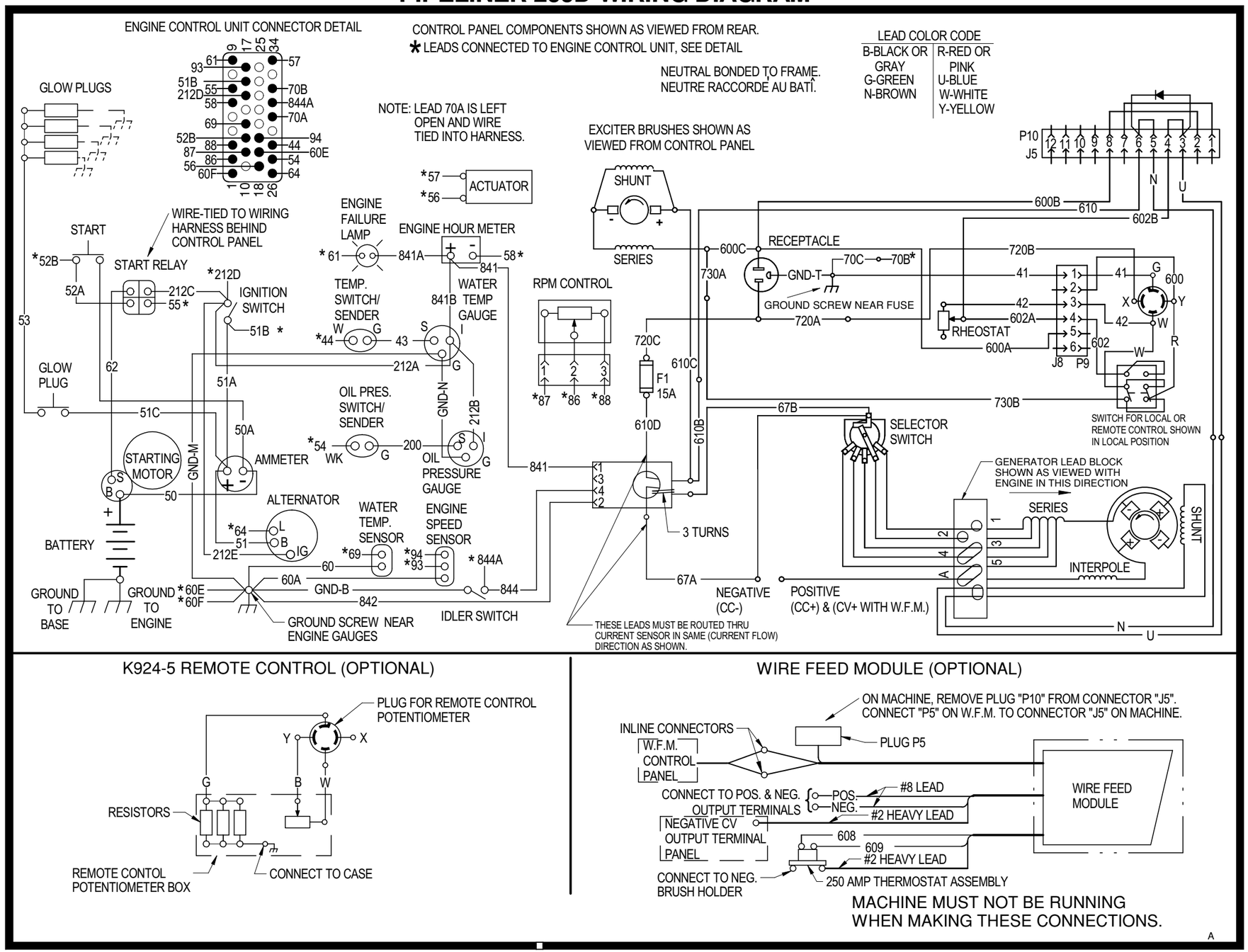
M20056

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.

Return to Section TOC
Return to Master TOC

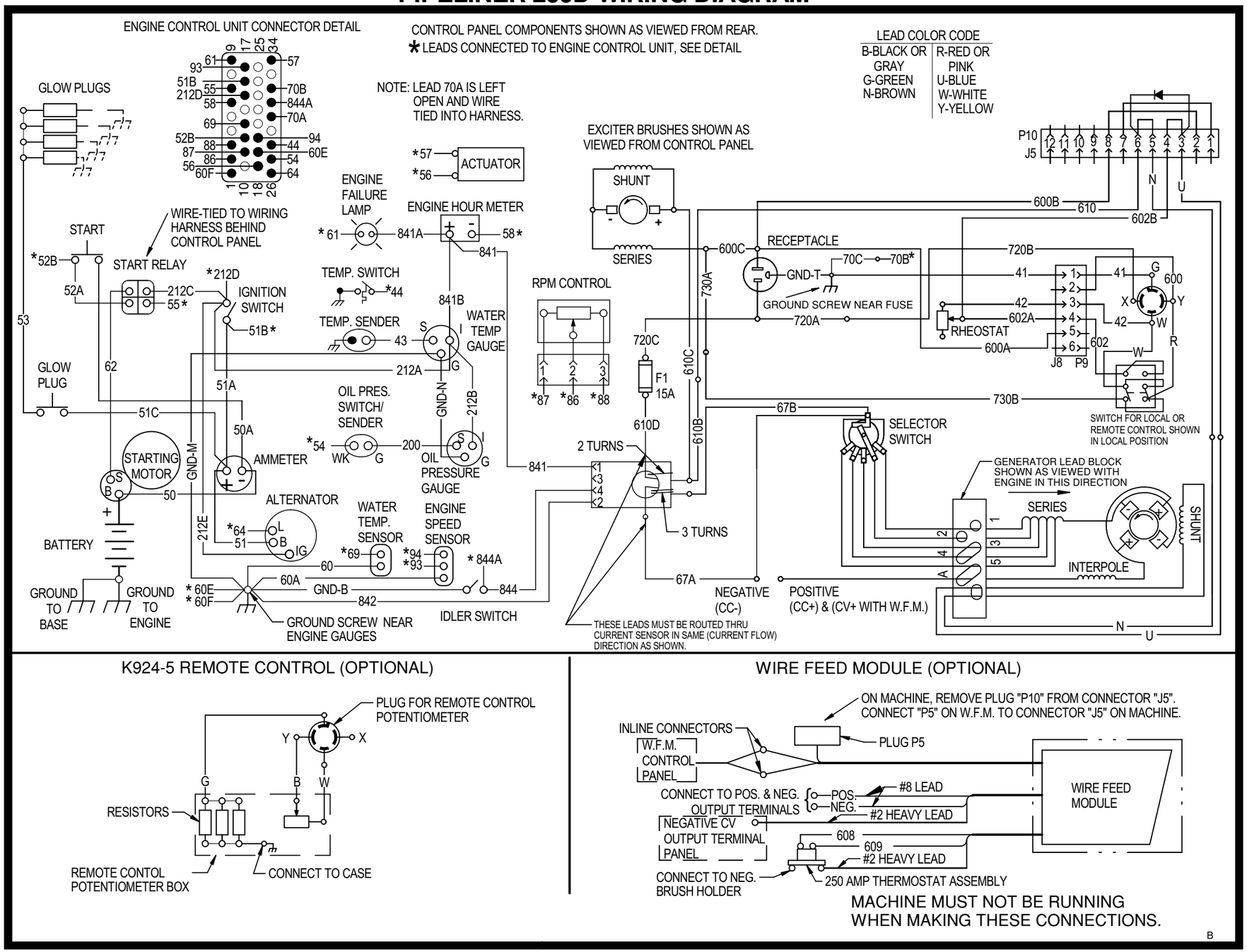
WIRING DIAGRAM - CODE 11114, 11316 - (M20464)

PIPELINER 200D WIRING DIAGRAM



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

PIPELINER 200D WIRING DIAGRAM

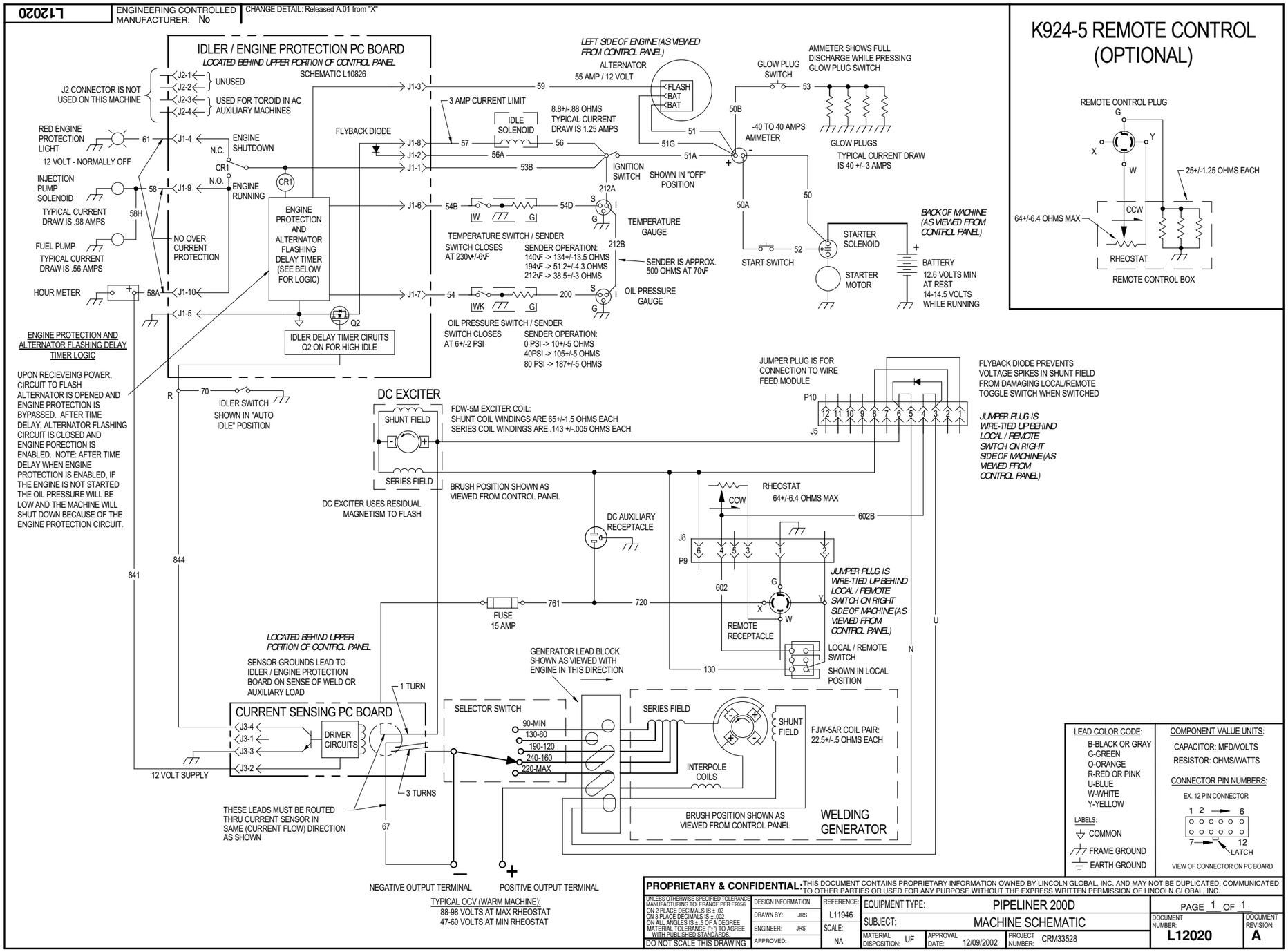


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC

SCHEMATIC -COMPLETE MACHINE - CODE 10929 - (L12020)

L12020 | ENGINEERING CONTROLLED | MANUFACTURER: No | CHANGE DETAIL: Released A.01 from "X"

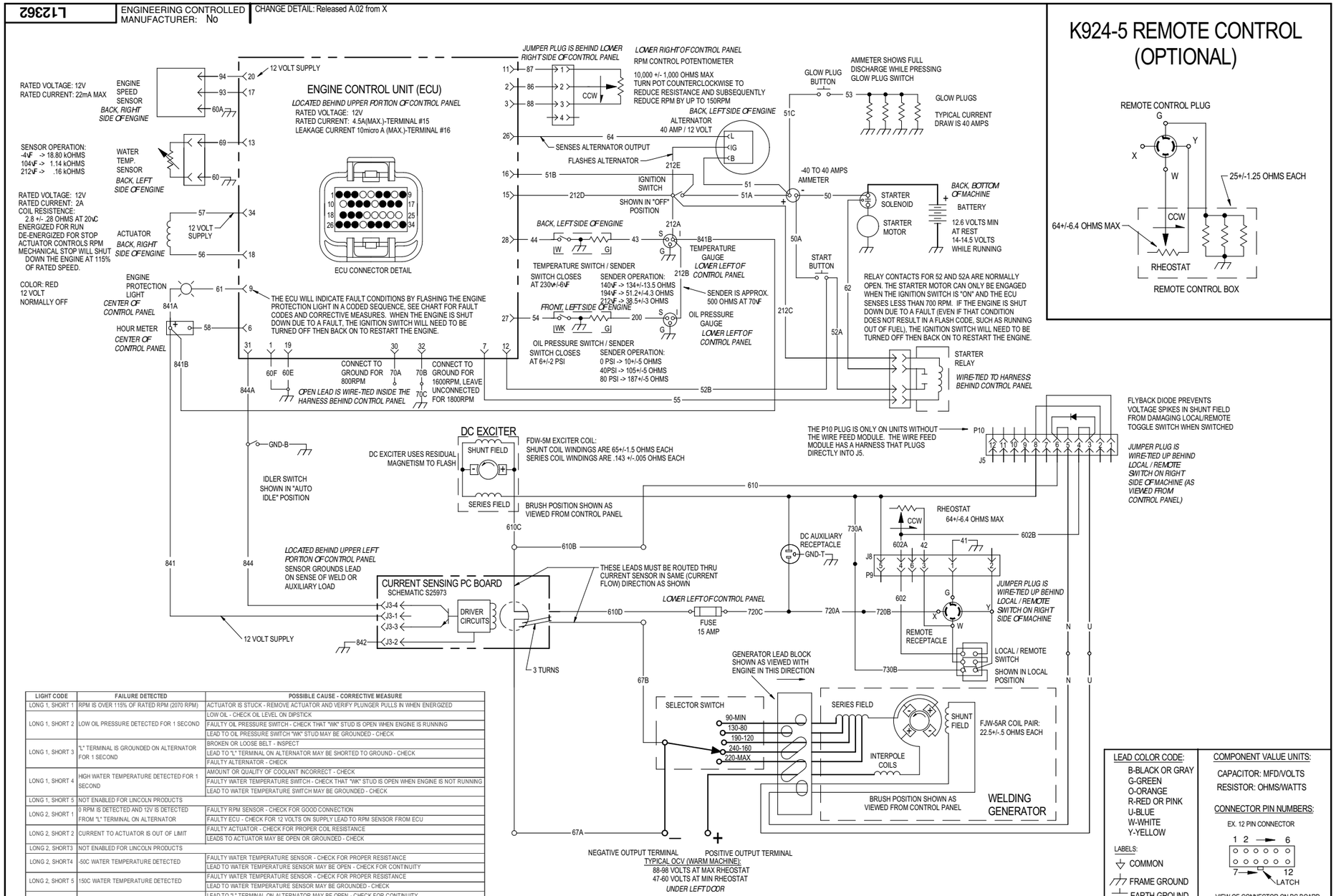


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - COMPLETE MACHINE - CODE 11114, 11316 - (L12362)

L12362 | ENGINEERING CONTROLLED | MANUFACTURER: No | CHANGE DETAIL: Released A.02 from X



LIGHT CODE	FAILURE DETECTED	POSSIBLE CAUSE - CORRECTIVE MEASURE
LONG 1, SHORT 1	RPM IS OVER 115% OF RATED RPM (2070 RPM)	ACTUATOR IS STUCK - REMOVE ACTUATOR AND VERIFY PLUNGER PULLS IN WHEN ENERGIZED
LONG 1, SHORT 2	LOW OIL PRESSURE DETECTED FOR 1 SECOND	LOW OIL - CHECK OIL LEVEL ON DIPSTICK
		FAULTY OIL PRESSURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS RUNNING
		LEAD TO OIL PRESSURE SWITCH "WK" STUD MAY BE GROUNDED - CHECK
LONG 1, SHORT 3	"L" TERMINAL IS GROUNDED ON ALTERNATOR FOR 1 SECOND	BROKEN OR LOOSE BELT - INSPECT
		LEAD TO "L" TERMINAL ON ALTERNATOR MAY BE SHORTED TO GROUND - CHECK
		FAULTY ALTERNATOR - CHECK
LONG 1, SHORT 4	HIGH WATER TEMPERATURE DETECTED FOR 1 SECOND	AMOUNT OR QUALITY OF COOLANT INCORRECT - CHECK
		FAULTY WATER TEMPERATURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS NOT RUNNING
		LEAD TO WATER TEMPERATURE SWITCH MAY BE GROUNDED - CHECK
LONG 1, SHORT 5	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT 1	0 RPM IS DETECTED AND 12V IS DETECTED FROM "L" TERMINAL ON ALTERNATOR	FAULTY RPM SENSOR - CHECK FOR GOOD CONNECTION
		FAULTY ECU - CHECK FOR 12 VOLTS ON SUPPLY LEAD TO RPM SENSOR FROM ECU
LONG 2, SHORT 2	CURRENT TO ACTUATOR IS OUT OF LIMIT	FAULTY ACTUATOR - CHECK FOR PROPER COIL RESISTANCE
		LEADS TO ACTUATOR MAY BE OPEN OR GROUNDED - CHECK
LONG 2, SHORT3	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT4	-50C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE
		LEAD TO WATER TEMPERATURE SENSOR MAY BE OPEN - CHECK FOR CONTINUITY
LONG 2, SHORT 5	150C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE
		LEAD TO WATER TEMPERATURE SENSOR MAY BE GROUNDED - CHECK
LONG 2, SHORT 6	0 VOLTS DETECTED FROM "L" TERMINAL ON ALTERNATOR FOR 1 SECOND	LEAD TO "L" TERMINAL ON ALTERNATOR MAY BE OPEN - CHECK FOR CONTINUITY
		BROKEN OR LOOSE BELT - INSPECT
		FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 7	OVER 18 VOLTS DETECTED FROM ALTERNATOR	INCORRECT BATTERY - INSPECT
		FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 8	LESS THAN 4 VOLTS TO RPM SENSOR AND/OR ACTUATOR SENSED BY ECU	FAULTY ECU - CHECK FOR 12 VOLTS ON LEADS TO RPM SENSOR AND ACTUATOR FROM ECU

LEAD COLOR CODE:
B-BLACK OR GRAY
G-GREEN
O-ORANGE
R-RED OR PINK
U-BLUE
W-WHITE
Y-YELLOW

LABELS:
COMMON
FRAME GROUND
EARTH GROUND

COMPONENT VALUE UNITS:
CAPACITOR: MFD/VOLTS
RESISTOR: OHMS/WATTS

CONNECTOR PIN NUMBERS:
EX. 12 PIN CONNECTOR
VIEW OF CONNECTOR ON PC BOARD

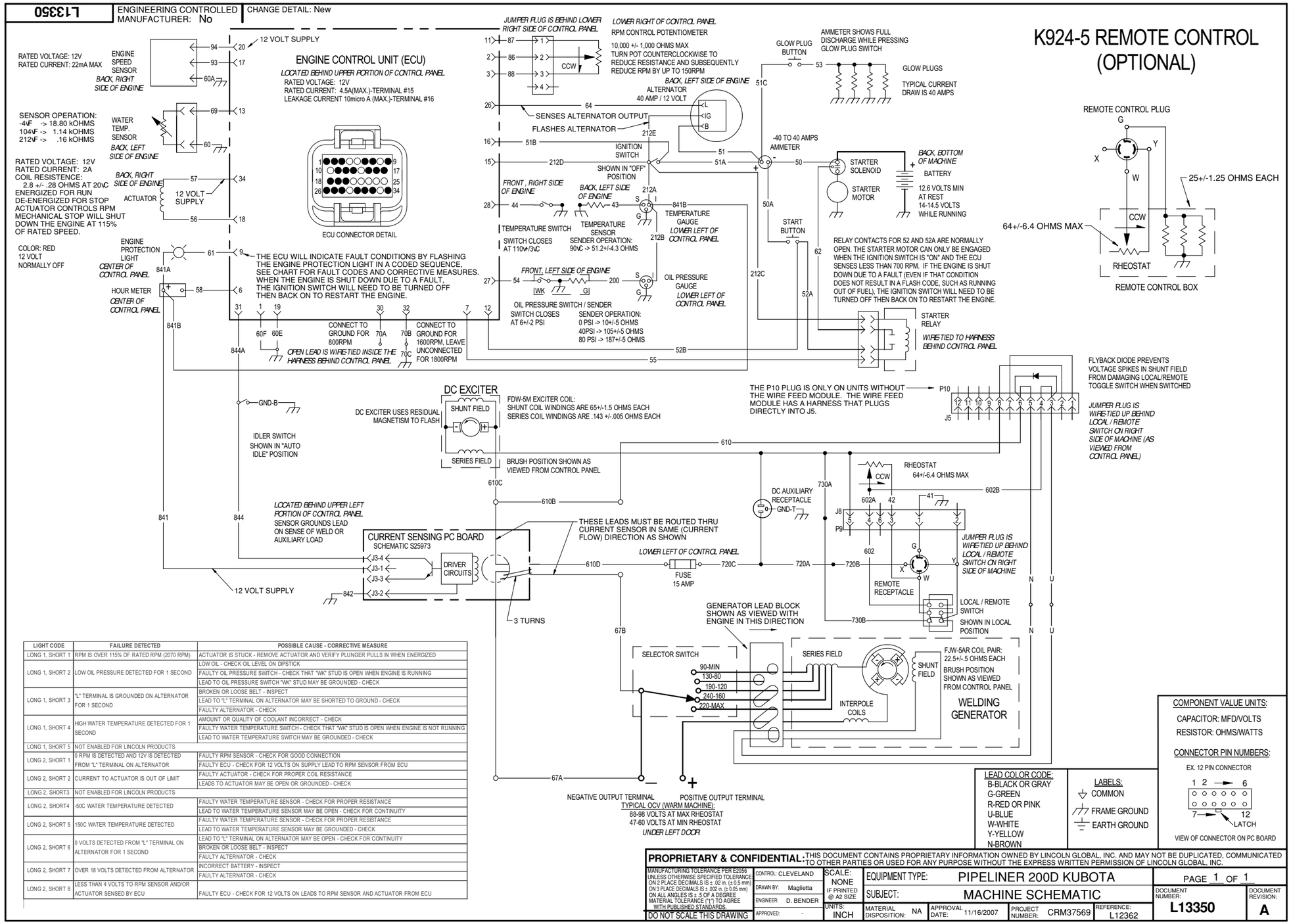
UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("±") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION	
DRAWN BY:	DM
ENGINEER:	J. STAPP
APPROVED:	
REFERENCE:	L12020
SCALE:	NA
EQUIPMENT TYPE:	PIPELINER 200D (KUBOTA V2203M)
SUBJECT:	MACHINE SCHEMATIC
MATERIAL DISPOSITION:	UF
APPROVAL DATE:	08/04/2004
PROJECT NUMBER:	CRM35581
PAGE	1 OF 1
DOCUMENT NUMBER:	L12362
DOCUMENT REVISION:	A

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

SCHEMATIC - COMPLETE MACHINE - CODE 11471 - (L13350)

L13350 | ENGINEERING CONTROLLED | MANUFACTURER: No | CHANGE DETAIL: New



LIGHT CODE	FAILURE DETECTED	POSSIBLE CAUSE - CORRECTIVE MEASURE
LONG 1, SHORT 1	RPM IS OVER 115% OF RATED RPM (2070 RPM)	ACTUATOR IS STUCK - REMOVE ACTUATOR AND VERIFY PLUNGER PULLS IN WHEN ENERGIZED
LONG 1, SHORT 2	LOW OIL PRESSURE DETECTED FOR 1 SECOND	LOW OIL - CHECK OIL LEVEL ON DIPSTICK
		FAULTY OIL PRESSURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS RUNNING
		LEAD TO OIL PRESSURE SWITCH "WK" STUD MAY BE GROUNDED - CHECK
LONG 1, SHORT 3	"L" TERMINAL IS GROUNDED ON ALTERNATOR FOR 1 SECOND	BROKEN OR LOOSE BELT - INSPECT
		LEAD TO "L" TERMINAL ON ALTERNATOR MAY BE SHORTED TO GROUND - CHECK
		FAULTY ALTERNATOR - CHECK
LONG 1, SHORT 4	HIGH WATER TEMPERATURE DETECTED FOR 1 SECOND	AMOUNT OR QUALITY OF COOLANT INCORRECT - CHECK
		FAULTY WATER TEMPERATURE SWITCH - CHECK THAT "WK" STUD IS OPEN WHEN ENGINE IS NOT RUNNING
		LEAD TO WATER TEMPERATURE SWITCH MAY BE GROUNDED - CHECK
LONG 1, SHORT 5	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT 1	0 RPM IS DETECTED AND 12V IS DETECTED FROM "L" TERMINAL ON ALTERNATOR	FAULTY RPM SENSOR - CHECK FOR GOOD CONNECTION
		FAULTY ECU - CHECK FOR 12 VOLTS ON SUPPLY LEAD TO RPM SENSOR FROM ECU
LONG 2, SHORT 2	CURRENT TO ACTUATOR IS OUT OF LIMIT	FAULTY ACTUATOR - CHECK FOR PROPER COIL RESISTANCE
		LEADS TO ACTUATOR MAY BE OPEN OR GROUNDED - CHECK
LONG 2, SHORT3	NOT ENABLED FOR LINCOLN PRODUCTS	
LONG 2, SHORT4	-50C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE
		LEAD TO WATER TEMPERATURE SENSOR MAY BE OPEN - CHECK FOR CONTINUITY
LONG 2, SHORT 5	150C WATER TEMPERATURE DETECTED	FAULTY WATER TEMPERATURE SENSOR - CHECK FOR PROPER RESISTANCE
		LEAD TO WATER TEMPERATURE SENSOR MAY BE GROUNDED - CHECK
LONG 2, SHORT 6	0 VOLTS DETECTED FROM "L" TERMINAL ON ALTERNATOR FOR 1 SECOND	LEAD TO "L" TERMINAL ON ALTERNATOR MAY BE OPEN - CHECK FOR CONTINUITY
		BROKEN OR LOOSE BELT - INSPECT
		FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 7	OVER 18 VOLTS DETECTED FROM ALTERNATOR	INCORRECT BATTERY - INSPECT
		FAULTY ALTERNATOR - CHECK
LONG 2, SHORT 8	LESS THAN 4 VOLTS TO RPM SENSOR AND/OR ACTUATOR SENSED BY ECU	FAULTY ECU - CHECK FOR 12 VOLTS ON LEADS TO RPM SENSOR AND ACTUATOR FROM ECU

LEAD COLOR CODE:
B-BLACK OR GRAY
G-GREEN
R-RED OR PINK
U-BLUE
W-WHITE
Y-YELLOW
N-BROWN

LABELS:
COMMON
FRAME GROUND
EARTH GROUND

COMPONENT VALUE UNITS:
CAPACITOR: MFD/VOLTS
RESISTOR: OHMS/WATTS

CONNECTOR PIN NUMBERS:
EX. 12 PIN CONNECTOR
1 2 → 6
7 → 12
LATCH
VIEW OF CONNECTOR ON PC BOARD

MANUFACTURING TOLERANCE PER E2056 UNLESS OTHERWISE SPECIFIED TOLERANCE ON 2 PLACE DECIMALS IS ± .02 in. (±0.5 mm) ON 3 PLACE DECIMALS IS ± .002 in. (±0.05 mm) ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("*") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

CONTROL:	CLEVELAND
DRAWN BY:	Maglietta
ENGINEER:	D. BENDER
APPROVED:	-

SCALE: NONE (IF PRINTED @ A2 SIZE)
UNITS: INCH

EQUIPMENT TYPE: PIPELINER 200D KUBOTA
SUBJECT: MACHINE SCHEMATIC
MATERIAL DISPOSITION: NA | APPROVAL DATE: 11/16/2007 | PROJECT NUMBER: CRM37569 | REFERENCE: L12362

PAGE 1 OF 1
DOCUMENT NUMBER: L13350
DOCUMENT REVISION: A

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

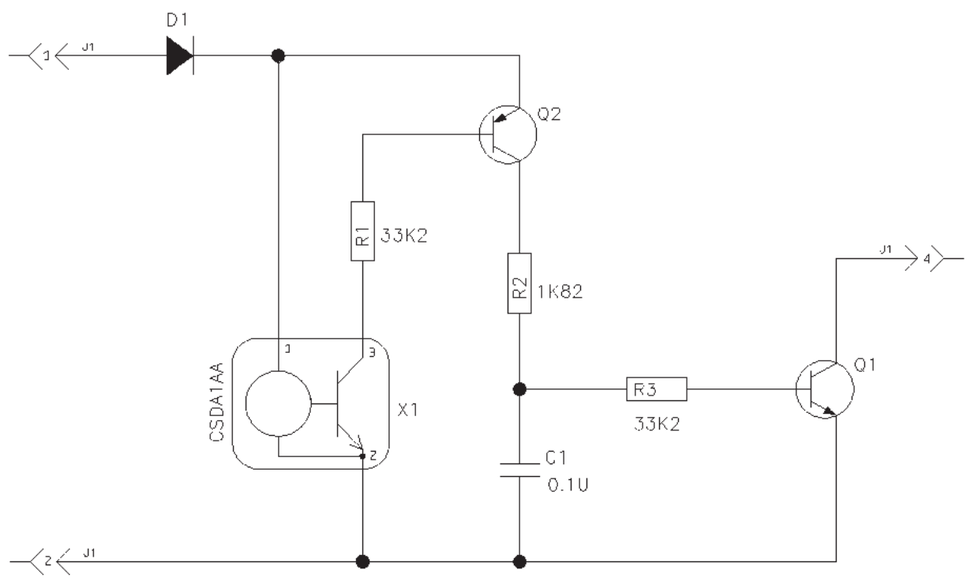
Return to Section TOC
Return to Master TOC

SCHEMATIC - CURRENT SENSE PC BOARD - CODE 10929,11114, 11316, 11471 - (S25973)

S25973

ENGINEERING CONTROLLED MANUFACTURER: No

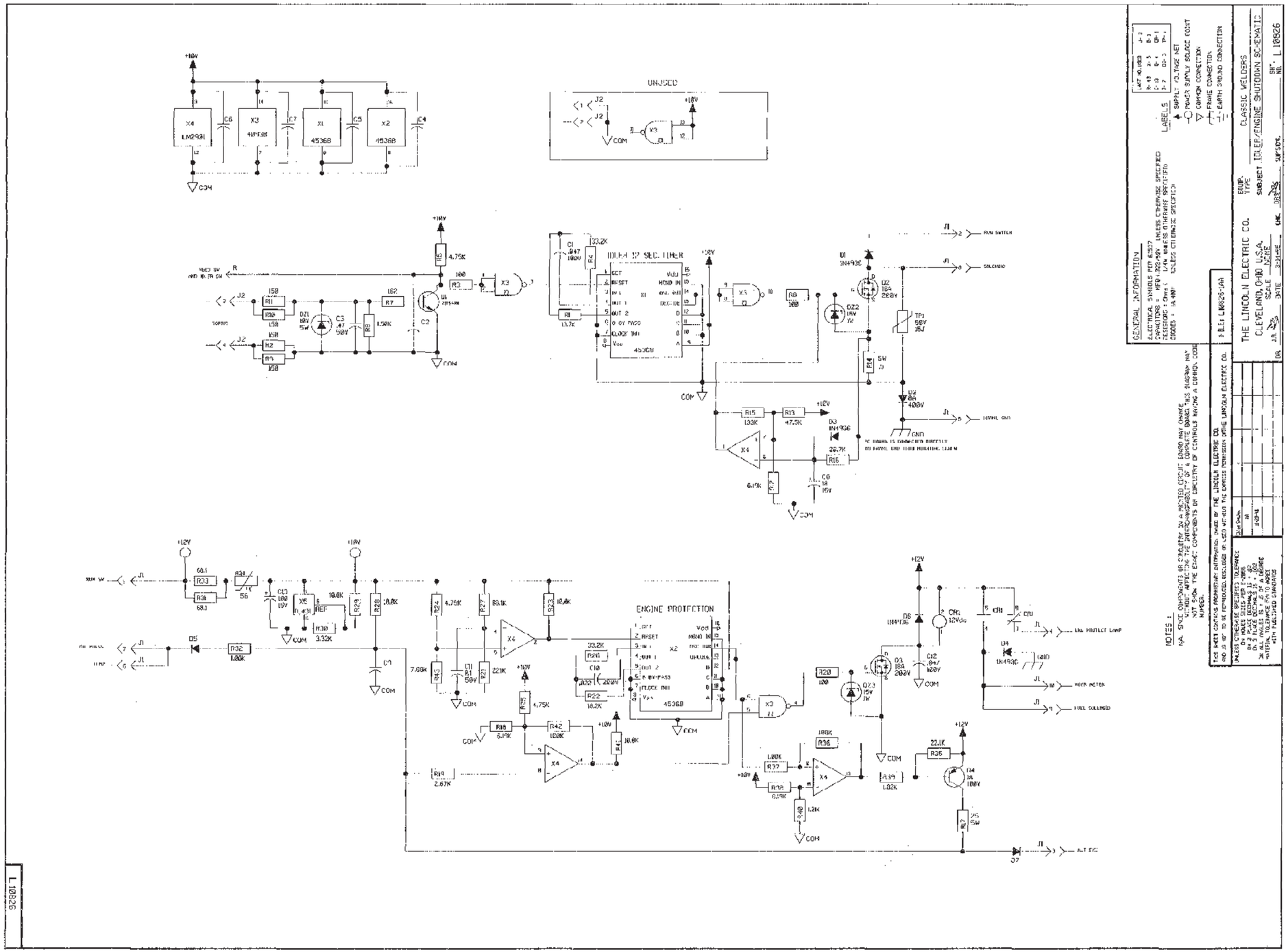
CHANGE DETAIL: NEW



UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING	DESIGN INFORMATION DRAWN BY: BTV ENGINEER: DM APPROVED:	REFERENCE: - SCALE: NONE	EQUIPMENT TYPE: CLASSIC SERIES SUBJECT: CURRENT SENSE PC BOARD SCHEMATIC MATERIAL DISPOSITION: NA APPROVAL DATE: 4/1/2004 PROJECT NUMBER: CRM34866	PAGE 1 OF 1 DOCUMENT NUMBER: S25973	DOCUMENT REVISION: A

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

SCHEMATIC - IDLER/ENGINE SHUTDOWN - CODE 10929 (L10826)



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