LINCOLN ELECTRIC

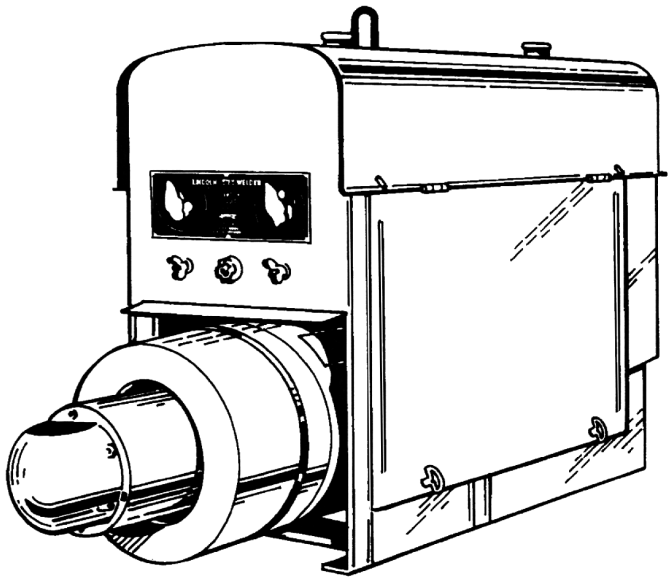
GENUINE LINCOLN PARTS™

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.

SA-200®

For use with machines having Code Numbers: **7276; 7302; 7307; 7693; 7699; 7789; 8017;8023; 8244; 8245; 8348; 8583; 8638; 8676;8677; 8790; 8791; 8915; 8916; 9052; 9053;9324; 9325; 9442; 9443; 9527; 95303417; 3418; 3554; 3555; 4113; 4149;4150; 4744; 4745; 4815; 4816; 4843;4998; 4999; 5065; 5107; 5108; 5141;5336; 5337; 5376; 5495; 5496; 5500;5537; 5568; 5604; 5642; 5660; 5696;5840; 5841; 5957; 6072; 6073; 6132;6339; 6340; 6345; 6552; 6632; 6633; 6634; 6779; 6791; 6792; 6934; 7044;7074; 7078; 7167; 7168; 7213; 7214; 7242, K-6090 215; 244; 317; 370; 371;445; 459; 527; 671; 681;960; 974; 1122; 1123;1223; 1228; 1421; 1422;1678; 1679; 1827; 1828;1846; 1847; 1903; 1904;2163; 2164; 2292; 2293;2364; 2365; 2866; 2867;2954; 2955; 3311; 3312**

SERVICE MANUAL



SVM224-A | Issue Date 12-Oct

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

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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

FOR ENGINE powered equipment.

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

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

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

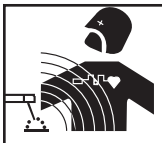
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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

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

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

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



ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

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

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

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

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

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

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.

3.k. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.

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.

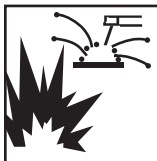
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

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



WELDING and CUTTING SPARKS can cause fire or explosion.

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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER may explode if damaged.

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

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

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

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

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

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

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

FOR ELECTRICALLY powered equipment.

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

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

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

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

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.

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

			
WARNING	• Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground.	• Keep flammable materials away.	• Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	• No toque las partes o los electrodos bajo carga con la piel o ropa mojada. • Aislese del trabajo y de la tierra.	• Mantenga el material combustible fuera del área de trabajo.	• Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	• Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. • Isolez-vous du travail et de la terre.	• Gardez à l'écart de tout matériel inflammable.	• Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	• Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! • Isolieren Sie sich von den Elektroden und dem Erdboden!	• Entfernen Sie brennbarres Material!	• Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	• Não toque partes elétricas e electrodos com a pele ou roupa molhada. • Isole-se da peça e terra.	• Mantenha inflamáveis bem guardados.	• Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

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

			
• Keep your head out of fumes. • Use ventilation or exhaust to remove fumes from breathing zone.	• Turn power off before servicing.	• Do not operate with panel open or guards off.	**WARNING**
• Los humos fuera de la zona de respiración. • Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	• Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	• No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
• Gardez la tête à l'écart des fumées. • Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	• Débranchez le courant avant l'entretien.	• N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
• Vermeiden Sie das Einatmen von Schweibrauch! • Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	• Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	• Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
• Mantenha seu rosto da fumaça. • Use ventilação e exhaustão para remover fumo da zona respiratória.	• Não opere com as tampas removidas. • Desligue a corrente antes de fazer serviço. • Não toque as partes elétricas nuas.	• Mantenha-se afastado das partes moventes. • Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
●頭部遠離煙霧。 ●在呼吸區使用通風或排風器除煙。	●維修前切斷電源。	●儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● أستعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

- MASTER TABLE OF CONTENTS FOR ALL SECTIONS -

TABLE OF CONTENTS

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

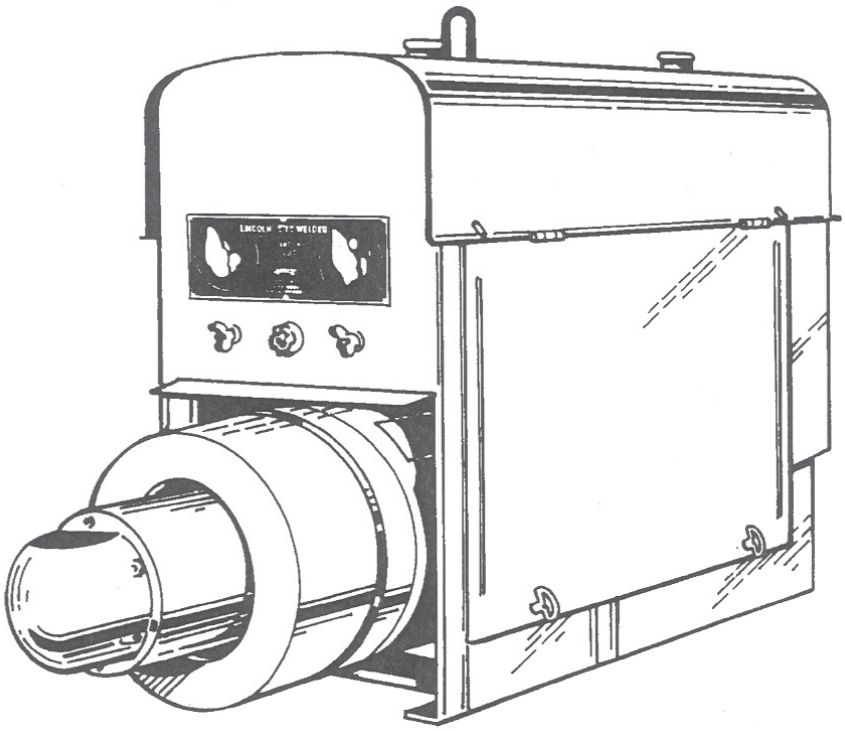
RETURN TO MAIN INDEX

IM-114-C
March, 1987

"Shield-Arc" SA-200 Welder

With LINCOLN MODEL L-200 ENGINE

TYPE: **S-6090**



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

SAFETY FIRST...

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Company. Specifications and the availability of optional features may have changed. Replacement parts for your machine are available through your local Lincoln Field Service Shop.

Please carefully read all of the updated safety cautions and warnings on the following pages. Thoughtful operation of this machine after reviewing these modern warnings will increase your overall safety and that of those around you.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info

TABLE OF CONTENTS - INSTALLATION SECTION

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

ARC WELDING SAFETY PRECAUTIONS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

1. HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed only by qualified people.

2. ELECTRIC SHOCK can kill.

   Protect yourself from possible dangerous electrical shock:

   a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Never permit contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
   b. Always insulate yourself from the work and ground by using dry insulation. When welding in damp locations, on metal floors, gratings or scaffolds, and when in positions such as sitting or lying, make certain that the insulation is large enough to cover your full area of physical contact with work and ground.
   c. 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.
   d. Ground the work or metal to be welded to a good electrical ground.
   e. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
   f. Never dip the electrode in water for cooling.
   g. 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.
   h. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.
   i. When working above floor level, protect yourself from a fall should you get a shock.
   j. Also see Items 6c and 8.

3. FUMES AND GASES can be dangerous to your health.

   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 on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
   b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and ray of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
   c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
   d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.
   e. Also see item 9b.

4. ARC RAYS can injure eyes and burn skin.

   a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the ray of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
   b. Use suitable clothing made from durable, flame-resistant material to protect your skin and that of your helpers from the arc rays.
   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.

5. FIRE OR EXPLOSION can cause death or property damage.

   a. Remove fire hazards well away from the area. If this is not possible cover them to prevent the welding sparks from starting a fire. Remember that welding and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have a fire extinguisher readily available.
   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.
   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.
   d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such producers will not cause flammable or toxic vapors from substances inside.

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

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 F4.1-80 from the American Welding Society (see address below).

e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
f. Also see items 6c and 9c.

6. For Welding in General.
   a. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with 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 when in a welding area. Use glasses with side shields when near slag chipping operations.
   b. 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.
   c. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance 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.

7. For Gas-Shielded Arc Welding.
   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.
   b. Always keeps cylinders in an upright position securely chained to an undercarriage or fixed support.
   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.
   d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
   e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
   f. Valve protection caps should always be in place and handtight except when the cylinder is in use or connected for use.
   g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 "Precautions for Safe Handling of Compressed Gases in Cylinders" available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.

8. For electrically Powered Equipment.
   a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
   b. Make the electrical installation in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
   c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.

9. For Engine Powered Equipment.
   a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
   b. Operate the internal combustion engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
   c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and, if possible, allow it to cool when 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.
   d. 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.
   e. 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.
   f. 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.
   g. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

For more detailed 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.

Return to Section TOC
Return to Master TOC

PROPER GROUNDING DURING INSTALLATION

The 1984 National Electric Code does not require this machine to be grounded under normal operating circumstances.

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.

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 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 National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

INSTALLATION, CONNECTION, AND MAINTENANCE OF BATTERY

To prevent EXPLOSION when:

a) Installing a new battery – disconnect the positive cable from the old battery first and connect the positive cable to the new battery last.

b) Connecting a battery charger – remove the battery from the welder by disconnecting the positive cable first, then the negative cable and battery clamp. When reinstalling, connect the positive cable last.

c) Using a booster – connect the negative lead to the battery.

To prevent ELECTRICAL DAMAGE when:

a) Installing a new battery.

b) Using a booster.

Use correct polarity – Positive Ground.

To prevent BATTERY BUCKLING, tighten nuts on batter clamp only until snug.

(S-17851)

OPERATION OF ENGINE WELDERS

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

OPERATION OF ALL WELDERS

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

MAINTENANCE AND TROUBLESHOOTING WARNINGS

WARNING: Have qualified personnel do the maintenance and troubleshooting 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.

ATTENTION OWNERS OF ENGINE WELDERS

WARNING: 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. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

CAUTION WHEN INSPECTING THE 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.

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.

Return to Section TOC
Return to Master TOC

UNCRATING THE WELDER

When the equipment arrives, it should be carefully uncrated and all parts checked. The use of pinch bars or anything which might injure the mechanism must be avoided. Any material which has been damaged in shipment should be put aside and called to the attention of your Traffic Department, so that proper claim may be made against the transportation company.

PRELIMINARY CHECKS

Upon receipt of the welder, a few preliminary checks must be made. Fill the crankcase to the "full" mark on the bayonet gage with the recommended weight of oil (See OPERATOR'S MANUAL), and check water, gasoline and air filter levels. Open the carburetor feed valve on the sediment bowl by turning the handle from right to left. Then put the ignition switch in the "on" position and start the engine. It is recommended that the engine be run for a short period of time before welding is attempted in order to check for any damage to the engine when in transit. It would be wise to run the engine for at least five minutes, then stop and check the oil level before proceeding. If the oil level is down, fill to the "full" mark again.

If the engine is running satisfactorily, connect the electrode and ground cables to the studs provided on the control panel. For positive (reversed) polarity, connect the electrode cable to the terminal marked "positive", and for negative (straight) polarity connect it to the "negative" terminal. It is recommended that you consult your Fleetwelding Manual, Bulletin 440, for the correct polarity on which to operate Lincoln rods. Wing nuts are provided to facilitate changing polarity.

After the welder has been in operation for some time, all external and internal connections should be checked, tightened if necessary.

In order to have automatic idling, the latching pin must be removed from the engine regulator, and the control lever allowed to swing freely.

For details on Idling Device, *See IM-117*

All adjustments other than those are made at the factory and none will be necessary upon receipt of the welder.

CONTROL OF WELDING CURRENT

This welder is provided with Dual Control of the welding current. Dual Control means that it is possible to get proper welding current through the range of the machine in at least two ways. By this means, the operator can obtain any arc type as well as any arc intensity. For example, he would use a "tenuous" arc for welding outside in a wind, a "snappy" arc for vertical or overhead work, or a high voltage-low current setting for sheet metal work. This Dual Control consists of a shunt field rheostat, which will vary not only the open circuit voltage, but also the current, and a four position current control. By using both these controls he can vary the current from 60 to 300 amperes at approximately 40 volts arc voltage.

In order to demonstrate the ability of the Dual Control to provide any arc type or intensity, the operator can perform some simple experiments. With a 5/32" rod, set the Selective Current control in the "150" position, and the Continuous Voltage control at "80". Weld a short bead with this welder setting and note the arc characteristics. Now, increase the Voltage control and as you run another bead notice how much "hotter" the arc acts. Vary the Voltage control and run short beads, noting the different arc characteristics each time; see how wide a range of welding currents can be covered with this single control. Not only does this Voltage control vary the open circuit voltage, but also the arc current as well.

Next, set the Voltage Control around "80", and using different rod sizes, run beads with the Selective Current Control in all four positions. First, set the control on "Min" and with a 1/8" rod weld a short bead noting the arc characteristics. Now, turn the current control to the "150" position and try to obtain the same arc intensity as before by carrying the Voltage control. (You will see that the Voltage setting must be decreased.) Notice how differently the arc now reacts to changes in arc length. It can thus be seen that for each size of electrode, the machine is designed to give at least two methods of securing the correct welding current. The method used by the operator is determined by the arc characteristics desired for a particular job.

These experiments graphically illustrate the fact that any arc type and arc intensity may be obtained to suit any individual operator. No "blind spots" exist along the entire welding range when both the Voltage and Selective Current controls are used.

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

CONTROL OF WELDING CURRENT CONT.

It is generally best to set the Current control at as low a value as possible, with the Voltage control set at a high value, in order to have a high open circuit voltage. However, with vertical or overhead work, a low open circuit voltage is required. In this case, it is advisable to keep the Voltage control at a low value, and the Current control at the next higher setting.

With these ideas in mind, the operator will be able to solve any welding problems falling within the capacity of the machine. Actual welding experience will determine which settings are best for the individual operator. Thus, he is assured the maximum weld quality on every application – and for lowest welding cost.

NOTE: Do not set the Current Control between any of the four designated points in an attempt to obtain an intermediate amount of current. (The Voltage control should be used for this purpose.) Doing so, short circuits, part of the series fields, affects welding characteristics and results in over heating and arching of the contacts.

CHOICE OF ELECTRODE SIZE AND CURRENT

It is usually possible to use several different electrode sizes and current settings to weld any given thickness of material. The table given below lists only one electrode size and one current range for each plate thickness. It is felt that the values given are those which will make the joint most easily weldable. Experience might indicate that you may prefer to use a higher or lower current or smaller electrode on certain applications. For a more complete chart of electrodes, currents and joint types, it is recommended that you consult the Fleetwelding Manual, Bulletin 440.

Thickness of Material Being Welded	Electrode Size (Wire Dia.)	Current Setting
1/32”	1/16”	25-35
3/64”	5/64”	40-50
1/16”	3/32”	60-80
5/64”	3/32”	60-80
7/64”	1/8”	90-110
1/8”	5/32”	120-150
5/32” - 3/16”	3/16”	150-225
3/16” - 1/4“	7/32”	250-300

POWER PLUG

A 115 volt D.C. power plug outlet is located on the control panel of welders with rheostat control. The current available is 8.7 amperes. This will furnish 1 kilowatt of power to operate various tools, lights, etc.

IDLING DEVICE

An engine regulator idling device is provided on this welder in order to conserve fuel and reduce engine wear. A detailed description of the regulator operation can be found in ***IM-117***, “Instructions for Installation and Operation of Lincoln Engine Regulators”. The only operator adjustment on the regulator is the regulating needle valve, by which the operator can vary the time required for the engine to reach idle speed once the arc is broken. This time may be varied from 2-20 seconds, having been set at the factory between 10 and 12. Turn the valve counterclockwise to decrease the time delay. Unless it is definitely desired to change the time delay, it is recommended that the factory setting be left alone. Never use a different hole in the link connection to the regulator than the one with which the machine left the factory.

CARBURETOR DE-ICER

Welders with codes 1846 and higher are provided with an “anti-frosting” device. This is to prevent frosting of the carburetor under certain temperature and humidity conditions. Remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive preheated air to the carburetor.

Disconnect this hose for warm weather operation.

RECOMMENDED CABLE SIZES

Machine Size in Amperes	Duty Cycle	Cable Sizes for Combined Lengths of Electrode and Ground Cables				
		0 to 50 ft.	50 to 100 ft.	100 to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	60	2	2	2	1	1/0

Return to Section TOC
Return to Master TOC

COMMUTATOR AND BRUSHES

The commutator and brushes are inspected by removing the commutator cover. Do not remove or replace the cover while the welder is running.

The brushes on the generator are properly adjusted when the outfit arrives. No particular attention is required to keep the brushes in good condition. As the brushes wear out they must be replaced with new ones. One complete set of brushes should always be kept on hand. New brushes must be sanded in before they can be used on the machine. This is accomplished by removing the old brush from the holder, placing the new brush in position with a piece of medium sandpaper (never use emery cloth) placed under the brush. A second person should hold the brush in its normal position by a slight pressure of the fingers. The sandpaper then should be drawn back and forth under the brush with the back of the sandpaper held closely in contact with the commutator. This will wear the brush down to the curve of the commutator. When the end of the brush has the proper curve, the operation is complete. Care should be exercised to blow all of the carbon dust away from the commutator.

The commutators require practically no attention. They should be cleaned from time to time with a clean rag, or while running with a piece of fine sandpaper. Never use emery cloth or paper for this purpose. DO NOT SHIFT THE BRUSHES.

BEARINGS

This welder is equipped with a double-shield ball bearing having sufficient grease to last 5 years under the most severe service. It, however, is well to add one-half ounce of grease each 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.

Lincoln Approved Grease is available in a convenient 8 ounce tube.

GENERAL INSTRUCTIONS

1. Blow out the welder and controls with an air hose at least once every two months – once every week in dirty locations. Use low air pressure to avoid driving dirt into the insulation.
2. Current control contacts are self lubricating and 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. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Drain and change the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when filler is drained.
5. Do not let link (***See IM-117***) bind the butterfly valve shaft.
6. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
7. Inspect air filter (oil bath type) weekly – daily under dusty conditions. Clean and fill with oil to bead.
8. Grease the zerk fitting on fan bearing as outlined in the OPERATOR'S MANUAL.
9. Put a drop of oil on the Current control shaft at least once every month.
10. This welder is NEMA rated 200 Amperes at 40 Arc Volts on a 60% Duty Cycle. Duty Cycle is based on a 10 minute period; thus, the welder can be loaded at Rated Output, for 6 minutes out of every 10 minute period.

ENGINE SPECIFICATIONS

LINCOLN MODEL L-200, 4 Cycle, 4 Cylinder

Stroke	4-3/8"
Bore	3-7/16"
Displacement	162 cu. in.
Horsepower at 1400 RPM	32 BHP
Oil Capacity (Filter and Crankcase)	5 quarts
Oil Pressure	20 lbs. min., 35 lbs. max. (when engine is hot)
Fuel System	Gravity Feed
Fuel	At least 75 octane
Fuel Capacity	12.5 gallons
Cooling System Capacity	13 quarts
Rotation	Counterclockwise from welder end

LINCOLN ARC WELDING SET "TROUBLE-SHOOTING" CHART

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator.	Commutator should be trued or cleaned.
	Brushes may be worn down to limit of life.	Replace brushes.
	Brush springs may be broken.	Replace brush springs.
	Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire.	Check field current with ammeter to discover varying current. This applies to both the main generator and exciter.
	Electrode lead or work lead connection may be poor.	Tighten all connections.
	Wrong grade of brushes may have been installed on generator.	Check with manufacturer's recommendations.
	Field rheostat may be making poor contact and overheating.	Inspect rheostat and clean and adjust finger tension on contact.
	Engine regulator rheostat shorting switch out of adjustment.	Adjust mercury switch tilt angle so circuit is open when engine is at full speed and when welding.
Welder starts but fails to generate current.	Generator or exciter brushes may be loose or missing.	Be sure that all brushes bear on the commutator and have proper spring tension.
	Exciter may not be operating.	Check exciter output voltage with voltmeter or lamp.
	Field circuit of generator or exciter may be open.	Check for open circuits in rheostat, field leads and field coils.
	Exciter may have lost excitation.	Flash the field with a storage battery or another generator, first with one polarity and then with another to see if it "builds up", (Flash exciter field).
	Series field and armature circuit may be open-circuited.	Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high.	Check setting and current output with ammeter.
	Polarity may be wrong.	Check polarity. Try reversing polarity or try an electrode of the opposite polarity.
	Engine regulator shorting switch contacts close intermittently when running at full speed, causes increasing surge of current and spatter.	Adjust so mercury level is well below contact on mercury tilt switch when engine is at full speed position of engine regulator (bellows fully extended).
Welding current too great or too small compared to indication on the dial.	Exciter output low causing low output compared to dial indication.	Check exciter field circuit.
Engine fails to start.	Out of fuel.	Fill with at least 75 octane gasoline.
	Clogged fuel system.	Check all supply lines to carburetor.
	Choke not closing tightly.	Loosen choke cable screw and slack off choke wire.
	Lead attached to stud on outside of magneto is grounded.	Check for ground and insulate lead.
	Magneto points are pitted and fused.	Dress points and adjust to 0.020"
	Ignition switch shorted.	Replace.
	Moisture or carbon on spark plugs.	Remove plugs, clean and adjust gap to 0.025".

Return to Section TOC
Return to Master TOC

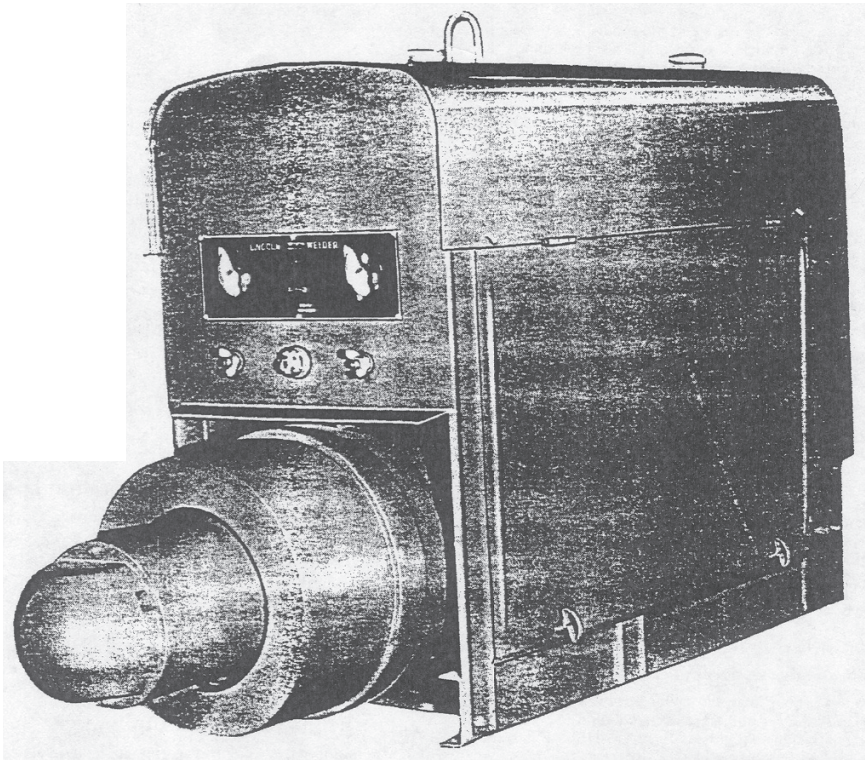
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info

RETURN TO MAIN INDEX

Shield-Arc SA-200 Welder

With CONTINENTAL 4-CYLINDER GASOLINE ENGINE

TYPE S-6090 AND S-6090-SM: (Codes below 3400) For K-6090 and K-6090-SM *See IM-208*



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

Safety Depends on You

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation. . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON THE INSIDE FRONT COVER.** And, most importantly, think before you act and be careful.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

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

CONTENTS

GENERATOR

ENGINE

HOW TO ORDER REPLACEMENT PARTS

In ordering replacement parts, refer to the pictures of the welder shown on the preceeding pages to get part name and number. From the nameplate, get the serial number, code number and name and model of welding machine. Parts should be ordered from the Lincoln Electric Co., its branch offices, or the nearest Authorized Field Service Shop. (The "Lincoln Service Directory" listing these shops geographically is available on request). All Authorized Field Shops and branch offices can quote current prices for these replacement parts.

– BUY ONLY GENUINE LINCOLN REPLACEMENT PARTS

SERVICE

The Lincoln Electric Company has authorized Field Service Shops in all industrial centers in the United States, Canada, and Hawaii. These shops stock GENUINE Lincoln Replacement Parts and have Factory Trained ??? to service your welder. They also offer preventive service and Welder Rental ??? ??? Welding" the Lincoln FSS Exchange Plan extended only through FSS, ??? ??? factory built and guaranteed STATORS, ARMATURES and other parts at material savings over rewinding.

GUARANTEE

The Lincoln Electric Company the seller warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment. provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from date of shipment.

??? the Buyer gives the Seller written notice of any defects ??? equipment or electrode within any period of warranty and the Seller's inspection confirms the existence of such defects, than the seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place designated by the Seller.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the ??? factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure o meet the conditions of any warranty. The liability, of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in equipment or replaceing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and there are no other guarantees or warranties either expressed or implied.

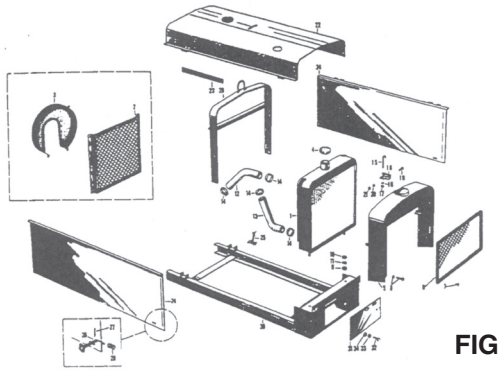


FIGURE 5141-A

RADIATOR, HOSES, BASE AND CANOPY

Item	Description	Qty.	Code: Note (A)	960	974	1122	1123	Note (B)	Note (C)	3311 2954	3312 2955	Part No.
1.	Radiator Ass'y	1	•	x	x	x	x	x	x	•	•	S-7904
	Radiator Ass'y	1	•	•	•	•	•	•	•	x	x	S-9810
	Radiator Ass'y incl.	1	x	•	•	•	•	•	•	•	•	G-916
2.	Front Guard	1	x	•	•	•	•	•	•	•	•	G-916-B
3.	Fan Shroud	1	x	•	•	•	•	•	•	•	•	G-916-A
4.	Radiator Cap (1)	1	x	•	•	•	•	•	•	•	•	S-8353
	Radiator Cap (1)	1	•	x	x	x	x	x	x	•	•	S-8354
	Radiator Cap	1	•	•	•	•	•	•	•	x	x	S-9970-1
5.	Radiator Shell	1	•	x	x	x	x	x	x	•	•	L-2597
	Radiator Shell	1	•	•	•	•	•	•	•	x	x	L-3007
6.	Front Screen Ass'y	1	•	•	•	•	•	•	•	x	x	S-9809
7.	Thread Cutting Screw	4	•	•	•	•	•	•	•	x	x	S-8025-38
8.	Thread Cutting Screw	4	•	x	x	x	x	x	x	x	x	S-9225-8
9.	Nut	2	x	x	x	x	x	x	x	x	x	1/2-13
10.	Plain Washer	2	x	x	x	x	x	x	x	•	•	3/32
	Plain Washer	2	•	•	•	•	•	•	•	x	x	S-92625
11.	Lockwasher	2	x	x	x	x	x	x	x	x	x	E-106-A-5
12.	Hose, Upper	1	x	•	•	•	•	•	•	•	•	T-8632
	Hose, Upper	1	•	x	x	x	x	x	x	•	•	S-7895
	Hose, Upper	1	•	•	•	•	•	•	•	x	x	S-9788
13.	Hose, Lower	1	x	x	x	x	x	x	x	•	•	M-6591
	Hose, Lower	1	•	•	•	•	•	•	•	x	x	M-7999
14.	Hose Clamp	4	x	x	x	x	x	x	x	x	x	T-10004-1
15.	Roof Hook, Front	2	x	x	x	x	x	x	x	x	x	T-8818
	Rear	2	x	x	x	x	x	x	x	x	x	T-8818-1
16.	Lockwasher	4	x	x	x	x	x	x	x	x	x	E-106-A-3
17.	Nut	4	x	x	x	x	x	x	x	x	x	5/16-18
18.	Bracket Left Hand	1	•	x	x	x	x	x	x	x	x	S-8050-2
	Right Hand	1	•	x	x	x	x	x	x	x	x	S-8050-1
19.	Screw Hex Hd. Cap	2	•	x	x	x	x	x	x	x	x	5/16-18x1
20.	Lockwasher	2	•	x	x	x	x	x	x	x	x	5/16 Std.
21.	Nut	2	•	x	x	x	x	x	x	x	x	5/16x18
22.	Roof (2)	1	x	x	x	x	x	x	x	•	•	L-2637
	Roof (2)	1	•	•	•	•	•	•	•	x	x	L-3209
23.	Lincoln Decal	2	x	x	x	x	x	x	x	x	x	M-5249-1
24.	Door Ass'y Incl. (3)	2	x	x	x	x	x	x	x	x	x	M-7533-A
	Hinge Barrel Ass'y	2	x	x	x	x	x	x	x	x	x	T-8429-1
25.	Door Hook Ass'y	4	x	x	x	x	x	x	•	•	•	S-4828-A
26.	Door Hook	4	•	•	•	•	•	•	x	x	x	S-8929-1
27.	Cotter Pin	4	•	•	•	•	•	•	x	x	x	1/8x1
28.	Spring	4	•	•	•	•	•	•	x	x	x	T-9721-1
29.	Left Bale Ass'y	1	x	x	x	x	x	x	x	x	x	T-8486
30.	Base Ass'y (4)	1	x	•	•	•	•	•	•	•	•	M-6427
	Base Ass'y (4)	1	•	x	x	x	x	•	•	•	•	M6780
	Base Ass'y (4)	1	•	•	•	•	•	x	x	x	x	M-6954
31.	Base Panel	1	•	•	•	•	•	x	x	x	x	S-10403
32.	Hex Head Screw	2	•	•	•	•	•	x	x	•	•	S-9225-2
	Hex Head Screw	2	•	•	•	•	•	•	•	x	x	1/4-20x1/2
33.	Washer	2	•	•	•	•	•	x	x	•	•	T-1095
34.	Lockwasher	2	•	•	•	•	•	•	•	x	x	E-106-A-2

Note (A) For Codes 215, 224, 317, 370, 371, 445, 459, 671 and 681.
Note (B) For Codes 1223, 1228, 1421, 1422, 1678, 1679, 1827, 1828, 1846, 1847, 1903 and 1904.
Note (C) For Codes 2163, 2164, 2292, 2293, 2364, 2365, 2866 and 2867.
(1) G-940 Radiator uses S-8354 cap. G-944 Radiator uses S-8353 cap.
(2) Roof does not include hinge barrels or hinge pins.
(3) On machine code numbers 1904 & lower it is necessary to order kit T-9874 (which includes items 25, 26, 27).
(4) M-6954 Base Ass'y includes foot supports T-8824 (Item 60, page 6). Base Assemblies M-6427 and M-6780 do not include foot supports.
* Order G-1087 Radiator, L-3007 Radiator Shell (Item 5), and M-8858 Fan Shroud.

WELDING GENERATOR

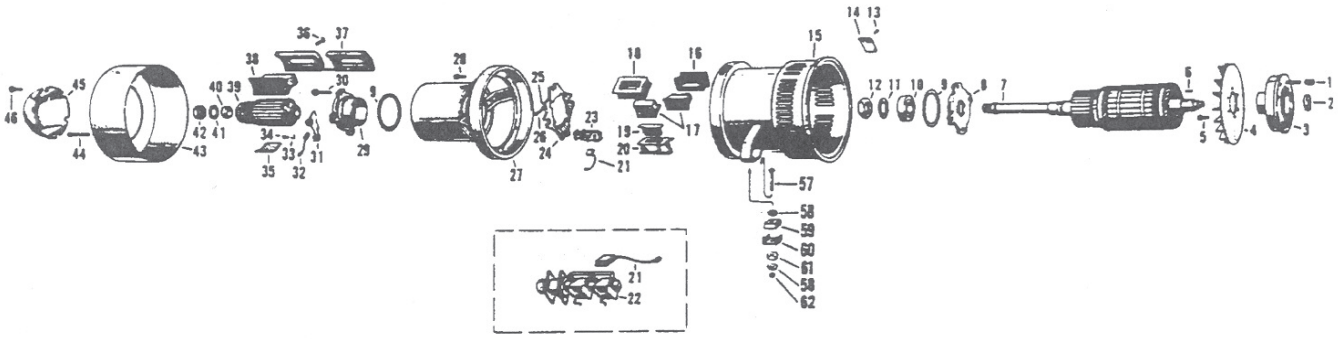


FIGURE 5141-B-1

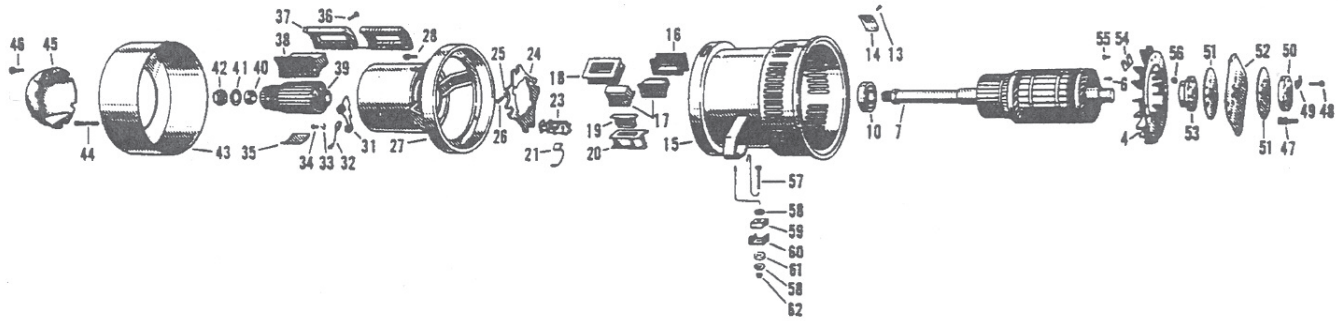


FIGURE 5141-C-1

CONVERSION KIT TO OVERSIZE (FDW) EXCITER

1. Codes 215 thru 371, Part No. M-6879, (Note 1).
2. Codes 445, 671, 960 and 1122, Part No. M-6878, (Note 2).
3. Codes above 1122 all have the Oversize Exciter.

Note 1: M-6879 includes: Engine Regulator, Rheostat, Power Outlet Receptacle, Oversize Exciter, End Bracket, Exciter Pole Pieces and Field Coils, plus misc. leads, screws, etc., and instructions.

Note 2: M-6878 includes: Mercury Switch (for Engine Regulator), Rheostat, Power Outlet Receptacle, Oversize Exciter, End Bracket Exciter Pole Pieces and Field Coils, plus misc. leads, screws, etc., and instructions.

WELDING GENERATOR (Cont'd) FIGURES 5141-B & 5141-C

Ref. Pict.	Item	Description	Qty.	Code 215	244	317	370	371	445	459	671	681	960	974	1122	1123	1223 1228 NOTE (C)					Part Number
B	1	Lord Bushing (in Flywheel)	6	x	x	x	x	x	x	x	x	x										T-8845
B	2	Pilot Bearing	1	x	x	x	x	x	x	x	x	x										205
-	-	Coupling & Blower Ass'y, incl:	1	x	x	x	x	x	x	x	x	x										M-4587-A
B	3	Coupling Ass'y, incl:	1	x	x	x	x	x	x	x	x	x										L-2427
-	-	Coupling	1	x	x	x	x	x	x	x	x	x										S-9311-5
-	-	Locking Pin	6	x	x	x	x	x	x	x	x	x										S-9311-9
-	-	Drive Pin	6	x	x	x	x	x	x	x	x	x										S-7247
B	4	Blower	1	x	x	x	x	x	x	x	x	x										M-6140
C	4	Blower	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x				M-6774
B	5	Hex Hd. Cap Screw	6	x	x	x	x	x	x	x	x	x										3/8-16X1/4
B, C	6	Key, (3/8 x 3/8 x 1-7/8) (1)	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x					E-261-6
B	7	Armature Ass'y, including: (2)	1	x	x	x	x	x														M-5860
-	-	Armature Coil Set (2)	1	x	x	x	x	x														FJW-28.6B
-	-	Shaft	1	x	x	x	x	x	x	x	x	x										M-5859
-	-	Commutator (83 bar) (2)	1	x	x	x	x	x														M-6111-E
B	7	Armature Ass'y, including	1	x	x	x	x	x	x	x	x	x										M-5860-1
-	-	Armature Coil Set (3)	1	•	•	•	•	•	x	x	x	x										FJW-27.6
-	-	Shaft	1	x	x	x	x	x	x	x	x	x										M-5859
-	-	Commutator (81 bar, tang) (3)	1	•	•	•	•	•	x	x	x	x										M-6111-F
C	7	Armature Ass'y, including: (1)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x					M-6820-1
-	-	Armature Coil Set	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x				FJW-27.6A
-	-	Shaft (keyed hub) (1)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x					M-6775
-	-	Commutator (81 bar, tangless)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x				M-6816
C	7	Armature Ass'y, including:	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	x				M-7014-1
-	-	Armature Coil Set	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x				FJW-27.6A
-	-	Shaft (welded hub)	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	x				M-7015
-	-	Commutator (81 bar, tangless)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x				M-6816
B	8	Inner Dust Cap	1	x	x	x	x	x	x	x	x	x										S-4386
B	9	Gasket, Dust Cap	2	x	x	x	x	x	x	x	x	x										T-3633-8
B, C	10	Generator Armature Bearing	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				308
B	11	Washer, Bearing Spacer	1	x	x	x	x	x	x	x	x	x										T-8533
B	12	Locknut, Bearing	1	x	x	x	x	x	x	x	x	x										T-8532
B, C	13	Screw, Inst. Plate	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-8025-8
B, C	14	Instruction Plate	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-7300
B	15	Generator Frame Ass'y	1	x	x	x	x	x	x	x	x	x	x	x	x	x						M-6431
B, C		Generator Frame Ass'y	1														x	x				M-6873
B	16	Series Field Coil	2	x																		FJW-115H
B, C		Series Field Coil	2	•	x	x	x	x	x	x	x	x	x	x	x	x	x	x				FJW-115M
B, C	17	Generator Main Pole	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-7925-5
B, C	18	Shunt Field Coil	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				FJW-5K
-	-	Interpole Coil & Pole Ass'y, incl:	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-5050-1
B, C	19	Pole Piece	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-6704-1
B, C	20	Coil	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-5050
B, C	21	Generator Brush	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-2687
B	22	Generator Brush Holder Ass'y (4)	4	x	x	•	•	x														S-5382
B, C	23	Generator Brush Holder Ass'y (4)	4	•	•	x	x	•	x	x	x	x	x	x	x	x	x	x				M-6964-2-A
B, C	24	Rocker	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				M-1961
B, C	25	Lockwasher	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				3/16
B, C	26	Screw, Fil. Head	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				10-24x3/4
B, C	27	End Bracket, St'd Exciter	1	x	x	x	x	x	x	•	x											M-6429
B, C		End Bracket, Oversize Exciter	1	•	•	•	•	•	•	x	•	x										M-6428-1
B, C		End Bracket, St'd Exciter	1	•	•	•	•	•	•	•	•	•	x	•	x							M-6771
B, C		End Bracket, Oversize Exciter	1	•	•	•	•	•	•	•	•	•	•	x	•	x	x	x				M-6773
B, C	28	Screw, Hex Hd. Cap	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				1/2-13x3/4

(C) For codes 1421, 1422, 1678, 1679, 1827, 1828, 1846, 1847, 1903, 1904, 2163, 2164, 2292, 2293, 2364, 2365, 2866, 2867, 2954, 2955, 3311 and 3312.

WELDING GENERATOR (Cont'd) FIGURES 5141-B & 5141-C-1

Ref. Pict.	Item	Description	Qty.	Code 215	244	317	370	371	445	459	671	681	960	974	1122	1123	1223 1228	NOTE (C)	NOTE (D)	NOTE (E)				Part Number
B	29	Outer Dust Cap	1	x	x	x	x	x	x	x	x	x												S-4387
B	30	Screw, Hex Hd. Cap. Dust Cap	4	x	x	x	x	x	x	x	x	x												1/4-20 x 2 3/4
-	-	Grease Pipe	1	x	x	x	x	x	x	•	x	•	x	•	x									T-7599-9
-	-	Grease Pipe Cap	1	x	x	x	x	x	x	•	x	•	x	•	x									1/8 St'd
-	-	Grease Hole Plug	1	•	•	•	•	•	•	x	•	x	•	x	•	x	x	x	x	x				1/8 St'd
B, C	31	Exciter Brush Holder Ass'y, incl:	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-6531-A
-	-	Spring	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-6887
-	-	Insulation Tube	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-8167
-	-	Insulation Washer	8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-7626
B, C	32	Exciter Brush	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-6968
B, C	33	Plain Washer	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-1095
B, C	34	Screw, Ex. B. H. Mt'g	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-9225-1
B, C	35	Lead Shield	1	x	x	x	x	x	x	•	x	•	x	•	x									T-2454
B, C		Lead Shield	1	•	•	•	•	•	•	x	•	x	•	x	•	x	x	x	x	x				T-9100
B, C	36	Screw, Hex Hd. Cap	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				5/16- 18x1
B, C	37	Exciter Field Coil Set	1	x	x	x	x	x	x	•	x	•	x	•	x									FBS-5D
B, C		Exciter Field Coil Set	1	•	•	•	•	•	•	x	•	x	•	x	•	x	x	x	x	x				FDW-5E
B, C	38	Exciter Pole Piece	2	•	•	•	•	•	•	x	•	x	•	x	•	x	x	x	x	x				T-3980-1
B, C		Exciter Pole Piece	2	x	x	x	x	x	x	•	x	•	x	•	x									T-3980-4
B, C	39	Exciter Armature	1	x	x	x	x	x	x	•	x	•	x	•	x									FBS- 24. 104
B, C		Exciter Armature	1	•	•	•	•	•	•	x	•	x	•	x	•	x	x	x	x	x				FDW-24. 28A
B, C		Exciter Armature	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	x				FDW-24. 27
B, C	40	Collar Exciter Sleeve	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-5345
B, C	41	Exciter Nut Washer	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-7090-1
B, C	42	Exciter Nut	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-6225-1
B, C	43	Generator End Shell	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				M-7594
B, C	44	Screw, Rd. Hd.	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				1/4-20 x 2 1/2
B, C	45	Exciter Cover	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				L-2594
B, C	46	Screw, Rec. Hd. Th'd Cutting #1	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				1/4-20x1/2
C	47	Stud (in Cast Iron Flywheel)	4	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	•	•				T-8906
C	47	Stud (in Steel Flywheel)	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	x	x				T-9663
-	-	Coupling Ass'y. including: (1)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x							M-6870-B
C	48	Screw, Disc to Hub	8	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				T-8833-2
C	49	Locking Clip. Inner	4	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				T-9450
C	50	Clamping Ring	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				S-7803
C	51	Disc. Secondary	2	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				S-8042
C	52	Disc. Main	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				M-6730
C	53	Coupling Hub (1)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x							S-7892
C	54	Locking Clip. Outer	4	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				T-9049
C	55	Screw, Disc to Flywheel	8	•	•	•	•	•	•	•	•	•	x	x	x	x	x	x	x	x				T-8833-1
C	56	Set Screw, Hollow Cup Pt. (1)	1	•	•	•	•	•	•	•	•	•	x	x	x	x	x							3/8- 16x1/2
B, C	57	Screw, Hex. Hd	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				1/2-13x3
B, C	58	Washer	4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				S-9262-1
B, C	59	Cushion, Upper	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-8823
B, C	60	Foot Support	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-8824
B, C	61	Cushion, Lower	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-8822
B, C	62	Huglock Nut	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				T-9187-4

FOOTNOTES:

1. Welders code number 960 and higher may have had original armature M-6820-1 replaced by M-7014-1 which has welder coupling hub rather than keyed hub.
2. Armature Assembly M-5860 replaced by M-5860-1. When ordering either armature coils or commutator determine correct part number by number of commutator bars.
3. Replacement M-5860-1 armature may have tangless commutator M-6816 and armature coil set FJW-27.6A.
4. For component parts see pictures 5111-A and 5111-B.

(C) For codes 1421, 1422, 1678, 1679, 1827, 1828, 1846, 1847, 1903, 1904, 2163, 2164, 2292 and 2293.
(D) For codes 2364 and 2365.
(E) For codes 2866, 2867, 2954, 2955, 3311 and 3312.

CONTROL PANEL

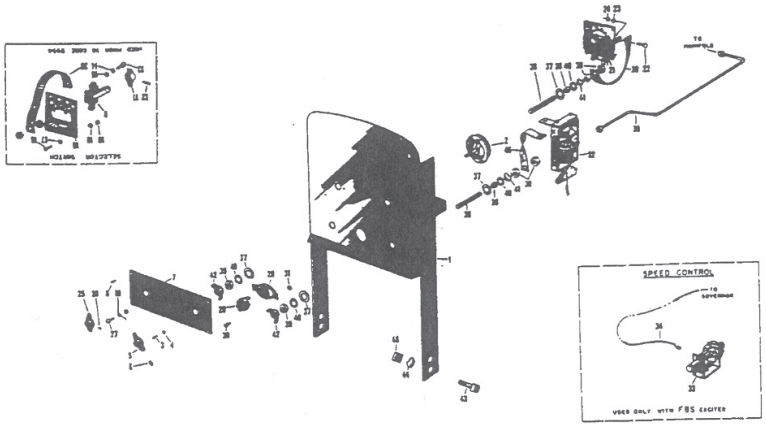


FIGURE 5141-K

			Code											
Item	Description	Qty.	Note (A)	445	459	671	681	960	974	1122	(D)	3311 2954	3312 2955	Part No.
....	Control Panel Ass'y Incl:	1	x	-	-	-	-	-	-	-	-	-	-	L-2479-A
....	Control Panel Ass'y Incl:	1	-	x	-	x	-	x	-	x	-	-	-	L-2479
....	Control Panel Ass'y Incl:	1	-	-	x	-	x	-	x	-	x	-	-	L-2478-A
....	Control Panel Ass'y Incl:	1	-	-	-	-	-	-	-	-	-	x	x	L-3011
1.	Control Panel	1	x	x	x	x	x	x	x	x	x	-	-	L-2636
	Control Panel	1	-	-	-	-	-	-	-	-	-	x	x	L-2636-A
2.	Rheostat	1	-	-	x	-	x	-	x	-	x	x	x	M-5090-C
3.	Screw	2	x	x	x	x	x	-	x	-	x	x	x	10-24-3/8
4.	Lockwasher	2	x	x	x	x	x	-	x	-	x	-	-	3/16 Std.
	Lockwasher	2	-	-	-	-	-	-	-	-	-	x	x	E-106-A-1
5.	Handle	1	x	x	x	x	x	x	x	x	x	x	x	S-8158
6.	Set Screw Headless	1	x	x	x	x	x	x	x	x	x	x	x	10-24x3/16
7.	Nameplate	1	-	-	x	-	x	-	x	-	x	x	x	M-7811
	Nameplate	1	x	x	-	x	-	x	-	x	-	-	-	M-7805
8.	Screw	6	x	x	x	x	x	x	x	x	x	x	x	S-8025-13
	Selector Ass'y Incl.	1	x	x	x	x	x	x	x	x	x	-	-	M-5048
9.	Moving Ass'y	1	x	x	x	x	x	x	x	x	x	-	-	S-6251
10.	Stationary Ass'y	1	x	x	x	x	x	x	x	x	x	-	-	S-6193
11.	Handle	1	x	x	x	x	x	x	x	x	x	-	-	S-10066
12.	Grove Pin	1	x	x	x	x	x	x	x	x	x	-	-	1/8x3/4
13.	Fillister Hd. Stop Screw	2	x	x	x	x	x	x	x	x	x	-	-	1/4-20x3/4
14.	Lockwasher	2	x	x	x	x	x	x	x	x	x	-	-	5/16 Std.
15.	Hex Nut	2	x	x	x	x	x	x	x	x	x	-	-	1/4-20
16.	Rd. Hd. Machine Screw	2	x	x	x	x	x	x	x	x	x	-	-	1/4-20-3/4
17.	Plain Washer	2	x	x	x	x	x	x	x	x	x	-	-	T-1095
18.	Lockwasher	4	x	x	x	x	x	x	x	x	x	-	-	E-106-A-2
19.	Hex Nut	4	x	x	x	x	x	x	x	x	x	-	-	1/4-20
20.	Lead	1	x	x	x	x	x	x	x	x	x	x	x	T-8445
21.	Selector Switch	1	-	-	-	-	-	-	-	-	-	x	x	M-8179
22.	Sq. Hd. Screw	1	-	-	-	-	-	-	-	-	-	x	x	5/16-18x3/4
23.	Lockwasher	1	-	-	-	-	-	-	-	-	-	x	x	E-106-A-3
24.	Hex Nut	1	-	-	-	-	-	-	-	-	-	x	x	5/16-18
25.	Handle	1	-	-	-	-	-	-	-	-	-	x	x	S-10066
26.	Set Screw (Cup Point)	1	-	-	-	-	-	-	-	-	-	x	x	10-24x3/16
27.	Rd. Hd. Screw	2	-	-	-	-	-	-	-	-	-	x	x	1/4-20x1/2
28.	Receptacle	1	-	-	x	-	x	-	x	x	x	x	x	S-7588-1
29.	Plug	1	-	-	x	-	x	-	x	x	x	x	x	S-7587-1
30.	Screw	2	-	-	x	-	x	-	x	x	x	x	x	10-24x1/2
31.	Nut	2	-	-	x	-	x	-	x	x	x	x	x	10-24
32.	Engine Regulator (1)	1	-	-	x	x	-	x	-	x	-	-	-	L-2299-D
	Engine Regulator (1)	1	x	x	-	-	x	-	x	-	x	x	x	L-2299
33.	Speed Control Ass'y	1	x	x	-	x	-	x	-	x	-	-	-	S-7291-1
	Handle	1	x	x	-	x	-	x	-	x	-	-	-	S-8158
	Speed Control	1	x	x	-	x	-	x	-	x	-	-	-	S-7291
34.	Chain	1	x	x	-	x	-	x	-	x	-	-	-	T-8667-1
35.	Air Line	1	-	x	x	x	x	x	x	x	x	x	x	S-8058-2
	Stud Ass'y Incl.	2	x	x	x	x	x	x	x	x	x	x	x	T-8061
36.	Stud	2	x	x	x	x	x	x	x	x	x	x	x	T-6931-2
37.	Insulating Washer	4	x	x	x	x	x	x	x	x	x	x	x	T-2719
38.	Insulating Bushing	2	x	x	x	x	x	x	x	x	x	x	x	T-4122
39.	Brass Jam Nut	6	x	x	x	x	x	x	x	x	x	-	-	1/2-13
	Brass Jam Nut	5	-	-	-	-	-	-	-	-	-	x	x	T-10114
40.	Washer	2	x	x	x	x	x	x	x	x	x	-	-	1-1/16x17/32x1/16
	Washer	4	-	-	-	-	-	-	-	-	-	x	x	S-9262
41.	Lockwasher	2	x	x	x	x	x	x	x	x	x	x	x	E-106-A-5
42.	Wing Nut	2	x	x	x	x	x	x	x	x	x	x	x	T-3960
43.	Screw Sq. Hd.	4	x	x	x	x	x	x	x	x	x	x	x	3/8-16x1
44.	Lockwasher	4	x	x	x	x	x	x	x	x	x	x	x	E-106-A-4
45.	Nut Sq. Hd.	4	x	x	x	x	x	x	x	x	x	x	x	3/8-16
46.	Lead	1	-	x	x	x	x	x	x	x	x	x	x	T-8581-1
....	Connector, Airline to Manifold	1	-	x	x	x	x	x	x	x	x	x	x	T-9075

(1) For component parts of Engine Regulator, Refer to ***IM-117***.
(A) For codes 215, 244, 317, 370 and 371.
(D) For codes 1123, 1223, 1228, 1421, 1422, 1678, 1679, 1827, 1828, 1846, 1847, 1903, 1904, 2163, 2164, 2292, 2364, 2365, 2866 and 2867.

GENERATOR BRUSH HOLDERS

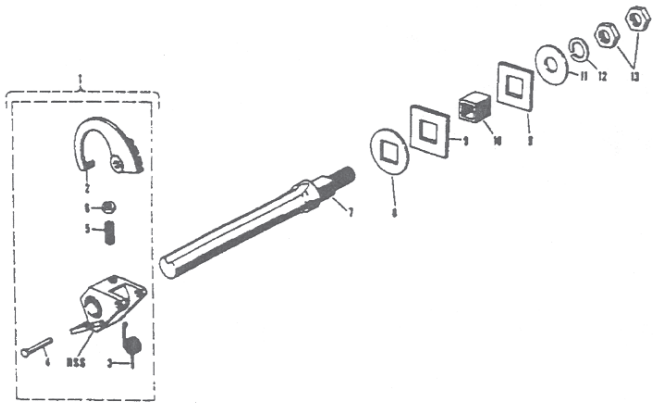


FIGURE 5111-A

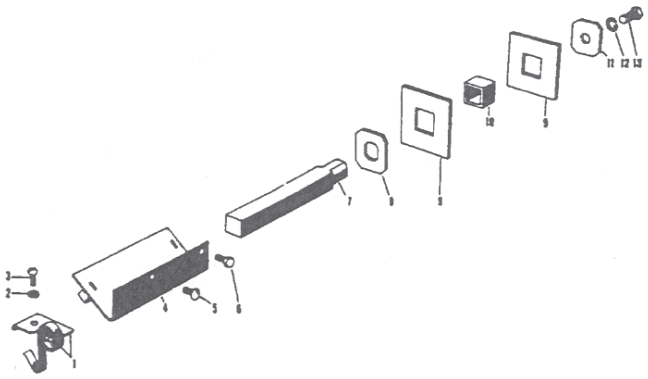


FIGURE 5111-B

Item	Description	Qty.	Part No.
--	Brush Holder & Stud Ass'y incl.	4	S-5382
1	Brush Holder Ass'y, incl.	8	S-3939
2	Finger	8	T-574
3	Spring	8	T-1448
4	Finger Stud	8	T-579
5	Set Screw, Allen	8	5/16-18x5/8
6	Nut, Hex Jam	8	5/16-18
7	Stud	4	T-3117
8	Washer	4	T-3121
9	Insulating Washer	8	T-4479
10	Insulating Tube	4	T-2667
11	Washer	4	T-1455
12	Lockwasher	4	5/8 St'd
13	Nut, Hex Jam	8	T-1449

NSS means "Not Stocked Separately"; is sold only in the Assembly of Item 1.

Item	Description	Qty.	Part No.
--	Brush Holder Ass'y incl.	4	M-6964-2A
1	Spring & Clip Ass'y	8	T-8495
2	Lockwasher (Note 2)	8	E-106-A-2
3	Screw, Rd. Hd.	8	T-10107-1
4	Plate & Retainer Ass'y	4	M-6304-2B
5	Screw, Rd. Hd.	4	5/16-18x1/2
6	Screw, Hex Hd. Cap	4	5/16-18x1/2
7	Stud (1)	4	M-6963-4
8	Washer	4	T-9020
9	Insulating Washer	8	T-4479
10	Insulating Tube	4	T-2667
11	Washer	4	T-2414
12	Lockwasher (Note 2)	4	E-106-A-4
13	Screw, Hex Hd. Cap	4	T-10106-1

1. If early style brush holder Stud (with taper pin) is required, replace by ordering M-6963-4 Stud and Inner Washer T-9020.
2. These lockwashers no longer used on current production models.

1) SERVICE GASKET KIT S-9250-193

2) CYLINDER AND CRANKCASE ASSEMBLIES:

a) S-9250-1-A includes Cylinder and Crankcase, Camshaft Bushings, Main Bearings and Caps, Studs, Valve Guides.

b) S-9250-1-C includes S-9250-1-A plus Pistons, Rings, and Piston Pins.

c) S-9250-1-I includes S-9250-1-C plus Valves and Tappets.

d) S-9250-1-R includes S-9250-1-I plus Connecting Rods, Camshaft, Crankshaft, Front End Plate.

e) S-9250-1-S includes S-9250-I-R plus Filler Blocks, Oil Pump, Oil Pan, Cylinder Head, Gear Cover.

Return to Section TOC
Return to Master TOC

CRANKCASE FIGURE 5141-F1 (See Page A-22)

Unless specified to the contrary, the same part numbers apply to all of the various welder code numbers.

Item	Description	Qty.	Part No.
1	Cyl., Water Outlet Elbow (Codes 215 thru 1904)	1	S-9311-10
	Cyl., Water Outlet Elbow (Codes 2163 & higher)	1	S-9250-129
2	Nut	2	T-10940-1
3	Lockwasher	2	E-106-A-111
4	Gasket	1	S-9250-143
7	Stud, Elbow (Codes 215 thru 1904)	2	S-9311-11
	Stud, Elbow (Codes 2163 & higher)	2	S-9250-148
8	Plug	1	S-9250-189
9	Cylinder Head		
	(Codes 215 thru 681)	1	S-9311-12
	(Codes 960 & up)	1	S-9250-118
10	Cylinder Head Gasket	1	S-9250-137
11	Nut Cylinder Head	15	S-9250-161
12	Washer	15	S-9250-172
13	Stud, Cylinder Head	15	S-9250-21
14	Filler Cap Assembly	1	S-9250-66
15	Oil Filler Tube	1	S-9250-120
16	Drain Cock	1	T-9956
17	Oil Gauge Rod	1	S-9250-91
18	Oil Rod Support	1	S-9250-15
19	Block	1	S-9250-2
20	Lift Eye (Codes 215 thru 2164)	2	S-9311-13
21	Oil Filter, Fram (Codes 960 & higher)	1	L-2676
	Oil Filter, Michiana (Codes 215 thru 681)	1	S-9311-14
22	Filter Element, Fram (Codes 960 & higher)	1	L-2676-1
	Filter Element, Michiana (Codes 215 thru 681)	1	S-9311-15

Item	Description	Qty.	Part No.
23	Stud	2	S-9250-147
24	Lockwasher	2	E-106-A-3
--	Plain Washer	2	T-1093
25	Nut, Hex	2	5/16-18
26	Oil Line (Codes 960 & higher)	1	T-9955
26A	Oil Line (Note 1)	1	T-10153
27	Elbow (Codes 960 & higher)	2	T-9949
28	Bushing (Note 2)	1	T-9948
28A	Tee Fitting	1	T-9738
29	Gasket, Front Plate	1	S-9250-114
30	Front End Plate	1	S-9250-113
31	Gasket, Gear Cover	1	S-9250-116
32	Gear Cover	1	S-9250-115
33	Ring Dowell, Front Plate	1	S-9250-135
34	Ring Dowell, Gear Cover	1	S-9250-136
35	Screw & Washer Assembly	1	S-9250-159
36	Nut, G.C. to End Plate	1	S-9250-163
37	Lockwasher	1	S-9250-170
38	Screw, G.C. to End Plate	1	S-9250-158
39	Oil Seal	1	S-9250-117
40	Nut, G.C. Dowell Screw	1	S-9250-165
41	Lockwasher, Dowell Screw	1	S-9250-171
42	Screw, Dowell Screw	1	S-9250-149
43	Screw, G.C. to Filler Block (Early Models Only)	1	S-9250-158
44	Lockwasher	8	3/8 St'd
45	Screw, G.C. to Filler Block	3	S-9250-154
46	Screw, G.C. to Block	1	S-9250-158
47	Screw, G.C. to Block (At Ring Dowel)	1	S-9250-155
48	Nut, G.C. to Stud	2	S-9250-163
49	Stud, G.C. to Block (Upper Holes)	2	S-9311-16
50	Oil Pan Gasket	2	S-9250-73
51	Front Filler Block	1	S-9250-128

Note 1 Used on earlier models without identical oil lines.

Note 2 Used on machines with identical oil lines and all codes 2954 & higher.

Return to Section TOC
Return to Master TOC

CRANKCASE, GEAR COVER & ASSOCIATED PARTS

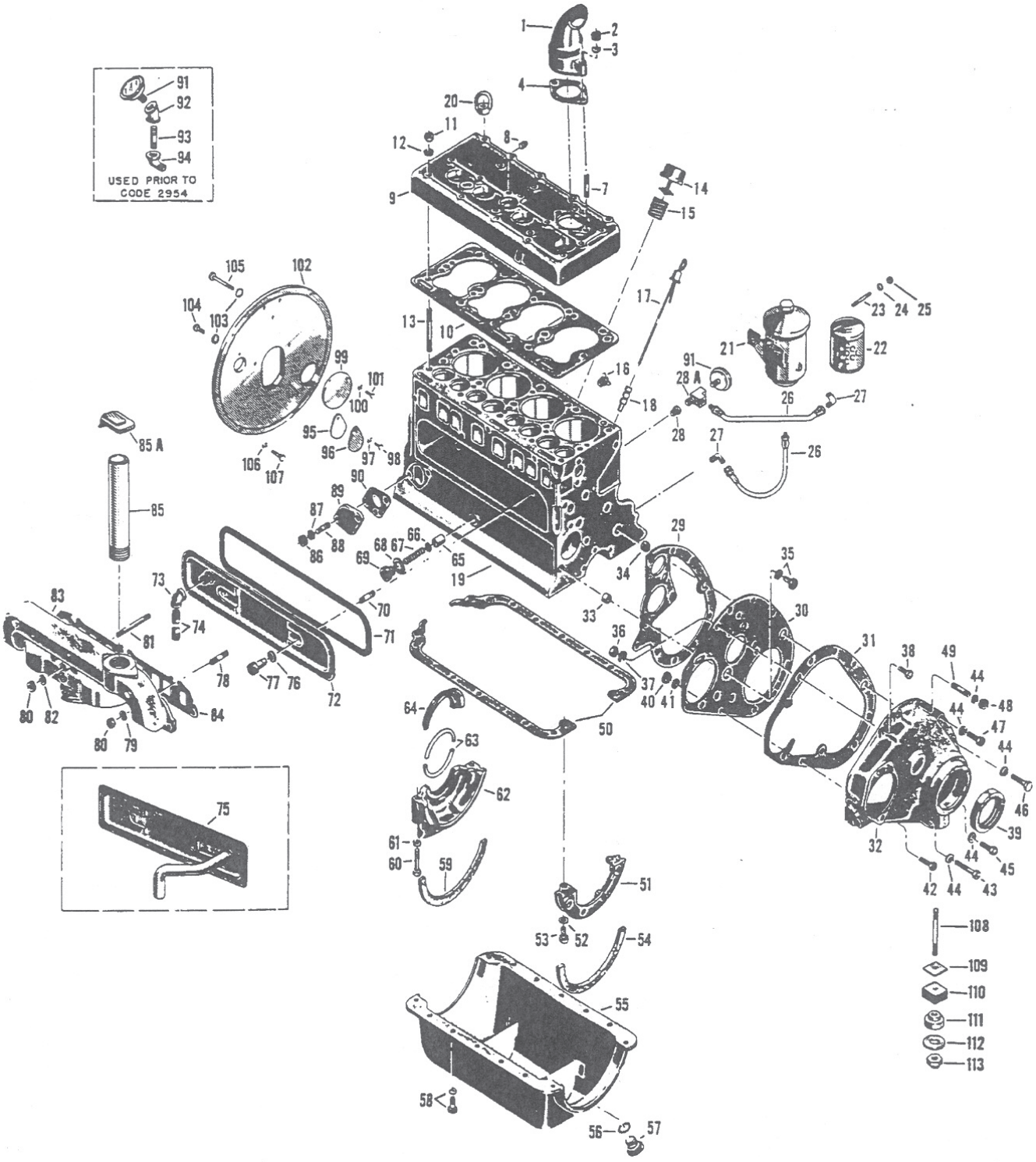


FIGURE 5141-F-1

CRANKCASE (Cont'd) FIGURE 5141-F-1

Item	Description	Qty.	Part No.
52	Lockwasher	2	S-9250-168
53	Screw, Ft. Filler Block	2	S-9250-156
54	Cork, Filler Block	1	S-9250-142
55	Oil Pan Assembly	1	S-9250-70
56	Gasket, Drain Plug	1	S-9250-72
57	Drain Plug	1	S-9250-71
58	Screw & Washer Assembly	14	S-9250-159
59	Cork, Rear Filler Block	1	S-9250-142
60	Screw	2	S-9250-157
61	Lockwasher	2	S-9250-168
62	Rear Filler Block	1	S-9250-111
	Rear Br'g. Oil Guard Ass'y Incl.	1	S-9250-203
63	Seal, Rear Filler Block	2	S-9250-48
64	Rear Br'g. Oil Guard	1	S-9250-47
	Felt	1	S-9250-201
65	O.P. Relief Valve	1	S-9250-123
66	Plain Washer	As Req'd	S-9250-173
67	Relief Valve Spring	1	S-9250-124
68	Gasket, Relief Valve	1	S-9250-139
69	Plug, Relief Valve	1	S-9250-186
70	Stud, Vlv. Chamber Cover	2	S-9250-16
71	Gasket, Valve Cover	1	S-9250-68
72	Valve Chamber Cover	1	S-9311-17
	(Codes 215 thru 1422)	1	
73	Elbow, Vent Tube	1	S-9311-18
	(Codes 215 thru 1422)		
74	Tube, Vent	1	S-9311-19
	(Codes 215 thru 1422)		
75	Valve Chamber Cover	1	S-9250-67
	(Codes 1678 & higher)		
76	Gasket	2	S-9250-146
77	Nut, Valve Cover	2	S-9250-167
78	Stud, Manifold	6	S-9250-19
79	Washer, End &Ctr. Studs	3	S-9250-177
80	Nut, Manifold	6	S-9250-164
81	Stud, Manifold Center	1	S-9250-20
82	Washer	4	S-9250-178
83	Manifold	1	S-9250-92
84	Gasket, Manifold	1	S-9250-140

Item	Description	Qty.	Part No.
85	Exhaust Pipe	1	S-7348
85A	Exhaust Pipe Cover	1	S-10271
86	Nut	2	S-9250-162
87	Lockwasher	2	S-9250-169
88	Stud, Hole Cover	2	S-9250-17
89	Cover	1	S-9250-121
90	Gasket	1	S-9250-138
91	Gauge, Oil Pressure	1	S-8163
92	Elbow, 45°	1	T-9960
	(Codes 1678 & higher)		
93	Pipe	1	T-9959-2
	(Codes 1678 & higher)		
94	Elbow, 90°	1	T-9958
	(Codes 1678 & higher)		
95	Felt, Timing Hole Cover	1	S-9311-20
96	Timing Hole Cover	1	S-9311-21
97	Lockwasher	1	3/8
98	Screw	1	3/8-16x5/8
99	Cover, Starter Hole	1	S-8076
	(Codes 1223 & higher)		
100	Lockwasher	2	7/16
	(Codes 1223 & higher)		
101	Screw, Cover	2	7/16-14x1/2
	(Codes 1223 & higher)		
102	Rear End Plate and	1	S-9352
	Timing Pin Ass'y. Incl.		
	Rear End Plate	1	L-2883-1
	Timing Pin	1	T-10088
	(Codes 1223 & higher)		
102	Rear End Plate	1	S-9311-22
	(Codes 215 thru 1123)		
103	Lockwasher	5	T-9695-4
104	Screw, Dowell	2	T-9944
105	Screw – 7/16" - 14 x 1	3	T-8833-1
106	Lockwasher, Gen. Mt'g	6	T-9695-4
107	Screw, Gen. Mt'g	6	3/8-16x1
108	Stud (1)	1	T-8911
109	Washer	1	T-9054
110	Upper Engine Mount	1	T-8823
111	Lower Engine Mount	1	T-8823
112	Washer	1	T-1455
113	Huglock Nut	1	T-9187-3

1. When replacing T-8911 stud, order T-9187-3 Huglock nut.

PISTONS, CRANKSHAFT, FLYWHEEL

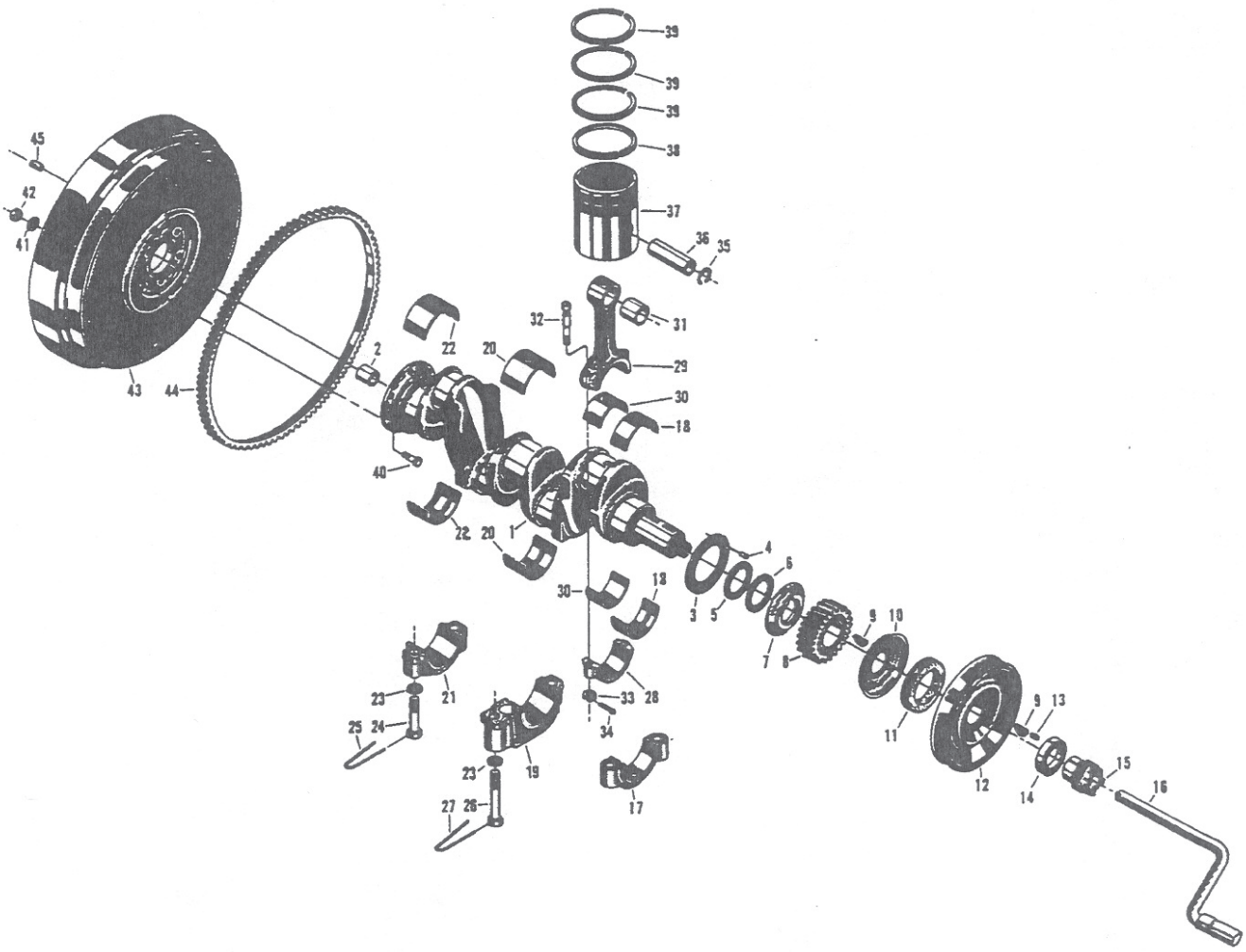


FIGURE 5141-G

OVERSIZE AND UNDERSIZE DESIGNATIONS

To specify either an oversize or undersize Piston, Ring or Bearing add the desired over or undersize dimension to the part number as a suffix; for example:

The standard Connecting Rod Bearing (#2 & 4 Cylinders) is S-9250-65, if a 0.020” undersize is desired order S-9250-65-020. Available sizes are .020” and .002”.

(1) Piston Assembly Kit S-9250-192.

PISTONS, CRANKSHAFT, FLYWHEEL, FIGURE 5141-G

Item	Description	Qty.	Part No.
1	{Crankshaft - Code 1223 & higher	1	S-9250-204
	{Crankshaft, incl: - Code 215 thru 1123	1	S-9311-1
2	Bushing - Code 215 thru 1123	1	S-9311-2
3	Thrust Washer	2	S-9250-35
4	Pin, Thrust Washer	3	S-9250-46
5	Shim, .002”	8	S-9250-32
6	Shim, .008”	8	S-9250-33
7	Thrust Plate	1	S-9250-34
8	Crankshaft Gear	1	S-9250-122
9	Key	2	S-9250-37
10	Oil Thrower	1	S-9250-133
11	Seal, Fan Pulley	1	S-9250-144
12	Pulley	1	S-9250-126
13	Cork	1	S-9250-145
14	Spacer Collar	1	S-9250-176
15	Starting Jaw	1	S-9022
16	Crank	1	S-7430
17	Bearing Cap, Ft. Main.	1	S-9250-9
18	Bearing Ass’y, Ft. Main (Note 1) (one bearing ass’y is two halves)	1	S-9250-38
19	Bearing Cap, Ctr. Main.	1	S-9250-10
20	Bearing Ass’y, Ctr. Main (one bearing ass’y is two halves)	1	S-9250-40
21	Bearing Cap, Rear Main.	1	S-9250-11
22	Bearing Ass’y, Rear Main (one bearing ass’y is two halves)	1	S-9250-39
23	Washer, Plain	6	S-9250-14
24	Screw, Bearing Cap, Ft. & Br.	4	S-9250-12
25	Lockwire #19	2	S-9250-183
26	Screw, Ctr. Br’g. Cap	2	S-9250-13
27	Lockwire #19	1	S-9250-182
--	Connecting Rod Ass’y #1-3, incl:	2	S-9250-58
28	Cap	2	N.S.S.
29	Rod	2	N.S.S.
30	Bearing (one bearing is one half)	4	S-9250-62
31	Bushing, Pin.	2	S-9250-59
32	Bolt	4	S-9250-60
33	Nut	4	S-9250-61
--	Connecting Rod Ass’y #2-4, incl:	2	S-9250-64
28	Cap	2	N.S.S.
29	Rod	2	N.S.S.
30	Bearing (one bearing is one half)	4	S-9250-65
31	Bushing, Pin.	2	S-9250-59
32	Bolt	4	S-9250-60
33	Nut	4	S-9250-61
34	Cotter Pin	8	S-9250-180
35	Ring, Pin Retaining	8	S-9250-57
36	Piston Pin	4	S-9250-56
37	Piston	4	S-9250-53
38	Piston Ring, Oil	4	S-9250-55
39	Piston Ring, Taper Face	12	S-9250-54
40	Bolt, Flywheel	6	S-9250-36
41	Lockwasher	6	T-9695-5
42	Nut	6	T-10018
--	Flywheel Ass’y, including.-. Codes 215 thru 681	1	S-9311-6
43	Flywheel - Code 215 thru 681	1	S-9311-7
45	Lord Bushing - Codes 215 thru 681	6	T-8845
--	Expansion Plug - Code 215 thru 681	6	S-9311-23
43	Flywheel Ass’y - Codes 960 thru 1123 (Note 2)	1	S-9311-8
--	Flywheel Ass’y, incl: - Codes 1223 & higher	1	M-7671
43	Flywheel - Codes 1223 & higher (Note 2)	1	L-2880
44	Ring Gear - Codes 1223 & higher	1	M-7664

N.S.S. Not Serviced Separately

Note 1. For service of old bearing with flange – order present bearing and F-600-C-220 Thrust Washer.

Note 2. Flywheel does not include studs (item 47, page 6).

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

OIL PUMP, VALVES & CAMSHAFT

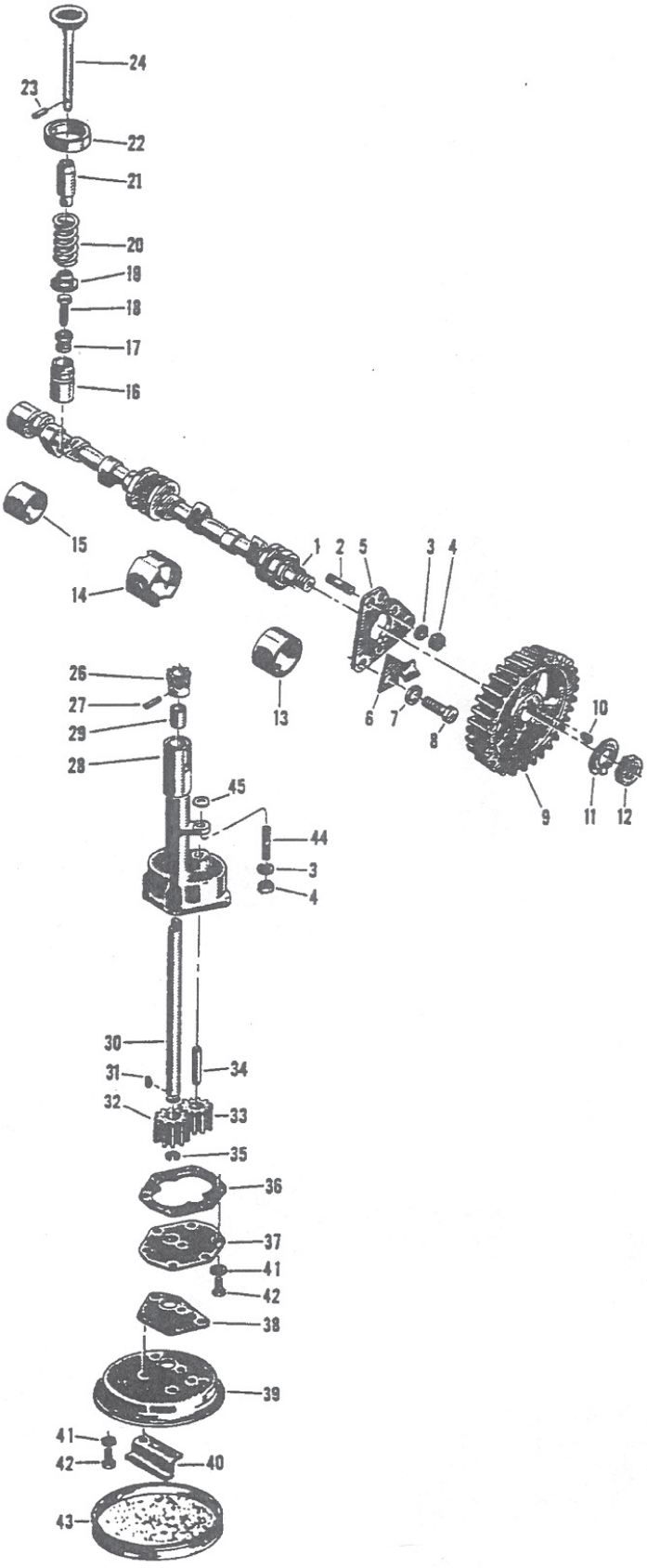


FIGURE 5141-H

OIL PUMP, VALVES AND CAMSHAFT, FIGURE 5141-H

Item	Description	Qty.	Part No.
1	Camshaft	1	S-9250-41
2	Stud, Camshaft, Thrust Plate	2	S-9250-18
3	Lockwasher 3/8”	3	S-9250-170
4	Nut 3/8-16	3	S-9250-163
5	Thrust Plate	1	S-9250-131
6	Plate, Oiler, Timing Gear	1	S-9250-134
7	Lockwasher	1	S-9250-171
8	Screw 7/16”-14 x 1-1/4”	1	S-9250-160
9	Gear, Camshaft	1	S-9250-130
10	Key, Woodruff #6	1	S-9250-184
11	Lock Nut	1	S-9250-132
12	Nut 3/4-16 x 1/4 PHK	1	S-9250-166
13	Bushing, Camshaft, Front	1	S-9250-198
14	Bushing, Camshaft, Center	1	S-9250-199
15	Bushing, Camshaft, Rear	1	S-9250-200
	Valve Tappet Assembly, incl.	8	S-9250-42
16	Tappet	8	S-9250-43
17	Lock Nut	8	S-9250-44
18	Screw	8	S-9250-45
19	Seat, Valve Spring	8	S-9250-28
20	Valve Spring	8	S-9250-27
21	Valve Stem Guide	8	S-9250-24
22	Insert, Exhaust Valve Seat	4	S-9250-5
23	Lock, Valve Spring	8	S-9250-29
24	Valve, Intake	4	S-9250-25
--	Valve, Exhaust	4	S-9250-26
--	Oil Pump Assembly, incl. *	1	S-9250-93
26	Gear, O.P. Dr. Gear	1	S-9250-96
27	Pin, O.P. Dr. Gear 3/16 x 5/16	1	S-9250-108
28	O.P. Body Ass’y, incl.	1	S-9250-94
29	Bushing	1	S-9250-95
30	Shaft	1	S-9250-102
31	Key, Woodruff #5 or #3	1	S-9250-106
32	Gear, O.P. Driven	1	S-9250-97
33	Gear, O.P. Driven	1	S-9250-98
34	Stud, O.P. Idler Gear	1	S-9250-103
35	Snap Ring, O.P. Dr. Shaft	1	S-9250-110
36	Gasket, O.P. Cover	1	S-9250-104
37	Cover Assembly O.P.	1	S-9250-99
38	Gasket, Strainer Screen	1	S-9250-105
39	Strainer Frame	1	S-9250-100
40	Strainer Spacer	1	S-9250-101
41	Lockwasher	6	S-9250-90
42	Screw 1/4”-20 x 5/8”	6	S-9250-107
43	Oil Strainer Screen	1	S-9250-109
44	Stud, Body to Cap 3/8-16 x 1-5/8”	1	S-9250-51
45	Washer, O.P. Spacer	1	S-9250-179

* Oil Pump Repair Kit S-9250-197

WATER PUMP

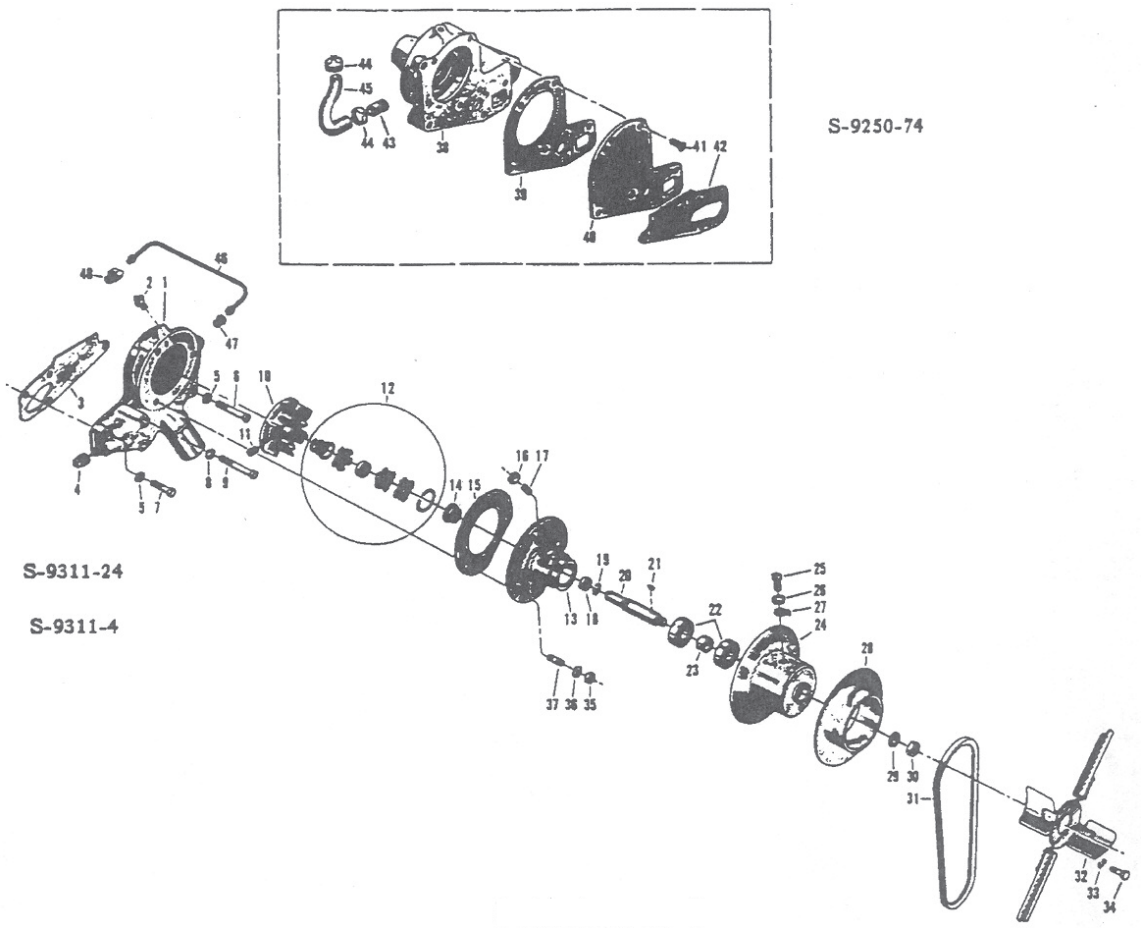


FIGURE 5141-I

PREFACE: Three different Water Pumps have been used on the original installations:

S-9311-24 Codes 215 thru 681 (Note 1) Order S-9311-64

S-9311-4 Codes 960 thru 1904 (Note 1) Order S-9311-64

S-9250-74 Codes 2163 & higher (Note 1) Order S-9311-64

Item	Description	Qty.	S-9311-24	S-9311-4	S-9250-74
1	Water Pump Body	1	S-9311-25	S-9311-25	see #38
2	Grease Fitting	1	S-9311-26	S-9311-26	---
3	Gasket, Water Pump to Block	1	S-9250-141	S-9250-142	see #42
4	Plug	1	S-9311-28	S-9311-28	---
5	Lockwasher	3	S-9250-170	S-9250-170	S-9250-170
6	Screw	3	S-9250-153	S-9250-153	S-9250-153
7	Screw	1	S-9311-29	S-9250-152	S-9250-152
8	Copper Washer, Ctr.	1	S-9250-174	S-9250-174	S-9250-174
9	Screw	1	S-9311-30	---	---
10	Impeller	1	S-9311-31	S-9311-31	S-9250-202
11	Set Screw	1	S-9311-38	S-9311-38	---

NOTE 1. Although specific code numbers identify specific water pumps sent out as original equipment, due to replacements in the field there is no definite way of identifying a particular water pump when a code number is furnished. Therefore, in replacing a water pump for any code, order S-9311-64 water pump and Repair Kit which fits all models and codes.

WATER PUMP (Cont'd) FIGURE 5141-I

Item	Description	Qty.	S-9311-24	S-9311-4	S-9250-74
12	Seal Assembly	1	S-9311-32	S-9311-32	S-9250-78
13	Support Assembly, including	1	S-9311-33	S-9311-33	---
--	Bushing	1	S-9311-34	S-9311-34	---
14	Water Shedder	1	---	---	S-9250-80
15	Gasket	1	S-9311-35	S-9311-35	---
16	Nut	1	S-9311-39	S-9311-39	---
17	Set Screw, Bearing	1	S-9311-40	S-9311-40	---
18	Retainer	1	S-9311-41	S-9311-41	---
19	Snap Ring	1	S-9311-42	S-9311-42	S-9250-79
20	Shaft	1	S-9311-43	S-9311-44	S-9250-76
21	Key	1	S-9311-45	S-9311-46	---
22	Bearing	2	S-9311-47	S-9311-47	---
23	Spacer	1	S-9311-48	S-9311-48	---
24	Fan Hub	1	S-9311-49	S-9311-50	S-9250-86
25	Screw, Flange	2	S-9311-51	S-9311-51	S-9250-89
26	Lockwasher	2	S-9250-90	S-9250-90	S-9250-90
27	Lock Nut	2	S-9250-88	S-9250-88	S-9250-88
28	Flange	1	S-9250-87	S-9250-87	S-9250-87
29	Lockwasher	1	S-9311-52	S-9311-52	---
30	Nut	1	S-9311-53	S-9311-53	---
31	Fan Belt, No Starter	1	S-8075	S-8075	S-8075
	Fan Belt, With Starter	1	---	S-8074	S-8074
32	Fan Blade Ass'y	1	S-9311-54	L-2649	L-2649
33	Lockwasher	4	E-106-A-3	E-106-A-3	E-106-A-3
34	Screw	4	5/16-18x3/4	5/16-18x3/4	5/16-18x3/4
35	Nut	3	S-9311-55	S-9311-55	---
36	Lockwasher	3	S-9311-56	S-9311-56	---
37	Stud	3	S-9311-57	S-9311-57	---
38	Body	1	---	---	S-9250-75
39	Cover Gasket	1	---	---	S-9250-83
40	Cover	1	---	---	S-9250-82
41	Screw	4	---	---	S-9250-81
42	Gasket, To Block	1	---	---	S-9250-141
43	Nipple	1	---	---	T-10113
44	Hose Clamp	2	---	---	T-9957
45	Hose	1	---	---	T-9950
46	Tube Assembly	1	S-9311-58	S-9311-59	---
47	Bushing, Water Pump	1	S-9311-60	S-9311-60	---
48	Elbow, Cylinder Outlet Elbow	1	S-9311-61	S-9311-61	---
--	Water Pump and Repair Kit (1)	-	S-9311-64	S-9311-64	S-9311-64

(1)S-9250-191 WaterPump and Repair Kit (Includes:S-9250-74, S-9250-129, S-9250-141, S-9250-143, T-10113, S-9250-153, S-9250-152, S-9250-148, T-9950, T-9957, M-6591, S-9250-170)

FUEL SYSTEM

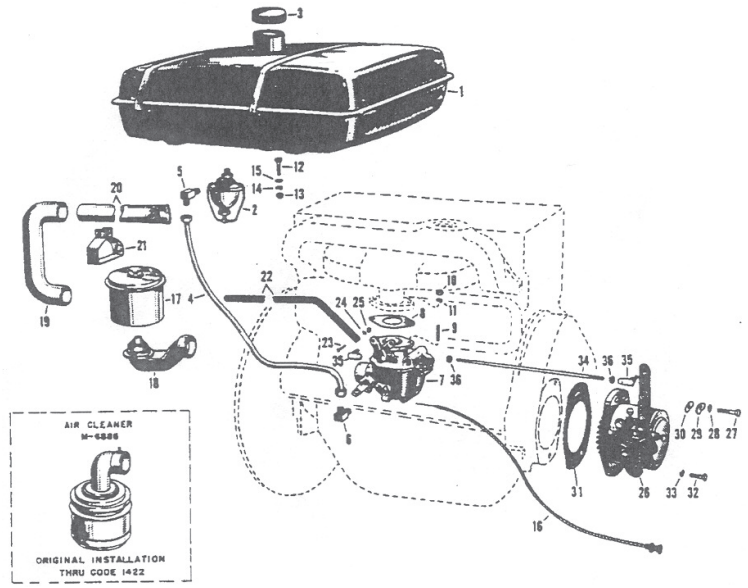


FIGURE 5141-J-I

Item	Description	Qty	Part No.
	Fuel Tank Assy. (6)	1	L-2581-A
	Fuel Tank Assy. Incl:	1	L-3167-A
1.	Fuel Tank, (6)	1	L-2581
	Fuel Tank	1	L-3167
2.	Fuel Strainer (1)	1	
	Bowl	1	S-6185-1
	Screen	1	S-6185-2
	Gasket	1	S-6185-3
3.	Filler Cap (6)	1	S-8000
	Filler Cap	1	S-10149
4.	Fuel Line	1	S-4893-49
5.	Fitting Straight (Codes 215 thru 1123)	1	T-8644
	Fitting Elbow (Codes 1223 & higher)	1	T-8645
6.	Elbow & Strainer Assy.	1	T-9961
7.	Carburetor (2) (6)	1	S-9239
	Carburetor	1	S-9790
8.	Gasket	1	S-9233
9.	Stud	1	T-9954
10.	Nut	1	5/16-18
11.	Lockwasher	2	E-106-A-3
12.	Sq. Hd. Bolt	4	3/8-16x1
13.	Sq. Hd. Nut	4	T-10384
14.	Lockwasher	4	E-106-A-4
15.	Plain Washer	4	7/8x3/8x1/16
16.	Choke Control	1	S-7525
17.	Air Cleaner (Codes 215 thru 1422)	1	M-6886
	Air Cleaner (Codes 1678 & higher)	1	M-7311
18.	Elbow (Codes 1678 & higher)	1	M-7161-1
19.	Hose, Air Heater (Note 5) (Codes 1846 & higher)	1	S-8688
20.	Heater Tube (Codes 1846 & higher)	1	S-8626
21.	Clamp, Tube (Codes 1846 & higher)	1	T-9486

Item	Description	Qty	Part No.
22.	Control Rod (Codes 215 thru 1422)	1	T-8583
	Control Rod (Codes 1678 & higher)	1	S-6192-5
23.	Screw	1	10-24x3/4
24.	Lockwasher	1	3/16 St'd
25.	Nut	1	10-24
26.	Governor Assy. (6) (Note 4)	1	M-8217
	Governor Assy. (Note 4)	1	M-8028
	Governor Drive Gear	1	M-7018-1
	Governor Operating Spring	1	M-7018-2
27.	Screw, Top Mtg. (6)	1	3/8-16x1-1/8
28.	Washer, Cu Asbestos	1	S-9236
29.	Cover Plate	1	S-9240
30.	Gasket, Cover Plate	1	S-9235
31.	Gasket, Governor	1	S-9234
32.	Screw, Hex. Hd.	1	3/8-16x1-1/8
33.	Lockwasher	1	E-106-A-4
34.	Governor Rod	1	T-9962
35.	Ball Joint (3)	2	T-9963
36.	Hex Nut	2	1/4-28

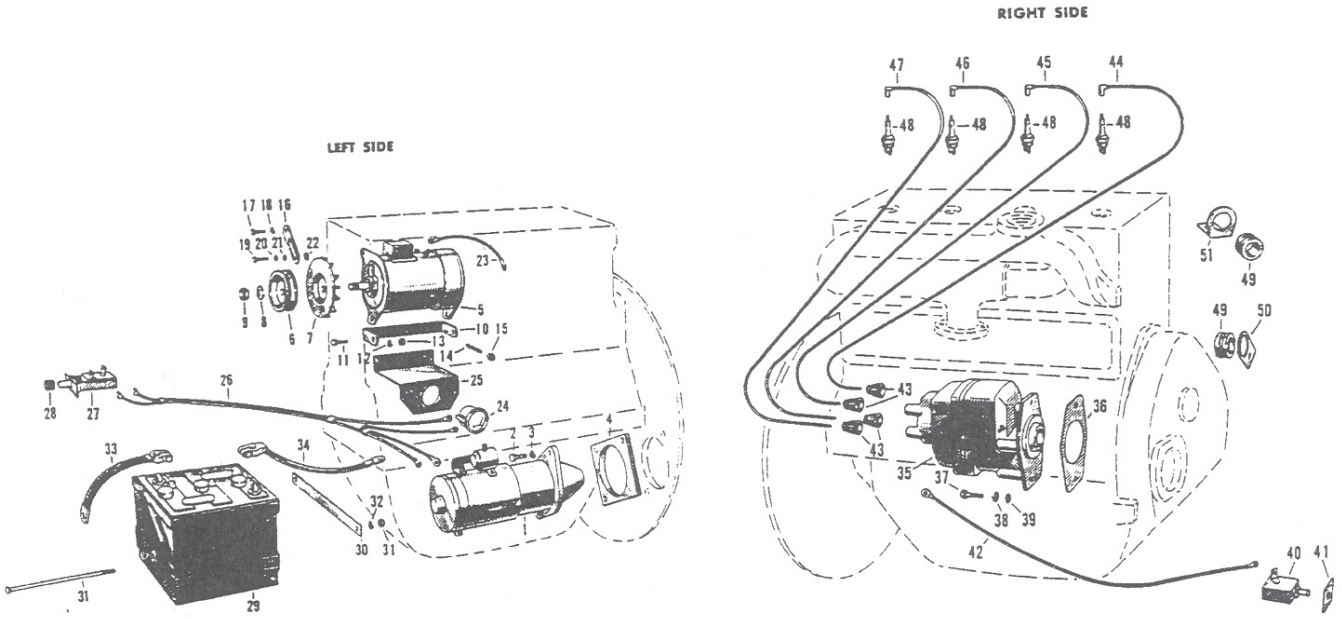
ANTI-FROST KIT

A. For codes 215 thru 1422: Kit part number S-8685 includes new valve cover plate, air heater hose and tube, new air cleaner, new oil gauge fittings and engine regulator rod.
B. For codes1678 thru 1828: Kit part number S-8686 includes air heater hose and tube, new cleaner shell.

FOOTNOTES:

1. Early model machines require 1/2" to 3/8" reducing bushing for application of latest S-6185 strainer.
2. For component parts see page 20.
3. On machines with plain (not tapped) hole in governor arm use one T-8624 ball joint.
4. Order Governor M-7018 for models with speed control.
5. Air Heater Hose mounted on Lift Bale (item 28, page 3) when welder leaves factory.
6. Codes prior to 2954.

ENGINE ELECTRICAL SYSTEM



Item	Description	Qty	Part No.
2.	Screw, Hex Hd. Cap	2	7/16-14x1-1/2
3.	Lockwasher	2	E-106A-8
4.	Starter Spacer	1	S-8073
6.	Generator Pulley	1	M-7204
7.	Generator Pulley Fan (Codes 2954 & higher)	1	Delco 1866400
8.	Lockwasher	1	S-9311-36
9.	Nut	1	S-9311-37
10.	Bracket (3) (7)	1	S-8532
	Bracket (3)	1	S-10249
11.	Screw	2	3/16-18x1
12.	Lockwasher	2	E-106-A-3
13.	Nut, Hex	2	5/16-18
14.	Stud	2	T-9087
15.	Nut, Hex	2	3/8x16
16.	Adj. Strap (4)	1	S-8533
17.	Screw	1	3/8-16x7/8
18.	Lockwasher	1	E-106-A-4
19.	Screw	1	5/16-18-7/8
20.	Lockwasher	1	E-106-A-3
21.	Plain Washer	1	T-1093
22.	Plain Washer	1	T-1096
23.	Lead, Gen. to Ammeter	1	S-7816-19
24.	Ammeter	1	S-7514
25.	Ammeter, Panel	1	M-6955
26.	Harness	1	M-6957
....	Switch Assy. incl:	1	T-9623
27.	Switch	1	S-9157
28.	Bushing	1	S-8334
29.	Battery, Domestic	1	M-6962-1
	Export	1	M-6962-2
30.	Battery, Strap	1	S-8069
31.	Carriage Bolt & Nut	2	1/4-20x7-1/2
32.	Lockwasher	2	E-106-A-3
33.	Ground Lead	1	S-8070
34.	Battery Lead	1	S-5938-R

Item	Description	Qty	Part No.
35.	Magneto (5) (7)	1	L-2677
....	Magneto	1	L-3228
36.	Magneto Gasket	1	S-9234
37.	Screw, Hex Hd. Cap.	1	3/8-16x3-1/4
38.	Lockwasher	1	E-106A-4
39.	Washer	1	S-9262-2
40.	Switch Magneto	1	S-8020
41.	Plate, Switch	1	T-9061
....	Adapter, Switch Plate (Codes 215 thru 1123)	1	T-9101
42.	Lead Assembly	1	T-8609-21
43.	Nipple	4	T-8627
44.	Ignition Wire #1 Cyl.	1	S-7518-5
45.	Ignition Wire #2 Cyl.	1	S-7518-7
46.	Ignition Wire #3 Cyl.	1	S-7518-11
47.	Ignition Wire #4 Cyl.	1	S-7518-14
48.	Spark Plug	4	S-8159
49.	Grommet	3	S-9250-194
50.	Bracket, Wire Support	1	S-9250-196
51.	Bracket, Wire Support	2	S-9250-195

BATTERY START CONVERSION KIT – M-6996

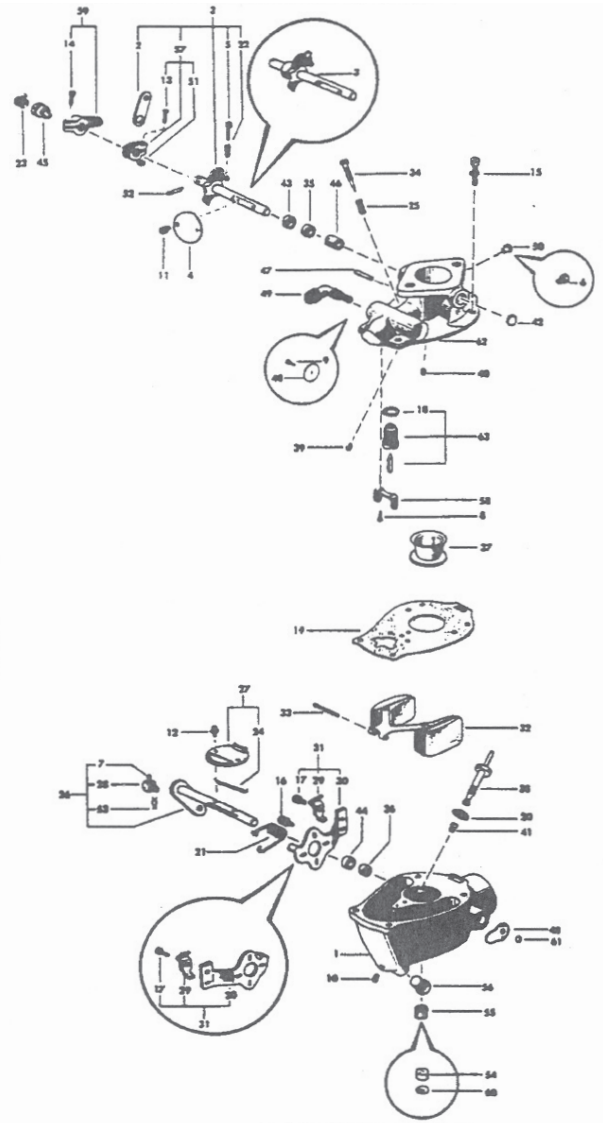
Possible only on welder's code number 1223 & higher.

FOOTNOTES:

1. S-8532 Bracket for Delco Remy Generator: order S-8140 for units with Elec. AutoLite Generator.
2. S-8533 Strap for Delco Remy Generator: order S-8071 for units with Elec. AutoLite Generator.
3. Many types of magnetos have been used – order component parts by magneto nameplate reading.
4. On switch replacements for welder's code 215 thru 1123 order new S-8020 switch, adapter T-9101 and plate T-9061.
5. Codes prior to 2954.

MARVEL - SCHEBLER CARBURETOR PARTS

Carburetor Part Number S-9239



Item	Part Name And Description	Part No.	No. Req'd.
1	Body Assembly	10-3180	1
2	Lever, Throttle, Loose	12-A38	1
3	Shaft, Stop & Lever Ass'y. Throttle	13-930*	1
4	Valve, Throttle (20°)	14-227	1
5	Screw, Throttle Stop (8-32 x 3/4)	15-42	1
7	Screw, Choke Swivel (8-32 x 5/16)	15-285	1
8	Screw, Drive, Float Bk't. (2 x 1/4)	15-343	2
10	Screw, Nozzle Hole Plug (8-32)	15-409	1
11	Screw & L.W. Ass'y. (4-40 x 1/4)	15-A91*	2
12	Screw & L.W. Ass'y. (4-40 x 1/4)	15-A91*	2
13	Screw, Clevis Clamp (10-24 x 5/8)	15-A55	1
14	Screw & L.W. Ass'y. (12-24 x 5/8)	15-A82	1
15	Screw & L.W. Ass'y. (12-24 x 5/8)	15-A82	4
16	Screw & L.W. Ass'y. (8-32 x 3/8)	15-A93	1
17	Screw & L.W. Ass'y. (8-32 x 5/16)	15-A99	1
18	Gasket, Float Valve Set	16-4	1
19	Gasket, Throttle Body to Bowl	16-80	1
20	Gasket, Main Nozzle	16-449	1
21	Spring, Choke Return	24-247*	1
22	Spring, Throttle Stop Screw	24-262	1
23	Spring, Governor Lever	24-281	1
24	Spring, Choke Valve Flapper	24-425	1
25	Spring, Idle Needle	24-340*	1
26	Lever & Shaft Ass'y. Choke	26-659	1
27	Valve Assy. Choke	27-539	1
28	Swivel, Choke Lever	28-49	1
29	Clip, Choke Bracket	29-81	1
30	Bracket, Choke	29-104	1
31	Bracket, Ass'y. Choke	29-528	1
32	Float & Lever Ass'y	30-600	1
33	Shaft, Float Lever	32-27*	1
34	Needle, Idle Adjusting	43-33*	1
35	Packing, Throttle Shaft	44-38*	1
36	Packing, Choke Shaft	44-39*	1
37	Venturi (25/32" Dia.)	46-457	1
38	Nozzle, Main	47-180	1
39	Jet, Idle	49-203*	1
40	Jet, Economizer	49-145*	1
41	Jet, Power	49-188*	1
42	Cup, Throttle Shaft	55-230*	1
44	Retainer, Choke Shaft Packing	55-243*	1
45	Bushing, Governer Lever	60-257	1
47	Pin, Throttle Stop	62-167	1
50	Plug, Idle Drilling	80-171	1
51	Nut, Clevis Clamp (10-24)	81-1	1
52	Pin, Cotter	82-14	1
53	Cotter, Hairpin	82-16	1
54	Strainer, Fuel Drain	95-40	1
56	Plug, Bowl Drain	99-7	1
57	Clevis Ass'y.	121-504	1
58	Bracket, Float	136-54	1
59	Lever Ass'y., Governor	155-590	1
60	Plug, Expansion Fuel Drain	179-35	1
61	Ball, Numbering Plate	206-36	1
62	Throttle Body & Shaft Ass'y.	227-1130	1
63	Valve & Seat Ass'y., Float	233-536*	1
-	Repair Kit (See*Note)	286-856	-
-	Gasket Kit	16-613*	-
	*These parts included in repair kit 286-856		

RETURN TO MAIN INDEX

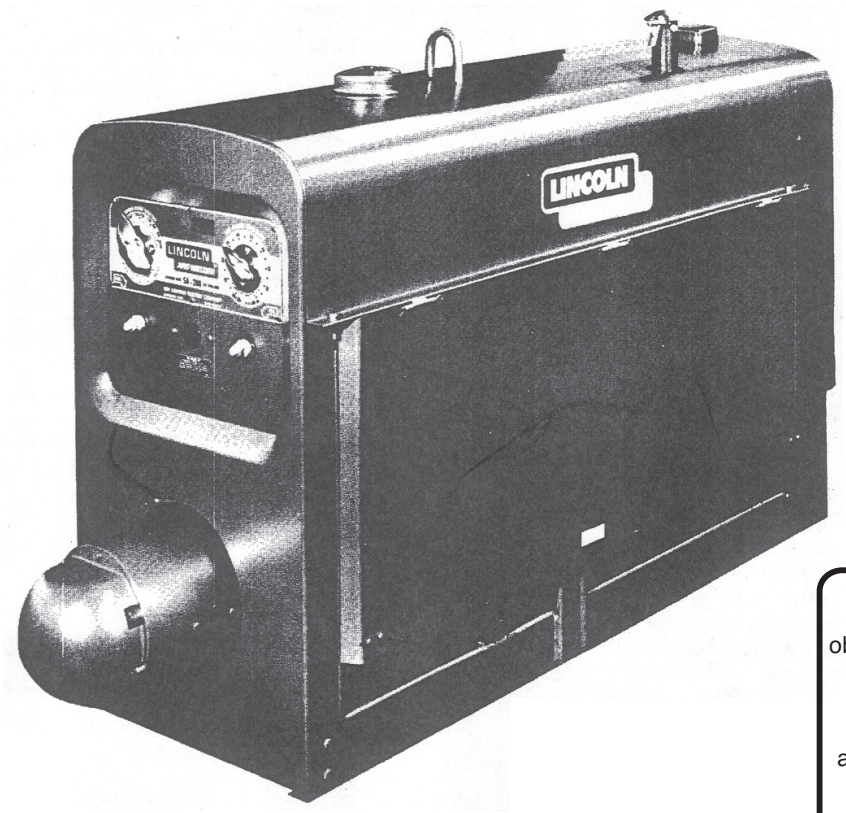
IM-208-A
October, 1969

Shield-Arc® SA-200-F163

DC Arc Welder With CONTINENTAL F163 ENGINE

Type: K-6090 Models: SA-200-F162, SA-200-F163 Codes 3400 to 7275.

For machines above code 7275 request IM-276.



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

Safety Depends on You

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation. . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS CONTAINED ON PAGES ii, iii, AND iv.** And, most importantly, think before you act and be careful.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info

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

Return to Section TOC
Return to Master TOC

PROPER GROUNDING DURING INSTALLATION

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

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.

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 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 National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

INSTALLATION, CONNECTION, AND MAINTENANCE OF 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 copper strap on the engine foot.

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 the engine is not running.

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

(S-17851)

OPERATION OF ENGINE WELDERS

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

OPERATION OF ALL WELDERS

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

MAINTENANCE AND TROUBLESHOOTING WARNINGS

WARNING: Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) 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.

ATTENTION OWNERS OF ENGINE WELDERS

WARNING: 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. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

CAUTION WHEN INSPECTING THE 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.

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.

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

Need Welding Training?

The Lincoln Electric Company operates the oldest and most respected Arc Welding School in the United States at its corporate headquarters in Cleveland, Ohio. Over 60,000 students have graduated. Tuition is low and training is “hands on”.

For details write: Lincoln Welding School
22801 St. Clair
Cleveland, Ohio 44117

Ask for bulletin ED-80 or call 216-481-8100 and ask for the Welding School Registrar.

Return to Section TOC
Return to Master TOC

DAMAGE CLAIMS

When Lincoln equipment is shipped, title passes to the purchaser upon receipt by carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at time shipment is received.

The 1978 National Electric Code does not require this machine to be grounded under normal operating circumstances.

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.

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 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 National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

PRELIMINARY CHECKS AND OPERATION

See the engine manufacturer's operating manual supplied with the welder for detailed engine operating instructions.

Engines equipped with starters are furnished with dry charged batteries. Fill with the electrolyte supplied per the instructions furnished with the welder. **Use caution as the electrolyte is a strong acid.**

Upon receipt of the welder, fill the crankcase to the "full" mark on the bayonet gauge with the recommended weight of oil (See ENGINE MANUAL). Fill the radiator, gasoline tank and air filter oil bath. Open the carburetor feed valve on the sediment bowl by turning the handle from right to left. Then put the ignition switch in the "on" position and start the engine. Run the engine for five minutes before welding in order to check for any damage to the engine when in transit. Stop and check the oil level before proceeding. If the oil level is down, fill to the "full" mark again.

When the engine is running satisfactorily, stop the engine and connect the electrode and work cables to the studs on the control panel. For positive (reverse) polarity, connect the electrode cable to the terminal marked "Positive", and for negative (straight) polarity connect it to the "Negative" terminal.

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

Before starting the engine everyday, check the fuel supply (running out of fuel may draw dirt into the fuel system), crankcase oil, radiator and battery.

When hauling the welder between job sites, close the fuel feed valve on the sediment bowl by turning the handle from left to right. Failure to turn the fuel off when traveling can cause carburetor flooding and difficult starting at the new job site.

The fan belt tends to loosen after about 40 hours of operation. Check and tighten, if necessary. Check and tighten all internal and external connections as necessary.

The machine has a pressure radiator with a 10-1/2 quart capacity. Keep the radiator cap tight and the system clean. Add sufficient anti-freeze in cold weather.

NOTE: Machines built after Feb. 1971 (above code 6900) have an alternator rather than a DC generator in the engine electrical system. In these machines the negative battery cable is connected to ground rather than the positive cable as used in the generator equipped welders for many years. When using jumper cables, extra care must be taken to connect + and + to – and – when using an "alternator" equipped machine to start a "generator" machine and vice versa.

IDLING DEVICE

The engine idler reduces engine speed after the arc is broken to conserve fuel and reduce engine wear. For automatic idling, remove the latching pin from the idler control lever allowing the lever to swing freely.

For detailed description of the idler operation, ***See IM-179***.

CARBURETOR DE-ICER

This welder is provided with an anti-frosting device. Frosting generally occurs when the humidity is high and the temperature is between 26 and 40ºF. To connect the de-icer, remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive preheated air to the carburetor.

Disconnect this hose for warm weather operation.

EXHAUST SPARK ARRESTER

Some federal, state or local laws may require that gasoline engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard.

This welder is not originally shipped with a spark arrester nor does the optional muffler qualify as a spark arrester. When required by local regulations, suitable spark arresters must be installed and properly maintained. **NOTICE**: An incorrect arrester may lead to damage of the engine or its performance. Contact the engine manufacturer for specific recommendations.

CONTROL OF WELDING CURRENT

Duty Cycle

This welder is NEMA rated 200 amperes at 40 arc volts on a 60% duty cycle. Duty cycle is based on a 10 minute period; thus, the welder can be loaded at Rated Output for 6 minutes out of every 10 minute period.

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' (Continuous Voltage Control) 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 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 a lower open circuit voltage.

*Older machines have only a single number at each position on the nameplate as shown here. These values are the center of the ranges for each setting.

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 for 175 amps.

DO NOT attempt to set the 'Current Range Selector' between the five points designated on the nameplate. All switches made after 1959 have a spring-loaded cam which almost eliminates the possibility of setting this switch between the designated points.

RECOMMENDED CABLE SIZES

Machine Size in Amperes	Duty Cycle	Cable Sizes for Combined Lengths of Copper Electrode and Work Cables		
		0 to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	60	2	1	1/0

POWER PLUG

A 115 D.C. power plug outlet is located on the control panel. The current available is 8.7 amperes. This will furnish 1 kilowatt of power to operate power tools and lights. Drawing more power may damage the welder exciter. To draw this power, hold the idler in full power position with the latching pin.

Power tools should always be grounded to the welder frame unless they are protected by an approved system of double insulation. (On old machines equipped with a 2-prong receptacle, either replace the receptacle with a 3-prong grounding type or use an adapter in the receptacle and connect the pigtail to the control panel.)

PIPE THAWING – WARNING

"Pipe thawing, if not done properly, can result in fire, explosion, damage to wiring which may make it unsafe, damage to pipes, burning up the welder, or other hazards. Do not use a welder to thaw pipe before reviewing Lincoln bulletin E-695.1 (dated December '76 or later)".

For protection of the welder from overloads when thawing pipe, use of a device called the "Linc-Thaw" is recommended. A description of the "Linc-Thaw" is in bulletin E695.1.

COMMUTATOR AND BRUSHES

The generator brushes are properly adjusted when the welder is shipped. It requires no particular attention. DO NOT SHIFT THE BRUSHES or adjust the rocker setting.

Periodically inspect the commutators and brushes by removing the commutator 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, clean while running with fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

Replace brushes when they wear within ¼" of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator.

Return to Section TOC
Return to Master TOC

Seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low-pressure air.

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

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

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.

MAINTENANCE INSTRUCTIONS

Have a qualified electrician do the maintenance and trouble-shooting work. Turn the engine off before working inside the machine.

1. Blow dirt out of the welder and controls with an air hose at least once every two months – once every week in dirty locations. Use low air pressure to avoid driving dirt into the insulation.
2. Current control 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. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Drain and change the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when filter is changed.
5. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
6. Inspect air filter (oil bath type) daily – more often under dusty conditions. Clean and fill with oil to bead. The oil cup should never be removed while the engine is running.
7. Put a drop of oil on the current control shaft at least once every month.
8. See the engine manufacturer's manual supplied with the welder for more complete engine maintenance information.

Return to Section TOC
Return to Master TOC

TROUBLE SHOOTING

Have a qualified electrician do the maintenance and trouble shooting work. Turn the engine off before working inside the machine.

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator. Brushes may be worn down to limit. Brush springs may be broken. Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire. Electrode lead or work lead connection may be poor. Wrong grade of brushes may have been installed on generator. Field rheostat may be making poor contact and overheating.	Commutator should be trued or cleaned. Replace brushes. Replace brush springs. Check field current with ammeter to discover varying current. This applies to both the main generator and exciter. Tighten all connections. Use Lincoln brushes. Inspect rheostat and clean and adjust finger tension on contact.
Welder starts but fails to generate current.	Generator or exciter brushes may be loose or missing. Exciter may not be operating. Field circuit of generator or exciter may be open. Exciter may have lost excitation. Series field and armature circuit may be open-circuited.	Be sure that all brushes bear on the commutator and have proper spring tension. Check exciter output voltage with voltmeter or lamp. Check for open circuits in rheostat, field leads, and field coils. Flashing the exciter fields consists of passing current through the fields using an external source of 6 to 125 volts of DC power from a storage battery or a generator. If using a DC generator, keep the generator turned off except when actually applying the flashing current. To flash the fields: 1. Turn the welder off and raise one exciter brush off the commutator. 2. On Lincoln welders, attach the positive lead from the DC source to the right hand brush holder. 3. Carefully holding an insulated section of the negative lead from the DC source, touch its lug or clamp to the left hand brush holder for 5 seconds. Pull it away quickly to minimize arcing. Remove the leads from the brush holder, replace the brush on the commutator, start the welding and generator voltage should build up. Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high. Polarity may be wrong.	Check setting and current output with ammeter. Check polarity. Try reversing polarity or try an electrode of the opposite polarity.
Welding current too great or too small compared to indication on the dial.	Exciter output low causing low output compared to dial indication. Operating speed too low or high.	Check exciter field circuit. Adjust speed screw on governor for 1550 rpm operating speed for welding.*
Arc continuously pops out.	Selective Current control switch may be set at an intermediate position.	Set the switch at the center of the current range desired.
Engine fails to start.	Out of fuel. Clogged fuel system. Choke not closing tightly. Lead attached to stud on outside of magneto is grounded. Magneto points are pitted and fused. Ignition switch shorted. Moisture or carbon on spark plugs.	Fill with at least 75 octane gasoline. Check all lines to carburetor. Loosen choke cable screw and slack off choke wire. Check for ground and insulated lead. Dress points and adjust to 0.020". Replace. Remove plugs, clean and adjust gap to 0.025".

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

TROUBLE SHOOTING (Continued)

TROUBLE	CAUSES	WHAT TO DO
Low oil pressure.	Oil too light. Oil too low. Defective oil gage.	Drain, refill with heavier grade. Fill to "full" mark on bayonet gage. Do not overfill. Replace.
Lack of power.	Carbon deposits, causing pre-ignition.	Run engine under full load for a short time.
	Incorrect timing.	Time ignition.*
Overheating.	No water in radiator or clogged cooling system.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump.
	Late timing.	Time ignition.*
	Improper valve clearance.	Adjust valve tappets
	Fan belt too loose.	(cold settings). Intake Exhaust F162 .014 .014 F163 .012 .021 Adjust to from 3/4" to 1" deflection.
Knocking.	Poor grade of gasoline.	Use at least 75 octane gasoline.
	Spark advanced too far.	Retime ignition.
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking.	Clean and lubricate. Replace toggles if worn.
	Dirty or chocked air filter.	Remove and clean according to instructions on unit.
	Governor spring adjusting screw misadjusted.	Adjust screw just enough to eliminate surge.*
	Governor control rod wrong length.	Adjust length of control rod so that there is from 1/32" to 1/16" clearance between the stop pin and the stop when the engine is shut off and the regulator expanded.
Low Output.	Operating speed is set too low.	Adjust speed screw on governor for 1550 rpm operating speed for welding.*
Large decrease in speed.	Misadjusted governor spring adjusting screw.	Adjust screw until speed does not drop more than 150 rpm+ 25 rpm when arc is struck. If surge occurs, eliminate it with the control rod. If high idle speed changes readjust the high idle speed screw.*
Unable to strike an arc.	Idle speed screw is misadjusted.	Idle speed is set too low so idler fails to operate when arc is struck. Adjust low idle speed screw for 950-1050 rpm.*
Engine runs irregularly.	Carburetor set too lean.	Adjust carburetor adjusting screw so engine will run smoothly at idle speed.*
Engine fails to pick up speed when arc is struck.		Check the idler, etc.*

See "Gasoline Engine Adjustment: Timing, Carburetor, Governor & Idler," Instruction Manual IM-179.

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

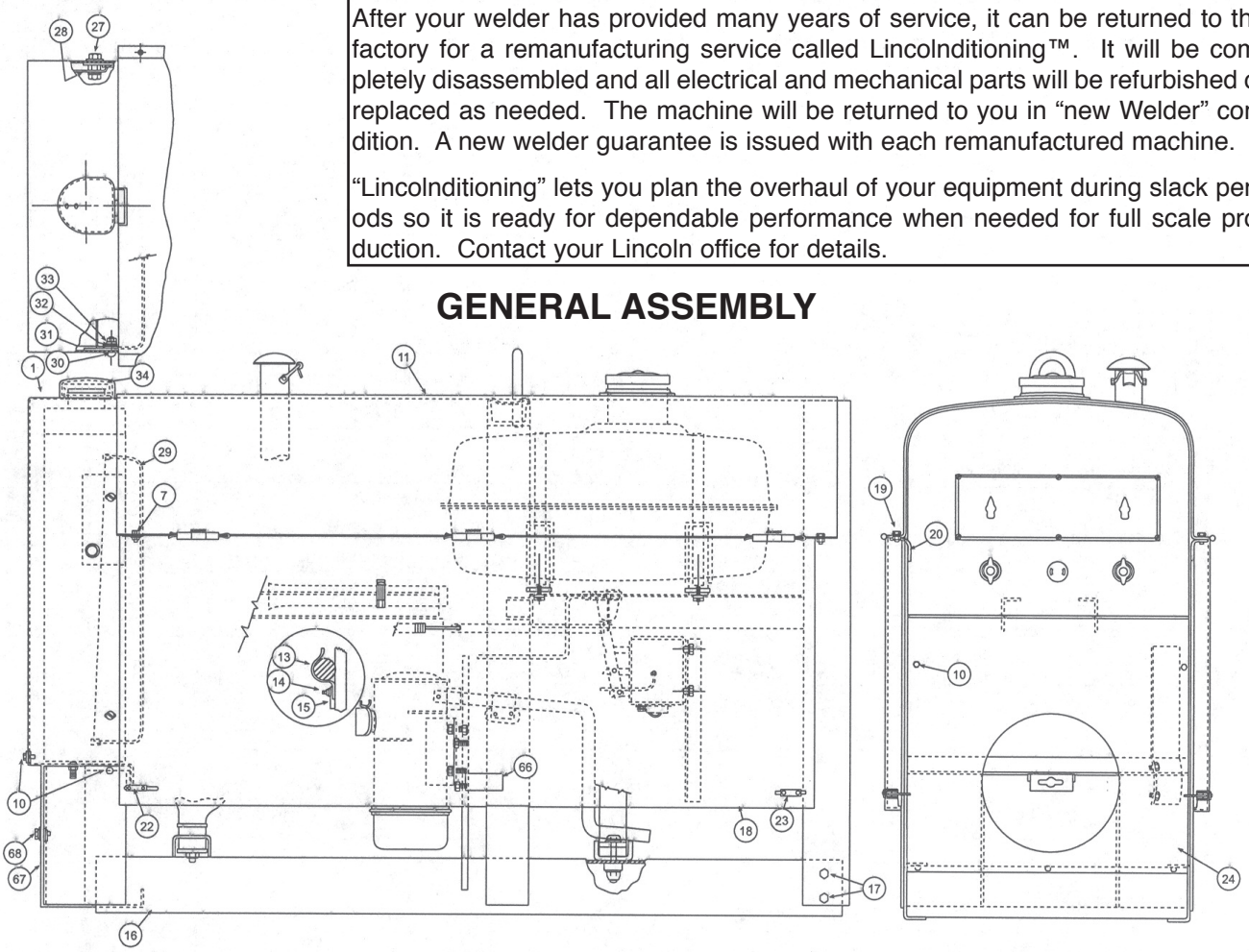
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

REMANUFACTURING

After your welder has provided many years of service, it can be returned to the factory for a remanufacturing service called Lincolnditioning™. It will be completely disassembled and all electrical and mechanical parts will be refurbished or replaced as needed. The machine will be returned to you in "new Welder" condition. A new welder guarantee is issued with each remanufactured machine.

"Lincolnditioning" lets you plan the overhaul of your equipment during slack periods so it is ready for dependable performance when needed for full scale production. Contact your Lincoln office for details.

GENERAL ASSEMBLY



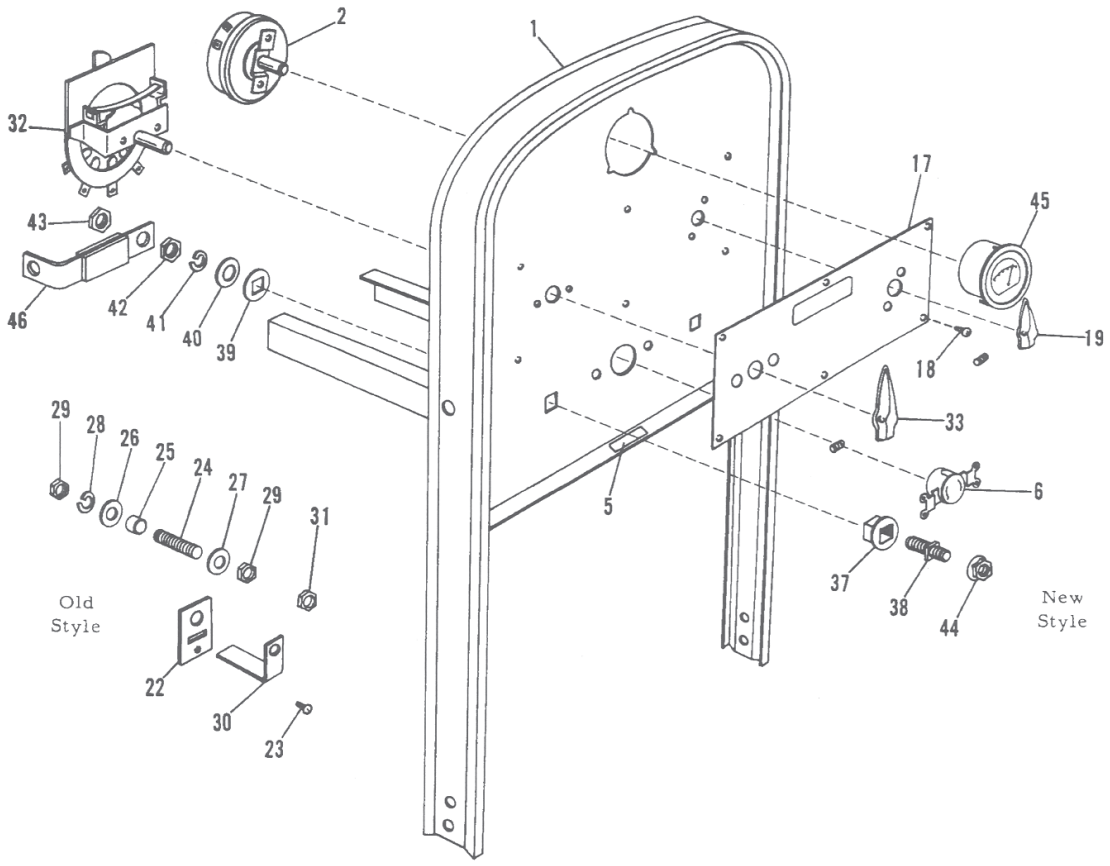
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-C

Item	Part Name And Description	No. Req'd.
1	Radiator Shell and Screen Assembly	1
7	Hex Head Bolt Front Roof Mounting	2
	Hug Hut - Front Roof Mounting	2
	Plain Washer - Front Roof Mounting	2
10	Thread Cutting Screw - Mounts Radiator Shell	
	and Rear Panel	9
11	Roof	1
13	Clamp - Crank	1
14	Round Head Screw - Clamp Mounting	1
	Hex Nut - Clamp Mounting	1
	Lockwasher	2
15	Washer	1
16	Base Assembly	1
17	Hex Head Bolt - Rear Roof Support to Base	4
	Hex Nut - Rear Roof Support to Base	4
	Lockwasher - Rear Roof Support to Base	4
18	Door	2
19	Hex Head Bolt - Rear Roof Mounting	2
	Hug Nut - Rear Roof Mounting	2
20	Rear Roof Mounting Angle	2

Item	Part Name And Description	No. Req'd.
20	Rear Roof Mounting Angle	2
22	Door Hook	2
23	Door Hook	2
	Thread Cutting Screw - Door Hook Mounting	8
	Washer - Door Hook Mounting	4
24	Rear Panel	1
27	Hex Head Bolt - Shell to Radiator	2
	Washer - Shell to Radiator	2
	Hex Nut - Shell to Radiator	2
28	Plain Washer - Shell to Radiator	2
28	Lockwasher - Shell to Radiator	2
29	Radiator Shroud Assembly Includes:	1
	Radiator Shroud	1
	Neoprene Channel	4
30	Sems Screw - Shroud to Shell	4
31	Washer - Shroud to Shell	4
32	Lockwasher - Shroud to Shell	4
33	Hex Nut - Shroud to Shell	4
66	Door Decal	2
67	Base Panel	1
68	Hex Head Screw - Panel Mounting	2
	Lockwasher - Panel Mounting	2
	Lincoln Decal	2

CONTROL PANEL



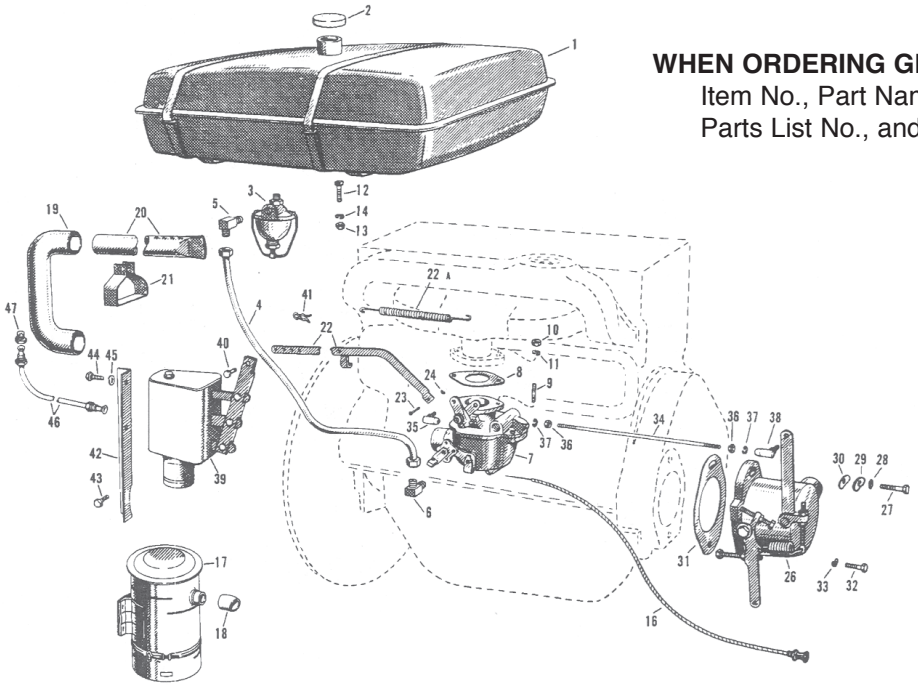
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-D

Item	Part Name And Description	No. Req'd.
1	Control Panel	1
2	Rheostat	1
5	Instruction Decal	1
6	Receptacle	1
	Round Head (Brass) Screw, Lead to Rheostat	2
	Lockwasher " " "	4
	Hex (Brass) Nut " " "	4
17	Nameplate	1
18	Self Tapping Screw	6
19	Rheostat Handle	1
22	Insulator	1
23	Self Tapping Screw	1
	Output Stud Assembly, (Code 3555 and below), Includes 24 thru 31, except 30	2
24	Stud	1
25	Insulating Tube	1
26	Insulating Washer	1
27	Flat Washer	2
28	Lockwasher	1
29	Hex Jam Nut	2
31	Weld Nut	1
30	Connection Strap	1

Item	Part Name And Description	No. Req'd.
32	Selector Switch	1
33	Selector Switch Handle	1
	Output Stud Assembly, (Code 4113 and above), Including 37 through 44	2
37	Insulator	1
38	Stud	1
39	Insulating Washer	1
40	Flat Washer	1
41	Lockwasher	1
42	Hex Jam Nut	1
43	Brass Nut	1
44	Weld Nut	1
45	Voltammeter (Optional)	1
46	Shunt Assembly	1

FUEL SYSTEM



WHEN ORDERING GIVE:
Item No., Part Name,
Parts List No., and Welder Code.

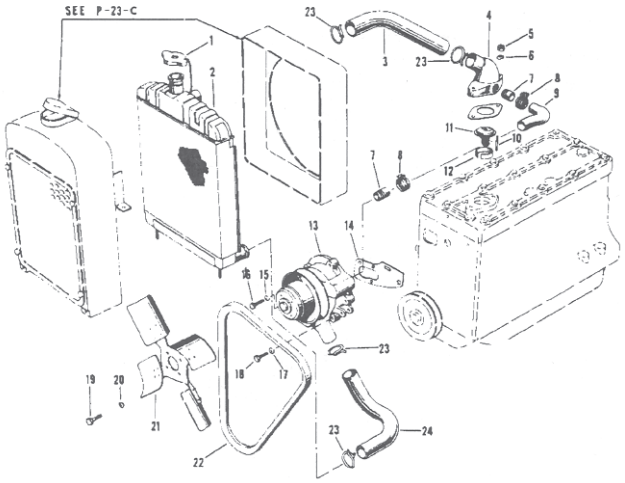
Parts List P-23-F

Item	Part Name And Description	No. Req'd.
1	Fuel Tank	1
	Filler Neck Gasket	1
2	Filler Cap	1
3	Fuel Strainer Includes:	1
	Bowl	1
	Screen	1
	Gasket	1
4	Fuel Line Includes:	1
	Fitting	2
5	Fitting - Fuel Line to Strainer	1
6	Elbow - Fuel Line To Carburetor	1
7	Carburetor	1
8	Gasket	1
9	Stud - Carburetor Mounting	2
10	Nut - Carburetor Mounting	2
11	Lockwasher - Carburetor Mounting	2
12	Square Head Bolt - Gas Tank Mounting	4
13	Clamp Nut - Gas Tank Mounting	4
14	Lockwasher - Gas Tank Mounting	4
	Rubber Washer - Mounts Between Gas Tank Foot and Rail	4
	Rubber Washer - Mounts Under Gas Tank Rail	4
16	Choke Control	
17	Air Filter Assembly Includes:	1
	Body Assembly	1
	Oil Cup Retaining	1
	Oil Cup Assembly	1
	Mounting Plate - Air Filter	1
	Hex Head Bolt - Mounting Plate Mounting	2
	Lockwasher - Mounting Plate Mounting	2
	Hex Head Bolt - Air Filter Mounting	2
	Flat Washer - Air Filter Mounting	2
	Lockwasher - Air Filter Mounting	2
	Hex Nut- Air Filter Mounting	2
18	Hose - Air Filter to Carburetor	1

Item	Part Name And Description	No. Req'd.
	Hose Clamp	2
19	Hose - Heater Tube to Air Filter	1
20	Heater Tube	1
21	Clamp Heater Tube to Manifold	1
	Round Head Screw - Clamp Mounting	1
	Hex Nut - Clamp Mounting	1
22	Throttle Rod	1
22A	Throttle Rod Spring	1
23	Pivot Pin - Throttle Rod to Carburetor	1
24	Spring Clip - Throttle Rod to Carburetor	1
25	Governor Assembly	1
27	Screw - Top Mounting	1
28	Washer, Copper Asbestos	1
29	Cover Plate	1
30	Gasket (Cover Plate)	1
31	Gasket (Governor)	1
32	Hex Head Screw	1
33	Lockwasher	1
34	Governor Rod	1
35	Ball Joint (Carburetor End)	1
36	Hex Nut	2
37	Lockwasher	2
38	Ball Joint (Governor End)	1
	Gas Line Clip	2
39	R-57 Idler	1
	R-57 Idler Seperate Parts - ***See IM-179***	
40	Pivot Pin - Idler to Throttle Rod	1
41	Spring Clip - Idler to Throttle Rod	1
42	Idler Mounting Bracket	1
43	Thread Cutting Screw - Idler Bracket to Frame	2
44	Hex Head Cap Screw	2
45	Lockwasher	2
	Hex Head Cap Screw - Idler Mounting (Old Style)	2
46	Air Line - Idler to Manifold	1
47	Connector - Air Line to Manifold	1

COOLING SYSTEM

WHEN ORDERING GIVE:
Item No., Part Name,
Parts List No., and Welder Code.

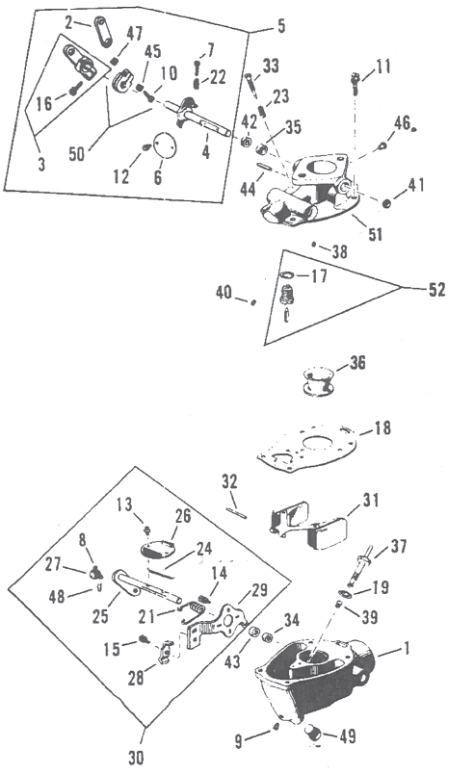


Parts List P-23-E

Item	Part Name And Description	No. Req'd.
1	Radiator Cap	1
2	Radiator	1
	Hex Nut	2
	Washer	2
	Lockwasher	2
3	Radiator Hose - Upper	1
4	Cylinder Water Outlet Elbow	1
5	Nut - Cylinder Water Outlet Elbow to Head	2
6	Lockwasher - Cylinder Water Outlet Elbow to Head	2
7	Nipple - Thermostat Bypass	2
8	Hose Clamp - Thermostat Bypass	2
9	Hose - Thermostat Bypass	1
10	Stud - Cylinder Water Outlet Elbow to Head	2
	Gasket - Cylinder Water Outlet Elbow	1
11	Thermostat	1
12	Thermostat Adaptor Ring	1
13	Water Pump Assembly	1
	Water Pump Repair Kit	1
14	Gasket	1
15	Copper Washer	1
16	Screw	1
17	Lockwasher	3
18	Screw	3
19	Hex Head Screw	4
20	Lockwasher	4
21	Fan Blae Assembly	1
22	Fan Belt - No Starter	1
22	Fan Belt - With Starter	1
23	Radiator Hose Clamp	4
24	Radiator Hose - Lower	1

MARVEL-SCHEBLER CARBURATOR

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



Parts List P-23-G

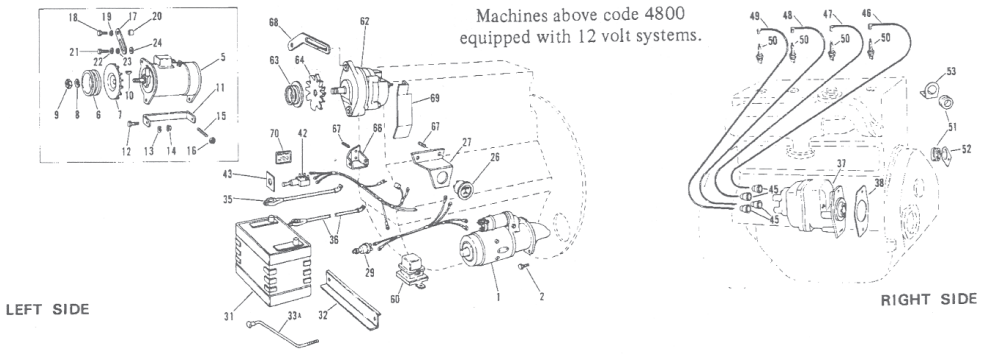
Item	Part Name And Description	No. Req'd.
1	Carburetor Assembly Complete Body Assembly	1
2	Lever, Throttle, Loose	1
3	Lever Assembly, Governor	1
4	*Throttle Shaft and Stop Assembly	1
5	*Throttle Shaft and Levers Assembly	1
6	Valve, Throttle (20°)	1
7	Screw, Throttle Stop (8/32 x 3/4)	1
8	Screw, Choke Swivel (8/32 x 5/16)	1
9	Screw, Nozzle Hole Plug (8-32)	1
10	Screw, Clevis Clamp (10-24 x 5/8)	1
11	Screw and Lockwasher (12-24 x 5/8)	4
12	*Screw and Lockwasher (4-40 x 1/4)	2
13	*Screw and Lockwasher (4-40 x 1/4)	2
14	Screw and Lockwasher (8-32 x 3/8)	1
15	Screw and Lockwasher (8-32 x 5/16)	1
16	Screw and Lockwasher (12-24 x 5/8)	1
17	Gasket, Float Valve Seat	1
18	Gasket, Throttle Body to Bowl	1
19	Gasket, Main Nozzle	1
	*Gasket Kit	1
21	*Spring, Choke Return	1
22	Spring, Throttle Stop Screw	1
23	*Spring, Idle Needle	1
24	Spring, Choke Valve Flapper	1
25	Lever and Shaft Assembly Choke	1
26	Valve Assembly Choke	1
27	Swivel Choke Lever	1
28	Clip, Choke Bracket	1
29	Bracket, Choke	1
30	Bracket, Assembly Choke	1
31	Float and Lever Assembly	1
32	*Shaft, Float Lever	1
33	*Needle, Idle Adjusting	1
34	*Packing, Choke Shaft	1

Continued on next page

Parts List P-23-G Continued

Item	Part Name And Description	No. Req'd.
35	*Packing, Throttle Shaft	1
36	Venturi (25/32" Dia.)	1
37	Nozzle, Main	1
38	*Jet, Economizer	1
39	*Jet, Power	1
40	*Jet, Idle	1
41	*Cup, Throttle Shaft	1
42	*Retainer, Throttle Shaft Packing	1
43	*Retainer, Choke Shaft Packing	1
44	Pin, Throttle Stop	1
45	Washer, Clevis Assembly	1
46	Plug, Idle Drilling	1
47	Nut Clevis Clamp (10-24)	1
48	Cotter Hairpin	1
49	Plug, Bowl Drain	1
50	Clevis Assembly	1
51	Throttle Body and Shaft Assembly	1
52	*Valve and Seat Assembly, Float	1
	Repair Kit	
	Gasket Kit (incl. 16-4 16-80 16-449)	
	*These parts included in repair Kit 286-1112	
	All above parts available from the Lincoln Electric Company and its Field Service Shops.	

ELECTRICAL SYSTEM



CAUTION: If replacing the ground lead (Item 35) for machines built to code 7214 or higher, be certain to use the standard Lincoln part or else install a separate electrical ground connection between the engine block and machine base.

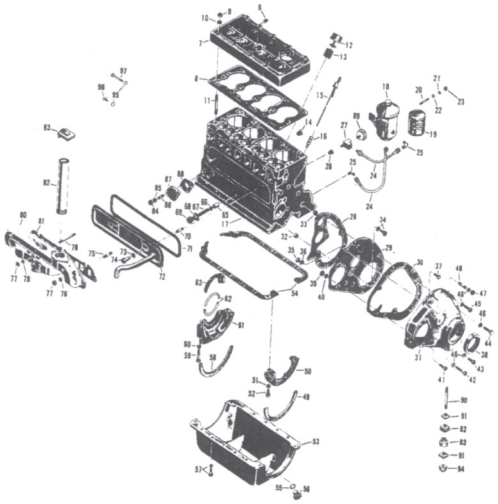
Parts List P-23-H

Item	Part Name And Description	No. Req'd.
1	Starting Motor	1
2	Hex Head Screw (Starter Mounting)	2
	Items 5 thru 24 Below Code 6900 Only	
	Generator Assembly Includes:	1
5	Generator	1
6	Generator Pulley	1
7	Generator Pulley Fan	1
8	Lockwasher (Generator Pulley)	1
9	Nut (Generator Pulley)	1
10	Woodruff Key (Generator Pulley)	1
11	Bracket	1
12	Hex Head Screw (Generator to Bracket)	2
13	Lockwasher (Generator to Bracket)	2
14	Hex Nut (Generator to Bracket)	2
15	Stud (Generator Bracket to Engine Block)	2
16	Hex Nut (Generator Bracket to Engine Block)	2
17	Adjusting Strap	1
18	Hex Head Screw (Adjusting Strap to Engine)	1
19	Lockwasher (Adjusting Strap to Engine)	1
20	Spacer (Adjusting Strap to Generator)	1
21	Hex Head Screw (Adjusting Strap to Generator)	1
22	Lockwasher (Adjusting Strap to Generator)	1
23	Plain Washer (Adjusting Strap to Generator)	1
24	Plain Washer (Adjusting Strap to Generator)	1
	Ammeter Panel Assembly Includes:	1
26	Ammeter	1
27	Ammeter Panel	1
29	Starter Switch	1
31	Battery	1
32	Battery Mounting Bracket	1
33	Carriage Bolt and Nut (Battery Mounting) (6 Volt)	2
33A	Battery Holder Bolt (12 Volt System)	2
35#	Ground Lead*	1
36	Battery Lead to Starter*	1
37	Magneto	1
38	Magneto Gasket	1
42	Switch - Ignition	1
43	Switch Nameplate	1
45	Nipple	4
46	Ignition Wire #1 Cylinder	1
47	Ignition Wire #2 Cylinder	1
48	Ignition Wire #3 Cylinder	1
49	Ignition Wire #4 Cylinder	1
50	Spark Plug	4
51	Grommet	3
52	Bracket (Wire Support)	2
53	Bracket (Wire Support)	1
	Following Parts Above Code 6900 Only	
60	Voltage Regulator	1
	Alternator Assembly Includes:	1
62	Alternator	1
63	Pulley	1
64	Fan	1
66	Mounting Bracket	1
67	Stud-Mount Alternator Bracket and Ammeter Panel	2
68	Adjusting Strap	1
69	Alternator Fan Guard	1
70	Caution Decal	1

*Ground lead is positive (+) on machine with a generator (Item 5). It is negative (–) on machines with an alternator (Item 62).

ENGINE EXTERIOR PARTS

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



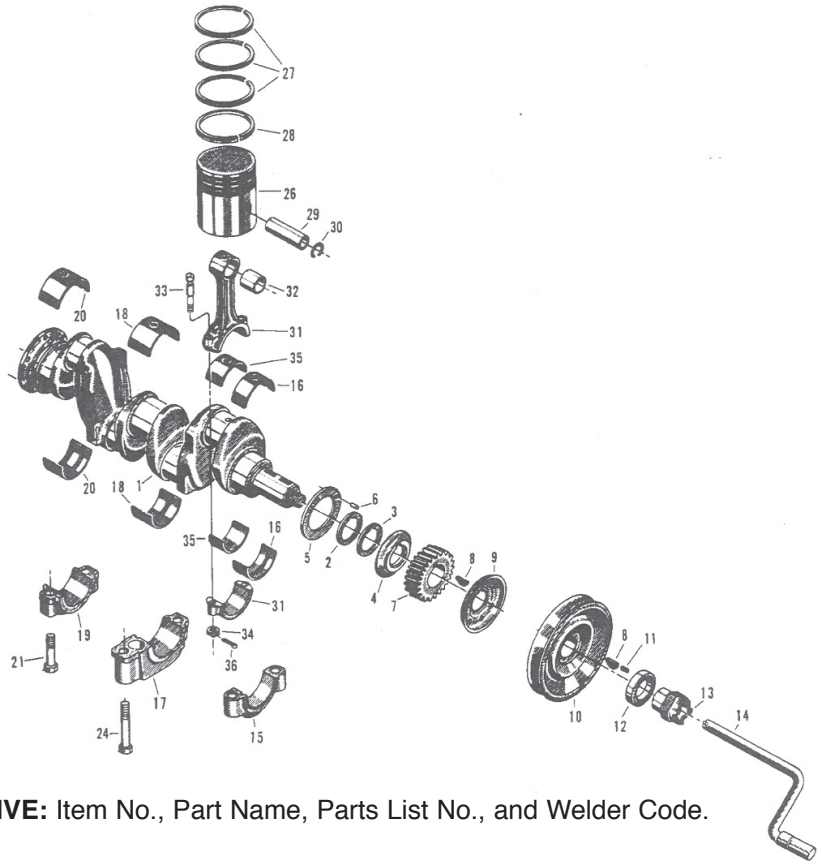
Parts List P-23-J

Item	Part Name And Description	No. Req'd.
6	Pipe Plug - Temperature Gauge Hole in Cylinder Head	1
7	Cylinder Head	1
8	Cylinder Head Gasket	1
9	Cylinder Head Nut	15
10	Washer - Cylinder Head Nut	15
11	Stud - Cylinder Head to Block	15
12	Oil Filler Cap Assembly	1
13	Oil Filler Tube	1
14	Drain Cock	1
15	Oil Gauge Rod	1
16	Oil Rod Support	1
17	Block	1
18	Oil Filter	1
19	Filter Element	1
20	Stud - Oil Filter to Cylinder Head	2
21	Lockwasher - Oil Filter to Cylinder Head	2
22	Washer - Oil Filter to Cylinder Head	2
23	Hex Nut - Oil Filter to Cylinder Head	2
24	Oil Filter Hose	2
25	Oil Filter Elbow	2
26	Reducing Bushing	1
27	Tee Fitting	1
	Front End Plate Assembly - Includes:	1
28	Gasket - Front End Plate	1
29	Front End Plate	1
30	Gasket, Gear Cover	1
31	Gear Cover	1
32	Ring Dowel, Front Plate	1
33	Ring Dowel, Gear Cover	1
34	Screw and Lockwasher Assembly	1
35	Nut - Gear Cover to End Plate	1
36	Lockwasher - Gear Cover to End Plate	1
37	Screw - Gear Cover to End Plate	1
38	Oil Seal	1
39	Nut - Gear Cover Dowel Screw	1
40	Lockwasher - Gear Cover Dowel Screw	1
41	Gear Cover Dowel Screw	1
42	Hex Head Screw - Gear Cover to Filler Block	1
43	Hex Head Screw - Gear Cover to Filler Block	3
44	Hex Head Screw - Gear Cover to Block	1
45	Hex Head Screw - Gear Cover to Block (At Ring Dowel)	1
46	Lockwasher - Gear Cover Mounting Screws	8
47	Hex Nut - Gear Cover to Stud	2
48	Stud - Gear Cover to Block (Upper Holes)	2
49	Cork - Oil Pan to Front Filler Block	1
50	Front Filler Block	1
51	Lockwasher - Front Filler Block to Engine Block	2
52	Hex Head Screw - Front Filler Block to Engine Block	2
53	Oil Pan	1
54	Oil Pan Gasket	2
55	Gasket - Oil Pan Drain Plug	1
56	Oil Pan Drain Plug	1
57	Screw and Lockwasher Assembly - Oil Pan to Block	14
58	Cork - Oil Pan to Rear Filler Block	1

Parts List P-23-J

Item	Part Name And Description	No. Req'd.
59	Hex Head Screw	2
60	Lockwasher	2
61	Rear Filler Block	1
	Rear Bearing Oil Guard Assembly - includes:	1
62	Seal - Rear Filler Block	2
63	Rear Bearing Oil Guard	1
64	Felt - Rear Bearing Oil Guard	1
65	Oil Pressure Relief Valve	1
66	Washer - Oil Pressure Relief Spring Adjusting	As Req'd
67	Oil Pressure Relief Valve Spring	1
68	Gasket - Oil Pressure Relief Valve	1
69	Plug - Oil Pressure Relief Valve	1
70	Stud - Valve Chamber Cover	2
71	Gasket - Valve Chamber Cover	1
72	Valve Chamber Cover	1
73	Gasket - Valve Chamber Cover	2
74	Hex Nut - Valve Chamber Cover	2
75	Stud - Manifold to Block	6
76	Washer - Manifold to Block - End and Center Studs	3
77	Hex Nut - Manifold to Block	7
78	Stud - Manifold to Block (Center Hole)	1
79	Washer - Manifold to Block	4
80	Manifold	1
81	Manifold Gasket	1
82	Exhaust Pipe	1
83	Rain Cap - Exhaust Pipe	1
	Thread Cutting Screw	2
84	Nut - Fuel Pump Hole in Block	2
85	Lockwasher - Fuel Pump Hole in Block	2
86	Stud - Fuel Pump Hole in Block	2
87	Cover - Fuel Pump Hole in Block	1
88	Gasket - Fuel Pump Hole in Block	1
89	Oil Pressure Gauge	1
90	Stud - Front Engine Mounting	1
91	Washer - Front Engine Mounting	2
92	Engine Mount - Front Engine Mounting	2
	Rubber Washer - Front Engine Mounting	1
94	Huglock Nut - Front Engine Mounting	1
95	Lockwasher - Engine Rear End Plate to Engine	5
96	Dowel Screw - Engine Rear End Plate to Engine	2
97	Screw - Engine Rear End Plate to Engine	3

CRANKSHAFT AND PISTON ASSEMBLY



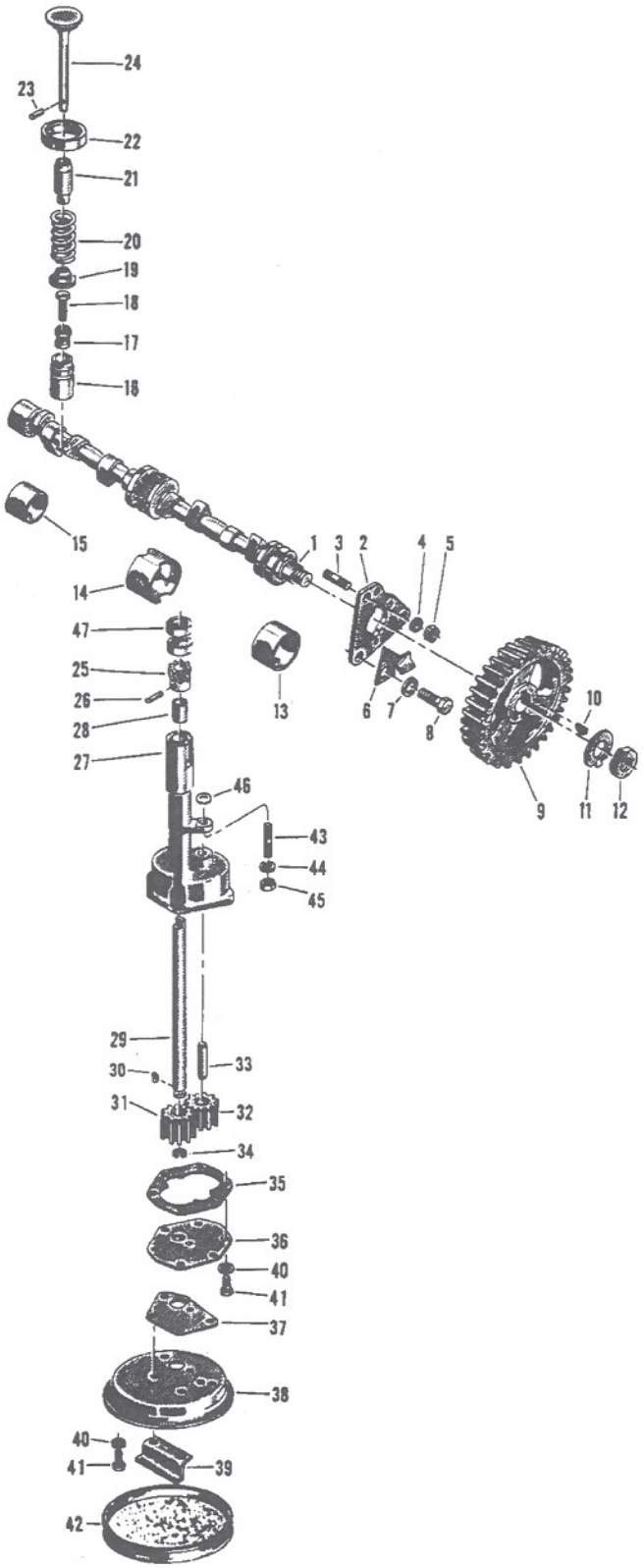
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-K

Item	Part Name And Description	No. Req'd.
1	Crankshaft Assembly - Includes:	1
	Crankshaft	1
2	Crankshaft Thrust Shim (.002)	8
3	Crankshaft Thrust Shim (.008)	8
4	Crankshaft Thrust Plate	1
5	Thrust Washer	2
6	Pin-Crankshaft: Thrust Washer to Crankcase	3
7	Crankshaft Gear	1
8	Key - Crankshaft Gear to Crankshaft	1
9	Oil Thrower	1
10	Pulley	1
11	Cork - Fan Drive Pulley Keyway Plug	1
12	Spacer Collar - Crank Starting Jaw	1
13	Starting Jaw	1
14	Crank	1
15	Bearing Cap - Front Main	1
16	Bearing Assembly - Front Main (One Bearing	
	assembly is two halves)	1
17	Bearing Cap - Center Main	1
18	Bearing Assembly - Center Main (One Bearing	
	is two halves)	1
19	Bearing Cap - Rear Main	1
20	Bearing Assembly - Rear Main (One Bearing	
	assembly is two halves)	1
21	Place bolt-Front and Rear Main Bearing Cap	
	Mounting	4
24	Place bolt-Center Main Bearing Cap Mounting	2
26	Piston	4
27	Piston Ring - Taper Face (Top 3)	12
28	Piston Ring - Oil Control (Bottom)	4
29	Piston Pin	4
30	Piston Pin Retaining Ring	8
	Connecting Rod and Cap Assembly - (#1 and #3	
	Cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
	Connecing Rod and Cap Assembly - (#2 and#4	
	Cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
36	Cotter Pin - Connecting Rod Bolts	8
	Piston Ring Kit (For Reringing Std. Bore)	1
	Piston Ring Kit (For Rebored Engines)	1
	Piston Assembly Kit	1

CAMSHAFT AND VALVE ASSEMBLY

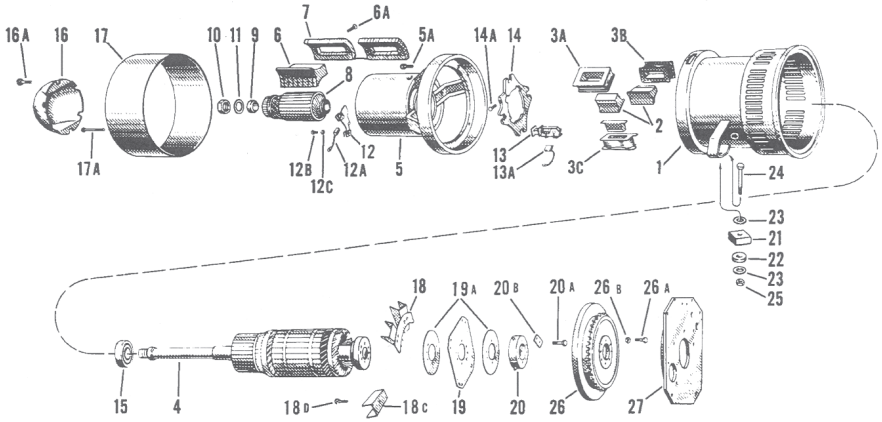
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



Parts List P-23-L

Item	Part Name And Description	No. Req'd.
1	Camshaft	1
2	Camshaft Thrust Plate	2
3	Stud - Camshaft Thrust Plate to Block	2
4	Lockwasher - Camshaft Thrust Plate to Block	2
5	Hex Nut - Camshaft Thrust Plate to Block	2
6	Timing Gear Oiler Plate	1
7	Lockwasher - Oiler Plate and Thrust Plate to Block	1
8	Hex Head Bolt - Oiler Plate and Thrust Plate to Block	1
9	Camshaft Gear	1
10	Key - Camshaft Gear to Camshaft	1
11	Washer - To Lock Nut on Camshaft	1
12	Hex Nut - Camshaft Gear to Camshaft	1
13	Bushing - Camshaft Front	1
14	Bushing - Camshaft Center	1
15	Bushing - Camshaft Rear	1
	Valve Tappet Assembly - Includes:	8
16	Valve Tappet	8
17	Valve Tappet Locknut	8
18	Valve Tappet Screw	8
19	Valve Spring Seat	8
20	Valve Spring	8
21	Valve Stem Guide	8
22	Exhaust Valve Seat Insert	4
23	Valve Spring Lock	8
24	Intake Valve	4
24	Exhaust Valve	4
	Oil Pump Assembly - Includes	1
25	Drive Gear - Oil Pump	1
26	Pin - Oil Pump Drive Gear to Shaft	1
27	Body Assembly - Includes:	1
28	Bushing	1
29	Shaft	1
30	Key	1
31	Gear - Oil Pump Driver	1
32	Gear - Oil Pump Driven	1
33	Stud - Oil Pump Idler Gear	1
34	Snap Ring - Oil Pump Drive shaft	1
35	Gasket - Oil Pump Cover	1
36	Cover- Oil Pump	1
37	Gasket - Strainer Screen	1
38	Strainer Frame	1
39	Strainer Spacer	1
40	Lockwasher	6
41	Hex Head Screw	6
42	Oil Straining Screen	1
43	Stud - Oil Pump Body to Center Main Bearing Cap	1
44	Lockwasher - Oil Pump Body to Center Main Bearing Cap	1
45	Hex Nut - Oil Pump Body to Center Main Bearing Cap	1
46	Washer - Oil Pump Spacer	1
47	Oil Pump Drive Shaft Sleeve	1

WELDING GENERATOR



WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-M

Item	Part Name And Description	No. Req'd.
1	Welder Frame	1
2	Main Pole Lamination	4
3A	Shunt Field Coil	2
3B	Series Field Coil	2
3C	Interpole Coil	2
3D	Interpole Pole Piece	2
4+	Armature, Includes:	1
	Armature Coil	1
5	Welder Bracket and Exciter Frame	1
5A	Hex Head Screw, Bracket to Frame	4
6	Exciter Pole	2
6A	Hex Head Screw, Pole to Frame	4
7	Exciter Field Coil	2
8+	Exciter Armature	1
9	Exciter Armature Sleeve Collar	1
10	Exciter Locknut	1
11	Locking Washer	1
12	Exciter Brush Holder	2
	Brush Holder Parts	See P-25-M
12A	Exciter Brush	2
12B	Screw, Brush Holder to Frame	4
12C	Washer, Brush Holder to Frame	4
13	Welder Brush Holder	4
	Brush Holder Parts	See P-25-L
13A	Welder Brush	8
14	Rocker	1
14A	Screw, Rocker to Hub	1
15	Ball Bearing	1
16	Exciter End Cover	1
	+ Available on Exchange Plan	

Item	Part Name And Description	No. Req'd.
16A	Screw, Mounts End Cover	2
17	Bracket Cover	1
17A	Round Head Screw, Mounts Bracket Cover	2
18*	Welder Fan Segments	4
18C	Blower Paddles	8
18D	Lockscrew	8
19*	Coupling Disc	1
19A*	Backing Plate	2
20*	Coupling Ring	1
20A*	Screw, Disc to Hub	8
20B*	Locking Clip, Disc to Hub	4
21	Welder Foot, Upper Cushion	2
22	Welder Foot, Lower Cushion	2
23	Washer	4
24	Hex Head Screw	2
25	Huglock Nut	2
26	Flywheel	1
26A	Screw, Flywheel to Crankshaft	6
26B	Locknut, Flywheel to Crankshaft	6
27	Engine Adapter Plate	1
	*Not used with codes 4744 and 4745 and codes 5100 through 5400	

THE LINCOLN EXCHANGE PLAN gives you fast repairs at a modest cost. Here's how:

Factory remanufactured replacements for the major parts indicated by + in this manual are available. These exchange parts are available only through the local authorized Field Service Shops. To get your welder back into operation quickly, replace the faulty parts with a rebuilt part – often from the service shop's stock. The cost is less than a normal rewinding job.

The service shop will ship the removed part to the factory for inspection. If it can be rebuilt, a credit will be issued to the shop. They, in turn, will pass this credit to you, thus further reducing the net cost of the repair. All exchange parts carry the same one year guarantee as new welders. For more information, contact your local Lincoln authorized Field Service Shop.

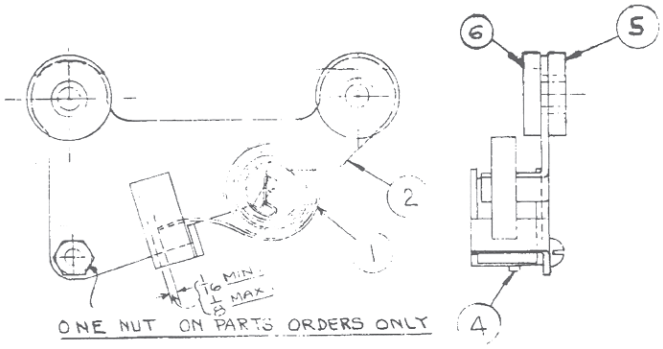
GENERATOR BRUSH HOLDER

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-25-L

Item	Part Name And Description	No. Req'd.
	Brush Holder Assembly Includes:	
1	Spring and Clip Assembly	2
2	Round Head Cap Screw	2
3	Plate and Retainer Assembly	1
4	Round Head Cap Screw	2
5	Hex Head Cap Screw	1
6	Stud	1
7	Clamping Washer	1
8	Insulating Washer	1
9	Insulating Tube	1
10	Clamping Washer	1
11	Hex Head Cap Screw, Sems Kantlink	1

EXCITER BRUSH HOLDER



Parts List P-25-M

Item	Part Name And Description	No. Req'd.
	Exciter Brush Holder Assembly Includes:	
1	Spring	1
2	Brush Holder	1
4	Hex Nut	1
5	Insulating Washer	2
6	Bushing	2

RETURN TO MAIN INDEX

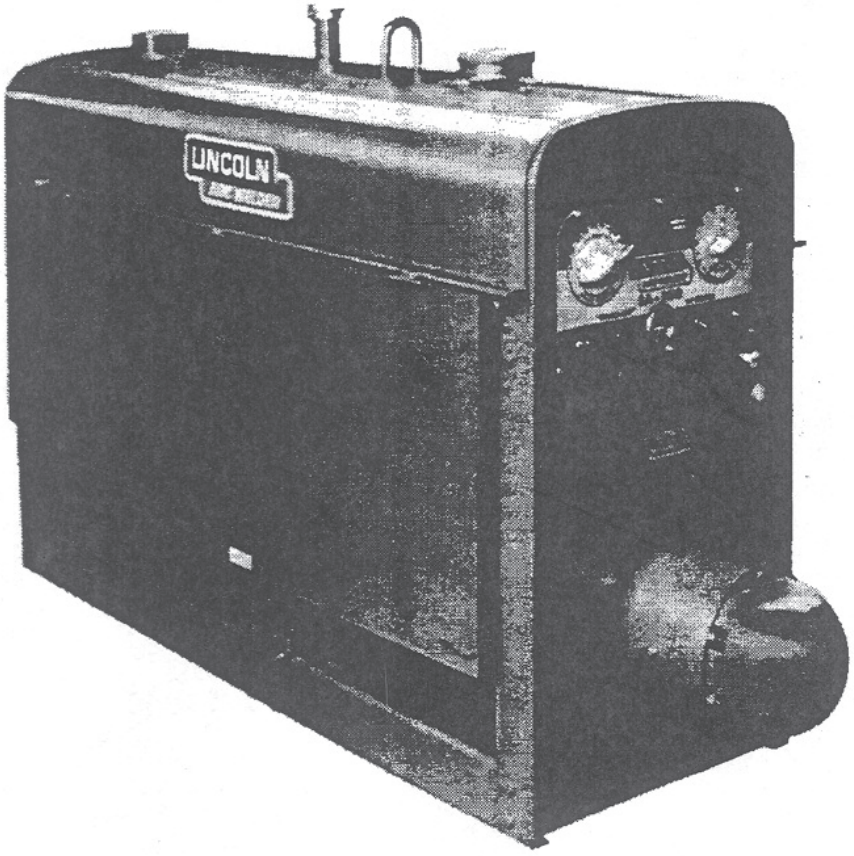
IM-276-B
July, 1993

Shield-Arc® SA-200-F163

DC Arc Welding Power Source with CONTINENTAL F163 ENGINE

Type: K-6090-SB **Model:** SA-200-F163 (Code 8023 and up) **Type:** K-6090-SM (Codes 7276 to 8017)

(For Codes below 7276 see IM-208-A)



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

DAMAGE CLAIMS

When Lincoln equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at time shipment is received.

Safety Depends on You

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation. . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC SAFETY PRECAUTIONS INSIDE FRONT COVER.** And, most importantly, think before you act and be careful.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

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

Return to Section TOC
Return to Master TOC

INSTALLATION, CONNECTION, AND MAINTENANCE OF 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 copper strap on the engine foot.

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 the engine is not running.

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

(S-17851)

OPERATION OF ENGINE WELDERS

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

OPERATION OF ALL WELDERS

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

MAINTENANCE AND TROUBLESHOOTING WARNINGS

WARNING: Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) 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.

ATTENTION OWNERS OF ENGINE WELDERS

WARNING: 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. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

CAUTION WHEN INSPECTING THE 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.

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.

Return to Section TOC
Return to Master TOC

PROPER GROUNDING DURING INSTALLATION

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

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.

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 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 National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

ENGINE OPERATION

See the engine manufacturers operating manual supplied with the welder for detailed engine operating and maintenance instructions, parts lists and safety precautions.

Exhaust Spark Arrester

Some federal, state or local laws may require that gasoline engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard. This welder is not originally shipped with a spark arrester nor does the optional muffler qualify as a spark arrester. When required by local regulations, suitable spark arresters must be installed and properly maintained. WARNING: An incorrect arrester may lead to damage of the engine or its performance. Contact the engine manufacturer for specific recommendations.

WARNING: Operate internal combustion engines in open, well-ventilated areas or vent engine exhaust fumes outdoors.

These machines are furnished with wet batteries. **WARNING: When servicing batteries use caution – the electrolyte is a strong acid that can burn skin and damage eyes.**

Fill the crank case to the “Full” mark on the bayonet gauge with the recommended weight oil (see ENGINE MANUAL). Fill the radiator, gasoline tank and air filter oil bath. Open the carburetor feed valve on the sediment bowl by turning the handle from right to left. Put the ignition switch in the “ON” position and start the engine. If the green oil pressure light does not light when the engine starts, stop the engine and locate the cause of low oil pressure. Run the engine for 5 minutes to check for proper operation. Stop the engine and check the oil level. If the oil level is down, fill to the “Full” mark again.

Routine Engine Operation

Start the engine with the ‘Idler Control’ switch in the ‘High Idle’ position. Allow it to run at high idle speed for several minutes to warm the engine. Cold engines tend to run at a speed too slow to supply the voltage required for proper idler operation.

Running the engine with proper oil pressure lights a green light on the control panel. If this light flickers or goes off, stop the engine immediately. Locate and correct the cause of low oil pressure (see Page 5) before re-starting the engine.

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

At the end of each day’s welding, refill the gasoline tank to minimize moisture condensation in the tank. Also running out of gas tends to draw dirt into the fuel system. Check the crankcase oil, radiator and battery water levels.

When hauling the welder between job sites, close the fuel feed valve on the sediment bowl by turning the handle from left to right. Failure to turn the fuel off when traveling can cause carburetor flooding and difficult starting at the new job site.

The fan belt tends to loosen after about 40 hours of operation. Check and tighten, if necessary. Check and tighten all internal and external connections as needed.

Idler Operation

The idler is controlled by an ‘Idle control’ toggle switch on the welder control panel. The switch has two positions as follows:

1. In the ‘High Idle’ position, the idler is off and the engine runs at the high speed controlled by the governor.
2. In the ‘Automatic Idle’ position, the idler operates as follows:
   a. When welding or drawing power for lights or tools (approximately 100-150 watts minimum) from the receptacle located below the welder nameplate, the engine operates at full speed.
   b. When welding ceases or the power load is turned off, a preset time delay of about 15 second 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 idler reduces the engine to low idle speed.

Cooling System

The SA-200-F163 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. Cooling system capacity is 10½ quarts.

Carburetor De-Icer

This welder is provided with an anti-frosting device. Frosting generally occurs when the humidity is high and the temperature is between 26 and 40ºF. To connect the de-icer, remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive preheated air to the carburetor.

Disconnect this hose for warm weather operation.

WELDER OPERATING INSTRUCTIONS

POLARITY CONTROL

With the engine off, connect the electrode and work cables of the appropriate size (see the following table) to the studs located on the gas tank mounting rail. For Positive polarity, connect the electrode cable to the terminal marked “Positive”. For Negative polarity, connect the electrode cable to the “Negative” stud.

Machine Size in Amperes	Duty Cycle	Copper Cable Sizes for Combined Lengths of Electrode and Ground Cables		
		0 to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	60%	2	1	1/0

CONTROL OF WELDING CURRENT

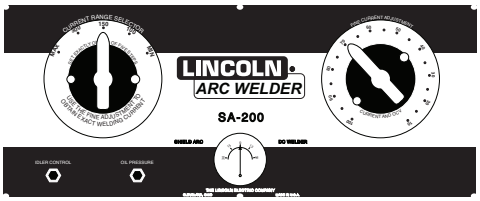
DO NOT TURN THE ‘CURRENT RANGE SELECTOR’ WHILE WELDING because the current may arc between the contacts and damage the switch.

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’ to get 175 amps.

Some arc instability may be experienced with E6010 and other EXX10 type electrodes when trying to operate with long arc techniques at settings, at the lower end of the OCV range. The above technique for obtaining a higher open circuit voltage will minimize this.

When a forceful “digging” arc is required, usually for vertical and overhead welding, use a higher ‘Current Range Selector’ setting and a 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.



DO NOT attempt to set the ‘Current Range Selector’ between the five point designated on the nameplate. These switches have a spring-loaded cam, which almost eliminates the possibility of setting this switch between the designated points.

POWER PLUG

A 115 volt DC power receptacle is located on the control panel. This is a 3-prong receptacle with the grounding terminal grounded to the welder frame. The current available is 15 amperes. This will furnish 1.75 KW of power to operate power tools and lights. (Welders prior to Code 7789 were equipped with 1 KW, 9 ampere receptacles.)

WARNING: This current goes through a coil on the idler printed circuit board. The coil has reserve current carrying capacity approximately equivalent to the exciter armature. However, excessive loading of the power receptacle can damage the coil and the armature. **DO NOT exceed the 15 amp rating of the auxiliary power receptacle.**

Power tools should always be grounded to the welder frame unless they are protected by an approved system of double insulation.

DUTY CYCLE

This welder is NEMA rated 200 Amperes at 28 Arc Volts on a 60% Duty Cycle (it also has the added capacity to be rated 200 amps at 40 volts). Duty Cycle is based on a 10 minute period; thus, the welder can be loaded at rated output for 6 minutes out of every 10 minute period.

Return to Section TOC
Return to Master TOC

PIPE THAWING

WARNING: Pipe thawing, if not done properly, can result in fire, explosion, damage to wiring which may make it unsafe, damage to pipes, burning up the welder or other hazards.

Do not use a welder to thaw pipe before reviewing Lincoln bulletin E-695.1 (dated December '76 or later).

For protection of the welder from overloads when thawing pipe, use of a device called the "Linc-Thaw" is recommended. A description of the "Linc-Thaw" is in bulletin E-695.1.

MAINTENANCE

WARNING: Have qualified personnel do the maintenance and trouble shooting 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.

Routine Service

1. Blow dirt out of the welder and controls with an air hose at least once every two months – once every week in dirty locations. Use low air pressure 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 'Current Range Selector' handle from maximum to minimum setting twice each morning before starting to weld.
3. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Drain and change the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when the filter is changed.
5. When necessary, remove the sediment bowl from beneath the gas tank and clean out any accumulated dirt and water. Replace the fuel filter at the carburetor as needed. In an emergency, the fuel filter can be back flushed for continued use until a replacement can be obtained.
6. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
7. Inspect air filter (oil bath type) daily – more often under dusty conditions. Clean and fill with oil to bead. The oil cup should never be removed while the engine is running.
8. Periodically service the battery and check the water level per instructions shipped with the welder. When reconnecting the battery, be certain the cables are clear of the fan, pulley and belt.
9. See the engine manufacturer's manual supplied with the welder for more complete engine maintenance information.

Commutator and Brushes

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.

Periodically inspect the commutators and brushes by removing the commutator 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, clean while running with fine sandpaper or a commutator stone. Never use emery cloth or emery paper for this purpose.

Replace brushes when they were within ¼" of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low pressure air.

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

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

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 on-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.

Return to Section TOC
Return to Master TOC

TROUBLE SHOOTING

WARNING: Have qualified personnel do the maintenance and trouble shooting 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.

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	Rough or dirty commutator.	Commutator should be trued or cleaned.
	Brushes may be worn down to limit.	Replace brushes.
	Brush springs may be broken.	Replace brush springs.
	Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire.	Check field current with ammeter to discover varying current. This applies to both the main generator and exciter.
	Electrode lead or work lead connection may be poor.	Tighten all connections.
	Wrong grade of brushes may have been installed on generator.	Use Lincoln brushes.
	Field rheostat may be making poor contact and overheating.	Inspect and clean the rheostat.
Welder starts but fails to generate current.	Generator or exciter brushes may be loose or missing.	Be sure that all brushes bear on the commutator and have proper spring tension.
	Exciter may not be operating.	Check exciter output voltage with voltmeter or lamp.
	Field circuit of generator or exciter may be open.	Check for open circuits in rheostat, field leads, and field coils.
	Exciter may have lost excitation.	Flash exciter fields.†
	Series field and armature circuit may be open-circuited.	Check circuit with ringer or voltmeter.
Welding arc is loud and spatters excessively.	Current setting may be too high.	Check setting and current output with ammeter.
	Polarity may be wrong.	Check polarity. Try reversing polarity or try an electrode of the opposite polarity.
Welding current too great or too small compared to indication on the dial.	Exciter output low causing low output compared to dial indication.	Check exciter field circuit.
	Operating speed too low or high.	Adjust speed screw on governor for 1550 rpm operating speed for welding.*
Arc continuously pops out.	Current Range Selector switch may be set at an intermediate position.	Set the switch at the center of the current range desired.
Engine fails to start.	Out of fuel.	Fill with at least 75 octane gasoline.
	Clogged fuel System.	Check all lines to carburetor.
	Choke not closing tightly.	Loosen choke cable screw and slack off choke wire.
	Lead attached to stud on outside of magneto is grounded.	Check for ground and insulate lead.
	Distributor or Magneto points are pitted and fused.	Dress or replace points and adjust to 0.020".
	Ignition switch shorted or open.	Replace.
	Moisture or carbon on spark plugs.	Remove plugs, clean and adjust gap to 0.025".
Low oil pressure. Light not lit when engine running.	Oil too light.	Drain, refill with proper grade.
	Oil too low.	Fill to "Full" mark on bayonet gauge. Do not overfill.
	Defective oil pressure switch or light.	Replace.
Lack of power.	Carbon deposits, causing pre-ignition.	Run engine under full load for a short time.
	Incorrect timing.	Time ignition.*

TROUBLE SHOOTING (Continued)

TROUBLE	CAUSES	WHAT TO DO
Overheating.	No water in radiator or clogged cooling system.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump.
	Late timing.	Time ignition*
	Improper valve clearance.	Adjust valve tappets (cold settings) — INTAKE .012, EXHAUST .021
	Fan belt too loose.	Adjust to from 3/4" to 1" deflection.
Knocking.	Poor grade of gasoline.	Use at least 75 octane gasoline.
	Spark advanced too far.	Retime ignition.*
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking.	Clean and lubricate. Replace toggles if worn.
	Dirty air filter.	Remove and clean according to instructions on unit.
	Governor spring adjusting screw misadjusted.	Adjust screw just enough to eliminate surge.*
	Governor control rod wrong length.	Adjust length of control rod so that there is from 1/32" to 1/16" clearance between the stop pin and the stop when the engine is shut off and the regulator expanded.*
Low Output.	Operating speed is set too low.	Adjust high speed screw on governor for 1550 rpm high idle operating speed*
Large decreases in speed.	Misadjusted governor spring adjusting screw.	Adjust screw until speed does not drop more than 100 rpm +/- 25 rpm when arc is struck. If surge occurs, eliminate it with the control rod. If high idle speed changes readjust the high idle speed screw*
Unable to strike an arc.	Idle speed screw is misadjusted.	Idle speed is set too low so idler fails to operate when arc is struck. Adjust low idle speed screw for 1000 -1050 rpm.*
Engine runs irregularly.	Carburetor set too lean.	Adjust carburetor adjusting screw so engine will run smoothly at idle speed.*
Engine fails to pick up speed when arc is struck.		Check the idler.*

* ***See "Gasoline Engine Adjustment: Timing, Carburetor, Governor & Idler." Instruction Manual IM-277-A***.

† Flashing the exciter fields consists of passing current through the fields using an external source of 6 to 125 volts of DC power from a storage battery or DC generator. If using a DC generator, keep the generator turned off except when actually applying the flashing current. To flash the fields:

1. Turn the welder off. Raise one exciter brush off the commutator.
2. On Lincoln welders, attach the positive lead from the external DC source to the right hand brush holder.
3. Carefully holding an insulated section of the negative lead from the DC source, touch its lug or clamp to the left hand brush holder for 5 seconds. Pull it away quickly to minimize arcing.

Remove the lead from the right hand brush holder, replace the brush on the commutator, start the welder and the generator voltage should build up.

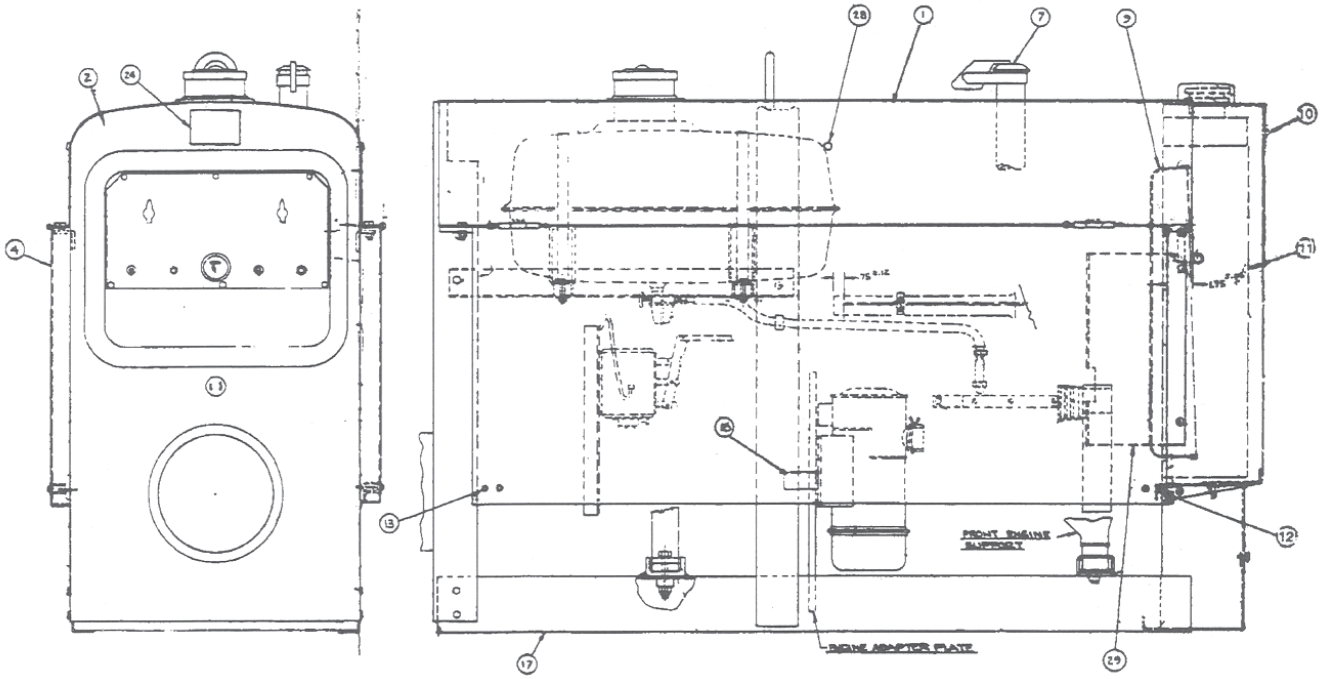
Return to Section TOC
Return to Master TOC

REMANUFACTURING

After your welder has provided many years of service, it can be returned to the factory for a remanufacturing service called LincolnditioningTM. It will be completely disassembled and all electrical and mechanical parts will be refurbished or replaced as needed. The machine will be returned to you in "new Welder" condition. A new welder guarantee is issued with each remanufactured machine.

"Lincolnditioning" lets you plan the overhaul of your equipment during slack periods so it is ready for dependable performance when needed for full scale production. Contact your Lincoln office for details.

GENERAL ASSEMBLY



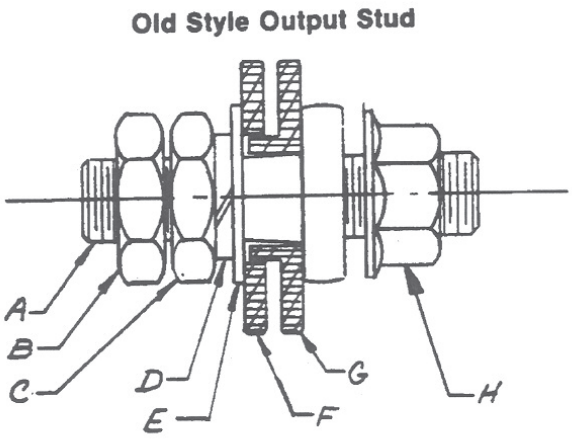
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

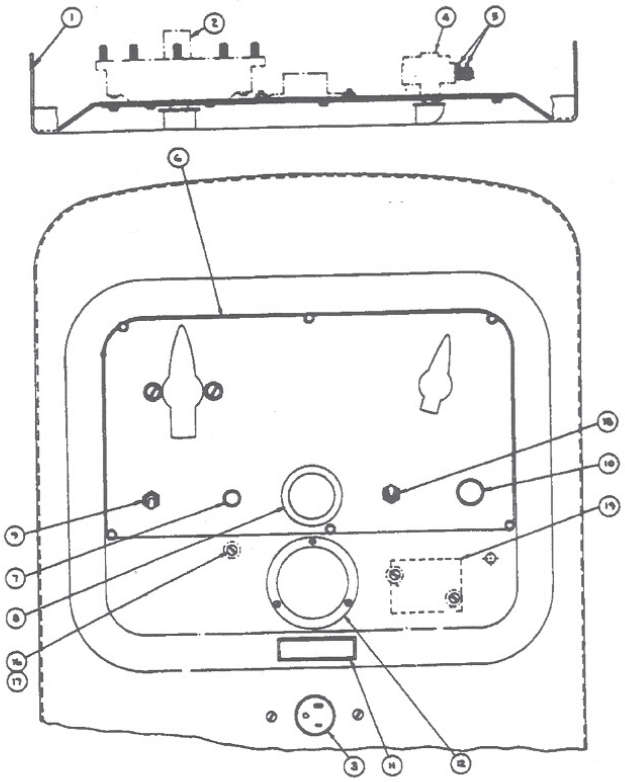
Parts List P-111-C

Item	Part Name And Description	No. Req'd.
1	Roof	1
	Roof Mounting Angle	2
	Roof Mounting Angle	2
	Square Head Bolt, Roof Mounting	4
	Hug Locknut, Roof Mounting	4
2	Control Panel and Output Studs See	P-111-D
4	Door	2
7	Exhaust Pipe	1
	Rain Cap	1
8	Radiator Shell and Screen Assembly	1
	Thread Cutting Screw, Shell Mounting	4
9	Radiator Shroud	1
10	Door Decal	2
11	Radiator See	P-23-E
12	Door Hook	2
	Thread Cutting Screw	4

Item	Part Name And Description	No. Req'd.
13	Door Hook	2
	Thread Cutting Screw	4
17	Base	1
	Stud, Front Engine Mounting	1
	Washer, Front Engine Mounting	2
	Engine Mount, Front Engine Mounting	1
	Rubber Washer, Front Engine Mounting	1
	Huglock Nut, Front Engine Mounting	1
23	Idler Solenoid Assembly	1
24	Decal	1
28	Door Bumper	2
29	Fan Guard (Side Shown)	1
29	Fan Guard (Opposite To Side Shown)	1
	Items Not Illustrated:	
	Engine Hour Meter (Optional)	1
	Hour Meter Shock Mounting	1
	Ground Stud Decal	1

CONTROL PANEL AND OUTPUT STUDS





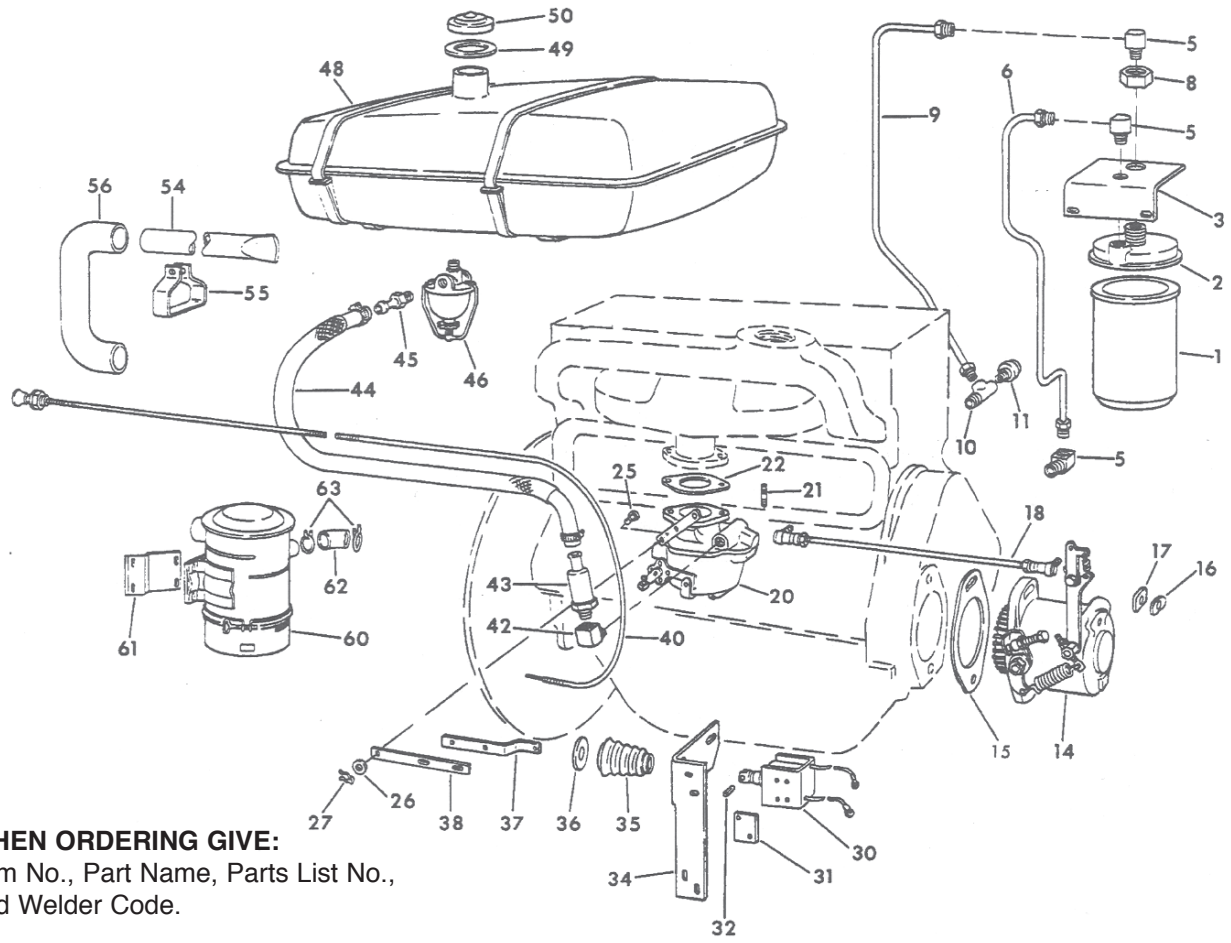
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-111-D

Item	Part Name And Description	No. Req'd.
1	Control Panel (Without Volt Ammeter)	1
1	Control Panel (With Volt Ammeter)	1
2	Selector Switch	1
	Idler Reed Switch	1
	Thread Cutting Screw, Switch Mounting	2
	Switch Handle	1
3	Receptacle	1
4	Rheostat	1
	Rheostat Handle	1
6	Nameplate	1
	Self-Tapping Screw, Nameplate Mounting	6
7	Pilot Light	1
8	Ammeter	1
9	Ignition and Idler Control Switches	2
10	Start Button	1
11	Instruction Decal	1
12	Volt Ammeter (Optional)	1
18	Ignition Switch	1
19	Idler P.C. Board	1
	Round Head Screw, Board Mounting	2
	Spacer, Board Mounting	2
	Lockwasher, Board Mounting	2
	Hex Nut, Board Mounting	2

Item	Part Name And Description	No. Req'd.
	Old Style Output Stud Assembly, Includes Items	
	A thru H (Codes Below 8200 Only)	2
A	Output Stud	1
B	Brass Nut	1
C	Hex Jam Nut	1
D	Lockwasher	1
E	Flatwasher	1
F	Insulating Washer	1
G	Insulator	1
H	Output Stud Nut	1
	New Style Output Stud Assembly Includes: (Codes Above 8200 Only), Not Illustrated	
	Molded Output Stud	2
	Output Stud Nut	2
	Hex Head Cap Screw	2
	Self-Tapping Screw	2

ENGINE FUEL SYSTEM AND OIL FILTER

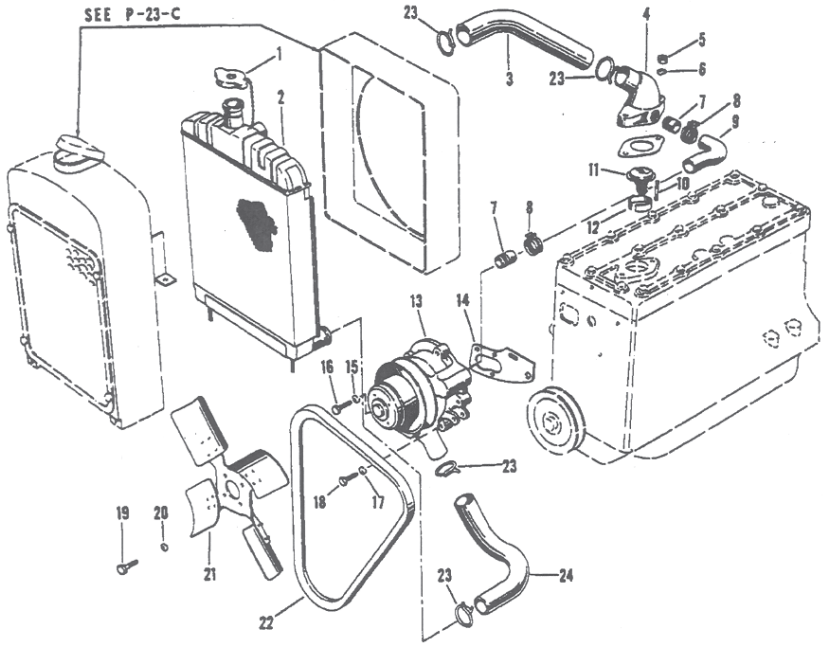


WHEN ORDERING GIVE:
Item No., Part Name, Parts List No., and Welder Code.

Parts List P-111-F

Item	Part Name And Description	No. Req'd.
1	Oil Filter	1
2	Filter Adapter Base	1
3	Filter Mounting Bracket	1
3	Filter Bracket Assembly	1
5	Tube Elbow	3
6	Inlet Oil Line	1
6	Inlet Oil Line	1
8	Hex Jam Nut	1
9	Outlet Oil Line	1
9	Outlet Oil Line	1
10	Tee Connector	1
11	Oil Pressure Switch	1
14	Governor (Magneto Ignition)	1
14	Governor (Distributor Ignition)	1
15	Flange Gasket	1
16	Cover Plate	1
17	Cover Plate Gasket	1
18	Governor to Carburetor Control Rod	1
20	Carburetor (Magneto Ignition)	1
20	Carburetor (Distribution Ignition)	1
21	Stud	2
22	Carburetor Gasket	1
25	Pivot Pin	1
26	Flatwasher	2
27	Spring Clip	1
30	Idler Solenoid	1
31	Mounting Spacer	1
32	Roll Pin	1
34	Mounting Bracket	1
35	Boot	1
36	Gasket	L
37	Idler Control Rod	1
38	Idler Control Rod Slide	1
40	Choke Control	1
42	Street Elbow	1
43	Fuel Filter	1
44	Fuel Hose Assembly	1
45	Hose Connector	1
46	Fuel Strainer	1
48	Gas Tank	1
49	Gas Tank Gasket	1
50	Filler Neck Cap	1
54	Heater Tube	1
55	Heater Tube Clamp	1
56	Heater Hose	1
60	Air Filter	1
61	Filter Mounting Bracket	1
62	Hose, Filter to Carburetor	1
63	Hose Clamp	2

COOLING SYSTEM



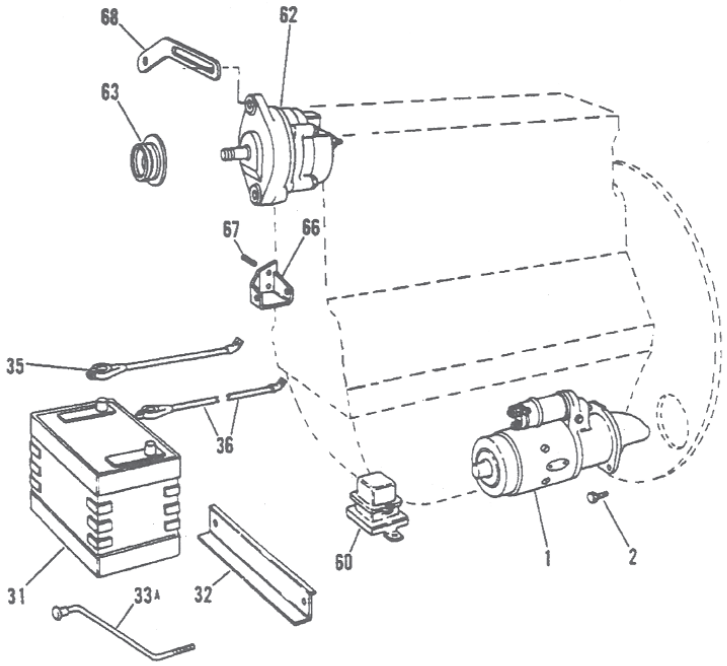
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-E

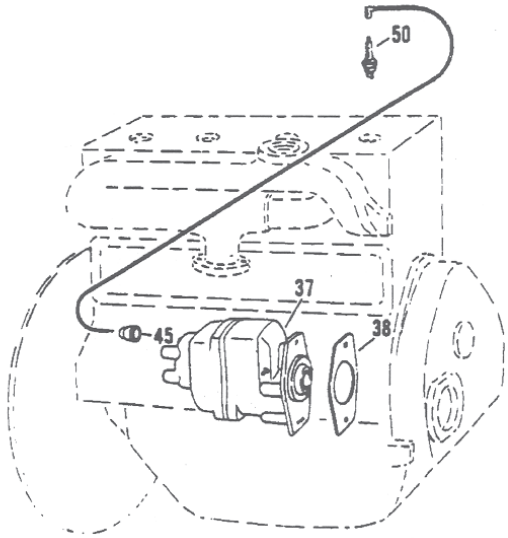
Item	Part Name And Description	No. Req'd.
1	Radiator Cap	1
2	Radiator	1
	Hex Nut	2
	Washer	2
	Lockwasher	2
3	Radiator Hose - Upper	1
4	Cylinder Water Outlet Elbow	1
5	Nut - Cylinder Water Outlet Elbow to Head	2
6	Lockwasher - Cylinder Water Outlet Elbow to Head	2
7	Nipple - Thermostat Bypass	2
8	Hose Clamp - Thermostat Bypass	2
9	Hose - Thermostat Bypass	1
10	Stud - Cylinder Water Outlet Elbow to Head	2
	Gasket - Cylinder Water Outlet Elbow	1
11	Thermostat	1
12	Thermostat Adapter Ring	1

Item	Part Name And Description	No. Req'd.
13	Water Pump Assembly	1
	Water Pump Repair Kit	1
14	Gasket	1
15	Copper Washer	1
16	Screw	1
17	Lockwasher	3
18	Screw	3
19	Hex Head Screw	4
20	Lockwasher	4
21	Fan Blade Assembly	1
22	Fan Belt - No Starter	1
22	Fan Belt - With Starter	1
23	Radiator Hose Clamp	4
24	Radiator Hose - Lower	1

ENGINE ELECTRICAL SYSTEM



LEFT SIDE



RIGHT SIDE

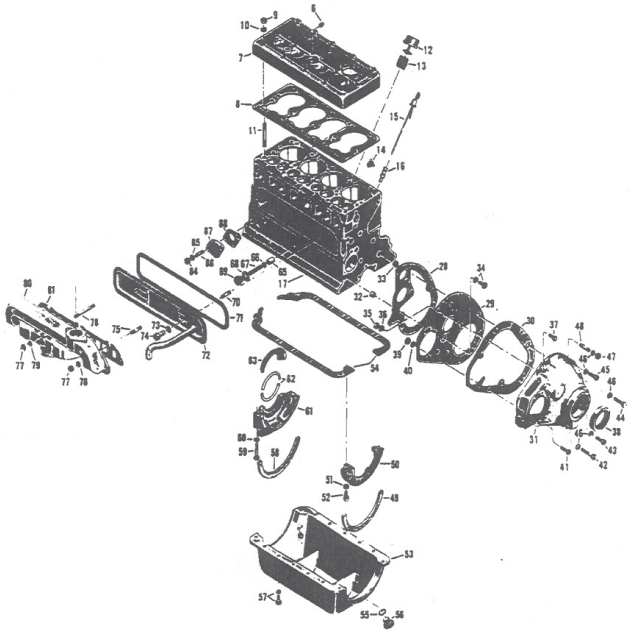
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-111-H

Item	Part Name And Description	No. Req'd.
1	Starting Motor	1
2	Hex Head Screw (Starter Mounting)	2
31	Battery	1
32	Battery Mounting Bracket	1
33A	Battery Holder Bolt	2
35	Ground Lead	1
36	Battery Lead to Starter	1
37	Magneto	1
38	Magneto Gasket	1
45	Nipple	4 or 6
50	Spark Plug	4
54	Distributor	1
	Drive Shaft Assembly	1
	Stud	1
55	Clamp Arm	1
56	Ignition Coil	1
60	Voltage Regulator	1
	Alternator Assembly Includes	1
62	Alternator (Includes Fan)	1
63	Pulley	1
66	Mounting Bracket	1
67	Stud-Mounts Alternator Bracket	2
68	Adjusting Strap	1

ENGINE EXTERIOR PARTS

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.



For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

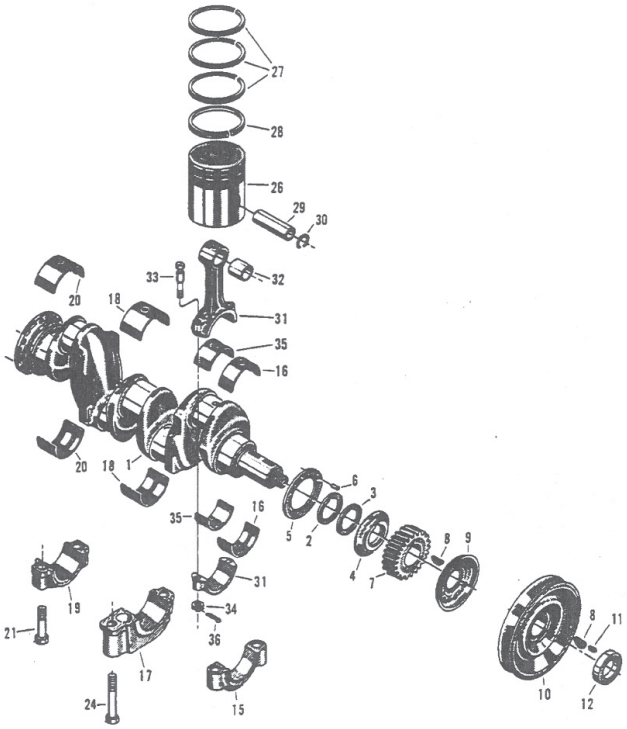
Parts List P-23-J

Item	Part Name And Description	No. Req'd.
6	Pipe Plug - Temprature Gauge Hole in Cylinder Head	1
7	Cylinder Head	1
8	Cylinder Head Gasket	1
9	Cylinder Head Nut	15
10	Washer - Cylinder Head Nut	15
11	Stud - Cylinder Head to Block	15
12	Oil Filler Cap Assembly	1
13	Oil Filler Tube	1
14	Drain Cock	1
15	Oil Gauge Rod	1
16	Oil Rod Support	1
17	Block	1
	Front End Plate Assembly - Includes:	1
28	Gasket - Front End Plate	1
29	Front End Plate	1
30	Gasket, Gear Cover	1
31	Gear Cover	1
32	Ring Dowel, Front Plate	1
33	Ring Dowel, Gear Cover	1
34	Screw and Lockwasher Assembly	1
35	Nut - Gear Cover to End Plate	1
36	Lockwasher - Gear Cover to End Plate	1
37	Screw - Gear Cover to End Plate	1
38	Oil Seal	1
39	Nut - Gear Cover Dowel Screw	1
40	Lockwasher - Gear Cover Dowel Screw	1
41	Gear Cover Dowel Screw	1
42	Hex Head Screw - Gear Cover to Filler Block	1
43	Hex Head Screw - Gear Cover to Filler Block	3
44	Hex Head Screw - Gear Cover to Block	1
45	Hex Head Screw - Gear Cover to Block (At Ring Dowel)	1
46	Lockwasher - Gear Cover Mounting Screws	8
47	Hex Nut - Gear Cover to Stud	2
48	Stud - Gear Cover to Block (Upper Holes)	2
49	Cork - Oil Pan to Front Filler Block	1
50	Front Filler Block	1
51	Lockwasher - Front Filler Block to Engine Block	2
52	Hex Head Screw - Front Filler Blck to Engine Block	2
53	Oil Pan	1
54	Oil Pan Gasket	2
55	Gasket - Oil Pan Drain Plug	1
56	Oil Pan Drain Plug	1
57	Screw and Lockwasher Assembly - Oil Pan to Block	14
58	Cork - Oil Pan to Rear Filler Block	1

Parts List P-23-J

Item	Part Name And Description	No. Req'd.
59	Hex Head Screw	2
60	Lockwasher	2
61	Rear Filling Block	1
	Rear Bearing Oil Guard Assembly - includes:	1
62	Seal - Rear Filler Block	2
63	Rear Bearing Oil Guard	1
64	Felt - Rear Bearing Oil Guard	1
65	Oil Pressure Relief Valve	1
66	Washer - Oil Pressure Relief Spring Adjusting	As Req'd
67	Oil Pressure Relief Valve Spring	1
68	Gasket - Oil Pressure Relief Valve	1
69	Plug - Oil Pressure Relief Valve	1
70	Stud - Valve Chamber Cover	2
71	Gasket - Valve Chamber Cover	1
72	Valve Chamber Cover	1
73	Gasket - Valve Chamber Cover Nut	2
74	Hex Nut - Valve Chamber Cover	2
75	Stud - Manifold to Block	6
76	Washer - Manifold to Block - End and Center Studs	3
77	Hex Nut - Manifold to Block	7
78	Stud - Manifold to Block (Center Hole)	1
79	Washer - Manifold to Block	4
80	Manifold	1
81	Manifold Gasket	1
84	Nut - Fuel Pump Hole in Block	2
85	Lockwasher - Fuel Pump Hole in Block	2
86	Stud - Fuel Pump Hole in Block	2
87	Cover - Fuel Pump Hole in Block	1
88	Gasket - Fuel Pump Hole in Block	1

CRANKSHAFT AND PISTON ASSEMBLY



WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

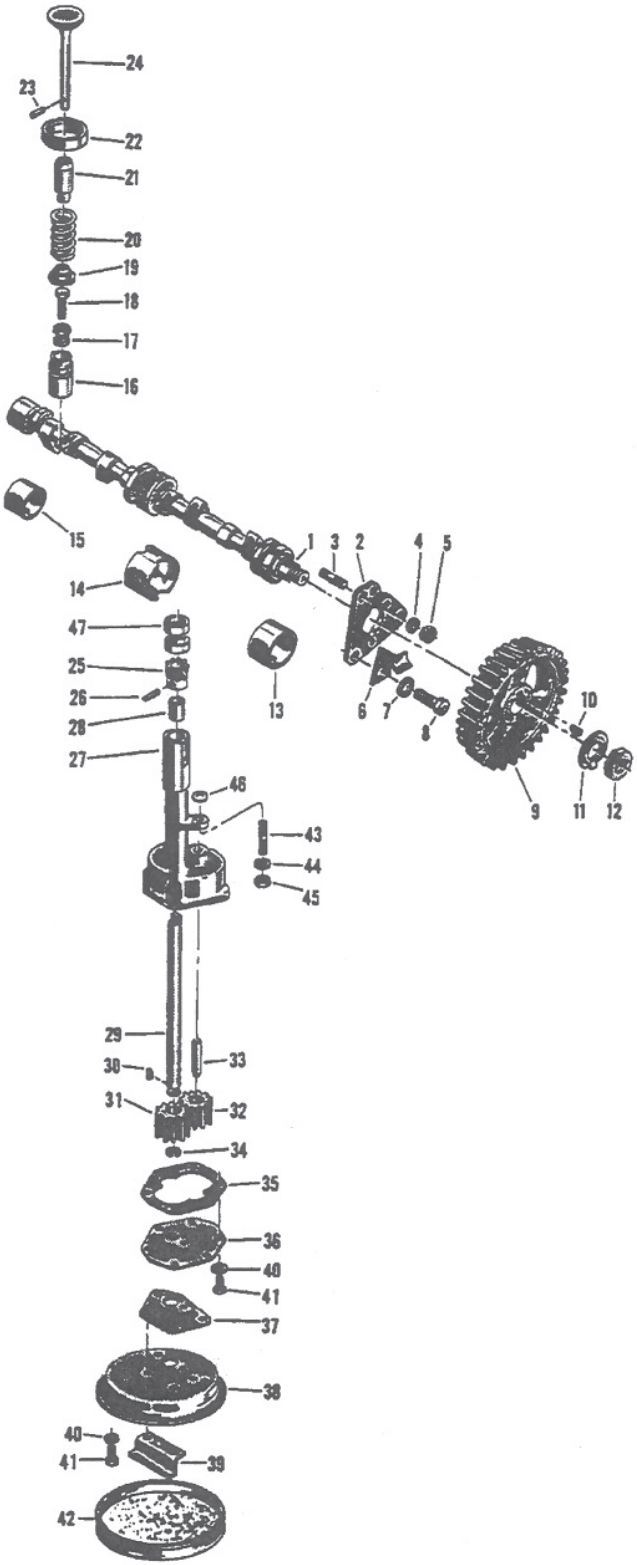
For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

Parts List P-23-K

Item	Part Name And Description	No. Req'd.
1	Crankshaft Assembly - Includes:	1
	Crankshaft	1
2	Crankshaft Thrust Shim (.002)	8
3	Crankshaft Thrust Shim (.008)	8
4	Crankshaft Thrust Plate	1
5	Thrust Washer	2
6	Pin-Crankshaft: Thrust Washer to Crankcase	3
7	Crankshaft Gear	1
8	Key - Crankshaft Gear to Crankshaft	1
9	Oil Thrower	1
10	Pulley	1
11	Cork - Fan Drive Pulley Keyway Plug	1
12	Spacer Collar - Crank Starting Jaw	1
15	Bearing Cap - Front Main	1
16	Bearing Assembly - Front Main (One Bearing assembly is two halves)	1
17	Bearing Cap - Center Main	1
18	Bearing Assembly - Center Main (One Bearing is two halves)	1
19	Bearing Cap - Rear Main	1
20	Bearing Assembly - Rear Main (One Bearing assembly is two halves)	1
21	Place bolt-Front and Rear Main Bearing Cap Mounting	4
24	Place bolt-Center Main Bearing Cap Mounting	2
26	Piston	4

Item	Part Name And Description	No. Req'd.
27	Piston Ring - Taper Face (Top 3)	12
28	Piston Ring - Oil Control (Bottom)	4
29	Piston Pin	4
30	Piston Pin Retaining Ring	8
	Connecting Rod and Cap Assembly - (#1 and #3	
	Cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
	Connecing Rod and Cap Assembly - (#2 and#4	
	Cylinders) - Includes:	2
31	Rod and Cap	2
32	Piston Pin Bushing	2
33	Connecting Rod Bolt	4
34	Connecting Rod Bolt Nut	4
35	Connecting Rod Bearing - Upper and Lower	4
36	Cotter Pin - Connecting Rod Bolts	8
	Piston Ring Kit (For Re-ringing Std. Bore)	1
	Piston Ring Kit (For Re-bored Engines)	1
	Piston Assembly Kit	1

CAMSHAFT AND VALVE ASSEMBLY



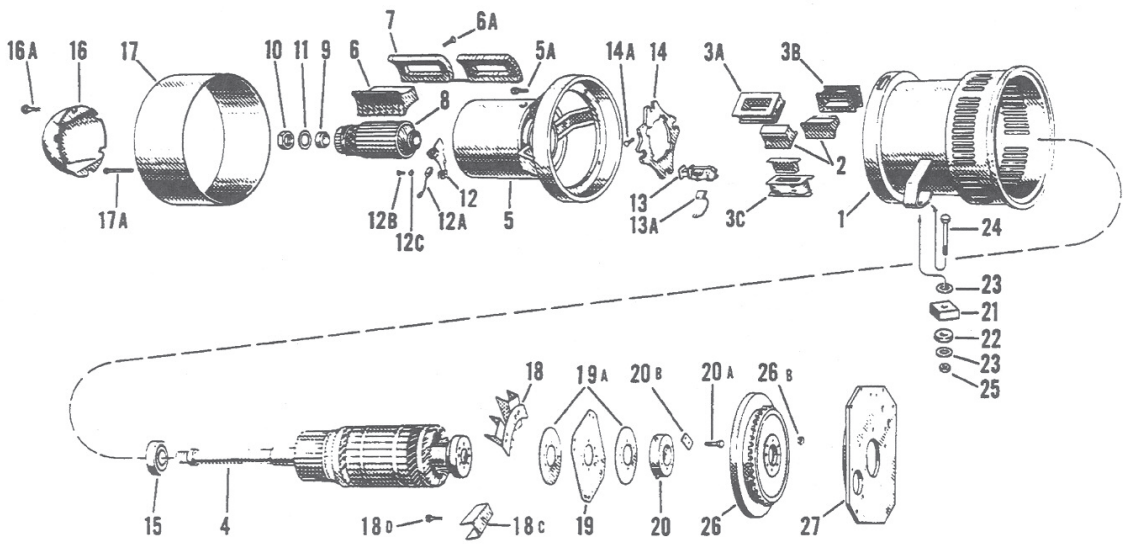
Parts List P-23-L

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Camshaft	1
2	Camshaft Thrust Plate	2
3	Stud - Camshaft Thrust Plate to Block	2
4	Lockwasher - Camshaft Thrust Plate to Block	2
5	Hex Nut - Camshaft Thrust Plate to Block	2
6	Timing Gear Oiler Plate	1
7	Lockwasher - Oiler Plate to Thrust Plate Block	1
8	Hex Head Bolt - Oiler Plate and Thrust Plate to Block	1
9	Camshaft Gear	1
10	Key - Camshaft Gear to Camshaft	1
11	Washer - To Lock Nut on Camshaft	1
12	Hex Nut - Camshaft Gear to Camshaft	1
13	Bushing - Camshaft Front	1
14	Bushing - Camshaft Center	1
15	Bushing - Camshaft Rear	1
	Valve Tappet Assembly - Includes:	8
16	Valve Tappet	8
17	Valve Tappet Locknut	8
18	Valve Tappet Screw	8
19	Valve Spring Seat	8
20	Valve Spring	8
21	Valve Stem Guide	8
22	Exhaust Valve Seat Insert	4
23	Valve Spring Lock	8
24	Intake Valve	4
24	Exhaust Valve	4
	Oil Pump Assembly - Includes	1
25	Drive Gear - Oil Pump	1
26	Pin - Oil Pump Drive Gear to Shaft	1
27	Body Assembly - Includes:	1
28	Bushing	1
29	Shaft	1
30	Key	1
31	Gear - Oil Pump Driver	1
32	Gear - Oil Pump Driven	1
33	Stud - Oil Pump Idler Gear	1
34	Snap Ring - Oil Pump Drive shaft	1
35	Gasket - Oil Pump Cover	1
36	Cover- Oil Pump	1
37	Gasket - Strainer Screen	1
38	Strainer Frame	1
39	Strainer Spacer	1
40	Lockwasher	6
41	Hex Head Screw	6
42	Oil Straining Screen	1
43	Stud - Oil Pump Body to Center Main Bearing Cap	1
44	Lockwasher - Oil Pump Body to Center Main	
	Bearing Cap	1
45	Hex Nut - Oil Pump Body to Center Main Bearing Cap	1
46	Washer - Oil Pump Spacer	1
47	Oil Pump Drive Shaft Sleeve	1

For fastest service, order engine parts from an area Continental parts distributor using these parts descriptions and the engine nameplate data.

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

WELDING GENERATOR



WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-23-M

Item	Part Name And Description	No. Req'd.
1	Welder Frame	1
2	Main Pole Lamination	4
3A	Shunt Field Coil	2
3B	Series Field Coil	2
3C	Interpole Coil	2
3D	Interpole Pole Piece	2
4+	Armature, Includes:	1
	Armature Coil	1
5	Welder Bracket and Exciter Frame	1
5A	Hex Head Screw, Bracket to Frame	4
6	Exciter Pole	2
6A	Hex Head Screw, Pole to Frame	4
7	Exciter Field Coil	2
8+	Exciter Armature	1
9	Exciter Armature Sleeve Collar	1
10	Exciter Locknut	1
11	Locking Washer	1
12	Exciter Brush Holder	2
	Brush Holder Parts See P-25-M	
12A	Exciter Brush	2
12B	Screw, Brush Holder to Frame	4
12C	Washer, Brush Holder to Frame	4
13	Welder Brush Holder	4
	Brush Holder Parts See P-25-L	
13A	Welder Brush	8
14	Rocker	1

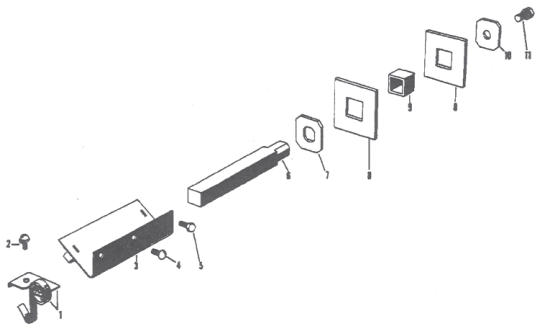
Item	Part Name And Description	No. Req'd.
14A	Screw, Rocker to Hub	1
15	Ball Bearing	1
16	Exciter End Cover	1
16A	Screw, Mounts End Cover	2
17	Bracket Cover	1
17A	Round Head Screw, Mounts Bracket Cover	2
18	Blower Segments	4
18C	Blower Paddle	8
18D	Lock Screw	8
19	Coupling Disc	1
19A	Backing Plate	2
20	Coupling Ring	1
20A	Screw, Disc to Hub	8
20B	Locking Clip, Disc to Hub	4
21	Welder Foot, Upper Cushion	2
22	Welder Foot, Lower Cushion	2
23	Washer	4
24	Hex Head Screw	2
25	Huglock Nut	2
26	Flywheel	1
26B	Locknut, Flywheel to Crankshaft	6
27	Engine Adapter Plate	1
	+ Available on Exchange Plan	

THE LINCOLN EXCHANGE PLAN gives you fast repairs at modest cost. Here's how:

Factory remanufactured replacements for the major parts indicated by + in this manual are available. These exchange parts are available only through the local authorized Field Service Shops. To get your welder back into operation quickly, replace the faulty parts with a rebuilt part – often from the service shop's stock. The cost is less than a normal rewinding job.

The service shop will ship the removed part to the factory for inspection. If it can be rebuilt, a credit will be issued to the shop. They, in turn, will pass this credit to you, thus further reducing the net cost of the repair. All exchange parts carry the same one year guarantee as new welders. For more information, contact your local Lincoln authorized Field Service Shop.

GENERATOR BRUSH HOLDER

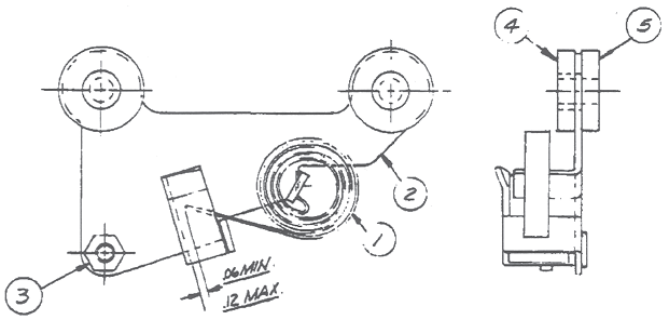


Parts List P-25-L

Item	Part Name And Description	No. Req'd.
	Brush Holder Assembly Includes:	
1	Spring and Clip Assembly	2
2	Round Head Cap Screw	2
3	Plate and Retainer Assembly	1
4	Round Head Cap Screw	2
5	Hex Head Cap Screw	1
6	Stud	1
7	Clamping Washer	1
8	Insulating Washer	1
9	Insulating Tube	1
10	Clamping Washer	1
11	Hex Head Cap Screw, Sems Kantlink	1

WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

EXCITER BRUSH HOLDER



ITEMS 4 & 5 ARE NOT PRE-ASSEMBLED

S-6531
6-8-79K

Item	Part Name And Description	No. Req'd.
	Exciter Brush Holder Assembly Includes:	1
1	Spring	1
2	Brush Holder	1
3	Hex Nut	1
4	Insulating Washer	2
5	Bushing	2

Return to Section TOC
Return to Master TOC

Need Welding Training?

The Lincoln Electric Company operates the oldest and most respected Arc Welding School in the United States at its corporate headquarters in Cleveland, Ohio. Over 60,000 students have graduated. Tuition is low and training is “hands on”.

For details write: Lincoln Welding School
22801 St. Clair
Cleveland, Ohio 44117

Ask for bulletin ED-80 or call 216-481-8100 and ask for the Welding School Registrar.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate – machine model, code and serial numbers.

(b) From this manual – complete part name and description, item number, quantity required and the number of the list used to get this information.

Any item indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do **not** order the indented parts.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment or electrode of flux within any period of warranty and the Seller's inspection confirms the existence of such defects, than the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure ?? ?? conditions of any warranty. The liability if the seller ?? out of the ??? of said equipment ?? ?? if its use by the Buyer, whether on warranties ?? ? shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode ?? with the above warrantee. Upon ?? ?? period of warranty?? such liability shall ??

The ?? guarantees and remedies are exclusive and ?? as above set forth. There are no guarantees or warranties with respect to engines, accessories, equipment, electrodes or ??? either express or arising by operation of law or trade usage or otherwise implied, including without limitations ??? warranty of merchantability, all such warranties ??? ??? by the Buyer.

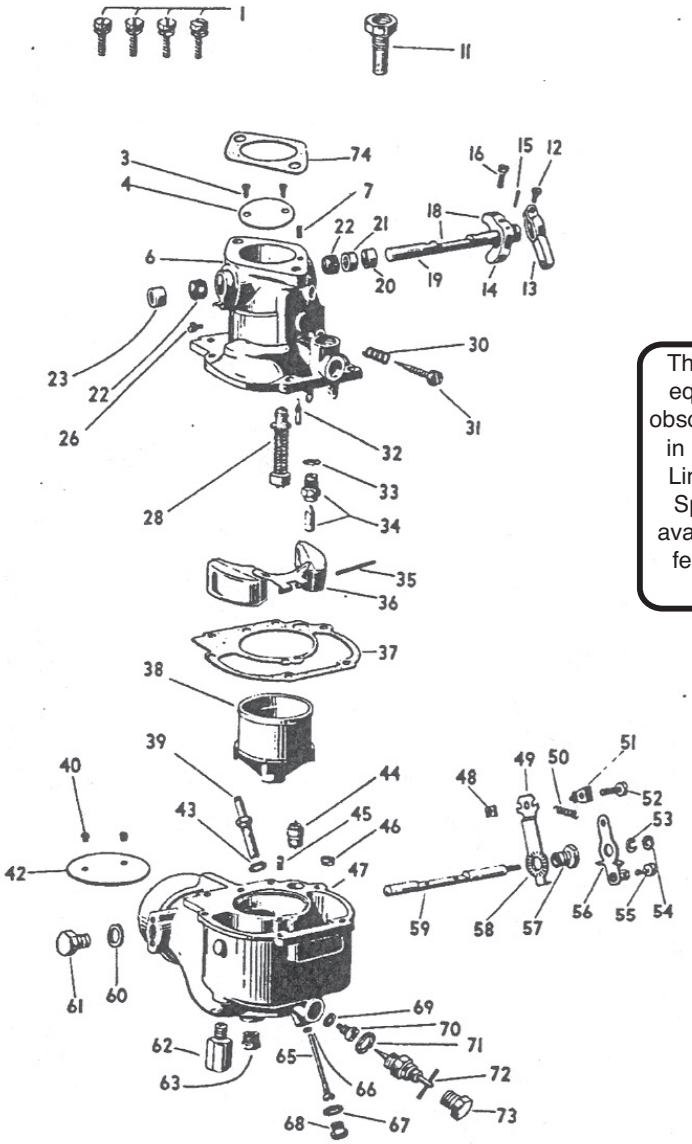
THE LINCOLN ELECTRIC COMPANY
World's Leader in Welding and Cutting Products • Premier Manufacturer of Industrial Motors
Sales and Service through Subsidiaries and Distributors Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

RETURN TO MAIN INDEX

IM-214
March, 1957

PARTS LIST

ZENITH CARBURETOR
TYPES: **S-7538, S-8110, M-7033**



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

SEE REVERSE SIDE FOR PART NUMBERS

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

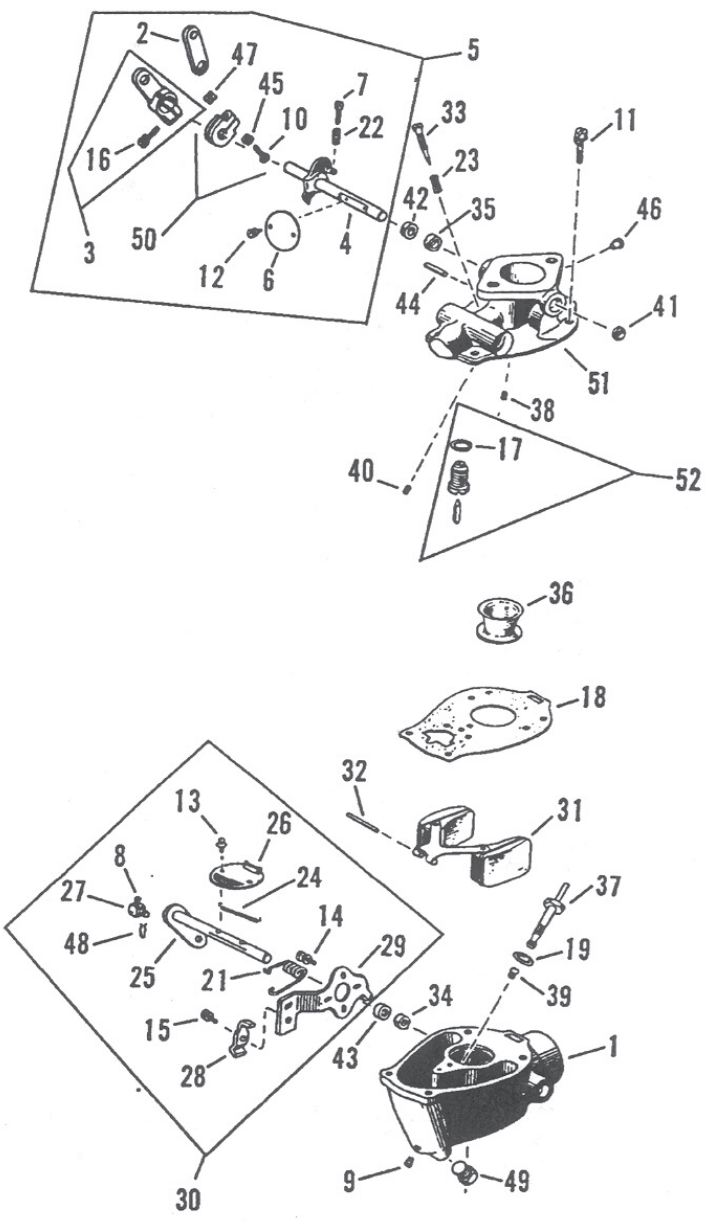
Return to Section TOC
Return to Master TOC

Item	Qty. Per Carb.	Part Name	Carburetor S-7538 Part Number	Carburetor S-8110 Part Number	Carburetor M-7033 Part Number
1	4	*Screw and Lockwasher Assembly. Incl.Lockwashers	T311S12-12	T311S12-12	T311S12-12
3	2	#*Screw - Throttle Plate	C136-3	C136-3	C136-3
4	1	Plate - Throttle	C21-78	C21-78	C21-78
6	1	Body - Throttle	B12-10150	B12-10647	B12-10779
7	1	Screw - Vacuum Channel	C138-38	----------	----------
9	1	!*Washer - Filter Plug Fibre	T56-10	T56-10	T56-10
11	1	Screen & Plug - Fuel Filter	C150-12	C150-12	C150-12
12	1	#Screw - Lever Clamp	T8S10-9	T8S10-9	T8S10-9
13	1	#Lever - Throttle Clamp	C24-7BBx3	C24-7BBx3	C24-7BBx3
14	1	#Lever - Throttle Stop	CR28-28	CR28-47	CR28-28
15	1	#Pin - Stop Lever Taper	CT63-9	CT63-9	CT63-9
16	1	#Screw - Lever Stop	T1S8-10	T1S8-10	T1S8-10
18	1	#Shaft & Stop Lever - Throttle	C29-624	C29-322	C29-624
19	1	#Shaft - Throttle	C23-176	C23-1[illegible]	C23-176
20	1	*Retainer - Shaft Packing	CT52-56	CT52-56	CT52-56
21	1	*Washer - Shaft Packing	CT48-10	CT48-[illegible]	CT48-10
22	2	Bushing, Throttle Shaft	----------	C29-[illegible]	CR9-36
23	1	Plug - Shaft Hole	C131-[illegible]	C[illegible]1-2	C131-2
26	1	*Screw and Lockwasher Assembly	T[illegible]1S8-6	T[illegible]1S8-6	T[illegible]1S8-6
28	1	*Pump	C36-6[illegible]1	C36-61x1	C36-[illegible]1x1
30	1	Spring - Idle Adjusting Screw	C[illegible]-17	C111-17	C111-[illegible]
31	1	*Needle - Idle Adjusting	C[illegible]-38	C46-38	C46-3[illegible]
32	1	*Jet Idling	C5[illegible]-18	C55-7-14	C5[illegible]-13
33	1	!*Washer - Fuel Valve Seat Fibre	T56-23	T56-23	T56-23
34	1	*Valve & Seat - Fuel	C81-1-40	C81-1-45	C81-1-40
35	1	*Axle - Float	C1[illegible]-15	C120-[illegible]	C120-15
36	1	Float	C85-[illegible]	C[illegible]-26	C85-26
37	1	!*Gasket - Bowl to Body	C142-21	C142-21	C142-21
38	1	Venturi - (cast in secondary)	B38-24-[illegible]	B38-24-29	B38-24A-28
39	1	Jet Discharge	C66-[illegible]-1-70	C66-22-1-70	C66-68-80
40	2	*Screw and Lockwash[illegible] Assembly	T315B6-4	T315B6-4	T315B6-4
42	1	Plate - Choke	C101-22	C101-59	C101-22
43	1	!*Washer - Dis[illegible]harge J[illegible]Fibre	T56-48	T56-48	T56-48
44	1	*Valve - P[illegible]wer J[illegible]	C97-15-15	C97-15-12	C97-15-0
45	1	*Jet - [illegible]well V[illegible]	C77-18-10	C77-18-24	C77-18-14
46	1	*[illegible]alve - Pu[illegible]Che[illegible]	CR41-3	CR41-3	CR41-3
47	1	Bowl - [illegible]uel	B3-62A	B3-62A-2	B3-62A
48	[illegible]	[illegible] - [illegible]n Screw	T21S8	T21S8	T21S8
49	[illegible]	[illegible]ket - Choke	C109-2	C109-2	C109-2
50	[illegible]	[illegible]g - Choke Return	C112-6	C112-6	C112-6
51	1	[illegible]amp - Bracket Tube	C110-1	C110-1	C110-1
52	1	Screw - Tube Clamp	T1S8-10	T1S8-10	T1S8-10
53	1	Lockwasher Shaft Nut	T45-8	T45-8	T45-8
54	1	[illegible]ut - Choke Shaft	T22S8	T22S8	T22S8
55	1	S[illegible]ew - Leve[illegible]Swivel	T8S8-7	T8S8-7	T8S8-7
56	1	Lev[illegible] Ch[illegible]ke	C106-2	C106-2	C106-2
57	1	Screw - Bracket Assembly	C140-2	C140-2	C140-2
59	1	Shaft - Choke	C105-19	C105-19	C105-19
60	1	!*Washer - Shaft Hole Plug Fibre	T56-23	T56-23	T56-23
61	1	Plug - Choke Shaft Hole	C138-24	C138-24	C138-24
62	1	Plug - Intake Drain Drip	C138-54	C138-54	C138-54
63	1	Plug - Bowl Drain (1/8”Pipe Plug)	CT91-3	CT91-3	CT91-3
65	1	Jet - Power & Accelerating	C51-20-20	C51-20-19	C51-20-14
66	1	!*Washer - Power & Accel. Jet Fibre	T56-4	T56-4	T56-4
67	1	!*Washer - Power & Accel. Passage Plug Fibre	T56-12	T56-12	T56-12
68	1	Plug - Power & Accel. Jet Passage	C138-53	C138-53	C138-53
69	1	!*Washer - Main Jet Fibre	T56-24	T56-24	T56-24
70	1	*Jet - Main	C52-6-22	C52-6-25	C52-6-25
71	1	!*Washer - Passage Plug Fibre	T56-23	T56-23	T56-23
72	1	Adjustment - Main Jet	C71-24	----------	----------
73	1	Plug - Main Jet Passage	----------	C138-23	C138-23
74	1	*Gasket - Flange	C141-4-1	C141-4-1	C141-4-1
	1	Gasket Kit (Includes 1)	C181-74	C181-74	C181-74
		Gasket Kit (Includes *)	K10150	K10647	K10779
		Shaft and Levers Assembly (Includes #)	C29-1095	C29-1096	C29-1095

These parts are available from the Lincoln Electric Company and its Field Service Shops.

PARTS LIST

MARVEL-SCHEBLER CARBURETOR
(used with Continental F-162 Engine)
Type: S-9790



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

MARVEL-SCHEBLER CARBURETOR PARTS

Item	Qty.	Part Name	Part Number
		Carburetor Assembly Complete	10-3594
1	1	Body Assembly	10-3912
2	1	Lever, Throttle, Loose	12-A38
3	1	Lever Assembly, Governor	12-952
4	1	*Throttle Shaft & Stop Assembly	13-955
5	1	*Throttle Shaft & Levers Assembly	13-1199
6	1	Valve, Throttle (20°)	14-227
7	1	Screw, Throttle Stop (8/32x3/4)	15-42
8	1	Screw, Choke Swivel (8/32x5/16)	15-285
9	1	Screw, Nozzle Hole Plug (8-32)	15-409
10	1	Screw, Clevis Clamp (10-24x5/8)	15-A297
11	4	Screw, L.W. Assembly (12-24x5/8)	15-A82
12	2	*Screw & L.W. Assembly (4-40x1/4)	15-A91
13	2	*Screw & L.W. Assembly (4-40x1/4)	15-A91
14	1	Screw, L.W. Assembly (8-32x3/8)	15-A93
15	1	Screw, L.W. Assembly (8-32x5/16)	15-A99
16	1	Screw, L.W. Assembly (12-2x5/8)	15-A296
17	1	Gasket, Float Valve Seat	16-4
18	1	Gasket, Throttle Body to Bowl	16-80
19	1	Gasket, Main Nozzle	16-449
	1	*Gasket Kit	16-613
21	1	*Spring, Choke Return	24-247
22	1	Spring, Throttle Stop Screw	24-262
23	1	*Spring, Idle Needle	24-340
24	1	Spring, Choke Valve Flutter	24-425
25	1	Lever & Shaft Assembly, Choke	26-659
26	1	Valve Assembly Choke	27-539
27	1	Swivel Choke Lever	28-49
28	1	Clip, Choke Bracket	29-81
29	1	Bracket Choke	29-104
30	1	Bracket Assembly Choke	29-528
31	1	Float & Lever Assembly	30-600
32	1	*Shaft, Float Lever	32-27
33	1	Needle, Idle Adjusting	43-33
34	1	*Packing, Choke Shaft	44-39
35	1	*Packing, Throttle Shaft	44-63
36		Venturi (25/32" Dia.)	46-457
37	1	Nozzle, Main	47-180
38	1	Jet, Economizer	49-145
39		*Jet, Power	49-188
40	1	*Jet, Idle	49-203
41	1	*Cup, Throttle Shaft	55-230
42	1	*Retainer, Throttle Shaft Packing	55-231
43	1	*Retainer, Choke Shaft Packing	55-243
44	1	Pin, Throttle Stop	62-167
45	1	Washer, Clevis Assembly	78-A4
46	1	Plug, Idle Drilling	80-171
47	1	Nut Clevis Clamp (10-24)	81-1
48	1	Cotter Hairpin	82-16
49	1	Plug, Bowl Drain	99-7
50	1	Clevis Assembly	121-504
51	1	Throttle Body & Shaft Assembly	227-1400
52	1	*Valve & Seat Assembly, Float	233-536
		Repair Kit	286-1112
		Gasket Kit (incl. 16-4, 16-80, 16-449)	16-613

NOTE:*These parts included in Repair Kit 286-1112

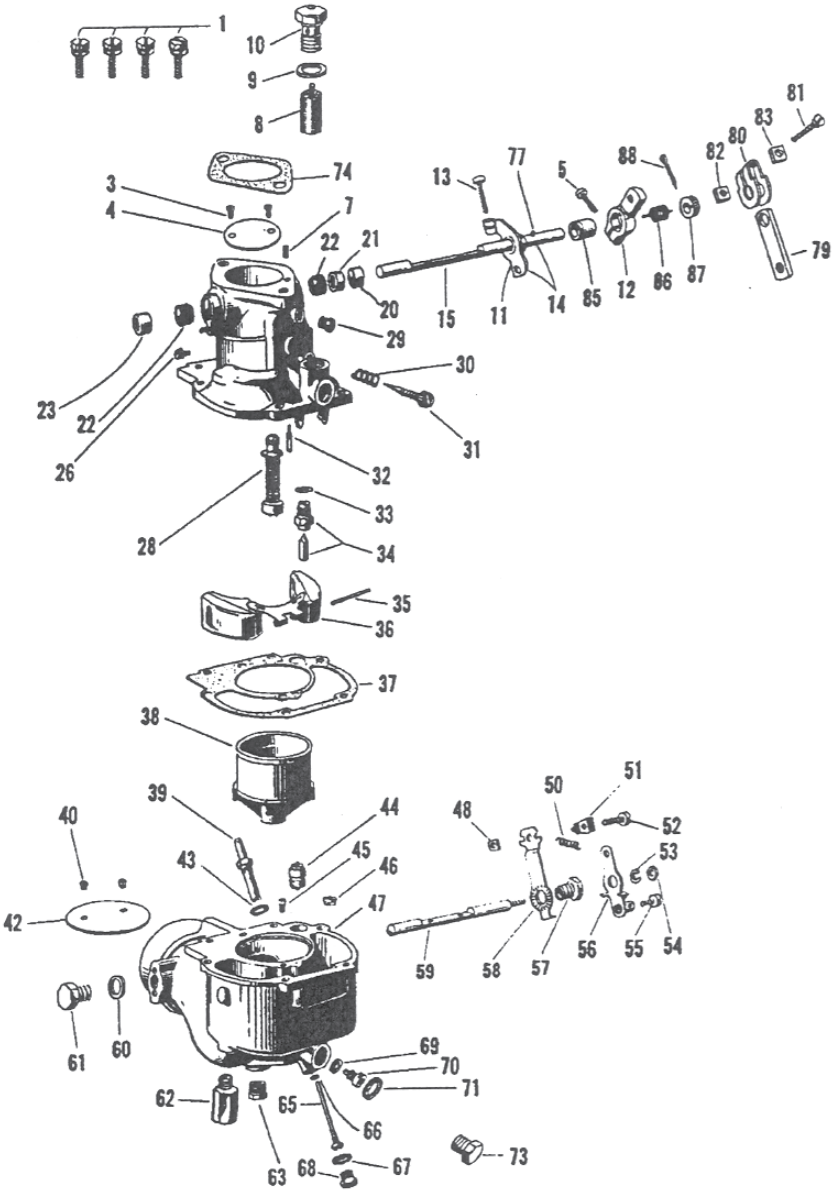
Return to Section TOC
Return to Master TOC

RETURN TO MAIN INDEX

IM-225
January, 1959

PARTS LIST

ZENITH CARBURETOR
TYPES: **S-8318, S-8082**



This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •

Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

Return to Section TOC
Return to Master TOC

Item	Quantity Per Carb.	Part Name	Carburetor S-8318 Part Number	Carburetor S-8082 Part Number
1	4 or 6	Screw, Bowl to Body Assembly	T311S12-12	T301S25-12
3	2	Screw, Throttle Plate	*C136-3	C136-13
4	1	Plate, Throttle	C21-78	C21-54
5	1	Screw, Lever Clamp	T8S10-9	T8S10-9
7	1	Screw, Vacuum Channel	C138-38	C138-38
8	1	Element, Fuel Filter	F2x1T5	F2x1T5
9	1	Washer, Filter Head	#*T56-3	#*T56-3
10	1	Head, Fuel Filter	C138-46	C138-46
11	1	Lever, Throttle Stop	CR28-28	CR28-28
12	1	Lever, Throttle Clamp	C24-11BFx9	C24-10EJx3
13	1	Screw, Lever Stop	T1S8-10	-
14	1	Shaft & Stop Lever, Throttle (includes items 11, 13, 15, 77)	C29-962	C29-995
15	1	Shaft, Throttle (see Note 1)	C23-496	C23-512
20	1	Retainer, Seal	CT52-56	CT52-56
21	1	Seal, Shaft	CT48-10	CT48-10
23	1	Plug, Shaft Hole	C131-2	C131-2
26	1	Screw, Venturi	T301S8-6	T301S8-6
28	1	Pump	*C36-61x1	C36-52x1
29	1	Plug, 1/8” Pipe (Vac. Spark)	CT91-3	-
30	1	Spring, Adjusting Needle	C111-17	C111-17
31	1	Needle, Idle Adjusting	C46-38	*C46-38
32	1	Jet, Idling	*C55-7-14	*C55-7-14
33	1	Washer, Fuel Valve Seat Fibre	#*T56-23	#*T56-23
34	1	Valve & Seat, Fuel	*C81-1-45	*C81-1-50
35	1	Axle, Float	*C120-15	*C120-15
36	1	Float	C85-[illegible]	C85-40
37	1	Gasket, Bowl to Body	#*T56-[illegible]	C1[illegible]-22
38	1	Venturi (with cast in Secondary)	B38-[illegible]4-24	B38-[illegible]2-31
39	1	Jet, Discharge	C[illegible]22-1-70	C66-3[illegible]2-80
40	2	Screw, Choke Plate	[illegible]315B6-4	T315B6[illegible]4
41	2	Lockwasher, Choke Screw	-	*T43-6
42	1	Plate, Choke	C101-22	C10[illegible]22
43	1	Washer, Discharge Jet Fibre	#*T56-48	T[illegible]6-14
44	1	Valve, Powerjet	*C97-15-12	C97-10-0
45	1	Jet, Well Vent	C77-18-24	C77-18-18
46	1	Valve, Pump Check	*CR41-[illegible]	CR41-1
47	1	Bowl, Fuel (includes item 46)	B3-[illegible]2A-3	B3-58-2
48	1	Nut, Clamp Screw	[illegible]21S8	T21S8
50	1	Spring, Choke Lever Return	C112-12	C112-6
51	1	Clamp, Bracket Tube	C110-1	C110-1
52	1	Screw, Clamp Tube	T858-10	T858-10
53	1	Lockwasher, Shaft Nut	T45-8	T45-8
54	1	Nut, Choke Shaft	T22S8	T22S8
55	1	Screw, Lever Stop	T8S8-7	T8S8-6
56	1	Lever, Clip	C106-127	C106-17
57	1	Screw, Bracket Assembly	C140-2	C140-2
58	1	Bracket, Choke (includes items 50, 52)	C109-46-1	C109-46-1
59	1	Shaft, Choke	C105-19	C105-87
60	1	Washer, Shaft Hole Plug Fibre	#*T56-23	#*T56-23
61	1	Plug, Choke Shaft Hole	C138-24	C138-24
62	1	Plug, Intake Drain Drip	C138-54	C138-89
63	1	Plug, Bowl Drain (1/8”Pipe)	CT91-3	CT91-3
65	1	Jet, Power & Accelerating	C51-20-13	C51-15-23
66	1	Washer, Power & Accelerating Jet Fibre	#*T56-4	T56-24
67	1	Washer, Passage Plug Fibre	#*T56-12	T56-23
68	1	Plug, Power & Accelerating Jet Passage	C138-53	C138-24
69	1	Washer, Main Jet Fibre	#*T56-24	T56-48
70	1	Jet, Main	*C52-6-24	C52-13-35
71	1	Washer, Main Pasage Plug Fibre	#*T56-23	T56-10
72	1	Adjustment, Main Jet	-	C71-25
73	1	Plug, Main Jet Passage	C138-23	C138-47
74	1	Gasket, Flange	*C141-4-1	C141-4-2
77	1	Pin, Stop Lever Taper	CT63-9	CT63-9
79	1	Lever, Throttle Floating	CR25-18Bx2	CR25-18Bx3
80	1	Stop, Floating Lever (includes items 81, 82)	C25-103	C25-158
81	1	Screw, Stop Clamp	T8S10-11	T8S10-13
82	1	Nut, Clamp Screw	T21S10	T21S10
85	1	Bushing, Throttle Lever	C26-61	C26-61
86	1	Spring, Throttle Lever	C117-27	-
87	1	Retainer, Lever Spring	CR115-10	-
88	1	Cotter Pin, Spring Retainer	T61-4	-
#		KIT GASKET (includes items marked #)	C181-74	C181-73
*		KIT, SERVICE PARTS (includes items marked *)	K10906	K10989

Note 1 - Pin, Throttle Shaft (not shown) order C121-12

These parts are available from The Lincoln Electric Company and its Field Service Shops.

IM-179-G
November, 1988

GASOLINE ENGINE AND ADJUSTMENT:

(For SA-200-F163 welders with an electronic idler, see IM-277)

TIMING, CARBURETOR, GOVERNOR & IDLER

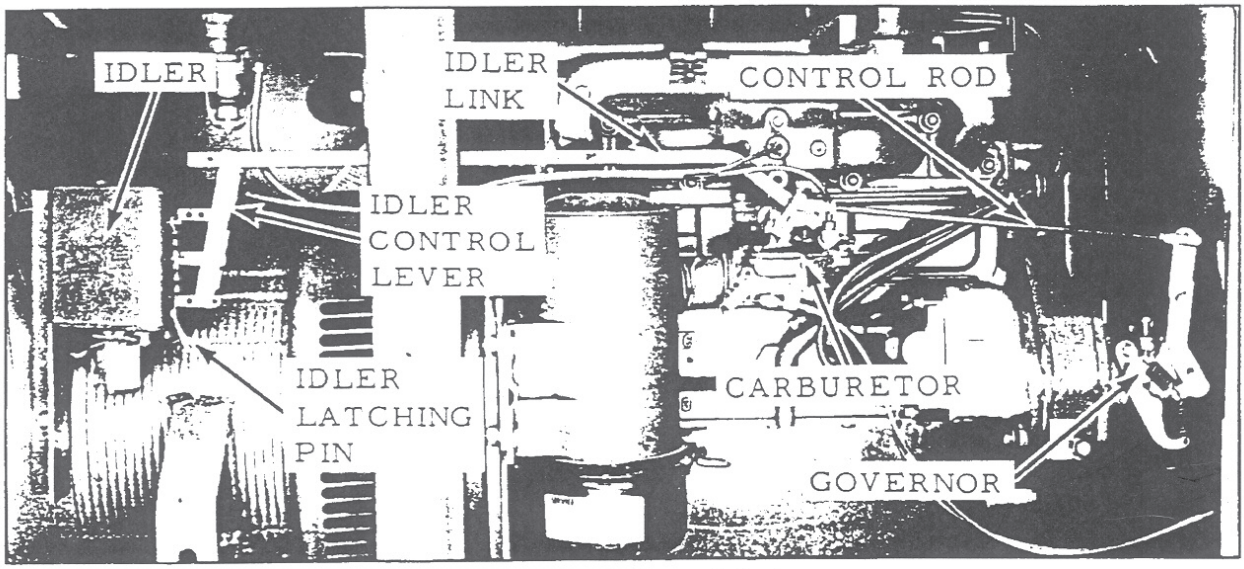


FIGURE 1 – Fuel Control System

This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

GENERAL INSTRUCTIONS

This manual is designed to help a qualified mechanic time the engine and adjust the fuel control system. Inexperienced workmen can do more harm than good in attempting to make many of these adjustments. If in doubt, call the nearest Lincoln authorized Field Service Shop.

The engine fuel control system consists of these major parts – carburetor, governor and idler. To save fuel and reduce engine wear, the idler slows the engine to *low idle speed* when no welding is being done.

When the arc is struck, the idler disengages allowing the governor to accelerate the engine to *load speed* for welding. When the arc is broken the governor keeps the engine operating at *high idle* speed until the idler takes over to reduce the speed.

NOTE: For air cooled engine carburetor and governor adjusting instructions, see the appropriate engine manufacturer's Operator's Manual. For idler adjustments, see pages 7 and 8.

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

Return to Section TOC
Return to Master TOC

PROPER GROUNDING DURING INSTALLATION

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

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.

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 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 National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

INSTALLATION, CONNECTION, AND MAINTENANCE OF 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 copper strap on the engine foot.

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 the engine is not running.

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

(S-17851)

OPERATION OF ENGINE WELDERS

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

OPERATION OF ALL WELDERS

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

MAINTENANCE AND TROUBLESHOOTING WARNINGS

WARNING: Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) 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.

ATTENTION OWNERS OF ENGINE WELDERS

WARNING: 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. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

CAUTION WHEN INSPECTING THE 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.

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.

TIMING

⚠ WARNING

MOVING PARTS can injure.

- Only qualified personnel should do maintenance and troubleshooting work. If possible, turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See operating manual parts list.)

⚠ WARNING

ENGINE EXHAUST can kill.

- Run engine in open, well ventilated areas or vent exhaust outside.

Engines on Lincoln welders are timed in the same general manner as all other gasoline engines. When timing the engines use #1 cylinder (nearest to fan). Timing marks shown in the table are on the flywheels of the Continental and Hercules engines and on the crank shaft pulley of International Harvester engines.

Firing sequence for six cylinder engines is 1 – 5 – 3 – 6 – 2 – 4. Firing sequence for four cylinder engines is 1 – 3 – 4 – 2.

If the leads between the spark plugs and the magneto or distributor were removed, reconnect as follows: Connect the lead from #1 spark plug to #1 terminal. This terminal is generally marked by a number 1 molded in the magneto or distributor cover. Connect the rest of the spark plug leads to the terminals in the same order as the firing sequence. Follow the sequence around the terminals clockwise or counterclockwise depending upon the direction of rotation of the rotor.

To check the direction of rotation, remove the magneto or distributor cover, crank the engine and note the direction of rotation.

The distributor point gap setting for International Harvester engines should be .016" (31 – 34º dwell angle). See the engine manufacturer's Operator's Manual for settings with other engines.

Engine	Mark	Comments
TIMING MARKS – MAGNETO IGNITION		
F162, F163, F226, F227, F244, F245	T	Marked by red spot
QXLD3	QX	Stamped next to SPARK
JXD & JXLD	JX	Stamped next to SPARK
G339 & G3400	SPARK	Marked by White Line
TIMING MARKS – DISTRIBUTOR IGNITION		
All Engines	DC	Time at 400 to 500 RPM

Set IH engines from DC to 2º retard.

CARBURETOR

The carburetor idle speed screw (A) and idle jet adjusting screw (B) should be adjusted periodically for smooth operation and fuel economy. These instructions cover both Zenith and Marvel Schebler carburetors.

NOTE: Although the arrangement of the parts for welders driven by International Harvester and Hercules engines are different than shown in these pictures, the adjustments are basically the same as described here.

IDLE SPEED SCREW (Figure 2 and *Figure 3*)

The purpose of the idle speed screw (A) is to set the low idle speed of the engine. Turn the screw clockwise to increase the low idle speed. Turn it counterclockwise to decrease the low idle speed. For recommended idle speed for Lincoln engine driven welders, see the table on page 8.

IDLE JET ADJUSTING SCREW (Figure 2 and *Figure 3*)

Purpose of the idle jet is to give smoothness of operation at low idle speed. To adjust the idle jet, latch the idler in the low idle position. Turn the idle jet adjusting screw (B) clockwise until the engine begins to falter and roll from richness. Then turn the adjusting screw out or counterclockwise until the engine runs smoothly. (This can best be done by using a tachometer to locate the setting at which the engine runs at highest speed.)

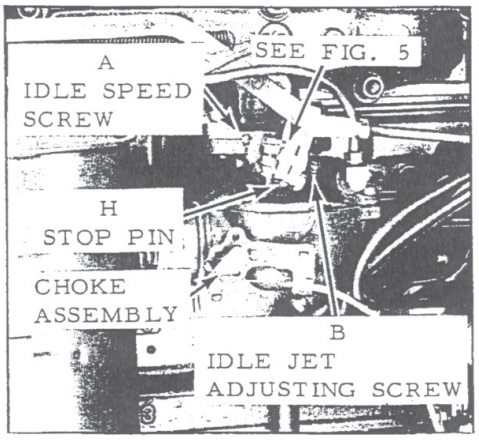


FIGURE 2 – Marvel Schebler Carburator

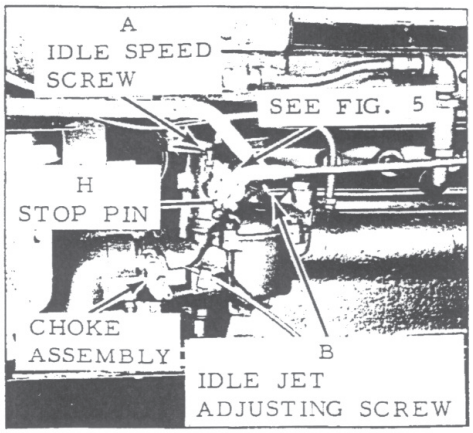


FIGURE 3 – Zenith Carburator

YOKE (*Figures 2*, 3 and 5)

The stop nut (F) on the yoke (E) acts as a stop for the idler link lever (G). Check the yoke and screw for tightness. If they are tight, leave them alone. If the yoke slips its position on the throttle shaft (D), the idler will fail to reduce engine speed all the way to low idle speed. Reset the yoke as follows:

Latch the idler in low idle position. Turn the throttle shaft counterclockwise until the idle speed screw (A) touches the stop pin (H) on the carburetor casting. Loosen the yoke screw. Turn the yoke clockwise until the stop nut is flush against the idler link lever. Tighten the yoke screw.

THROTTLE CONTROL LEVER (Figures 4 and 5)

The control lever screw holds the throttle control lever (C) onto the throttle shaft (D). Check the lever and screw for tightness. If they are tight, leave them alone. If they are loose or if you suspect the lever has slipped in its position on the shaft, loosen the control lever screw and reset the lever so angle A equals angle B in Figure 4. This angle should be about 35º. **NOTE:** This lever is not adjustable on the G339 and G3400 engines.

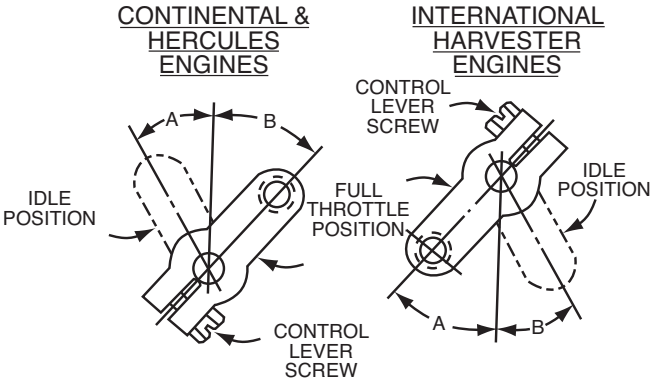


FIGURE 4 – Throttle Control Lever

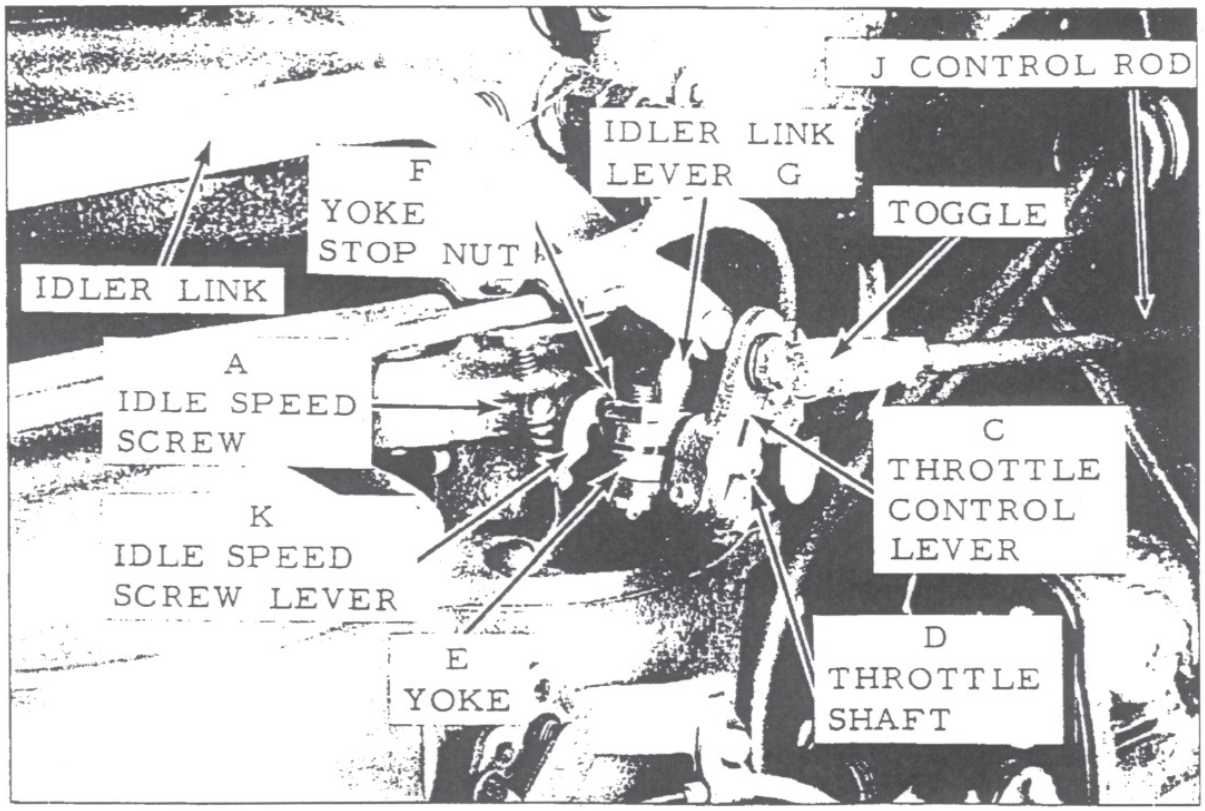


FIGURE 5 – Throttle Shaft and Control Assembly

Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

CONTROL ROD (*Figures 2, 3, 5*, 6 and 7)

The carburetor to governor control rod (J) is set at the factory and should require no field adjusting. When the engine is stopped, the stop on the idle speed screw lever (K) should be 1/32-inch off the stop pin (H) on the carburetor casting.

If this adjustment was changed, reset the control rod length as follows: Remove the toggle (L) at the governor end of the rod. Loosen the lockout (M). Screw the toggle out or into the rod to obtain the proper rod length. Once the length is set, DO NOT attempt to remove engine surge by adjusting to Control Rod.

GOVERNOR

⚠ WARNING

MOVING PARTS can injure.

- Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor.

GENERAL INSTRUCTIONS

The governor is set and locked for proper performance under actual welding conditions at the factory. Poor engine performance, including surging, can be caused by bad spark plugs, misadjusted carburetor, dirty air filter or many other troubles. Therefore make the following checks before touching the governor adjustments:

1. Check the Troubleshooting section in the engine manufacturer's operating manual.
2. Check the carburetor adjustments.
3. Be sure the locknuts on the control rod and on the governor and carburetor adjustment screws are tight.
4. Be sure the toggles, the throttle shaft and all other parts of the governor and the carburetor control systems are oiled and work smoothly without binding.

If these checks indicate the governor adjustments have slipped, adjust the governor according to the following instructions. These instructions are given for Hoof and Pierce governors.

SPEED CONTROL SCREW

The purpose of the speed control screw (N) is to set the high idle speed. To adjust this screw, latch the idler in the high idle position. Loosen the locknut and turn the screw in (clockwise) to increase the high idle speed. Turn the screw out (counterclockwise) to decrease the high idle speed. After making the adjustment, tighten the locknut.

As the engine becomes worn, it begins to lose power. When this happens, the load speed may drop below normal.

CAUTION: DO NOT adjust the speed control screw to raise the load speed. Doing this increases the high idle speed above normal. With excessive high idle speed the excited output voltage can cause serious damage to the excited output circuit. If full rated output is required, overhaul the engine.

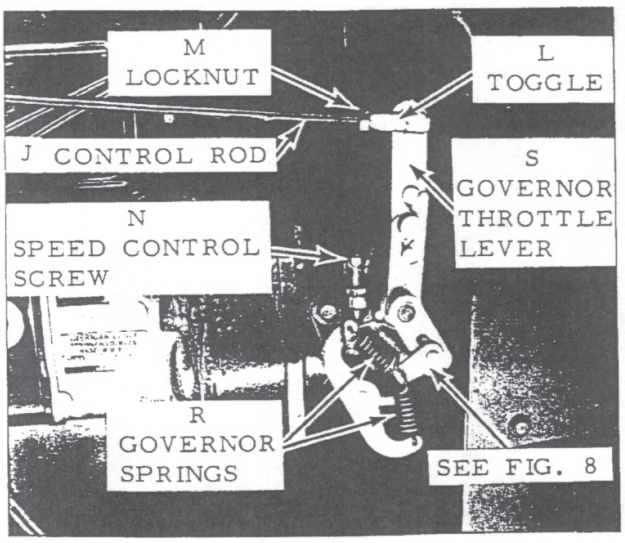


FIGURE 6 – Hoof Governor

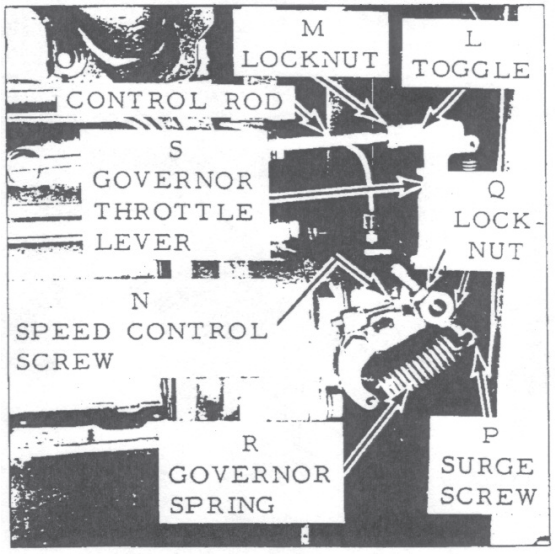


FIGURE 7 – Pierce Governor

Return to Section TOC
Return to Master TOC

SENSITIVITY ADJUSTMENT

The governor sensitivity adjustment has two purposes: (1) to control speed fluctuations (surge) at idle and load speeds, and (2) to control speed drop from high idle to load speed. Specific instructions for the method of changing this adjustment for Pierce and Hoof governors are given below.

CAUTION: Never use the sensitivity adjustment to eliminate surge which is present at load speed but not at high and low idle speeds. This type surge is almost never caused by governor misadjustment.

Changing the sensitivity adjustment in one direction reduces surge but increases the speed drop. Changing it in the other direction reduces the speed drop but increases the surge. Changing the sensitivity adjustment affects the idle speed. Therefore, always readjust the speed adjustment screw after changing the sensitivity adjustment.

NOTE: Although the governors on welders driven by International Harvester and Hercules appear different than shown in these pictures, the adjustments are basically the same.

To eliminate excess engine surge, latch the idler in high idle position. Adjust the sensitivity adjustment just far enough to eliminate the entire surge. Readjust the speed adjustment screw after eliminating surge.

Normally the engine surges three times when changing speeds. If it surges more often, the number of surges can usually be reduced by adjusting the sensitivity adjustment in the direction for less surging. This adjustment should only be made if the excess number of surges is objectionable.

The normal speed drop from high idle to low idle speed is 100 RPM +/- 25 RPM. The speed drop is usually increased too much when surge is eliminated. If the speed drop is too great, change the sensitivity adjustment in the direction opposite to that used to eliminate surge until the drop falls within the limits. If the speed drop is less than the limit, there is no harm done so long as the engine does not surge. Readjust the speed adjustment screw after completing this adjustment.

When the engine surges, the generator output varies. This can be detrimental to arc characteristics. If the speed drop is excessive, the load speed is low and the generator output is reduced. In adjusting the governor on a worn engine, you must balance the importance of eliminating surge with the need for full rated generator output. If you cannot obtain the proper adjustment, engine repair may be necessary.

HOOF GOVERNOR SENSITIVITY ADJUSMENT

Refer to Figure 8. The governor springs (R) are attached to the lower half of the throttle lever (S) by a spring link (T), which oscillates on a pin (U). The pin has serrated teeth (V), which engage a tooth rack (W) in the throttle lever slot. The governor spring tension maintains contact between the pin teeth and rack teeth at all times.

To change the sensitivity adjustment, loosen the nut (X) holding the pin, and turn the pin with a screwdriver. The pin teeth operate with the rack teeth as a gear system. Turning the pin down or away from the throttle lever pivot point (Y) reduces surge but increases speed drop. Turning the pin up or toward the pivot point (Y) increases surge but decreases speed drop.

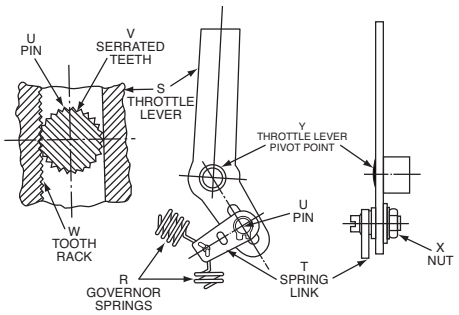


FIGURE 8 – Hoof Governor Sensitivity Adjustment

PIERCE GOVERNOR SENSITIVITY ADJUSTMENT

Refer to ***Figure 7***. The surge screw (P) is the sensitivity adjustment on the Pierce governor. To change this adjustment, loosen one locknut (Q) and tighten the other. This changes the position of the surge screw. Moving the screw down or to the right reduces surge but increases speed drop. Moving the screw up or to the left increases surge but reduces the speed drop.

BUMPER SPRING SCREW ADJUSTMENT

SAE-300-QXLD3 Hercules engine welders have a Pierce governor equipped with a bumper screw. The only purpose of this screw is to control surging as the engine goes from load to high idle speed after the arc is broken. To adjust the bumper spring screw, loosen the locknut and turn the screw out (counterclockwise) several turns. Then turn it in (clockwise) ¼ to ½ turn. Strike and break the arc to check the surging. Repeat this operation until the surging is at a minimum. Never turn the bumper spring screw in more than just enough to correct surging.

ENGINE STARTING

Starting at idle speed (with the latching pin – item 15 – hanging loose) is recommended. Engines can also be started with the idler held in full speed position by the latching pin.

Return to Section TOC
Return to Master TOC

Model	Recommended Engine RPM		
	Low Idle	Full Load	High Idle
SA-200-F162(1)& F-163(1)	1000	1450	1550
SAF-300-F163(1)	1100	1500	1590
SAE-300-F244(1)& QXLD3(1)	1000	1450	1550
SAE-300-F226(1)& F227(1)	1000	1500	1600
SAE-300-C221(1)	1000	1500	1600
SAM-300-F227(1)	1000	1550	1650
SAM-400-F245(1)	1000	1690	1790
SAE-400-JXD(1)	1000	1690	1790
SAE-400-F244(1)& F-245	1200	1700	1800
SAE-400-C263(1)	1000	1450	1550
SAE-600-JXLD(1)& G339(1)	1000	1450	1550
SAE-600-G3400(1)	1000	1450	1550
SAF-600-C301(1)	1200	1690	1790
SAM-600-C301(1)	1200	1690	1790
SAF-650-G3400(1) (Up to Code 6830)	1200	1600	1700
SAF-650-G3400(1) (Above Code 7210)	1200	1700	1800
SAM-650-G3400(1)	1200	1690	1790

(1) These models are no longer in production. SA-200-F163 models with electric starters built after May 1973 (above code 7275) have an electronic idler. ***See IM-277*** for idler and engine adjusting instructions.

⚠ WARNING

MOVING PARTS can injure.

- If possible, Turn the engine off and disconnect the battery before working inside the machine.
- 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.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

POWER TOOLS AND WIRE FEEDERS

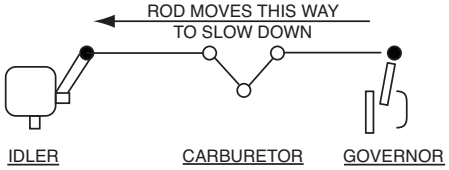
When using auxiliary power for these operations, latch idler in full speed position with the latching pin (15).

IDLER

IDLER OPERATION

General Operation:

1. The throttle on the carburetor is connected to the idler diaphragm assembly (Item 2) by a rigid rod.
2. The diaphragm assembly is operated by the engine intake manifold vacuum. The diaphragm vacuum is controlled by a spring-loaded valve (6).
3. The needle valve is operated by a spring-loaded solenoid (3).
4. The solenoid is connected to the welding generator circuit.



When Idling:

1. The needle valve is closed so air is exhausted from the diaphragm assembly by the manifold vacuum.

Upon Striking the Arc:

1. Voltage energizes the solenoid coil.
2. The plunger (8) is pulled down into the coil.
3. The needle valve spring (7) pushes the valve off its seat allowing air to enter the diaphragm chamber.
4. A spring on the idler to carburetor rod pulls the throttle to the full speed position set by the governor.

After Weld is Completed:

1. The solenoid coil is de-energized allowing the plunger to rise. The plunger spring (9) overcomes the needle valve spring and closes the valve.
2. Air is exhausted from the diaphragm chamber by the engine manifold vacuum pulling the diaphragm, idler-to-carburetor rod, and throttle to the idle position.

NOMINAL OPERATING VOLTAGES		
Solenoid Coil Assem.(1)	Min. Coil Volts	Max. Coil Volts (60% Load Factor)
S-8951-A	.65	5.75
S-8951-B	.38	4.25
S-8951-C	.75	7.65
S-8951-D	.32	2.90

(1) Suffix letters stenciled on assembly.

Return to Section TOC
Return to Master TOC

TIME ADJUSTMENTS

A time delay feature prevents the idler from slowing the engine speed when the arc is momentarily broken. The recommended time delay is 8 to 12 seconds to allow enough time to change rods without slowing the engine. To adjust:

1. Time delay is controlled by a petcock adjustment. Turning the petcock (11) clockwise compresses a felt inside the petcock lengthening the time it takes to exhaust air from the diaphragm chamber and move the idler to idle position.
   NOTE: Occasional cleaning or replacement of felt will improve idler operation.
2. Turning the petcock counterclockwise shortens the time it takes to exhaust air from the diaphragm chamber and moves the Idler to idle position.
3. After adjusting the petcock, tighten the sealing nut just snug enough to prevent leaking.
4. Do not reduce the delay to less than 8 seconds because this may prevent the engine from coming to full speed when welding.

IDLER MAINTENANCE

The idler is adjusted at the factory and should require minimum maintenance. If the following steps do not correct the difficulty, see the ***Troubleshooting Section***.

1. Be sure the time delay is adjusting according to the instructions under “Time Adjustments”.
2. The engine may fail to pick up speed when the arc is struck because the low idle speed is too slow to provide the required solenoid voltage. If it is set too slow, readjust the carburetor idle speed adjusting screw. When the engine runs at idle speed for a length of time in damp weather at temperatures under 40ºF, ice tends to form on the carburetor throttle plate reducing the idle speed. Try connecting the carburetor de-icer hose to eliminate idle speed variations.

On welders with Continental F163 and Hercules G3400 engines and serial numbers higher than A-594908 (1968), a ball check valve is installed in the air line at the manifold. It is also included with replacement idlers for these engines. At the time of engine servicing, remove this valve for inspection and cleaning with any commercial solvent.

ASSEMBLY AND DISASSEMBLY

Normally the idler should be disassembled only by Lincoln Field Service Shop personnel. If it does become necessary to disassemble the idler mechanism, the following procedure is recommended:

Remove solenoid assembly (3), which is fastened to the case (1) with two sheet metal screws. Valve (6) and valve spring (7) may then be removed. Care should be taken to avoid loss due to their small size. Remove the valve seat with a screwdriver and the petcock (11) with a wrench.

In reassembly of the idler, be sure all connections are leak-proof. Check to see that the large tapered solenoid armature spring is positioned with the wide end next to the solenoid coil. Center the head of the solenoid armature upon the valve and tighten the solenoid mounting screws.

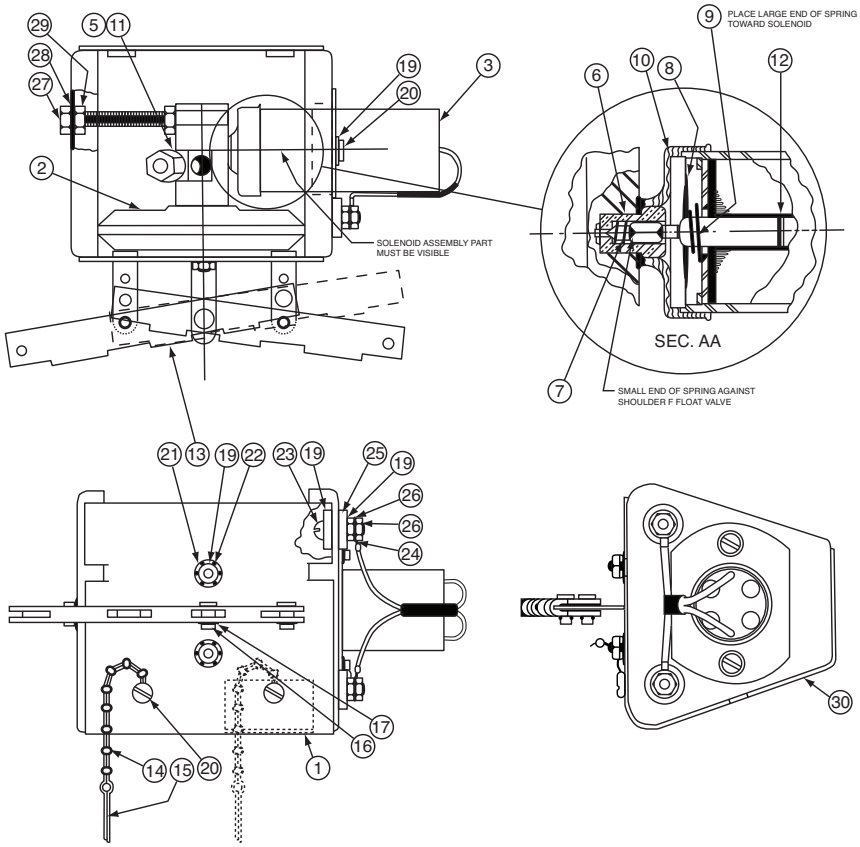
After reassembly adjust the solenoid plunger travel using the long screw (27) on the top of the idler. Lift the edge of the rubber dust cap and insert a feeler gauge between the armature and the valve stem. Recommended clearance is .018 to .022. After adjusting screw (27), tighten the locknuts. Be sure the rubber dust cap is in place.

HOW TO ORDER IDLER PARTS

Give the Item No., Part Name and No. Req'd from P-71-G. Also give the Model Name and Code No. from the welder nameplate.

Kits are available for many models of Lincoln welders to permit replacing the old bellows type idler, L-2299, with this new type idler. When ordering, give the full welder nameplate data and current rating to ensure getting an idler with a coil of the proper voltage rating.

Order parts from The Lincoln Electric Co., its branch offices, or the nearest Authorized Field Service Shop. (The "Lincoln Service Directory" listing of these shops geographically is available on request.) All Authorized Field Service Shops and branch offices can quote current prices for replacement parts.



IDLER

Parts List P-71-G

Item	Part Name And Description	No. Req'd.
	Idler, Includes All Below	1
1	Case Assembly	1
2	Diaphragm Assembly	1
3	Solenoid Assembly	1
5	Gasket	1
6	Float Valve Assembly	1
7	Float Spring	1
8	Core and Cap Assembly	1
9	Core Spring	1
10	Dust Seal	1
11	Petcock, Includes:	1
	Felt for Petcock	1
12	Spacer	1
13	Control Lever	1
14	Chain	1
15	Latching Pin	1
16	Pivot Pin	2

Item	Part Name And Description	No. Req'd.
17	Spring Clip	2
18	Flat Washer	8
19	Self Tapping Screw	2
21	Lock Washer	2
22	Hex Nut	2
23	Sems Screw	2
24	Insulating Bushing	2
25	Insulating Washer	4
26	Hex Nut	4
27	Hex Head Cap Screw (Full Thread)	1
28	Flat Washer	1
29	Hex Nut	2
30	Instruction Decal	1

TROUBLESHOOTING

⚠ WARNING

MOVING PARTS can injure.

- Have qualified personnel do maintenance and troubleshooting work.
- If possible, turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when necessary to perform maintenance, and replace them when the maintenance requiring their removal is complete.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See Operating Manual Parts List.)

TROUBLE	CAUSE	WHAT TO DO
Engine runs irregularly.	a. Carburetor may be set too lean.	a. Adjust the carburetor per instructions in this manual.
Engine surging.	a. Poor engine operation.	a. See troubleshooting in engine manufacturer's operating manual.
	b. Spark plugs may be bad.	b. Check and replace if necessary.
	c. Air filter may be dirty.	c. Check and clean if necessary.
	d. Control rod length may be wrong.	d. Check and adjust per instructions in this manual.
	e. Governor may be misadjusted.	e. Adjust the governor per instructions in this manual.
Low output.	a. High idle speed may be too slow.	a. Adjust the governor for the proper high idle speed per instructions in this manual.
Large decrease in speed when the arc is struck.	a. Governor may be misadjusted.	a. Adjust the governor per instructions in this manual.
IMPORTANT: Before making the adjustments described in the following troubles, Carefully read the section describing idler adjustment.		
Idler does not slow the engine in less than 12 seconds.	a. There may be a leak in the vacuum system.	a. Check for cracked or leaky vacuum line, fitting or diaphragm.
	b. Needle valve may not be sealing.	b. Check for dirt in the valve. Make sure the core spring (9) is not missing.
	c. Felt in petcock may be dirty.	c. Replace felt. In emergencies cut about 1/32" off clogged end of felt.
	d. Spacer (12) may be missing.	d. If removable bronze disc in older idlers is missing, residual magnetism will hold the core and cap assembly down. Insert part T-10172.
Engine does not pick up speed when the arc is struck. See if solenoid is pulling in by lifting rubber seal (10) to see if core assembly moves when the arc is struck. Be sure rubber seal is back in place after correcting the trouble. Check solenoid coil voltage (Table on page 8).	a. If solenoid pulls in, needle valve may be stuck closed.	a. Be sure Spring (7) is in the valve and not broken.
	b. If there is no voltage on the coil, there may be poor or broken electrical connections.	b. Correct any poor connections.
	c. If voltage on the coil is too low, idle speed may be too low.	c. See "Idler Maintenance" on page 9.
	d. If there is no voltage on the coil but it is not pulling in, coil may be burned out.	d. Replace coil if necessary.
	e. If there is voltage on the coil but it is not pulling in,air gap may be excessive. Check by lifting rubber seal and inserting feeler gauge.	e. Gap should be .018" to .022". Adjust with screw (27) and locking nuts. (See "Assembly and Disassembly" on page 9.)
Engine stalls when throttle is snapped open.	a. Engine may not be warmed up. May have too lean a fuel mixture or accelerator pump in the carburetor may be functioning improperly.	a. Warm up the engine. Check and adjust the carburetor.

Return to Section TOC
Return to Master TOC

LIMITED WARRANTY

STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

Three Years:

Transformer Welders
Motor-generator Welders
Semiautomatic Wire feeders
Plasma-cutting power source
Engine Driven Welders (except [illegible] engine accessories with operating speed under 2,000 RPM.

Two Years:

Engine driven welders (except engine and engine accessories) with operating speed over 2,000 RPM.

All engine and engine accessories are ??? ??? engine or engine accessory manufacturers and ??? not covered by this warranty.

TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service ??? Field Service ??? of any defect within the warranty period. Written notification is recommended.

WARRANTY REPAIR:

If Lincoln's insection of the ??? ??? ??? existence of a defect covered by this warranty. ??? defect will be corrected by repair or replacement ?? Lincoln's option.

WARRANTY COSTS:

You must bear ??? cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

IMPORTANT WARRANTY LIMITATIONS:

Lincoln ??? ??? accept responsibility for repairs made without its authorization.

??? shall not be liable for consequential damages such as loss of business, etc.) caused by the defect or unreasonable delay in correcting the defect.

Lincoln's liability under this warranty shall ot exceed the cost of ??? the ???.

This ??? warranty is the **only** express warranty provided by Lincoln with respect to its products. Warranties applied by law such as the Warranty of Merchantability ??? limited to the duration of this limited warranty for the ??? ???.

WARRANTY SUPERCEDED SEE LMWS 1

3 Year WARRANTY Made in U.S.A.

THE LINCOLN ELECTRIC COMPANY

World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors

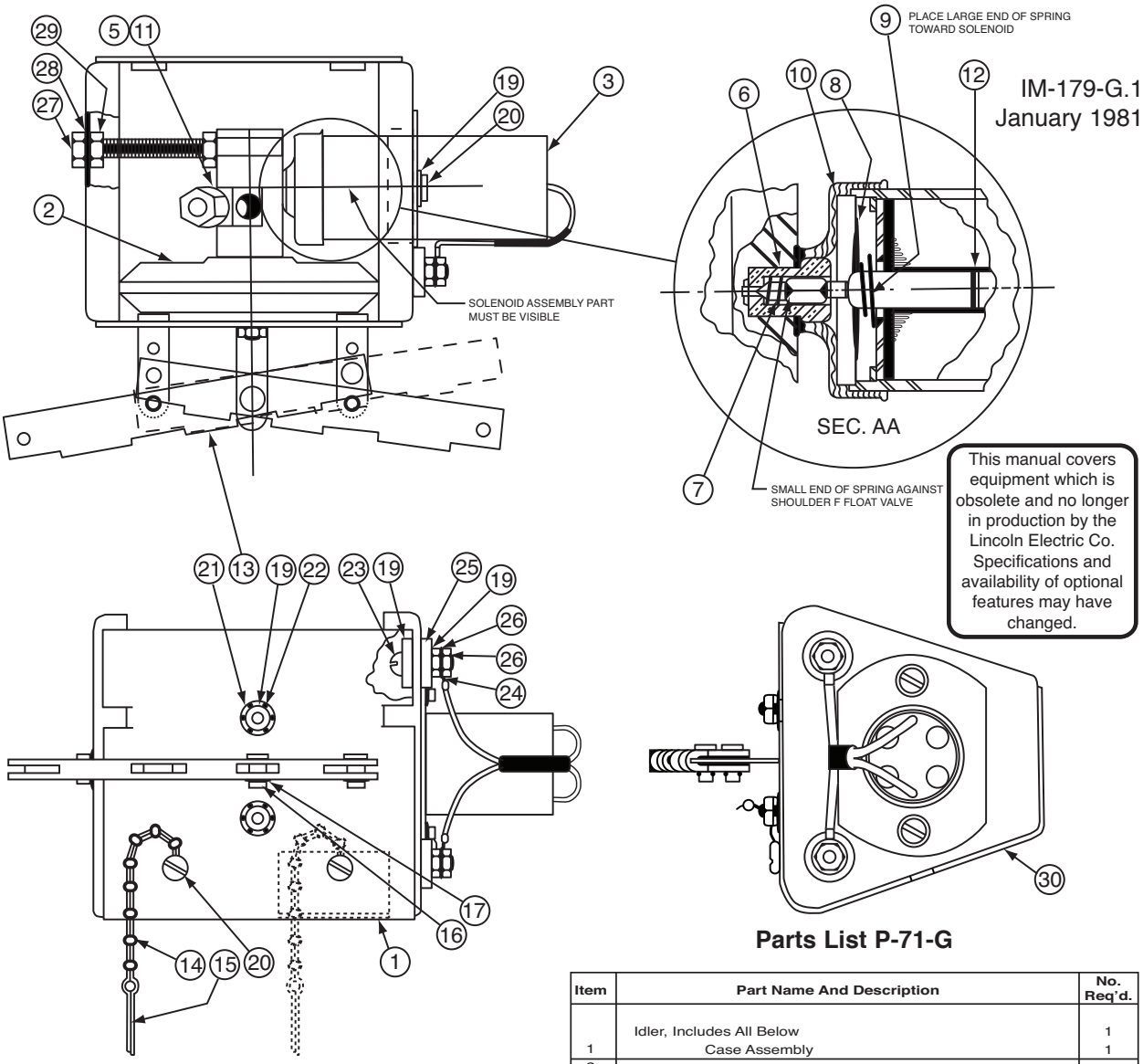
Sales and Service Worldwide Cleveland, Ohio 44117-1199 U.S.A.

Toronto M4G2B9 – Canada • Sydney 2211 – Australia • Rouen 76120 – France

LINCOLN® ELECTRIC

Return to Section TOC Return to Master TOC

IDLER INSTRUCTIONS



IM-179-G.1
January 1981

This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

Parts List P-71-G

Item	Part Name And Description	No. Req'd.
	Idler, Includes All Below	1
1	Case Assembly	1
2	Diaphragm Assembly	1
3	Solenoid Assembly	1
5	Gasket	1
6	Float Valve Assembly	1
7	Float Spring	1
8	Core and Cap Assembly	1
9	Core Spring	1
10	Dust Seal	1
11	Petcock	1
12	Spacer	1
13	Control Layer	1
14	Chain	1
15	Latching Pin	1
16	Pivot Pin	2
17	Spring Clip	2
19	Flat Washer	8
20	Self Tapping Screw	2
21	Lock Washer	2
22	Hex Nut	2
23	Sems Screw	2
24	Insulating Bushing	2
25	Insulating Washer	4
26	Hex Nut	4
27	Hex Head Cap Screw (Full Thread)	1
28	Flat Washer	1
29	Hex Nut	2
30	Instruction Decal	1

ENGINE STARTING

Starting at idle speed (with the latching pin – Item 15 – hanging loose) is recommended. Engines can also be started with the idler held in full speed position by the latching pin.

POWER TOOLS AND WIRE FEEDERS

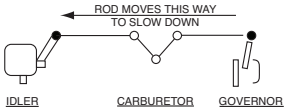
When using auxiliary power for these operations, latch idler in full speed position with the latching pin (15).

IDLER OPERATION

General Operation:

1. The throttle on the carburetor is connected to the idler diaphragm assembly (Item 2) by a rigid rod.

2. The diaphragm assembly is operated by the engine intake manifold vacuum. The diaphragm vacuum is controlled by a spring loaded valve (6).
3. The needle valve is operated by a spring loaded solenoid (3).
4. The solenoid is connected to the welding generator circuit.



5. A spring on the idler to carburetor rod pulls the throttle to the full speed position set by the governor.

When Idling:

1. The needle valve is closed so air is exhausted from the diaphragm assembly by the manifold vacuum.

Upon Striking the Arc:

1. Voltage energizes the solenoid coil.
2. The plunger (8) is pulled down into the coil.
3. The needle valve spring (7) pushes the valve off its seat allowing air to enter the diaphragm chamber.

NOMINAL OPERATING VOLTAGES		
Solenoid Coil Assem.*	Min. Coil Volts	Max. Coil Volts (60% Load Factor)
S-8951-A	*.65	5.75
S-8951-B	.38	4.25
S-8951-C	.75	7.65
S-8951-D	.32	2.90

*Suffix letters stenciled on assembly.

After Weld is Completed:

1. The solenoid coil is de-energized allowing the plunger to rise. The plunger spring (9) overcomes the needle valve spring and closes the valve.
2. Air is exhausted from the diaphragm chamber by the engine manifold vacuum pulling the diaphragm, idler-to-carburetor rod, and throttle to the idle position.

TIME ADJUSTMENTS

A time delay feature prevents the idler from slowing the engine speed when the arc is momentarily broken. The recommended time delay is 8 to 12 seconds to allow enough time to change rods without slowing the engine. To adjust:

1. Time delay is controlled by a petcock adjustment. Turning the petcock (11) clockwise compresses a felt inside the petcock lengthening the time it takes to exhaust air from the diaphragm chamber and move the idler to idle position. (**NOTE:** Occasional cleaning or replacement of felt will improve idler operation.)
2. Turning the petcock counter-clockwise shortens the time it takes to exhaust air from the diaphragm chamber and move the idler to idle position.
3. After adjusting the petcock, tighten the sealing nut just snug enough to prevent leaking.
4. Do not reduce the delay to less than 8 seconds because this may prevent the engine from coming to full speed when welding.

IDLER MAINTENANCE

The idler is adjusted at the factory and should require minimum maintenance.

1. Be sure the time delay is adjusted according to the instructions under “Time Adjustments.”
2. The engine may fail to pick up speed when the arc is struck because the low idle speed is too slow to provide the required solenoid voltage. If it is set to slow, readjust the carburetor idle speed adjusting screw. When the engines run at idle speed for a length of time in damp weather at temperatures under 40°F, ice tends to form on the carburetor throttle plate reducing the idle speed. Try connecting the carburetor de-icer hose to eliminate idle speed variations.

On welders with Continental F163 and Hercules G3400 engines and serial numbers higher than A-594908 (1968), a ball check valve is installed in the air line at the manifold. It is also included with replacement idlers for these engines. At the time of engine servicing, remove this valve for inspection and clean with any commercial solvent.

ASSEMBLY AND DISASSEMBLY

Normally the idler should be disassembled only by Lincoln Field Service Shop personal. If it does become necessary to disassemble the idler mechanism, the following procedure is recommended:

Remove solenoid assembly (3), which is fastened to the case (1) with two sheet metal screws. Valve (6) and valve spring (7) may then be removed. Care should be taken to avoid loss due to their small size. Remove the valve seat with a screwdriver, and the petcock (11) with a wrench.

In reassembly of the idler, be sure all connections are leak-proof. Check to see that the large tapered solenoid armature spring is positioned with the wide end next to the solenoid coil. Center the head of the solenoid armature upon the valve and tighten the solenoid mounting screws.

After reassembly adjust the solenoid plunger travel using the long screw (27) on top of the idler. Lift the edge of the rubber dust cap and insert a feeler gauge between the armature and the valve stem. Recommended clearance is .018 to .022. After adjusting screw(27), tighten the locknuts. Be sure the rubber dust cap is in place.

HOW TO ORDER IDLER PARTS

Give the Item No., Part Name and No. Req'd. from P-71-G. Also give the Model Name and Code No. from the welder nameplate.

Kits are available for many models of Lincoln welders to permit replacing the old bellows type idler, L-2299, with this later type idler. When ordering give the full welder nameplate data and current rating to insure getting an idler with a coil of the proper voltage rating.

Order parts from The Lincoln Electric Co., its branch offices, or the nearest Authorized Field Service Shop. (The "Lincoln Service Directory" listing these shops geographically is available on request.) All authorized Field Service Shops and branch offices can quote current prices for replacement parts.

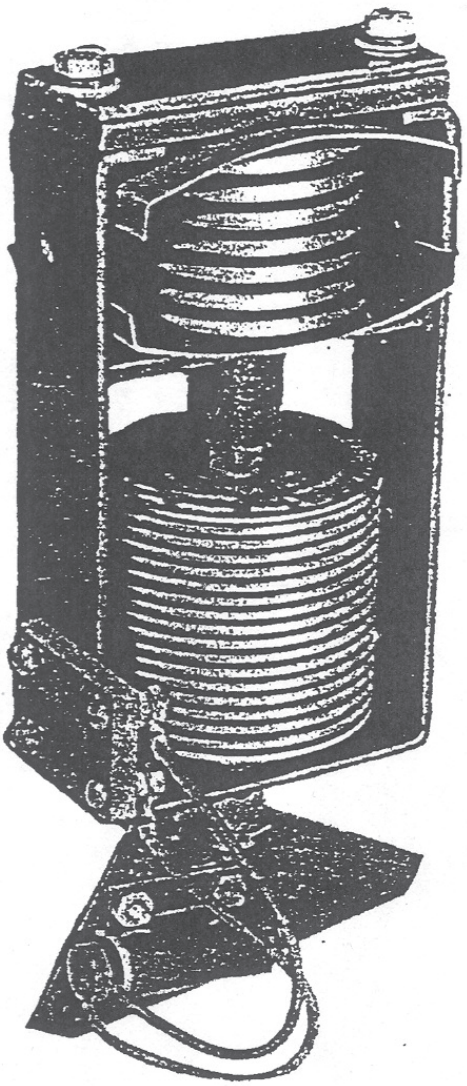
WARNING: Have a qualified technician do the maintenance and trouble shooting work. Turn the engine off before working inside the welder.

RETURN TO MAIN INDEX

IM-117-B
December, 1955

Lincoln Engine Idlers

TYPES: **L-2299, L-2299-D**

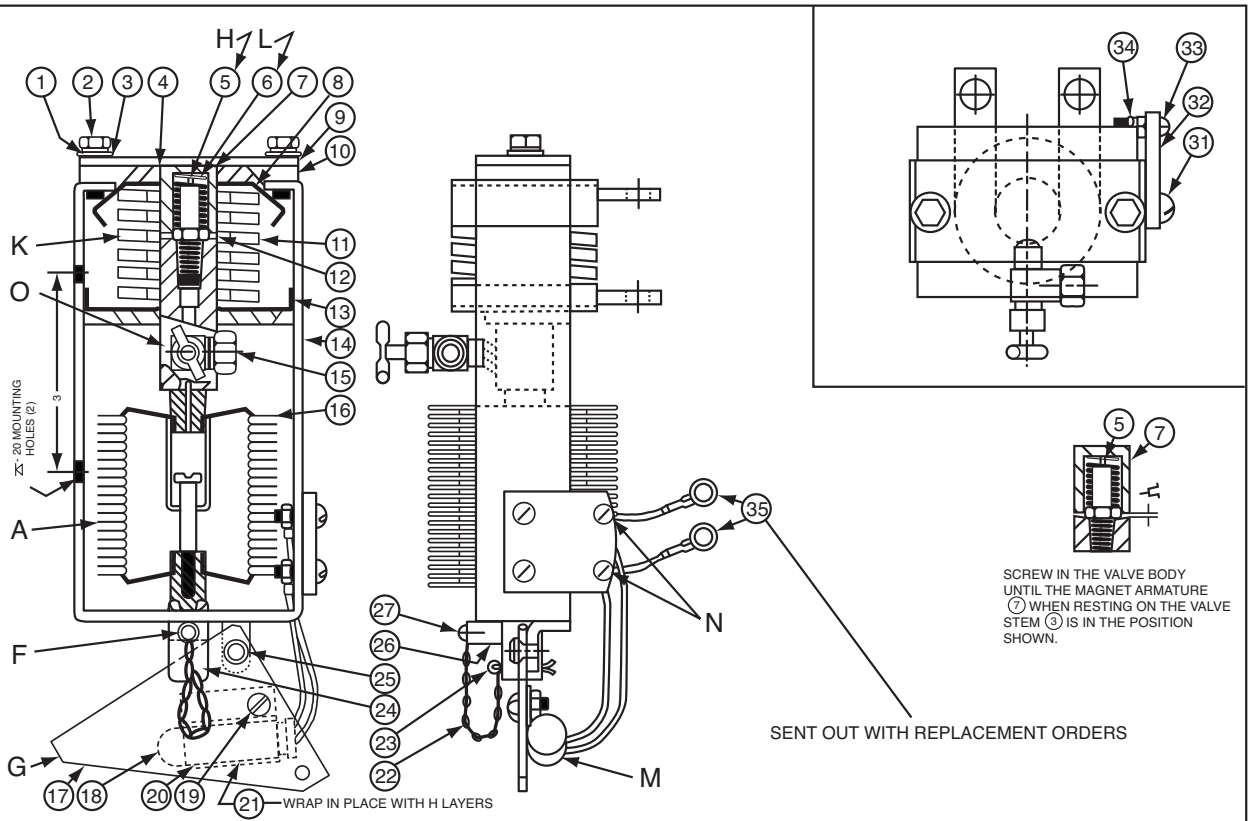


This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info
Return to Master TOC
View Safety Info

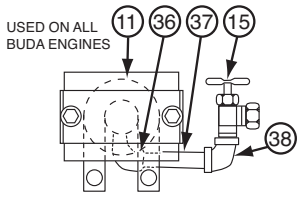


ASSEMBLY L-2299 - AS PICTURED ABOVE - USED ON HERCULES JXD & QXCS CONTINENTAL M-330 & F-162 WITH RHEO CONTROL

L-2299

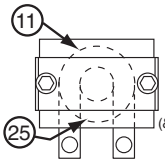
SPECIAL APPLICATIONS

L-2299A



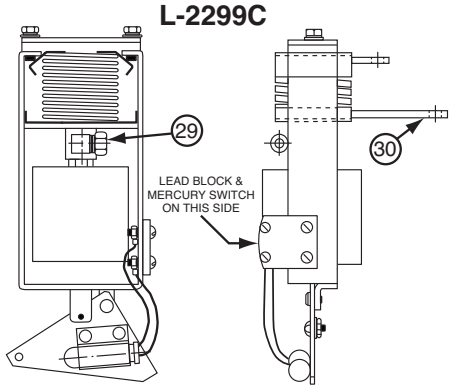
SAME AS L-2299 EXCEPT COIL IS TURNED AROUND AND PIPE FITTINGS ARE ADDED

L-2299B



SAME AS L-2299 EXCEPT COIL IS TURNED AROUND AND ITEM 25 IS USED IN PLACE IF ITEM 15

L-2299C



SIMILAR TO L-2299 EXCEPT FOR SPECIAL COIL AND WITH LEAD BLOCK & MERCURY SWITCH INSTALLED AS SHOWN USED ON HERCULES IXA ENGINES

L-2299-D - CANCEL ITEMS 18, 19, 20, 21, 31, 32, 33, 34, 35 & 39 (USE ON CONTINENTAL F-162 ENGINES WITH SPEED CONTROL.

REPLACEMENT PARTS

ITEM	PART NO.	DESCRIPTION	QTY. USED
1	1/4 Std.	Lock Washer	2
2	1/4-20-3/4	Hex. Hd. Cap Screw	2
3	T-1095	Plain Washer	2
4	T-6800	Plunger Guide	1
5	Schrader #6000	Core	1
	T-4252-2	Valve Stem	1
6	T-6272	Plunger Spring	1
7	T-6799	Plunger	1
8	T-7871	Insulation	1
9	T-6797	Plunger Stop	1
10	T-6798	Guide Support	1
11	S-6613	Coil, IXA Only	1
	S-8641	Coil, IXLD Only	1
	S-4812	Coil, All Others	1
12	T-5745	Stainless Steel Washer	1
13	T-7871	Insulation	1
14	M-5944	Frame	1
15	T-9074	Shutoff Cock	1
16	S-2867	Bellows	1
17	S-6504	Lever	1
18	T-9130	Mercury Switch	1
19	10-24x1/2	Rd. Hd. Mach. Screw, C.P.	2
	10-24	Hex. Nut. C.P.	2
	3/16	Lock Washer	2
20	T-7741	Switch Clip	1
21		3/4 Friction Tape	As Required
22	#000X2-1/2 ??	Safety Chairs	1
23	1/8x1	Cotter Pin	1
24	T-7739	Lever Coupling	1
25	T-7742	Rivet	1
26	T-7743	Locking Pin	1
27	S-8025-27	Drive Screw	1
29	T-9076	"Weatherhead" Elbow	1
30	S-6613	Coil	for 2299 only
31	#10-24x1/2	Rd. Hd. Mach. Screw	2
32	T-7740	Lead Block	1
33	10-24x5/8	Rd. Hd. Cod.	2
34	10-24	Hex Nut	4
36	1/8 Std.	Street	1
37	T-7509-4	Nipple	1
38	1/8 Std.	Elbow	1
39	S-5614-28	IXB Only	2
	S-5614-1	????	2
	S-5614-4	Hercules JXD & QXCS	2

Valve core for item 5 is a standard tire valve core such as Schrader 6000

When ordering parts specify numbers in circles, also give sheet number.

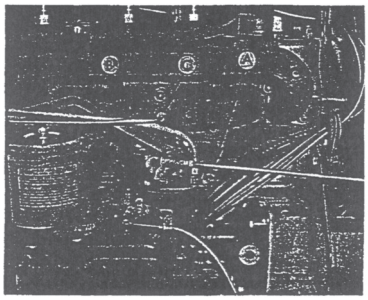
INSTRUCTIONS FOR USE OF LINCOLN ENGINE IDLER

Do not confuse this idling device with the engine governor which is also required. The governor keeps the engine operating at approximately the same speed regardless of load. The idling device causes the engine to decrease to idling speed when no welding is being done.

INSTALLATION ON "BUILD YOUR OWN" WELDERS

Mount the idler to the rear of the carburetor near the generator in a vertical position with the mounting holes facing the rear so that as the bellows contracts, it will pull the linkage and carburetor throttle arm toward the idler, thus causing the engine to idle.

For correct engine regulation, a governor is required which will govern engine speed.



Engine Idler Installation on Lincoln 200 Ampere Engine Driven Welder Using Carburetor.

A. Arm from Carburetor to Governor.
B. Connecting Link between Throttle and Idler.
C. Tubing between Manifold and Idler Bellows.

Most carburetors have a throttle arm which moves toward the fly-wheel to close. If the throttle arm moves toward the crank end to close, it should be turned around so it will close toward the fly-wheel.

Connect the throttle arm of the carburetor to some convenient point in front of the carburetor by means of a spring (not shown in photograph) which is strong enough to pull the throttle wide open when the engine is not running.

The throttle opening spring should be adjusted to pull the throttle wide open quickly when the arc is struck. The link between idler and carburetor should be adjusted in length so that the carburetor throttle is fully closed to the idle speed position when the latch pin is inserted to hold the bellows in the up, or collapsed position.

If intake manifold has no opening to which to attach the tubing from manifold to idler bellows, a hole with 1/8" pipe tap must be made so that the elbow supplied with the idler can be inserted.

OPERATION

The operation of the idler is as follows: (letters used will refer to details on L-2299 on opposite page).

The device consists of a metal bellows (A), operation from engine vacuum, which serves to close the throttle (a spring on the carburetor holds throttle open in operation) and an armature and spring (L) operating a relief valve (H). A control lever (G) is arranged to permit automatic operation or setting of the engine to idle or run at governed speed. Magnet Coil (K) is connected in series with the welding current. Current coil between an output stud and the generator lead originally on this stud.

In operation, with latching pin removed, if the operator is not welding but the engine is running, the bellows (A) will be collapsed by the suction of the engine intake and the throttle will be held closed. The throttle should be adjusted to let engine idle at about 950 to 1050 rpm.

Since there is no current flowing, the magnet armature is held up by the spring and the vacuum relief valve (H) remains closed. As soon as the operator touches his electrode to his work, the magnet coil (K) operating through the armature and spring (L) opens the vacuum relief valve (H), permitting the bellows to expand and allowing the engine throttle to open. The vacuum relief valve remains open as long as there is current passing through the welding circuit and thus the engine throttle is held open by its spring. When the operator ceases to weld, the vacuum relief valve closes and the bellows contracts, closing the throttle. The time of closing of the throttle may be regulated by the regulating needle valve (O) and can be set between 2 and 20 seconds. This valve should be opened until the timing is as desired.

On the control lever (G) is a tilting switch (M) which is used to short out the welder field rheostat when the engine idles at low speed. This is necessary so that with the welder voltage reduced and the operator using long leads for welding, there will be sufficient current through coil (K) to operate the engine idler. Connections from terminals (N) are made across the rheostat terminals, i.e., one wire on each side of rheostat. Do not connect these terminals in series with the welder field.

(Note: When speed control is used for varying current, instead of rheostat control, this paragraph does not apply.)

Control lever (G) may be made to hold engine throttle closed by raising handle to closed position and pressing in latching pin (F) to hold it in position. To hold throttle open, push lever down to open position and lock with latching pin. The latching pin must be pulled out for automatic operation.

For easier engine starting it is advisable to push the lever (G) to the closed position.

Replacement of vacuum relief valve (H). This is a standard automobile tire valve and may be replaced by removing plunger. This should be done if the operation becomes unreliable due to dirt in the valve.

TROUBLE SHOOTING GUIDE

A few of the common troubles and remedies are listed below to help get the maximum results from this idler.

1) If the engine fails to pick up speed when arc is struck:

   This may be due to dirt in the vacuum relief valve or line, or the mercury switch may not be shorting the rheostat. Turn the rheostat to maximum and if the engine picks up speed, the trouble is probably in the mercury switch or connections.

2) If there is too much welding current at the arc immediately after engine picks up:

   This is usually because the mercury switch does not return quickly to open position (bellows fully extended). Check for dirt in the vacuum relief valve. Sometimes the throttle opening spring is too weak and does not fully tilt the mercury switch, allowing the rheostat to remain shorted too long when the engine picks up to welding speed.

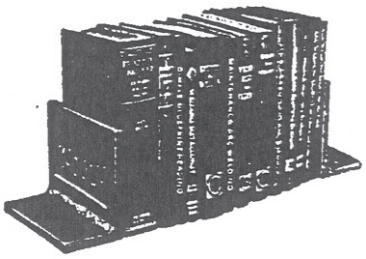
3) If engine stalls when arc is struck:

   This may occur because the carburetor is set to lean and cannot handle the sudden opening of the throttle when the arc is struck.

*Carburetors can be secured which have two throttle arms operating on the same shaft. If this type is used, then the governor should be connected to one arm and the engine idler to the other arm.

Return to Section TOC
Return to Master TOC

LEADING BOOKS ON ARC WELDING



As a service to its users, the Lincoln Electric Company publishes the following books. Order directly from the Lincoln Electric Company, Cleveland 17, Ohio.

"*Procedure Handbook of Arc Welding Design and Practice*", 9th Edition. Over 1200 pages and over 1300 drawings, diagrams and photographs; 8 sections of accurate concise information; 1 section of 32 pages of reference data and tables; bound in durable, semi-flexible simulated leather, gold-embossed; and indexed. $2.00 in U.S.A., $2.50 elsewhere.

"*New Lessons in Arc Welding*", 61 lessons based on the practical course in arc welding given at the Lincoln Electric Company plant. Consists of 320 pages with over 450 illustrations and drawings. Price complete $1.00, postage prepaid in the U.S.A.; $1.50 elsewhere.

"*Simple Blue Print Reading*", 4th edition, with particular reference to welding and welding symbols. Consists of 201 pages with 122 illustrations. Price $1.00, postage prepaid in the U.S.A.; $1.50 elsewhere.

"*Weldability of Metals*" A 141 page book; explains factors determining weldability; details welding procedures for steels, nickel, iron alloys, copper, aluminum and hardfacing. This information is reprinted from the "**PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE**" in order to make available at minimum cost this frequently requested information on how to weld various ferrous and non-ferrous metals. Price $.50 per copy in U.S.A., postage paid; $.75 elsewhere.

The following books are published by the James F. Lincoln Arc Welding Foundation. Make checks or money orders payable to this Foundation.

"*Metals and How to Weld Them*", a non-technical explanation of the structure of metals and their properties explains how this knowledge of metals is important to using good welding methods and solving welding problems. Proper steps for welding all common metals are detailed in over 250 pages, clearly illustrated. Price $2.00 in U.S.A., $2.50 elsewhere, postpaid.

"*Studies in Arc Welding*" Comprehensive abstracts of papers submitted in the Foundation's Second $200,000 Industrial Progress Award Program. Price $1.50, postage prepaid in the U.S.A., $2.00 elsewhere.

"*Design for Welding*" Detailed reviews of 90 papers from the Foundation's $200,000 Award Program. 1050 pages. Price $2.00, postage prepaid in the U.S.A., $2.50 elsewhere.

MOVIES

"*Prevention and Control of Distortion in Arc Welding*" by Walt Disney Productions. An education color-sound film, which explains through the cartoon figure, Mr. Shrink, the causes and cures of distortion in arc welding. Full details in Bul. 709, free on request.

"*Magic Wand of Industry Arc Welding*" A fast moving technicolor sound movie staged in practically every major industry to tell the story of arc welding. For sowing to business groups, schools, plants. Full details in Bul. 694, free on request.

"*Designing Machinery for Arc Welding*" sound-color motion picture describes functional approach to machine design. With animation. Solves typical problems in design of welded machine parts. Described in Bul. 724.

"*Design for Arc Welded Structures*" Color, sound movie explains how welded design permits new freedom of planning, reduces steel tonnage, simplifies detailing, fabrication and erection. Full details in Bul. 719.

ARC WELDING ACCESSORIES AND SUPPLIES

The Lincoln Electric Company manufactures complete line to meet your welding needs. The following items may be obtained from your nearest Lincoln Dealer, Lincoln Salesman, Lincoln Field service shop or The Lincoln Electric Company, Cleveland 17, Ohio.

Manual Welders for all types of AC and DC operation.
Automatic Power ?? Heads and Controls for every AC and DC automatic welding application.
Lincoln Electrode for every field application.
Electrode ?? to handle any size of electrode in all current ranges.
Electrode and Work Cables for use on every size ???? ????.
??? ??? ?? in all commonly used shade densities.
All types and sizes of both *Face and Head Shields*.
???? ??, Ground Clamps and Detachable Connectors to ??? welding cables.
Steel welded construction *Undercarriages* for each standard Lincoln Welder.
Flux and Wire Electrodes for automatic welding.

THE LINCOLN ELECTRIC COMPANY
The World's Largest Manufacturer of Arc Welding Equipment
CLEVELAND 17, OHIO
Branch Offices, Field Service Shops, and Distributing Agencies in All Principal Cities.
LINCOLN ELECTRIC CO., of Canada, Ltd., Leaside, Toronto 12, Canada
LINCOLN ELECTRIC CO., (AUSTRALIA) Pty., Ltd., Alexandria, Sydney
LA SOUDURE ELECTRIQUE LINCOLN, Bonneuil-sur-Marne, Paris, France
Export Representatives
THE ARMCO INTERNATIONAL CORPORATION, Chrysler Bldg., New York 17, New York
Middletown, Ohio, U.S.A.

IM-277-A

October, 1990

GASOLINE ENGINE ADJUSTMENT:

TIMING, CARBURETOR, GOVERNOR & IDLER

Codes - 7276 - 9530

For SA-200-F163 (K6090SM & K6090SB) Welders with Electronic Engine Idler

(For welders below Code 7275, ***See IM-179***)

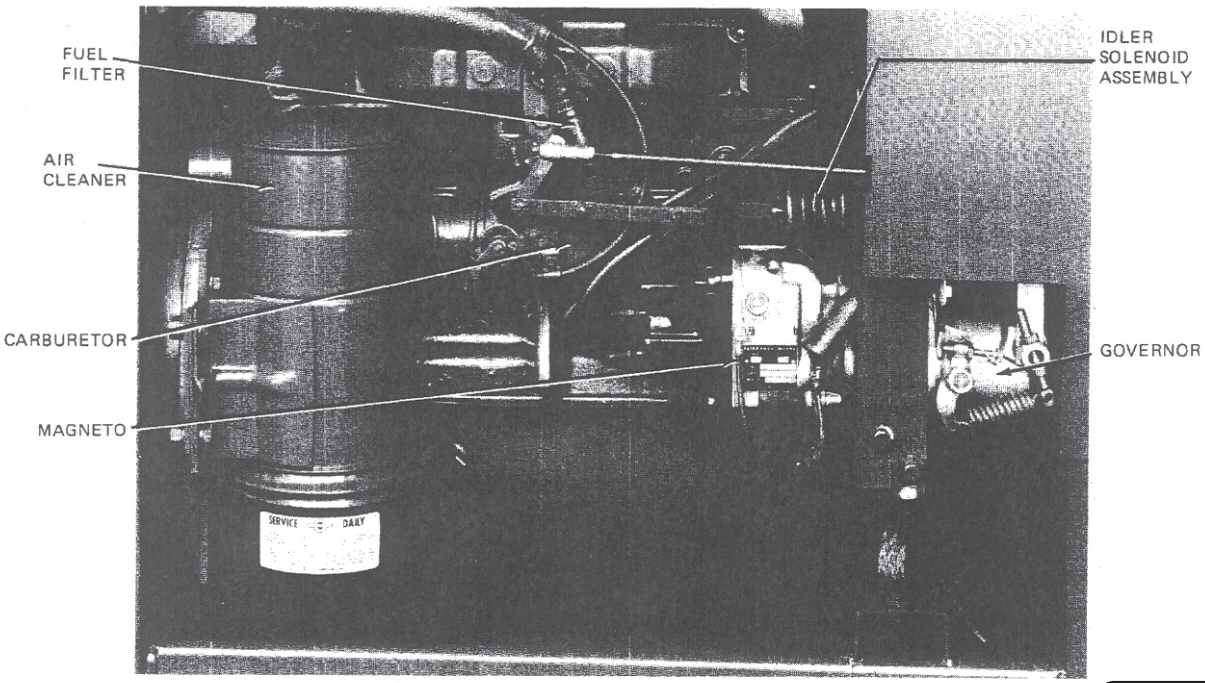


FIGURE 1 – Fuel Control Systems. (Unit shown with Magneto Ignition)

This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

IMPORTANT: This manual is designed to help a **qualified mechanic** time the engine and adjust the fuel control system. Inexperienced workmen should not make these adjustments. If in doubt, have the nearest Lincoln authorized Field Service Shop perform the work.

The engine fuel control system consists of three major parts – carburetor, governor and idler – which must be set for smooth engine operation and proper engine speed. The basic operating sequence of the system follows:

a. The idler holds the engine at *low idle speed* when no welding or auxiliary power output is needed.

b. When the arc is struck or auxiliary output load (about 100-150 watts minimum) is turned on, the idler disengages allowing the governor to accelerate the engine to *full load speed*.

c. When the arc is broken or the power load is turned off, the governor keeps the engine operating at *high idle speed* for about 15 seconds. After the fixed time delay elapses, the idler slows the engine to *low idle speed*.

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

⚠ WARNING

MOVING PARTS can injure.

- Only qualified personnel should do maintenance and troubleshooting work. If possible, turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See operating manual parts list.)

⚠ WARNING

ENGINE EXHAUST can kill.

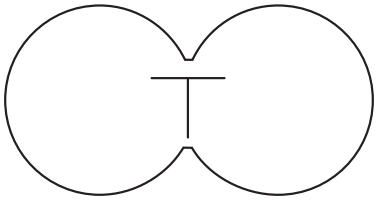
- Run engine in open, well ventilated areas or vent exhaust outside.

ENGINE ADJUSTMENTS FOR SMOOTH OPERATION

ENGINE TIMING – MAGNETO IGNITION

Time the engines on Lincoln welders with a timing light in the same general manner as all other gasoline engines. The specific information required is as follows:

1. Use #4 cylinder (nearest to generator).
2. The timing hole is located in the flywheel housing behind the air cleaner. It can be seen with the cup removed from the bottom of the air cleaner.
3. The timing mark is a “T” marked with red paint.



4. The “T” should be in the timing hole as shown.
5. To advance or retard the spark, loosen the bolts holding the magneto and turn the entire magneto. When properly timed, tighten the bolts.

If the magneto has been removed to check the point settings or for any reason, it must be replaced in accordance with the following instructions:

1. Remove the spark plug from #4 cylinder. With a finger placed tightly over the spark plug hole, crank the engine slowly until air pressure forces the finger away from the hole.
2. Look into the magneto mounting hole at the governor and camshaft gears. Continue cranking the engine slowly until the tooth on the camshaft gear indicated by a punch mark is between the two governor gear teeth indicated by punch marks.
3. Insert No. 4 spark plug wire into No. 4 hole in the magneto. (Firing order is 1-3-4-2 clockwise when looking at the magneto distributor cap.) Hold No. 4 spark plug wire by the insulation and position the end close to the metal housing of the magneto (See Figure 2). Turn the magneto impulse coupling by hand until No. 4 fires to the magneto case.

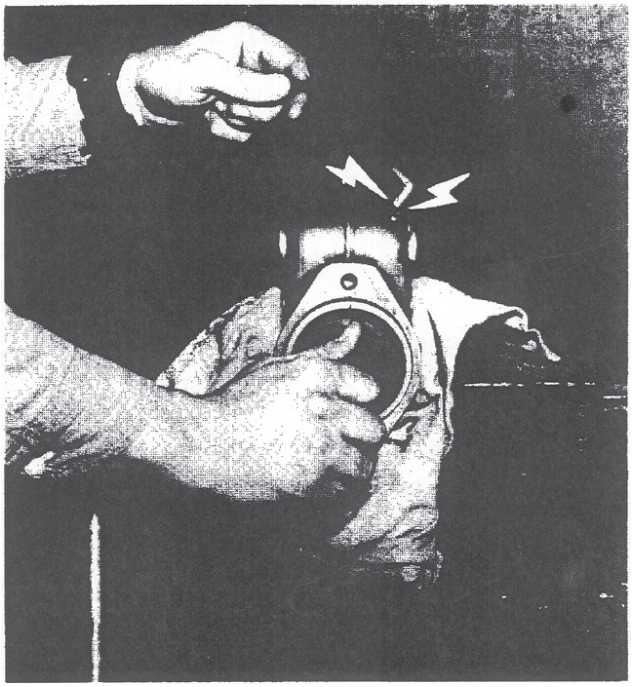


FIGURE 2 – Firing No. 4.

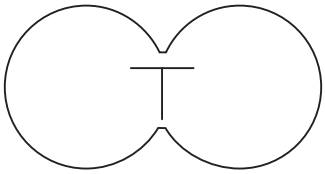
4. Turn the impulse coupling back (counterclockwise) about ¼ turn to line-up the impulse coupling with the driving slots in the governor. Install the magneto by fitting the impulse coupling into the governor gear.
5. If these instructions were followed, the engine will be properly timed. Timing can be adjusted while running using a timing light per the instructions above.

Be sure the lead connected to the stud on the outside of the magneto isn't grounded against the magneto housing. If it is, the engine will not run.

ENGINE TIMING – BATTERY IGNITION

To time the 4 cylinder Continental engine used on Lincoln welders with a timing light, the specific information required is as follows:

1. Time the engine using #1 cylinder (nearest to fan).
2. It is important to time the engine at the high idle speed of 1550 RPM.
3. Remove the air cleaner to expose the timing hole located in the flywheel housing.
4. The timing mark is a "T" marked with red paint and is located on the flywheel.
5. With engine properly timed, the "T" should be in the timing hole as shown below.



6. If necessary to advance or retard the spark, loosen the nut holding the distributor and rotate the distributor. When properly timed, retighten the nut.
7. The distributor point gap is .020 (0.5 mm).
8. The engine firing order is 1-3-4-2.

IDLE JET ADJUSTING SCREW (*See Figure 3*)

On the F-163 engine, a carburetor from any one of three manufacturers may be used. These are: 1) "Teledyne", which is identified by the word being cast into the carburetor bowl. 2) "Marvel-Schebler", which is identified by the name being cast into the carburetor flange and 3) "Zenith", which is cast into the carburetor bowl but is not visible since it is on the engine side of the bowl.

NOTE: The "Zenith" is also known as "Facet".

The carburetor adjustments are basically the same for all three except for the idle jet adjustment. On the Marvel-Schebler and the Zenith, the idle screw is turned *clockwise* to make the mixture richer. On the Teledyne, the idle screw is turned *counterclockwise* to make the mixture richer.

The purpose of the carburetor idle jet is to give smooth operation at low idle speed. To adjust the idle jet, warm the engine by running at high idle speed for 10 minutes. Put the "Idler Control" switch in the "Automatic Idle" position. Turn the idle jet adjusting screw (B) until the engine begins to falter and roll from richness. Then turn the adjusting screw in the opposite direction until the engine runs smoothly. (This can best be done using a tachometer to locate the setting at which the engine runs at the highest speed.)

ENGINE SPEED ADJUSTMENTS

⚠ WARNING

MOVING PARTS can injure.

- Turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when necessary to perform maintenance and replace them when the maintenance requiring their removal is complete.
- Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

Before attempting to adjust the speed controls, thoroughly warm the engine by running at high idle speed for about 10 minutes. Adjust the low idle speed first and then the high idle speed.

Recommended Engine RPM		
Low Idle	Full Load	High Idle
1000	1450	1550

LOW IDLE SPEED (*See Figure 3*)

Instructions for adjusting the low idle speed are as follows:

1. Stop the warmed engine. Loosen the two screws which hold the two halves of the idler control rod (G) together so the two halves slide freely with respect to each other.
2. Start the engine. Set the "Idler Control" switch into the "Automatic Idle" position.
3. Rotate the carburetor shaft (D) until the idle speed screw (A) is against the stop pin (H). While holding the screw against the stop pin, adjust the screw for a speed of 1000 to 1050 RPM.
4. Then with the idler plunger fully seated, pull the slotted half of the idler control rod (G) until the idle speed screw is against the stop pin and tighten the two screws to fix the idler control rod at this setting.

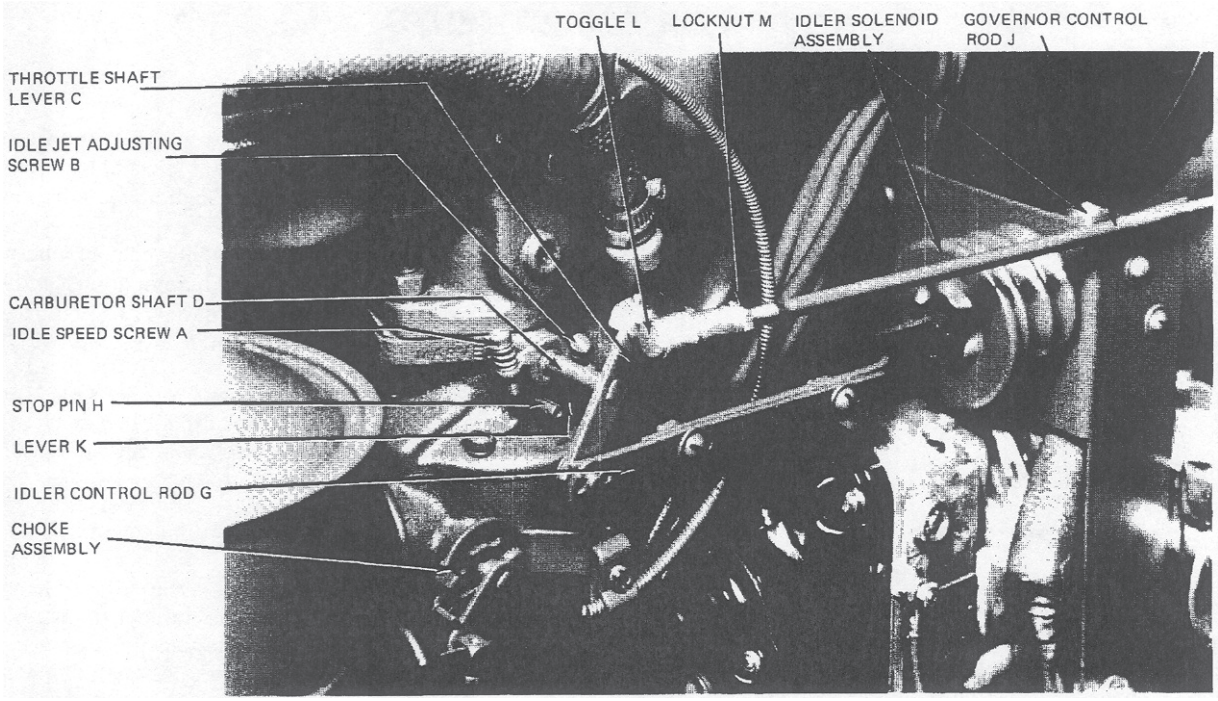


FIGURE 3 – Carburetor Adjustments (Unit shown with Magneto Ignition).

5. Idle speed should be 1000 to 1050 RPM. Readjust if necessary.

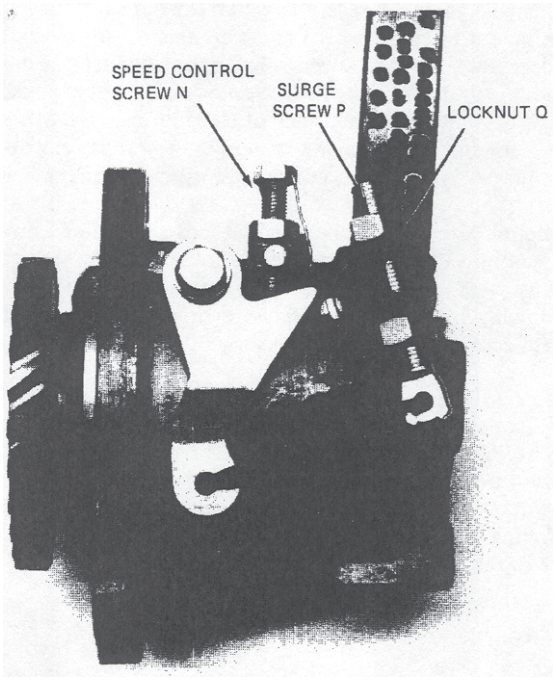


FIGURE 4 – Governor Sensitivity Adjustment.

HIGH IDLE SPEED (See Figure 4)

Adjust the high idle speed with the governor speed control screw (N) per the following instructions:

1. With the warmed engine running, set the “Idler Control” switch in the “High Idle” position.
2. Loosen the lock nut and turn the speed control screw (N) in (clockwise) to increase the high idle speed. Turn the screw out (counterclockwise) to decrease the high idle speed.
3. Tighten the lock nut.

As the engine wears, it begins to lose power and the load speed may drop below normal.

CAUTION: DO NOT adjust the speed control screw to raise the full load speed because this will also increase the high idle speed above normal. Excessive high idle speed increases the exciter output voltage which can damage the exciter circuit. To regain full rated output, overhaul the engine.

GOVERNOR ADJUSTMENTS

⚠ WARNING

MOVING PARTS can injure.

- Do not attempt to override the governor or idler by pushing on the throttle control rods while that engine is running.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor.

GENERAL INSTRUCTIONS

The governor is set and locked at the factory for proper performance under actual welding condition. Poor engine performance, including surging, can be caused by bad spark plugs, misadjusted carburetor, dirty air filter or many other troubles. Therefore, make the following checks *before* touching the governor adjustments:

1. Check the Troubleshooting section in the engine manufacturer's operating manual. Tune the engine if needed.
2. Check the timing, idle jet and engine speed adjustments per previous instructions from this manual.
3. Be sure the lock nuts on the control rod and on the governor and carburetor adjustment screws are tight.
4. Be sure the toggles, the throttle shaft and all other parts of the governor and carburetor control systems are oiled and work smoothly without binding.

If these checks indicate the governor adjustments have slipped, adjust the governor according to the following instructions.

CONTROL ROD (*See Figure 3*)

The carburetor to governor control rod (J) is set at the factory and should not need field adjusting. With the engine stopped, the stop on the idle speed screw lever (K) must be 1/32" to 1/16" (0.8 to 1.6 mm) off the stop pin (H) in the carburetor casting. If this setting is wrong, readjust as follows:

1. Remove the toggle (L) from the throttle shaft lever (C).
2. Loosen the lock nut (M).
3. Screw the toggle off or onto the rod to obtain the proper length.
4. Once set, DO NOT attempt to remove engine surge by adjusting the control rod length.

SENSITIVITY ADJUSTMENT

The governor sensitivity adjustment has two purposes: (1) to control speed fluctuations (surge) at idle and load speeds, and (2) to control speed drop from high idle to load speed.

NOTE: Never use the sensitivity adjustment to eliminate surge which is present at load speed but not at high and low idle speeds. This type surge is almost never caused by governor misadjustment.

Changing the sensitivity adjustment in one direction reduces surge but increases the speed drop. Changing it in the other direction reduces the speed drop but increases the surge. Changing the sensitivity adjustment affects the idle speed. Therefore, always readjust the speed adjustment screw after changing the sensitivity adjustment.

Normally the engine surges three times when changing speeds. If it surges more often, the number of surges can usually be reduced by adjusting the sensitivity adjustment in the direction for less surging. This adjustment should only be made if the excess number of surges is objectional.

The normal speed drop from high idle to load speed is 100 RPM +/- 25 RPM. The speed drop is usually increased too much when surge is eliminated. If the speed drop is too great, change the sensitivity adjustment in the direction opposite to that used to eliminate surge until the drop falls within the limits. If the speed drop is less than the limit there is no harm done so long as the engine does not surge.

When the engine surges, the generator output varies. This can be detrimental to arc characteristics. If the speed drop is excessive, the load speed is low and the generator output is reduced. In adjusting the governor on a worn engine, you must balance the importance of eliminating surge with the need for full rated generator output. If you cannot obtain the proper adjustment, engine repair may be necessary.

To eliminate excess engine surge, put the "Idler Control" switch into the "High Idle" position. Adjust the sensitivity adjustment just far enough to eliminate the entire surge per the following instructions. Always readjust the speed adjustment screw after eliminating surge.

Refer to Figure 4. The surge screw (P) is the sensitivity adjustment on the Pierce governor. To change this adjustment, loosen one lock nut (Q) and tighten the other. This changes the position of the surge screw. Moving the screw down or to the right reduces surge but increases speed drop. Moving the screw up or to the left increases surge but reduces the speed drop.

Return to Section TOC
Return to Master TOC

AUTOMATIC IDLER OPERATION

⚠ WARNING

MOVING PARTS can injure.

- If possible, turn the engine off before working inside the machine.
- 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.
- If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

AUTOMATIC IDLER OPERATION

The idler consists of a solenoid, an electronic control circuit and the “Idler Control” toggle switch on the control panel. The solenoid is connected to the carburetor throttle.

With the “Idler Control” switch in the “High Idle” position, the idler is off and the engine runs at the high speed controlled by the governor.

With the “Idler Control” switch in the “Automatic Idle” position, the idler operates as follows:

1. When operating at low idle speed, the solenoid holds the throttle in the slow speed position.
2. When the arc is struck or power load (approximately 100-150 watts minimum) is turned on, the electronic circuit senses the power load and releases the solenoid.
3. The governor then pulls the throttle to full speed position.
4. When the welding or power load is released, the fixed time delay built into the idler circuit starts.
5. After the time delay elapses, the solenoid coil is energized pulling the throttle to the slow speed position.

CAUTION: The auxiliary power receptacle has a 15 amp maximum rating. This current goes through a coil on the idler printed circuit board. The coil has good reserve current carrying capacity, but excessive loading of the power receptacle can damage the coil. Do NOT exceed the 15 amp rating of the auxiliary power receptacle.(1)

IDLER MAINTENANCE

1. The solenoid plunger must work freely because binding can cause engine surging. If surging occurs, be sure the plunger is properly lined-up with the carburetor lever. Dust the plunger about once a year with graphite powder.
2. When any service is done, reassemble the rubber bellows on the solenoid plunger with the vent hole on the lower side.
3. Proper operation of the idler requires good grounding of the printed circuit board (through its mounting), reed switch and battery.
4. If necessary, the welder can be used without automatic idling by setting the “Idler Control” switch to the “High Idle” position.

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)Machines built prior to Code 7789 had a 9 amp maximum rating.

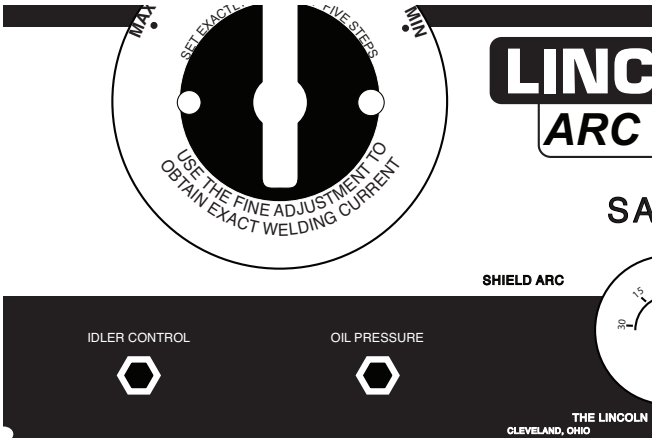


FIGURE 5 – Idler Control Switch.

Return to Section TOC
Return to Master TOC

TROUBLESHOOTING

⚠ WARNING

MOVING PARTS can injure.

- Have qualified personnel do maintenance and troubleshooting work.
- If possible, turn the engine off and disconnect the battery before working inside the machine.
- Remove guards only when necessary to perform maintenance, and replace them when the maintenance requiring their removal is complete.
- If fan guards are missing from a machine, obtain replacements from a Lincoln Distributor. (See Operating Manual Parts List.)

TROUBLE	CAUSES	WHAT TO DO
Engine runs irregularly.	a. Carburetor may be set too lean.	a. Adjust the carburetor per instructions in this manual.
Engine surging.	a. Poor engine operation.	a. See troubleshooting in engine manufacturer's operating manual.
	b. Spark plugs may be bad.	b. Check and replace if necessary.
	c. Air filter may be dirty.	c. Check and clean if necessary.
	d. Control rod length may be wrong.	d. Check and adjust per instructions in this manual.
	e. Governor may be improperly adjusted.	e. Adjust the governor per instructions in this manual.
	f. Idler solenoid may be binding.	f. Align, clean and lubricate with graphite powder.
Low output.	a. High idle speed may be too low.	a. Adjust the governor for the proper high idle speed per instructions in this manual.
Large decrease in speed when the arc is struck.	a. Governor may be improperly adjusted.	a. Adjust the governor per instructions in this manual.
Engine stalls when throttle is snapped open.	a. Engine may not be warmed up. May have too lean a fuel mixture.	a. Warm up the engine. Check and adjust the carburetor.

ELECTRONIC IDLER TROUBLESHOOTING GUIDE

Engine Will Not Return To Idle In Approximately 15 Seconds

Set Idler Control Switch To The Auto Position

Check To See Whether Oil Pressure Light Is On And Alternator Is Charging

Light OFF

If oil light is OK, replace oil pressure switch.

Light ON

Check continuity of idler control switch.

Continuity Good

1. Reed switch in weld circuit may be stuck closed.
2. Check continuity of idler solenoid coil (25 ohms).
3. Replace P.C. board.

Open

Replace switch.

Engine Will Not Pick Up Speed When:

The Arc Is Struck

Reed Switch In Weld Circuit Defective Will Not Close

To Check: Short The Red Lead On P.C. Board To Welder Frame

Engine Picks Up Seep When Arc Is Struck

Replace Reed Switch in weld circuit.

Engine Does Not Pick Up Speed

Replace P.C. Board.

The Auxiliary Power Load Is Turned On

Power Load Too Small Try Load Above 150 Watts

Engine Does Not Pick Up Speed

Replace P.C. Board

LIMITED WARRANTY

STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

Three Years:

Transformer Welders
Motor-generator Welders
Semiautomatic Wire Feeders
Plasma-cutting power sources
Engine Driven Welders (except engine and engine accessories) with operating speed under 2,000 RPM.

Two Years:

Engine Driven Welders (except engine and engine accessories) with operating speed over 2,000 RPM.

All engine and engine accessories are ??? ??? engine or engine accessory manufacturers and ??? not covered by this warranty.

TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service ??? Field Service ??? of any defect within the warranty period. Written notification is recommended.

WARRANTY REPAIR:

If Lincoln's insection of the ??? ?? ??? existence of a defect covered by this warranty, ??? defect will be corrected by repair or replacement ??? Lincoln's option.

WARRANTY COSTS:

You must be ??? cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

IMPORTANT WARRANTY LIMITATIONS:

- Lincoln ??? ?? accept responsibility for repairs made without its authorization.
- ??? shall not be liable for consequential damages (such as loss of business, etc.) caused by the defect or unreasonable delay in correcting the defect.
- Lincoln's liability under this warranty shall ot exceed the cost of ??? the ???.
- This ??? warranty is the **only** express warranty provided by Lincoln with respect to its products. Warranties applied by law such as the Warranty of Merchantability ??? limited to the duration of this limited warranty for the ??? ???.

WARRANTY SUPERCEDED
SEE IMWS 1

PERFORMANCE PLUS PROTECTION
3 YEAR WARRANTY PARTS & LABOR
LINCOLN® ELECTRIC

THE LINCOLN ELECTRIC COMPANY

World's Leader In Welding and Cutting Products • Premier Manufacturer of Industrial Motors
Sales and Service through Subsidiaries and Distributors Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

Return to Section TOC
Return to Master TOC

LINCOLN ARC WELDING SET "TROUBLE-SHOOTING" CHART

TROUBLE	CAUSES	WHAT TO DO
Low oil pressure.	Oil too light.	Drain, refill with heavier grade. (***See OPERATOR'S MANUAL***)
	Oil too low.	Fill to "full" mark on bayonet gauge.
	Defective oil gauge.	Replace.
Lack of power.	Carbon deposits, causing pre-ignition.	Run engine under full load for a short time.
	Incorrect timing.	Time ignition as outlined in ***IM-127***.
Overheating.	No water in radiator or clogged cooling system.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump.
	Thermostat sticking in the closed position.	Remove and check at what temperature the thermostat opens. (Should open at 161°.)
	Late timing.	Time ignition as outlined in ***IM-127***.
	Improper valve clearance,	Adjust valve tappets to 0.014" clearance.
	Fan belt too loose.	Adjust to from 3/4" to 1" deflection.
Knocking.	Poor grade of gasoline.	Use at least 75 octane gasoline.
	Spark advanced too far.	Retime ignition.
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking.	Clean and lubricate. Replace toggles if worn.
	Dirty or choked air filter.	Remove and clean according to instructions on unit.
	Governor spring adjusting screw misadjusted.	Adjust screw just enough to eliminate surge. (***See IM-127***.)
	Governor control rod wrong length.	Adjust length of control rod so that there is from 1/32" to 1/16" clearance between the stop pin and the stop when the engine is shut off and the regulator expanded. (***See IM-127***.)
Low Output.	High idle speed is set too low.	Adjust high idle speed screw on governor for 1500 rpm high idle speed. (***See IM-127***.)
Large decreases in speed when arc is struck.	Misadjusted governor spring adjusting screw.	Adjust screw until speed does not drop more than 150 rpm + 25 rpm when arc is struck. If surge occurs, eliminate it with the control rod. If high idle speed changes readjust the high idle speed screw. (***See IM-127***.)
Unable to strike an arc.	Low idle speed screw is misadjusted.	Low idle speed is set too low and engine regulator bellows fail to expand when arc is struck. Adjust low idle speed screw for 950-1050 rpm. (***See IM-127***.)
Engine runs irregularly.	Idle jet set too lean.	Adjust idle jet adjusting screw so engine will run smoothly at low idle speed. (***See IM-127***.)
Engine fails to pick up speed when arc is struck.	Dirt in vacuum relief valve or line of engine regulator.	Remove and clean line and check valve seat for wear. (***See IM-117***.)
	Mercury switch not shorting out rheostat.	Turn rheostat to maximum and if trouble is remedied, the mercury switch is defective. Replace.
Too much welding current at the arc immediately after engine picks up speed.	Mercury switch does not open immediately.	Check the mercury switch. Replace if defective.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate – machine model, code and serial numbers.

(b) From this manual – complete part name and description, item number, quantity required and the number of the list used to get this information.

Any item indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do **not** order the indented parts.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment or electrode of flux within any period of warranty and the Seller's inspection confirms the existence of such defects, than the Seller shall correct the defect or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility will be assumed by the Seller for ??? Made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any f??? conditions of any warranty. The liability of the Seller ??? out of the ??? of said equipment ??? its use by the Buyer, whether on warranties ??? shall not in any case exceed the cost of correcting defects in the equipment or replaceing defective electrode ?? with the above warrantee. Upon the ???? period of warranty?? such liability shall ???.

The ??? warranties and remedies are exclusive and ??? all other set forth. There are no guarantees or warranties with respect to engines, accessories, equipment, electrodes or ??? either express or arising by operation of law or trade usage or otherwise implied, including without limitations ??? warranty of merchantability, all such warranties ??? ??? by the Buyer.

SPECIAL GUARANTEE ON RECTIFIER STACKS

The Lincoln Electric Company guarantees the main power rectifiers on transformer-rectifier type welders against defects in material or workmanship for a period of five years from date of welder shipment. When ??? individual ??? ?? diode assembly is replaced the ??? diode or diode assembly must be returned to Cleveland for examination an? ??? judged defective. If a replacement diode or diode assembly is installed by an Authorized Field Service Shop within twelve months of the date of shipment of the original part, the labor expense will be paid by The Lincoln Electric Company. After 12 months any labor expense will be the owner's responsibility.

Return to Section TOC
Return to Master TOC

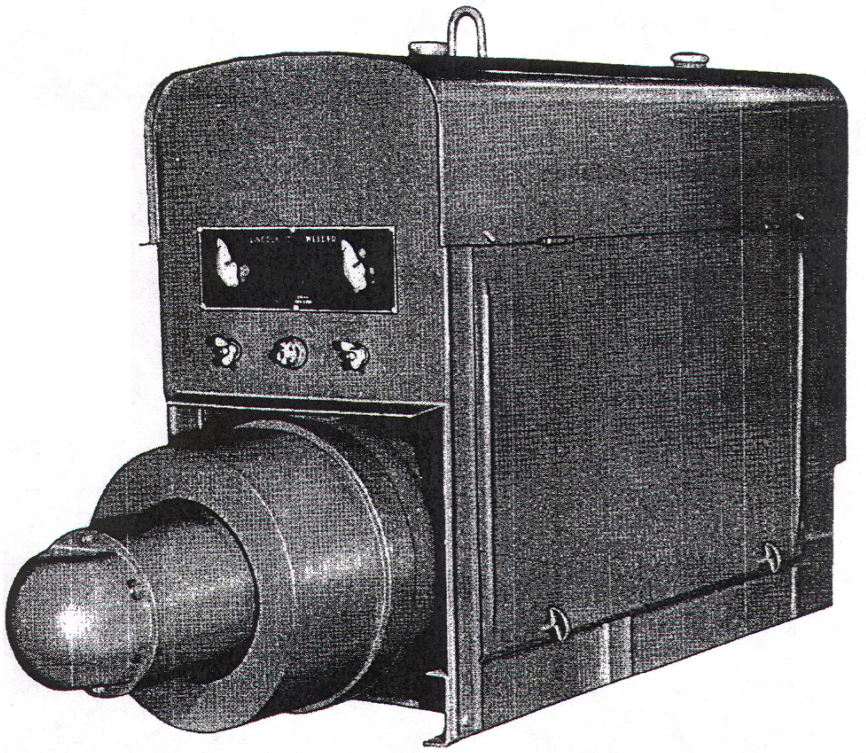
RETURN TO MAIN INDEX

IM-127-B

May, 1954

SA-200 MODEL S-6090

ADJUSTMENT and "TROUBLE-SHOOTING" ON THE SA-200 MODEL S-6090
WITH DUAL CONTROL DRIVEN BY LINCOLN MODEL L-200 ENGINE
For use with machines having Code Numbers: **215-3312**



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

This manual covers equipment which is obsolete and no longer in production by the Lincoln Electric Co. Specifications and availability of optional features may have changed.

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

INDEX

FIGURES

INSTRUCTION MANUAL IM-127-B

ADJUSTMENT OF LINCOLN MODEL L-200 (CONTINENTAL F-162) ENGINE

Continental F-162's are 4 cycle, 4 cylinder in line gasoline engines with a bore of 3-7/16", a stroke of 4-3/8", a displacement of 162 cu. in., and 27 H. P. at 1400 R.P.M. They are tested at the factory to give the following performance characteristics:

200 AMPERE GENERATOR

HIGH IDLE SPEED --- 1500 R.P.M. (for both STANDARD and OVERSIZE EXCITER MODELS with the regulator expanded, and with the speed control set at maximum point 100 on the STANDARD EXCITER MODEL.)

POINT 10 IDLE SPEED --- 1050 - 1150 R.P.M. (For the STANDARD EXCITER MODEL ONLY with the regulator expanded and with the speed control set at minimum point 10.)

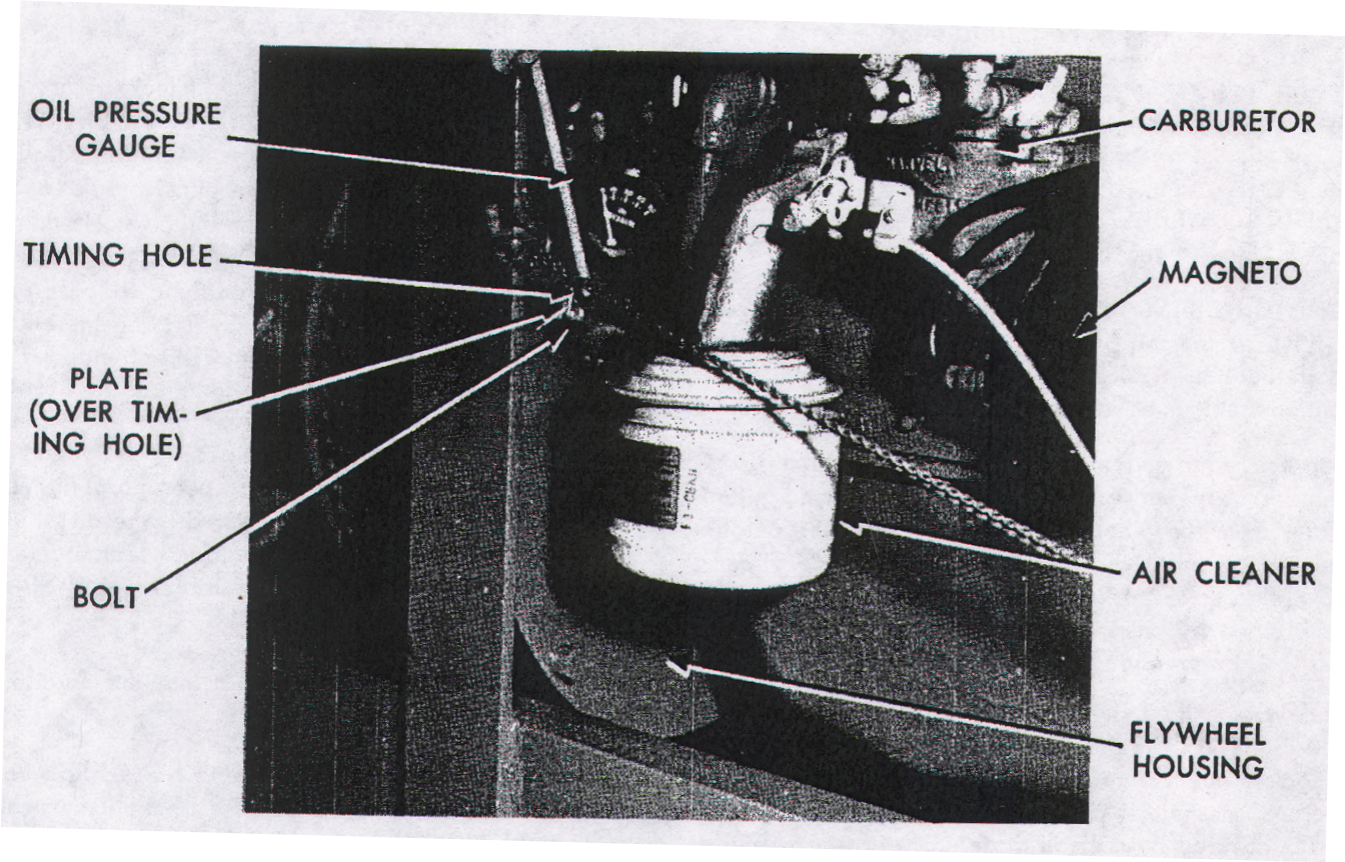
LOW IDLE SPEED --- 750 - 950 R.P.M. (STANDARD EXCITER MODELS) or 950 - 1050 R.P.M. (OVERSIZE EXCITER MODELS) with the regulator collapsed.

LOAD SPEED --- 1300 - 1400 R.P.M at 300 amperes and 40 - 46 volts top test load generator output for limited duty (obtained with both current and speed --- or rheostat-controls set at maximum output.)

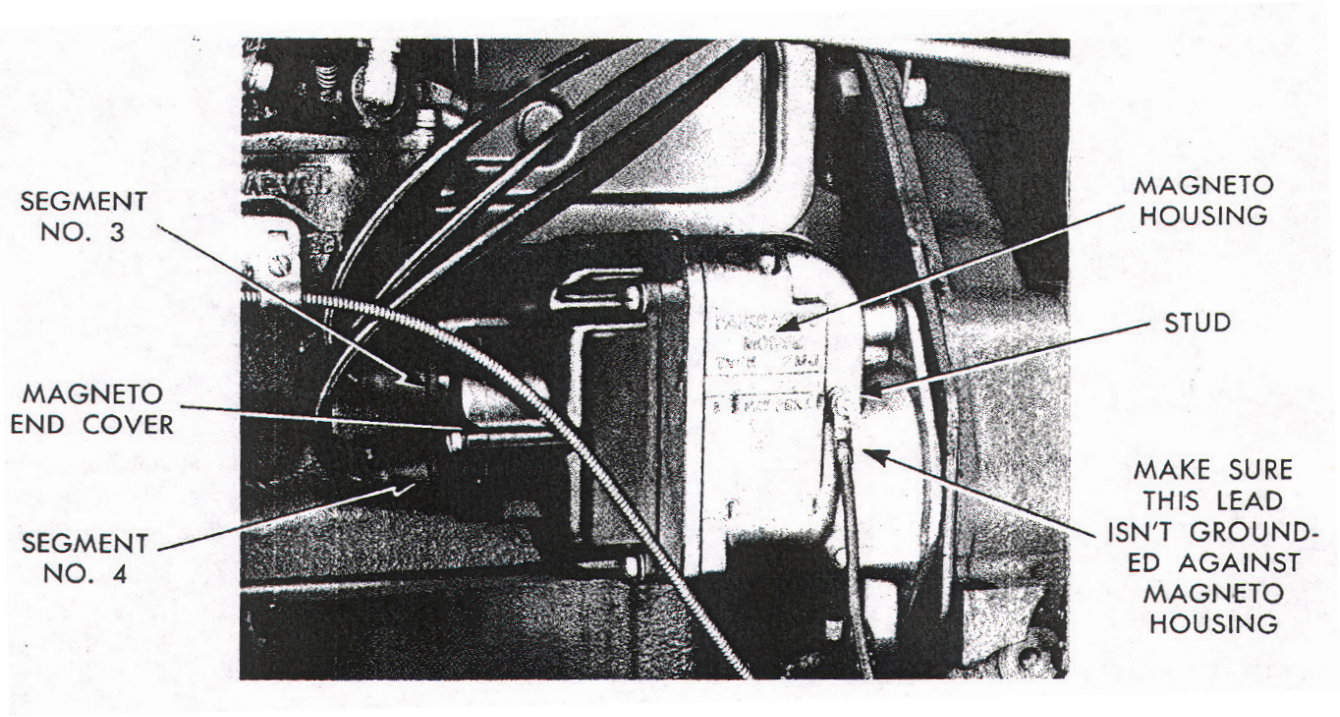
INTAKE MANIFOLD VACUUMS --- 18" - 21" Mercury at all idle speeds; 1 - 2 ½ " Mercury at top test load generator output.

OIL PRESSURE --- Minimum 20 P.S.I. --- Maximum 35 P.S.I. when engine is hot.

NOTE: Oversize exciters have an output of 1 K.W. of D.C. power at 115 volts in excess of output needed to excite main (welding) generator shunt fields.



FLYWHEEL HOUSING INSPECTION (TIMING) HOLE
Figure 1



MAGNETO
Figure 2

I. (F-162) IGNITION SYSTEM (*See Figs. 1* and 2)

Magneto Ignition

SPARK PLUG POINT GAP --- 0.025". Check with a round feeler gauge. Use a CHAMPION No. 7 Com. Spark Plug or its equivalent.

MAGNETO BREAKER POINT GAP --- 0.020". Check with a round feeler gauge.

IGNITION TIMING --- If the magneto has been removed, or if it is suspected by faulty engine performance such as detonation (knocking), overheating, etc. that the ignition timing is wrong, it should be checked as follows:

Stop the engine; remove the spark plug from No. 4 cylinder (one nearest the coupling) and the ignition cables from the other spark plugs. Crank the engine over slowly until the compression in No. 4 cylinder blows the air out of No. 4 spark plug hole. This may be ascertained by placing a finger over the hole and letting the compression force the finger away.

Next locate the flywheel housing inspection (timing) hole 1-3/8" in diameter in the flywheel housing just ahead of the flywheel on the carburetor side of the engine. This hole is just below the oil pressure gauge and is covered by a small plate. Slide the plate aside by loosening the bolt which holds it secure. Continue cranking the engine over, and through this hole, get the ignition timing or "IGN" mark (*not* the "EX.C" or the "DC" mark) *just beneath* the inspection hole pointer, which is on the right side of the hole and on the *inside* or *back* of the *flywheel* housing plate.

Remove the *magneto* end cover and check the *breaker point gap*. Remove the magneto, if necessary, by taking out the bolts holding it in position. (With the magneto removed, it will be seen that the punch mark on one camshaft gear tooth is between the punch marks on two governor gear teeth.) Turn the magneto over *clockwise* (viewing the impulse coupling) *until No. 4 spark plug fires*, which may be ascertained by holding the end of No. 4 spark plug ignition cable near the metal part of the magneto. Replace the magneto, fitting the impulse coupling into the slots in the governor gear. (The impulse coupling should fit almost exactly into the governor gear if all timing marks have been properly lined up and if No. 4 spark plug has fired.) The distributor cap on the rear end of the magneto has four segments which should be connected in the firing order of 1-3-4-2 read *clockwise* from No. 1.

Ignition timing may be checked while the engine is running as follows:

Connect a neon lamp in series with No. 4 spark plug ignition cable. If no neon lamp is available, use the No 4. spark plug ignition cable itself. With the engine at high idle speed, let the flash from the neon lamp (or the spark from No 4. spark plug ignition cable) when held near the inspection (timing) hole, illuminate the

"IGN" mark on the flywheel. At the time of the flash, the "IGN" mark should be *just beneath* the inspection hole pointer. If the "IGN" mark doesn't fall just beneath the pointer, or if it is desired to advance or retard the spark slightly, use the following procedures:

Loosen the bolts which hold the magneto in position. Viewing the distributor end of the magneto, turn the whole magneto *clockwise* to *advance* the spark; turn it counterclockwise to retard the spark; tighten the bolts.

Make sure that the red lead connected to the stud on the outside of the magneto isn't grounded against the metal magneto housing. If it is the engine won't start.

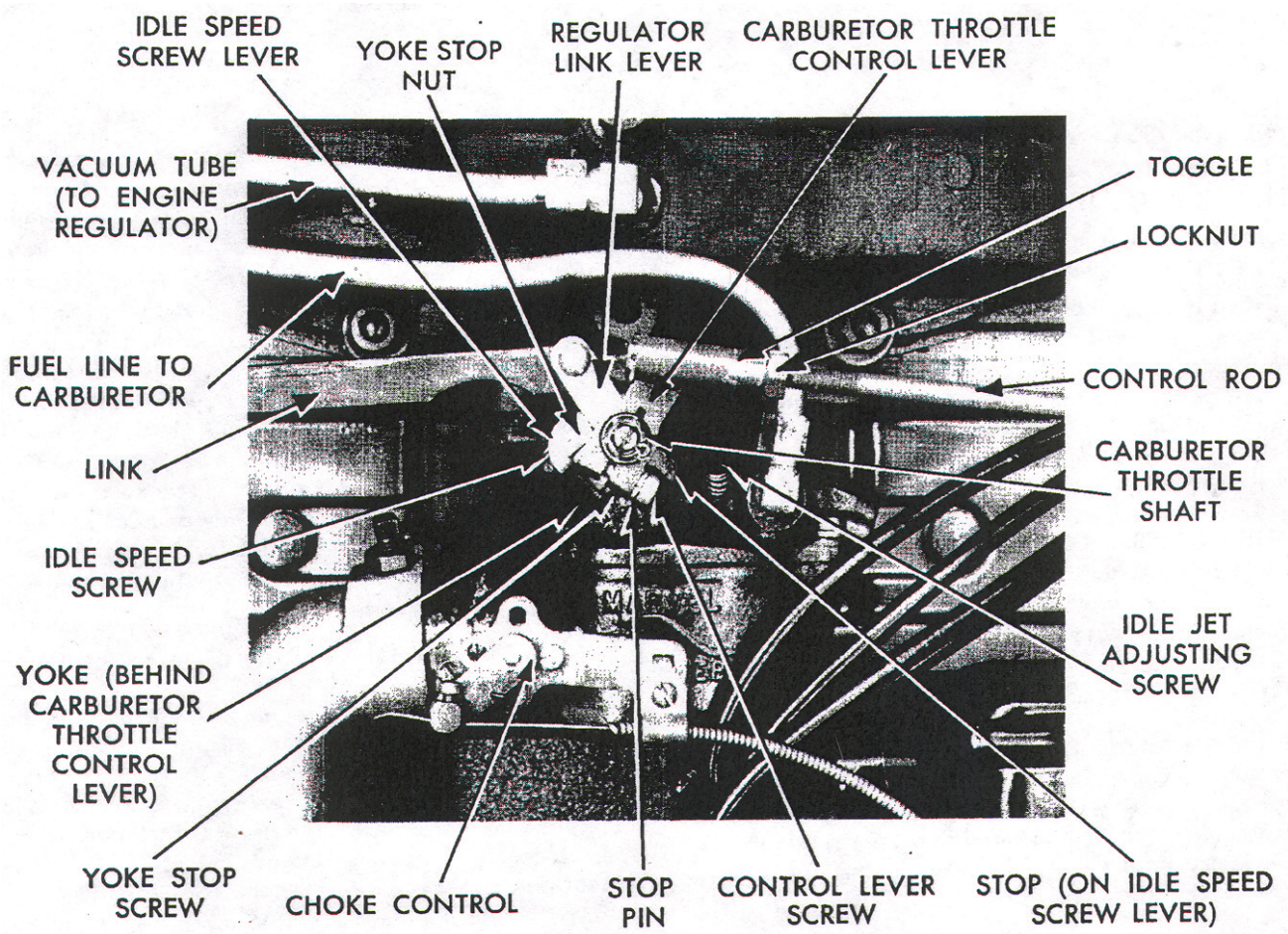
II. (F-162) CARBURETOR (See Fig 3)

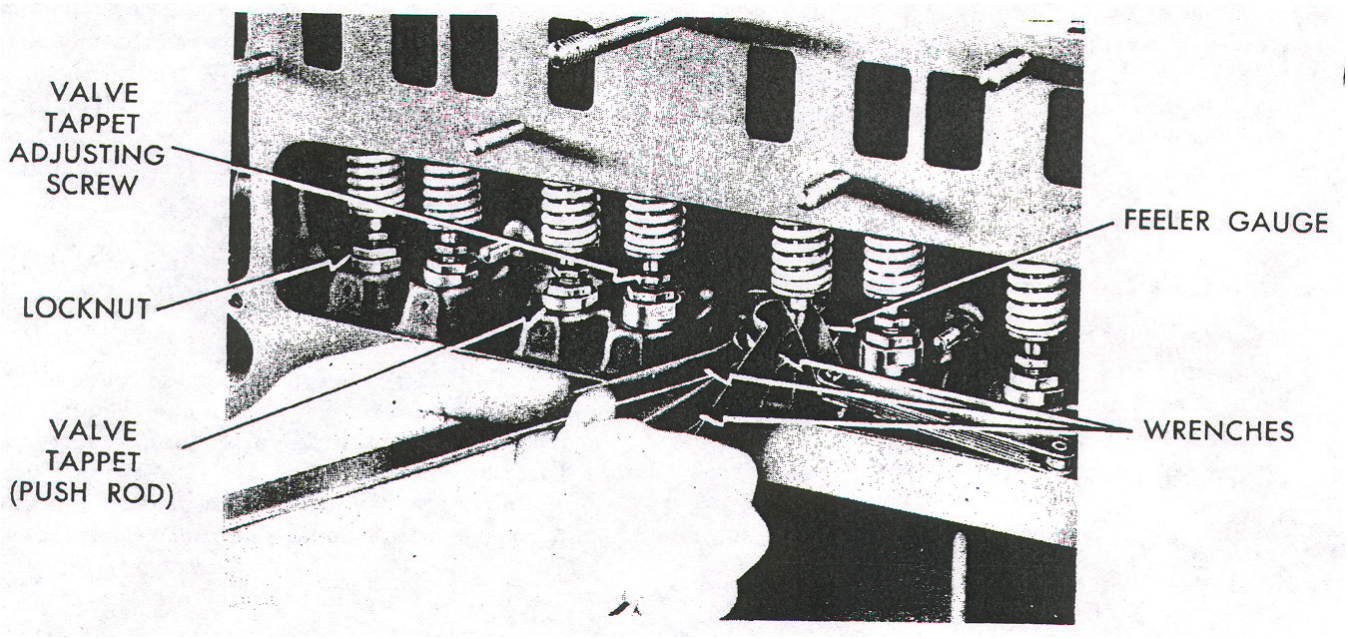
Carburetor adjustments should be made to obtain smoothness and economy in engine performance. There is only one adjustment on the carburetor itself --- the **IDLE JET ADJUSTING SCREW** (The main jet is of the fixed type requiring no adjustment.) When engine misperformance indicates carburetor trouble, first check the following adjustments before changing the idle jet adjustment:

IDLE SPEED SCREW --- CONTROL LEVER SCREW --- and **YOKE STOP SCREW AND NUT**.

THE IDLE SPEED SCREW --- The purpose of the **IDLE SPEED SCREW** is to set the low idle speed of the engine by varying the amount the engine regulator can close the carburetor butterfly valve. Turn the screw in (*clockwise*) to increase the low idle speed; turn it out (*counterclockwise*) to decrease the low idle speed. Set this speed where the engine runs smoothest for overall vibration.

CARBURETOR
Figure 3





CHECKING AND ADJUSTING VALVE CLEARANCES
Figure 4

The recommended low idle speed is 750 - 950 R.P.M. (**STANDARD EXCITER MODELS**) or 950 - 1050 R.P.M. (**OVERSIZE EXCITER MODELS**.)

THE CONTROL LEVER SCREW --- The control lever screw holds the carburetor throttle control lever onto the carburetor throttle shaft. Check the lever and screw for tightness; if they are tight leave them alone; if they are loose, or if it is suspected that the lever has slipped in its position on the shaft, reset the lever at a forward angle of about 40° when the stop on the *idle speed screw lever* is engaging the *stop pin* on the carburetor casting.

THE YOKE STOP SCREW AND NUT --- The yoke stop nut acts as a stop for the regulator link lever. Check the yoke and screw for tightness; *if they are tight leave them alone*; if they are loose, or if it is suspected that the yoke has slipped in its position on the carburetor throttle shaft, reset the yoke as follows:

Insert the latching pin to hold the regulator in the *up* or *collapsed* position; rotate the idle speed screw lever *counterclockwise* until the idle speed screw engages the stop pin on the carburetor casting, rotate the yoke *clockwise* until the nut is flush against the regulator link lever; tighten the screw.

If these adjustments are satisfactory, then check the idle jet adjustment.

A. Smoothness and Economy

THE IDLE JET ADJUSTING SCREW --- The purpose of the idle jet is to give *smoothness* in engine performance at low idle speed. Use a vacuum gauge (such as a Sun Vacuum Tester) and Tachometer in adjusting it. Turning the screw in (clockwise) increases suction by restricting the flow of air past the jet --- not the flow of fuel --- hence more fuel is drawn through the jet; turning the screw out (counterclockwise) has the opposite effect --- less fuel is drawn through the jet. In adjusting for *smoothness* at low idle speed, turn the screw in (*clockwise*) until it is seated. Then turn it out (*counterclockwise*) ¼ or ½ a turn at a time until the highest R.P.M. is obtained and the intake manifold vacuum is at least 18" Mercury --- or *the* highest steady point on the gauge. This should be at about 1 to 1 ½ turns open. The screw has no effect after three complete turns open.

B. Carburetor --- (General Information)

Inspect the screen and the jets in the carburetor periodically for dirt, grease, gum, etc., or whenever there is suspected carburetor trouble. If the carburetor is flooding constantly or is getting no gasoline at all, remove the carburetor. See if the float (needle) valve is stuck either open or closed; if there is freedom of movement at the hinge pin (float axle); and if there are any holes in the float.

Return to Section TOC
Return to Master TOC

It is also advisable to check the position of the float assembly for correct measurement to obtain the proper fuel level. The float setting is measured from the machined surface (no gasket) of the cover to the top side of the float bodies at the highest point. This distance should be 1-5/16" +/- 1/32". To increase or decrease the distance, use long nosed pliers and bend the lever close to the float body. (For further information, see the carburetor manufacturers bulletin).

III. (F-162) VALVES (*See Fig 4*)

Check or set the valve tappet clearances when the engine is hot and running at low idle speed. Remove the valve tappet inspection plate by taking out the two bolts holding it in position. Check the valve tappets (push rods) for freedom of movement in their guides or sleeves. They should revolve easily with finger pressure. Check the locknuts on the tappets for tightness. With a feeler gauge see if the valve clearance is correct --- 0.014" for both intake and exhaust valves. To make clearance *larger*, turn the valve tappet adjusting screw *down* (*clockwise*); to make it *smaller*, turn the screw *up* (*counterclockwise*). After adjustment, recheck the clearance with the feeler gauge, and recheck the locknuts for tightness.

IV. (F-162) GOVERNOR (*See Figs 5 and 6*)

NOTE: The following text applies to engines equipped with either the ***PIERCE*** or the ***MONARCH*** governor.

The governor has four functions:

1. Keeping the high idle speed for which it is set constant.
2. Controlling speed fluctuations at idle and load speeds (sometimes called "surge" or "hunting").
3. Maintaining a constant speed drop from high idle to load speeds. (Speed Regulation).
4. Controlling the number of surges as engine goes from idle to load speeds.

GENERAL RULE

Before changing any governor adjustments, always check for other causes of the particular engine trouble first, since these adjustments have been set and locked for correct governor performance under actual welding conditions at the factory. In particular, check adjustments listed under "2 --- CARBURETOR"

Also, make sure that the locknuts on the control rod are flush against the toggles; that the locknuts on the **LOCK SCREW**, the **SPEED CONTROL SCREW**, and the **GOVERNOR SPRING ADJUSTING SCREW** are tight; that the nuts which hold the toggles onto the **GOVERNOR CONTROL LEVER** and the **CARBURETOR THROTTLE CONTROL LEVER** are tight; that the toggles and all other parts of the governor controls have been *oiled frequently and work smoothly*. If these conditions are satisfactory, then check the governor adjustments in the following order:

A. STANDARD EXCITER MODEL

1. Setting the High Idle and Point 10 Idle Speeds

The purpose of the **SPEED CONTROL SCREW** is to set the high idle speed of the engine by varying the chain tension on the governor spring. The high idle speed should be 1500 R.P.M. and should be set when the **SPEED CONTROL** is wide open --- *set a maximum point 100*. Loosen the locknut and turn the screw *in* (*clockwise*) to *increase* the high idle speed. Turn it *out* (*counterclockwise*) to *decrease* the high idle speed. Tighten the locknut. If any *large* screws adjustments are necessary to obtain a high idle speed of 1500 R.P.M. the chain will need to be shortened or lengthened accordingly to make this speed fall at *Point 100* on the speed control.

WARNING! Leave the **LOCK SCREW** alone. On **STANDARD EXCITER MODELS** it has no function in governor operation.

The Point 10 Idle Speed is 1050 - 1150 R.P.M. and should be set *when the speed control is fully closed --- set at minimum Point 10*. *Shorten* the chain to *increase* the Point 10 Idle Speed; *lengthen* the chain to *decrease* the Point 10 Idle Speed. Usually one link will be sufficient and the speed may often be brought within limits by bending the chain connection slightly at the speed control end.

2. Controlling Speed Fluctuations (Surge) at Idle and Load Speeds

Allowable Speed Fluctuations +/- 5 R.P.M. at idle speeds; +/- 25 R.P.M. under load.

One purpose of the **GOVERNOR SPRING ADJUSTING SCREW** is to eliminate surge which occurs at both idle and load speeds or at idle speeds alone.

WARNING! *Never try to eliminate a surge which is continually present only when the engine is under load, and not when it is at idle speeds, by means of the* **GOVERNOR SPRING ADJUSTING SCREW**. *This type of speed fluctuations is almost never due to governor maladjustments*. (***See IM-129*** Trouble Shooting No. VII Speed Fluctuations).

To eliminate speed fluctuations (surge) in excess of the limits, have the engine at high idle speed. Loosen the *lower* locknut and tighten the *upper* locknut, thus *raising* the head of the Governor Spring Adjusting Screw until surge stops.

Return to Section TOC
Return to Master TOC

However, if the screw was already in or up nearly all the way, it may be necessary to reverse the above procedure and *lower* the head of the screw. *In either case, never adjust the screw more than just enough to remove all surge from the engine. Also, if an adjustment on the screw increases the High Idle Speed more than 20 to 30 R.P.M., leave the screw alone and remove the remaining surge by means of the Control Rod*. **NOTE:** Usually, with the *Pierce* governor, it is necessary to *raise* the head of the screw to eliminate surge; with the *Monarch* governor, to *lower* the head of the screw.

Adjust the **CONTROL ROD** so that when the engine is stopped and the *regulator expanded*, the **STOP** on the **IDLE SPEED SCREW LEVER** is about 1/32" off the **STOP PIN** on the carburetor casting. This adjustment is obtained by removing the **TOGGLE NUT** at the governor end of the rod, removing the Toggle from the **GOVERNOR CONTROL LEVER**, and screwing Toggle out of or into the rod to obtain the proper rod length.

In using the rod to eliminate surge, with the engine at High Idle Speed, *lengthen* the rod by turning the Toggle *out* (counterclockwise) one turn at a time until surge disappears, checking after each turn by replacing the Toggle and noting the amount of surge still in the engine. *Never lengthen the rod more than just enough to eliminate surge completely*.

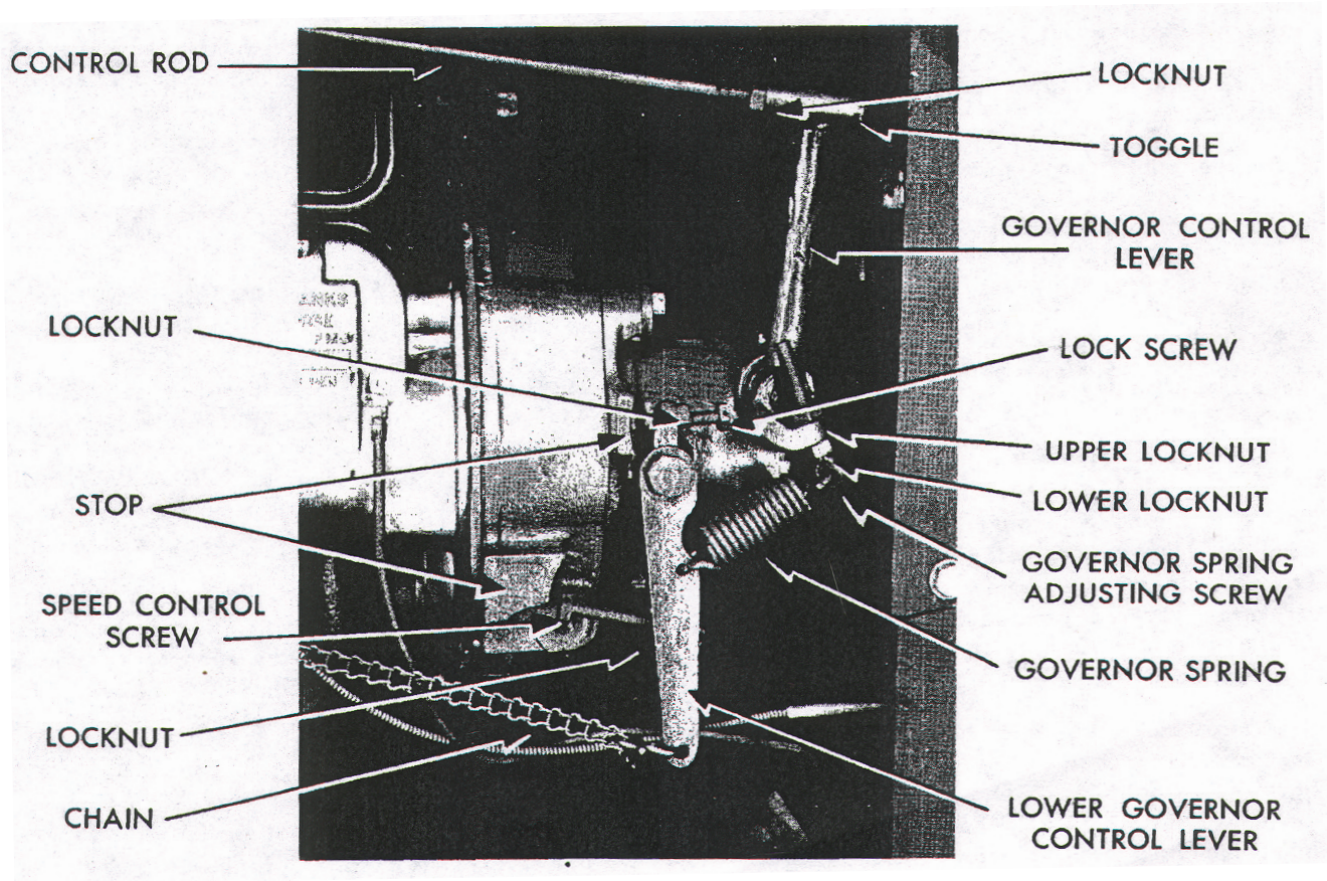
After surge has been eliminated, the High Idle Speed should be corrected to 1500 R.P.M., if necessary, by means of a small adjustment on the **SPEED CONTROL SCREW** (or the **LOCK SCREW** and the **SPEED CONTROL SCREW** on **OVERSIZE EXCITER MODELS**). *See B*. **OVERSIZE EXCITER MODELS** (*below*).

In eliminating surge: Using the **GOVERNOR SPRING ADJUSTING SCREW** *increases* the High Idle Speed; lengthening the **CONTROL ROD** decreases the High Idle Speed.

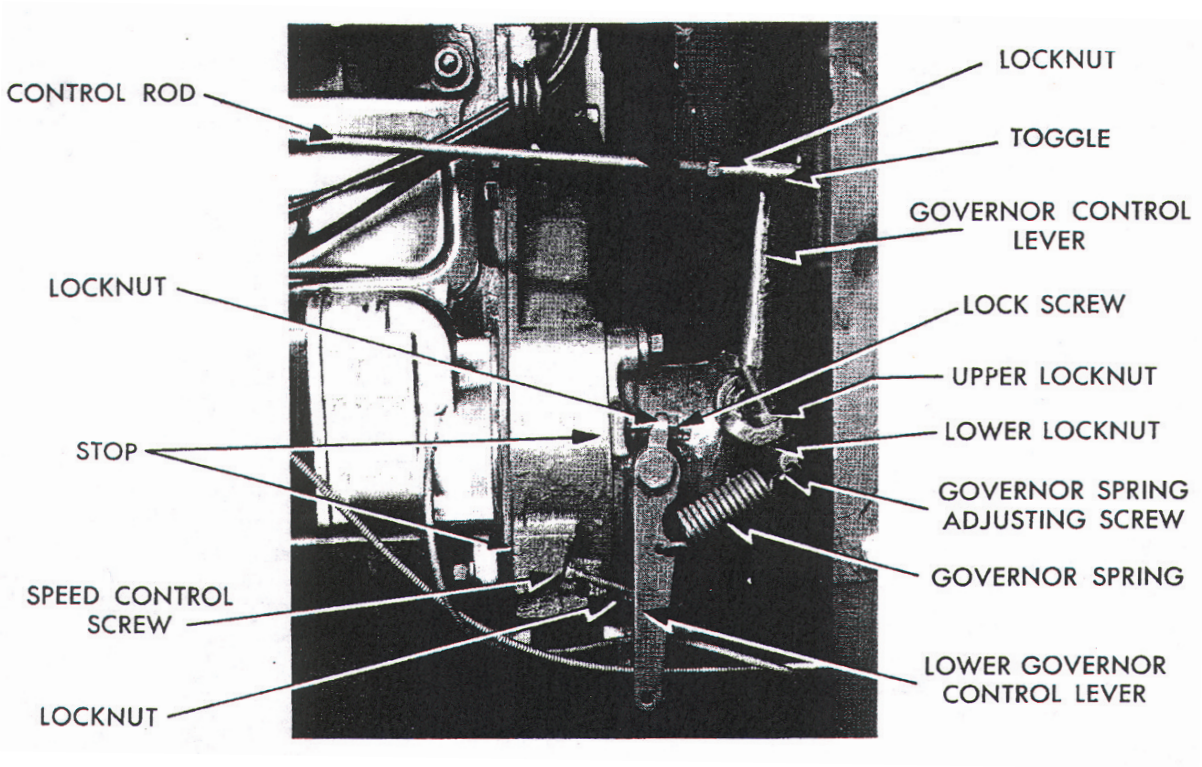
3. MAINTAINING A CONSTANT SPEED DROP FROM HIGH IDLE TO LOAD SPEEDS

Normal speed drop: 150 R.P.M. +/- 25 R.P.M.

The second purpose of the **GOVERNOR SPRING ADJUSTING SCREW** is to maintain a constant speed drop from High Idle to Load speeds.



GOVERNOR
(Standard Exciter Models with Speed Control)
Figure 5



GOVERNOR
(Oversize Exciter Models with Rheostat Control)
Figure 6

The speed drop is usually increased too much when this screw is *adjusted too far* in eliminating speed fluctuations (surge). If the speed drop is too great, adjust the screw in the opposite direction from that used in eliminating surge, until the speed drop falls within the limits. This will necessarily decrease the High Idle Speed a small amount, and it may cause surge. Correct these by means of the **SPEED CONTROL SCREW** (or the **LOCK SCREW** and the **SPEED CONTROL SCREW** on **OVERSIZE EXCITER MODELS**) and the **CONTROL ROD** respectively. If the speed drop is *less* than the limits, there is no harm done as long as the engine does not surge.

4. CONTROLLING THE NUMBER OF SURGES AS ENGINE GOES FROM IDLE TO LOAD SPEEDS

Allowable Surges: Maximum 3 surges.

Use the **GOVERNOR SPRING ADJUSTING SCREW** to control surges as the engine goes from Idle to Load Speeds. If there are more than 3 surges, *raise* the screw. However, if the screw is already *in* or *up* nearly all the way, it may be necessary to *lower* the screw until the number of surges is 3 or less. If this adjustment increases the speed drop beyond the limits, readjust the screw so that the speed drop is correct. Usually the number of surges can be controlled by means of the screw.

B. OVERSIZE EXCITER MODEL

1. Setting the High Idle Speed

The purpose of the **LOCK SCREW** is to set the High Idle Speed of the engine by varying the tension on the **GOVERNOR SPRING**. The High Idle Speed should be 1500 R.P.M. Loosen the locknut on the **SPEED CONTROL SCREW** and turn the screw in (clockwise) a few turns. Then loosen the locknut on the **LOCK SCREW** and turn it in (*clockwise*) to *increase* the High Idle Speed; turn it out (*counterclockwise*) to *decrease* the High Idle Speed. After adjusting the **LOCK SCREW**, lock the **LOWER GOVERNOR CONTROL LEVER** in position by turning the **SPEED CONTROL SCREW** out (*counterclockwise*) until it engages its stop. Then tighten the locknuts on both screws.

2. Controlling Speed Fluctuation (Surge) at Idle and Load Speeds.

3. Maintaining a Constant Speed Drop from High Idle to Load Speeds

4. Controlling the Number of Surges as Engine goes from Idle to Load Speeds

(All of these --- 2, 3, 4, are the same as for **THE STANDARD EXCITER MODEL**.)

V. (F-162) THE ENGINE REGULATOR

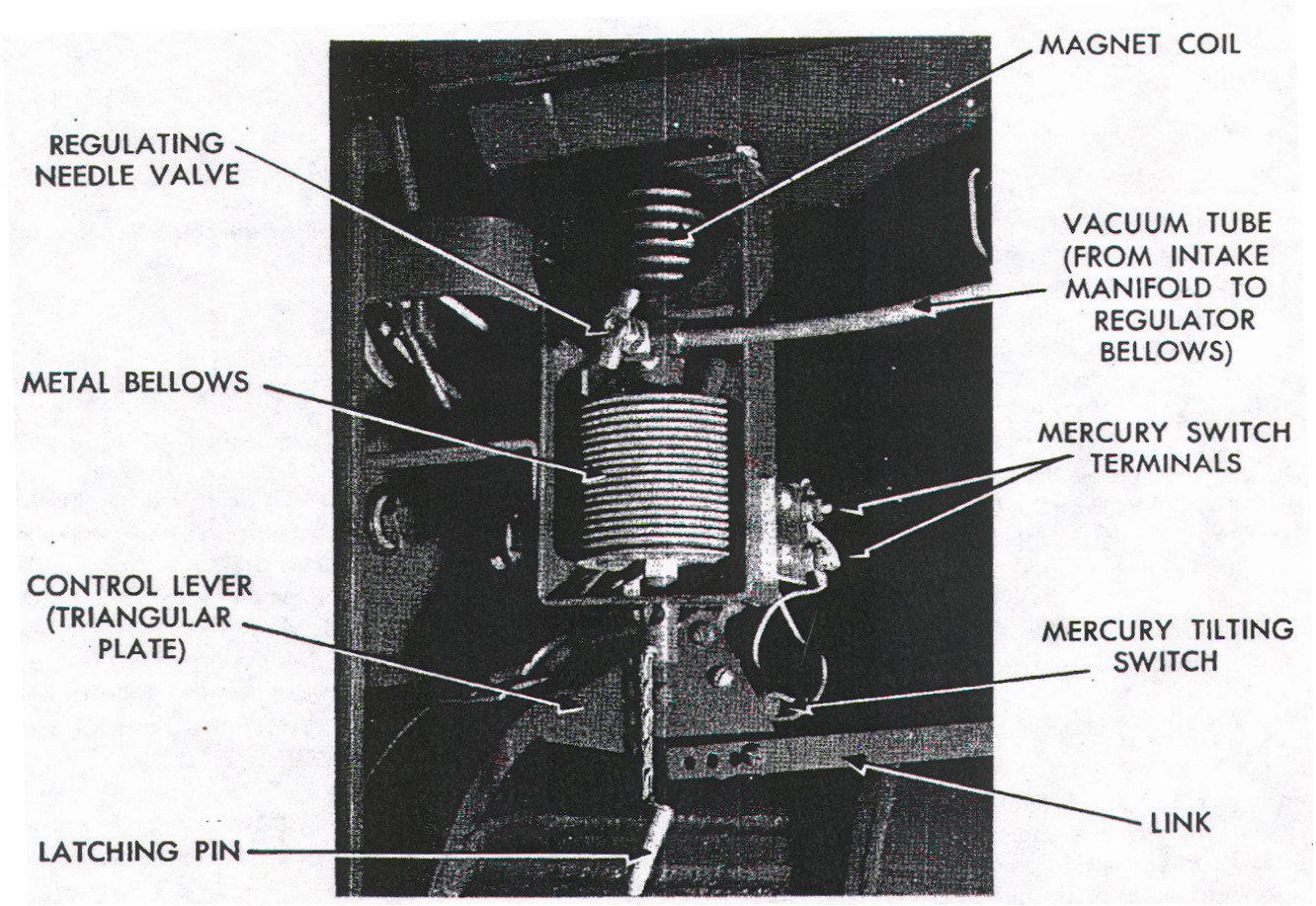
(Idling Device) (See Figs. 7 and ***Figs. 8***)

The purpose of the engine regulator is to cause the engine to drop back to low idle speed when the operator has ceased welding, thus cutting down on fuel consumption and engine wear. A complete description of how the regulator works may be found in the booklet entitled "Instructions for Installation and Operation of Lincoln Engine Regulators." (***IM-117***).

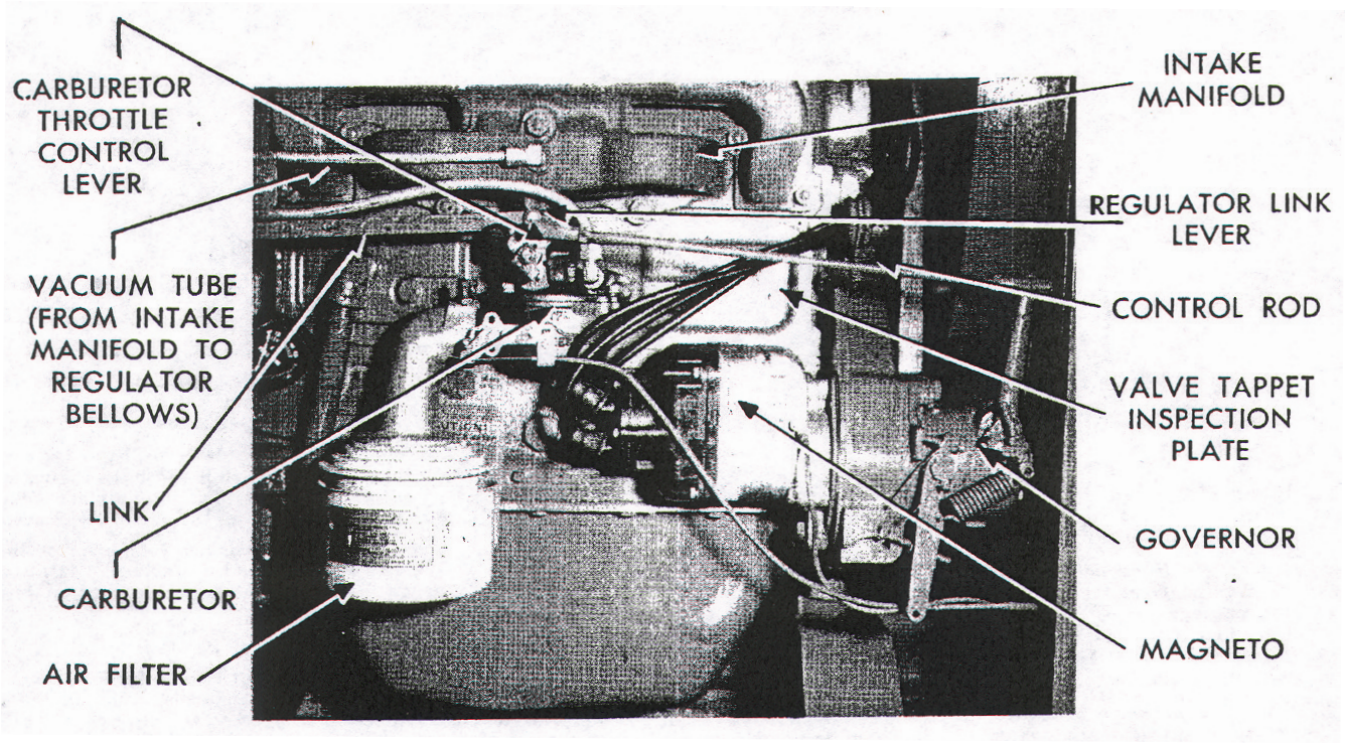
The only adjustment on the regulator itself is the **REGULATING NEEDLE VALVE** which controls the time for the engine to drop back to low idle speed after the arc is broken. This time is set at 10 seconds at the factory and is considered to be the correct setting. However, it may be regulated for any time from 2 to 20 seconds. If the time delay is not 10 seconds or if it is desired to change it, use the following procedure: Turn valve *out* (*counterclockwise*) to *decrease* the time delay; turn it *in* (*clockwise*) to *increase* the time delay. **IT IS ADVISED THAT THIS VALVE BE LEFT ALONE UNLESS IT IS DEFINITELY DESIRED TO CHANGE THE TIME DELAY**.

The throttle opening spring on the carburetor throttle shaft should pull the throttle *wide open quickly* when the arc is struck. The link between the control lever (triangular plate) underneath the metal bellows and the regulator link lever should be adjusted in length so that the carburetor throttle is fully closed to the Low Idle Speed position when the latch pin is inserted to hold the bellows in the *up* or *collapsed* position. *In general, do not connect the link to the plate through any hole on the link other than the one being used when the welder was delivered, since this hole was selected at the factory and found to be correct.*

If it is suspected that the vacuum relief valve is not operating properly, check it for dirt, grease, etc,. because improper operation of the valve will render the regulator useless. Also check the valve plunger seat (washer) for wear since it tends to get flattened out and make the bellows action sluggish.



ENGINE REGULATOR (IDLING DEVICE)
Figure 7



ENGINE REGULATOR CONNECTIONS AT CARBURETOR END OF LINK
Figure 8

The mercury tilting switch terminals should be connected *across* the voltage rheostat terminals, i.e,. one lead to each side of the rheostat. *Do not connect these terminals in series with the welder field*. The control lever (triangular plate) should be checked for proper amount and ease of tilt, because improper operation of the mercury tilting switch will make the regulator useless. (**NOTE:** Welders with a **STANDARD EXCITER** have no mercury tilting switch on the regulator since **SPEED CONTROL** instead of **RHEOSTAT CONTROL** is used for varying voltage.)

TROUBLE SHOOTING GUIDE

A few of the common troubles and remedies are listed below to help get the maximum results from this regulator.

(1) *If the engine fails to pick up speed when arc is struck:*

This may be due to dirt in the vacuum relief valve or line, or the mercury switch may not be shorting the rheostat. Turn the rheostat to maximum and if the engine picks up speed, the trouble is probably in the mercury switch or connections. If the trouble appears to be in the switch itself, install a new one.

(2) *If there is too much welding current at the arc immediately after engine picks up:*

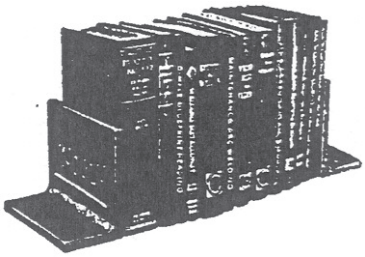
This is usually because the mercury switch does not return quickly to open position (bellows fully extended). Check for dirt in the vacuum relief valve. Sometimes the throttle opening spring is too weak and does not fully tilt the mercury switch allowing the rheostat to remain shorted too long when the engine picks up to welding speed. If the trouble appears to be in the switch itself, install a new one.

(3) *If engine stalls when arc is struck:*

This may occur because the carburetor is set too lean and cannot handle the sudden opening of the throttle when the arc is struck.

Return to Section TOC
Return to Master TOC

LEADING BOOKS ON ARC WELDING



As a service to its users, the Lincoln Electric Company publishes the following books. Order directly from the Lincoln Electric Company, Cleveland 17, Ohio.

"*Procedure Handbook of Arc Welding Design and Practice*", 9th Edition. Over 1200 pages and over 1300 drawings, diagrams and photographs; 8 sections of accurate concise information; 1 section of 32 pages of reference data and tables; bound in durable, semi-flexible simulated leather, gold-embossed; and indexed. $2.00 in U.S.A., $2.50 elsewhere.

"*New Lessons in Arc Welding*", 61 lessons based on the practical course in arc welding given at the Lincoln Electric Company plant. Consists of 320 pages with over 450 illustrations and drawings. Price complete $1.00, postage prepaid in the U.S.A.; $1.50 elsewhere.

"*Simple Blue Print Reading*", 4th edition, with particular reference to welding and welding symbols. Consists of 201 pages with 122 illustrations. Price $1.00, postage prepaid in the U.S.A.; $1.50 elsewhere.

"*Weldability of Metals*" A 141 page book; explains factors determining weldability; details welding procedures for steels, nickel, iron alloys, copper, aluminum and hardfacing. This information is reprinted from the "**PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE**" in order to make available at minimum cost this frequently requested information on how to weld various ferrous and non-ferrous metals. Price $.50 per copy in U.S.A., postage paid; $.75 elsewhere.

The following books are published by the James F. Lincoln Arc Welding Foundation. Make checks or money orders payable to this Foundation.

"*Metals and How to Weld Them*", a non-technical explanation of the structure of metals and their properties explains how this knowledge of metals is important to using good welding methods and solving welding problems. Proper steps for welding all common metals are detailed in over 250 pages, clearly illustrated. Price $2.00 in U.S.A., $2.50 elsewhere, postpaid.

"*Studies in Arc Welding*" Comprehensive abstracts of papers submitted in the Foundation's Second $200,000 Industrial Progress Award Program. Price $1.50, postage prepaid in the U.S.A., $2.00 elsewhere.

"*Design for Welding*" Detailed reviews of 90 papers from the Foundation's $200,000 Award Program. 1050 pages. Price $2.00, postage prepaid in the U.S.A., $2.50 elsewhere.

MOVIES

"*Prevention and Control of Distortion in Arc Welding*" by Walt Disney Productions. An education color-sound film, which explains through the cartoon figure, Mr. Shrink, the causes and cures of distortion in arc welding. Full details in Bul. 709, free on request.

"*Magic Wand of Industry Arc Welding*" A fast moving technicolor sound movie staged in practically every major industry to tell the story of arc welding. For sowing to business groups, schools, plants. Full details in Bul. 694, free on request.

"*Designing Machinery for Arc Welding*" sound-color motion picture describes functional approach to machine design. With animation. Solves typical problems in design of welded machine parts. Described in Bul. 724.

"*Design for Arc Welded Structures*" Color, sound movie explains how welded design permits new freedom of planning, reduces steel tonnage, simplifies detailing, fabrication and erection. Full details in Bul. 719.

ARC WELDING ACCESSORIES AND SUPPLIES

The Lincoln Electric Company manufactures a complete line to meet your welding needs. The following items may be obtained from your nearest Lincoln Dealer, Lincoln Salesman, Lincoln Field service shop, The Lincoln Electric Company, Cleveland 17, Ohio.

Manual Welders for all types of AC and DC operation.
Automatic Power ?? Heads and Controls for every AC and DC automatic welding application.
Lincoln Electrode for every weld application.
Electrode ?? to handle any size of electrode in all current ranges.
Electrode and Work Cables for use on every size ???? ????.
??? ?? in all commonly used shade densities.
All types and sizes of both *Face and Head Shields*.
??? ??, Ground Clamps and Detachable Connectors to ??? welding cables.
Steel welded construction *Undercarriages* for each standard Lincoln Welder.
Flux and Wire Electrodes for automatic welding.

THE LINCOLN ELECTRIC COMPANY
The World's Largest Manufacturer of Arc Welding Equipment
CLEVELAND 17, OHIO
Branch Offices, Field Service Shops, and Distributing Agencies in All Principal Cities.
LINCOLN ELECTRIC CO., of Canada, Ltd., Leaside, Toronto 12, Canada
LINCOLN ELECTRIC CO., (AUSTRALIA) Pty., Ltd., Alexandria, Sydney
LA SOUDURE ELECTRIQUE LINCOLN, Bonneuil-sur-Marne, Paris, France
Export Representatives
THE ARMCO INTERNATIONAL CORPORATION, Chrysler Bldg., New York 17, New York
Middletown, Ohio, U.S.A.

TABLE OF CONTENTS-THEORY OF OPERATION SECTION

* This theory addresses later production machines.

FIGURE E.1 BLOCK LOGIC DIAGRAM

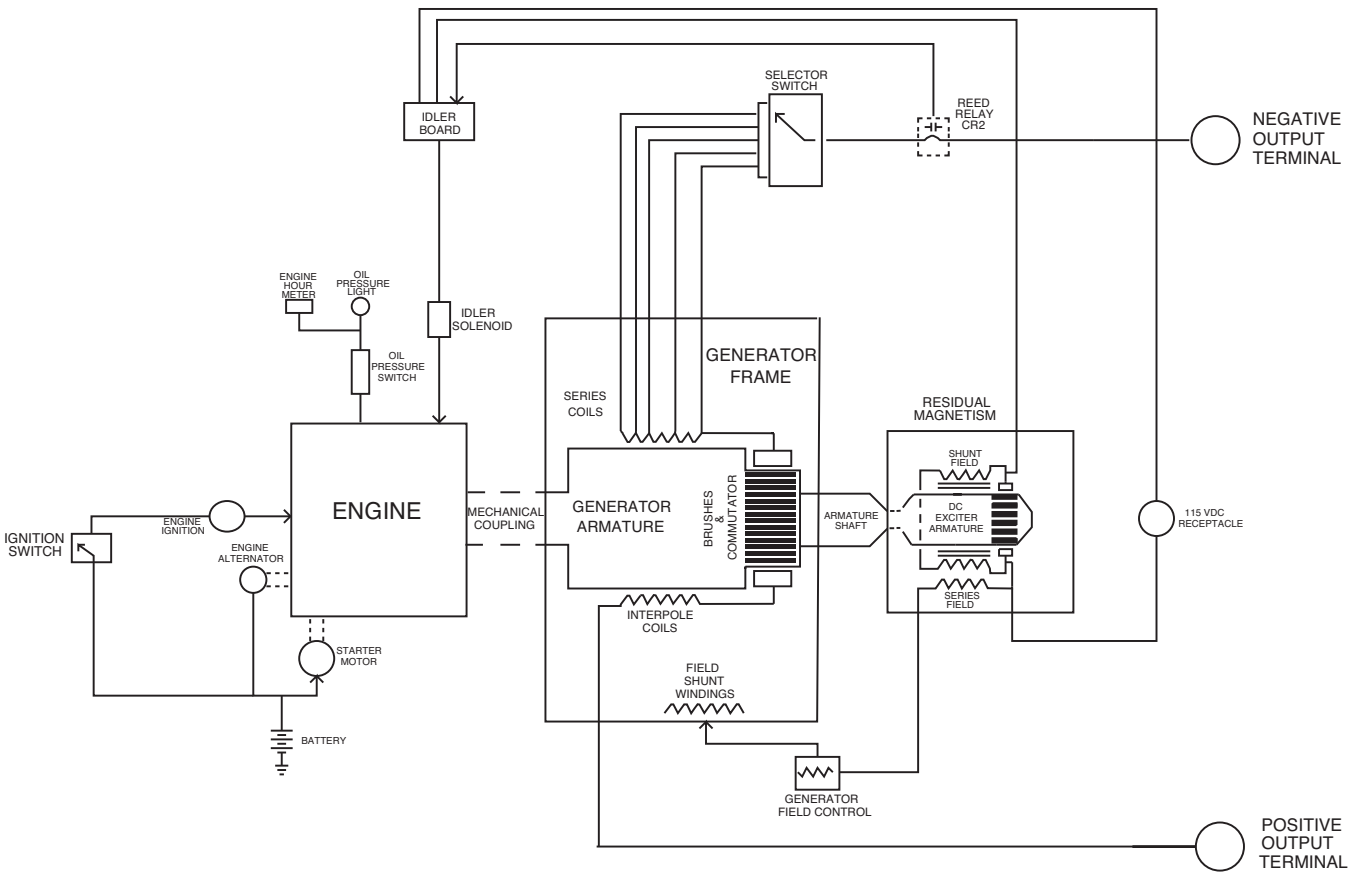
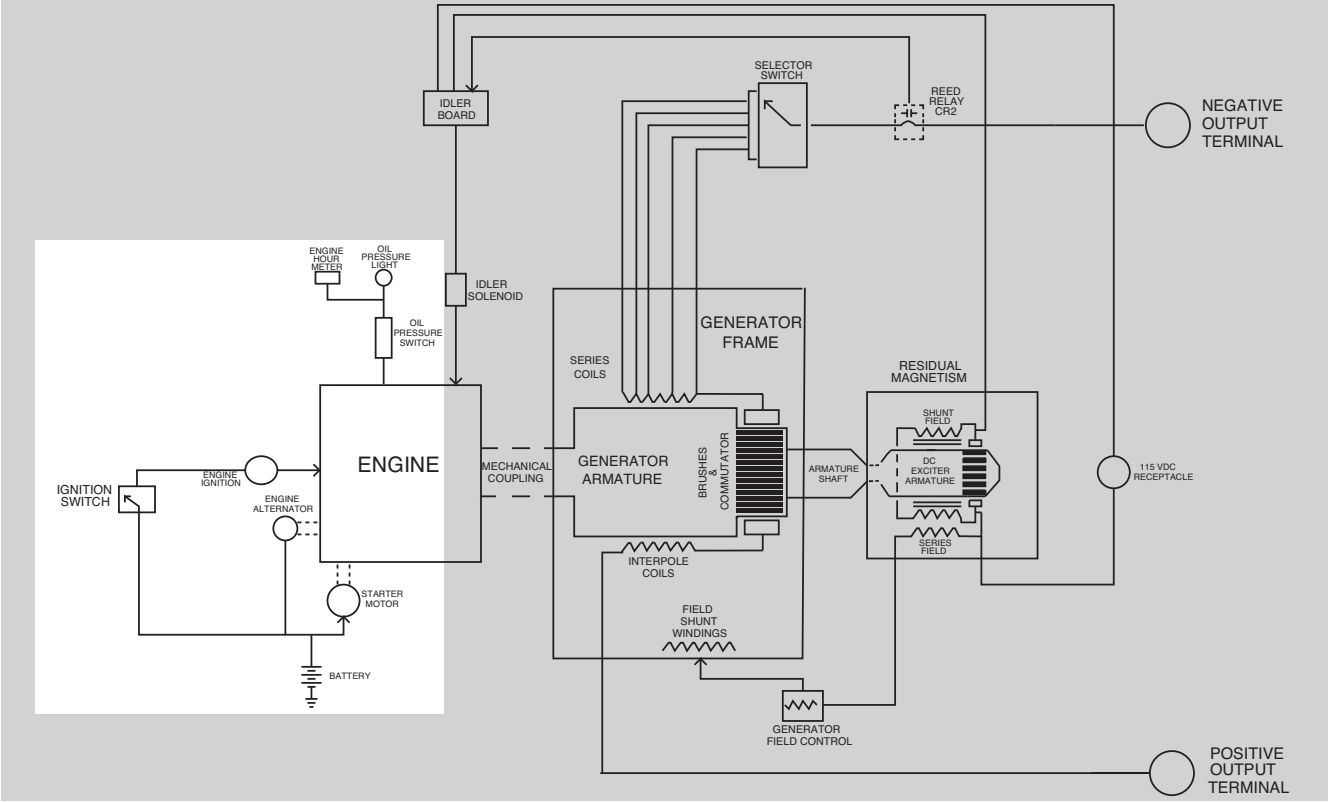


FIGURE E.2 - BATTERY, STARTER, ENGINE ALTERNATOR AND OIL SWITCH CIRCUIT



GENERAL DESCRIPTION

The SA-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 1,000 watts or, 1750 watts (on later models) of auxiliary power is available at the 115VDC receptacle.

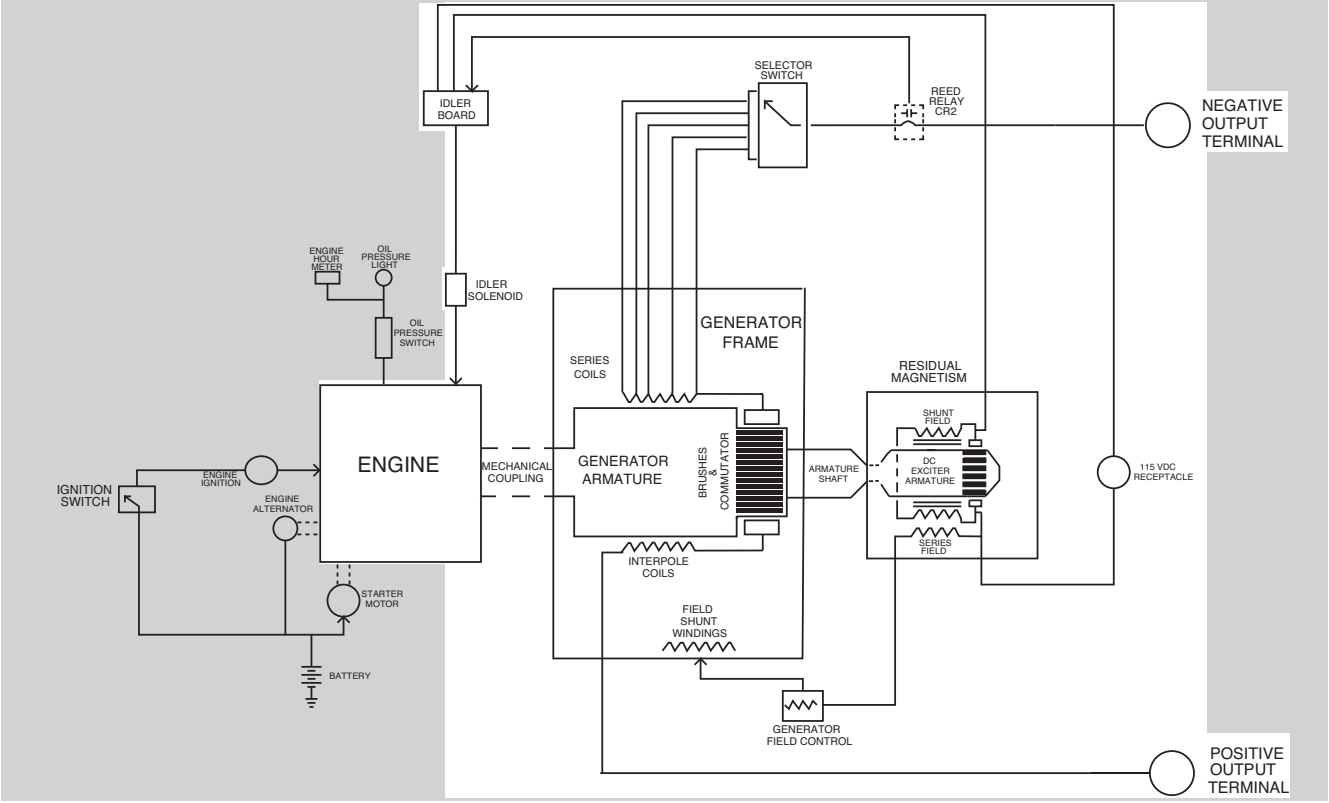
BATTERY, STARTER, ENGINE ALTERNATOR AND OIL SWITCH CIRCUIT

The 12VDC battery powers the starter motor through the ignition switch and engine ignition. The engine alternator supplies "charging" current for the battery circuit. If the oil pressure switch does not close, due to low oil pressure or inadequate oil supply, the oil pressure light will not glow, the hour meter will not operate and the engine alternator will not function. (Not all SA-200's)

Early machines used a crank start and magneto ignition. Field installed conversions to electric start used an engine Generator to charge the battery and a positive ground. See related code numbers and wiring diagrams for correct Wiring Diagrams.

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

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



ENGINE, MAIN GENERATOR ARMATURE AND FRAME AND DC EXCITER

EXCITATION (FLASHING)

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

MAIN SHUNT, INTERPOLE AND SERIES COILS

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

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

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

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 shunt field windings. Open circuit weld voltage can also be controlled by the field rheostat control.

Earliest machines used engine speed for fine current control.

ENGINE IDLER CIRCUIT

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

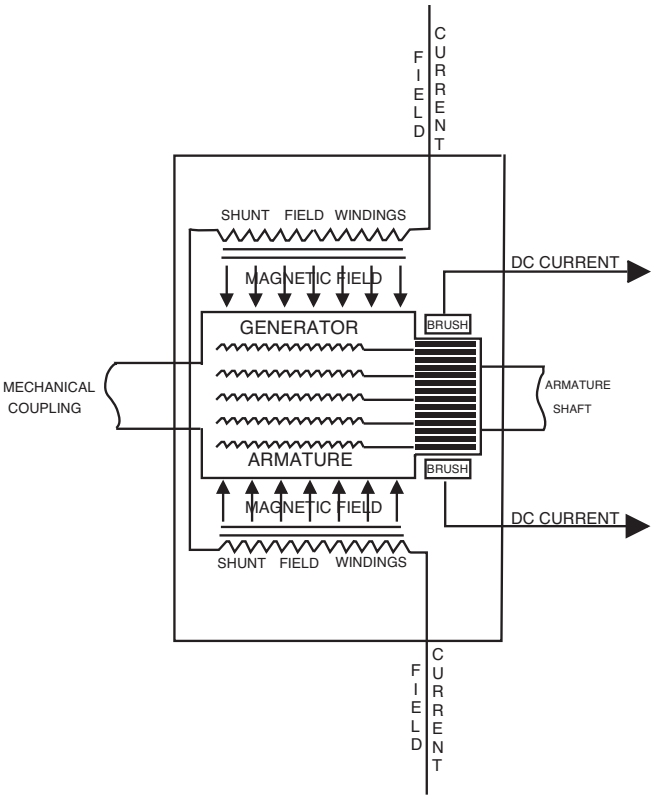
When welding ceases or the auxiliary load is removed, a preset time delay of about 15 seconds starts. After approximately 15 seconds, the idler PC board activates the idler solenoid, and the machine will return to a low idle speed condition.

Some early machines used a “Vacuum” idler to adjust engine speed. Engine vacuum is applied to a bellows to pull the engine to low speed. The vacuum bellows has a small coil that is connected across the series coils of the main D.C. generator. When welding current is drawn through the series coils the solenoid coil is energized and pulls a small valve in the idler, releasing the vacuum and allowing the engine to go to high idle.

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.



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

NOTES

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

TABLE OF CONTENTS - TROUBLESHOOTING AND REPAIR

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

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, function 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.

Return to Section TOC
Return to Master TOC

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.

Return to Section TOC
Return to Master TOC

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 very low to no 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. (Not all machines) 2. Perform the ***DC Exciter Test***.
The engine starts and runs at the correct speed but there is very low to no 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 brush holders 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 brush holders, 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. 6. Check for proper brush rack position. Perform ***Rack Adjustment 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.

Return to Section TOC
Return to Master TOC

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 (Not all machines). The welding generator is functioning correctly.	1. Check the DC receptacle and plug for loose or faulty connections. (Not all machines). 2. Check the 15 Amp fuse. (Not all machines)	1. Check for loose or faulty connections or wires at the 120 VDC receptacle and associated circuitry. (Not all machines). See Wiring Diagram.

⚠ CAUTION

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

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

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 an adjustment. 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. 7. Check brush rack. Perform ***Rack Adjustment Test***.
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 an adjustment. 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***. 4. Check brush rack position. Perform ***Brush Rack Adjustment Test***. 5. Test Series coils for a short.

⚠ 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.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The engine will not return to low idle when the welding and auxiliary loads are removed. (Not all machines were equipped with auto idle) R51 - idler code 445-2867 @ fbs exciter R57 - 3417 - 7242 codes Electronic 7276 - 9530 codes (**Above code 7275 only**)	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. 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 Wiring Diagram. 2. Perform the ***Idler Solenoid Test***. 3. Check for loose or faulty connections at the idler PC board. 4. 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.

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

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION 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. R51 - Codes 445 - 2867 R57 - Codes 3417 - 7242 Do not go to high idle @ aux. load. (**Above code 7242 only**)	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. Perform the ***Idler Solenoid Test.*** 3. Check for loose or faulty connections at the idler PC board. 4. Contact the Lincoln Electric Service Dept. 1-888-935-3877. 5. Perform the appropriate Idler Test.
Engine is sluggish to go to high speed - or will not go to high speed.	1. Verify idler (if equipped) is operating properly. 2. Engine Governor may not be operating correctly. 3. Engine throttle may need adjustment.	1. ***See IM-127*** code 445-8312. ***IM-179*** code 3354 - 7225, ***IM-277*** code 7225 and up for proper engine adjustment procedure.

⚠ 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.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
1. The machine will not achieve low range on each tap. 2. There is minimum control on each tap.	1. Rheostat may be open or shorted. 2. Shunt field coils may be shorted. 3. Brush rack may be out of position. 4. Series coils may be shorted.	1. Check rehostat function. 2. Perform ***Main Generator Shunt Field Winding Test***. 3. Check Rack Position. 4. Check Series coils for shorts.

⚠ 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.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The engine will NOT go to high idle 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. Does not apply to: R51 - codes 445 - 2867 & R57 - code 3417 - 7242 Above code 7276 only.	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. Perform the ***Idler Solenoid Test***. 3. Check for loose or faulty connections at the idler PC board. 4. The idler PC board may need replacing. 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. Contact the Lincoln Electric Service Dept. 1-888-935-3877. 3. ***See IM-127-B*** 445-3312. ***See IM-277-A*** for codes 7275 & above = ***IM-179*** 3754 - 7275 ***See IM-129***.

⚠ 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.

Return to Section TOC
Return to Master TOC

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. Check engine oil level. 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. 2. The temperature switch may be faulty. 3. The alternator may be faulty. 4. The Idler/Engine Protection Board 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. If necessary, adjust. 2. Check the main DC generator brushes for good commutation and alignment. Contact the Lincoln Electric Service Dept. 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. If necessary, adjust. 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. 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.

Return to Section TOC
Return to Master TOC

NOTES

F-12

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

DC EXCITER TEST

⚠ WARNING

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

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

TEST DESCRIPTION

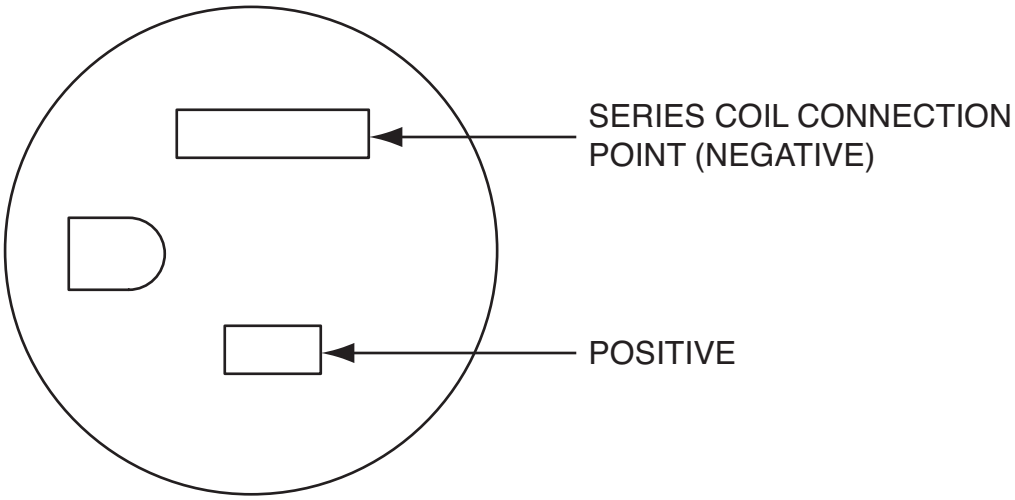
This test will help determine whether or not the DC Exciter is operating correctly. If operation is not correct, the test will also determine what component(s) may be faulty.

MATERIALS NEEDED

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

DC EXCITER TEST (continued)

FIGURE F.1 – 120VDC RECEPTACLE



PROCEDURE

1. Turn off the engine and remove all external loads to the welder terminals and auxiliary receptacle.

WARNING

MOVING PARTS can injure.

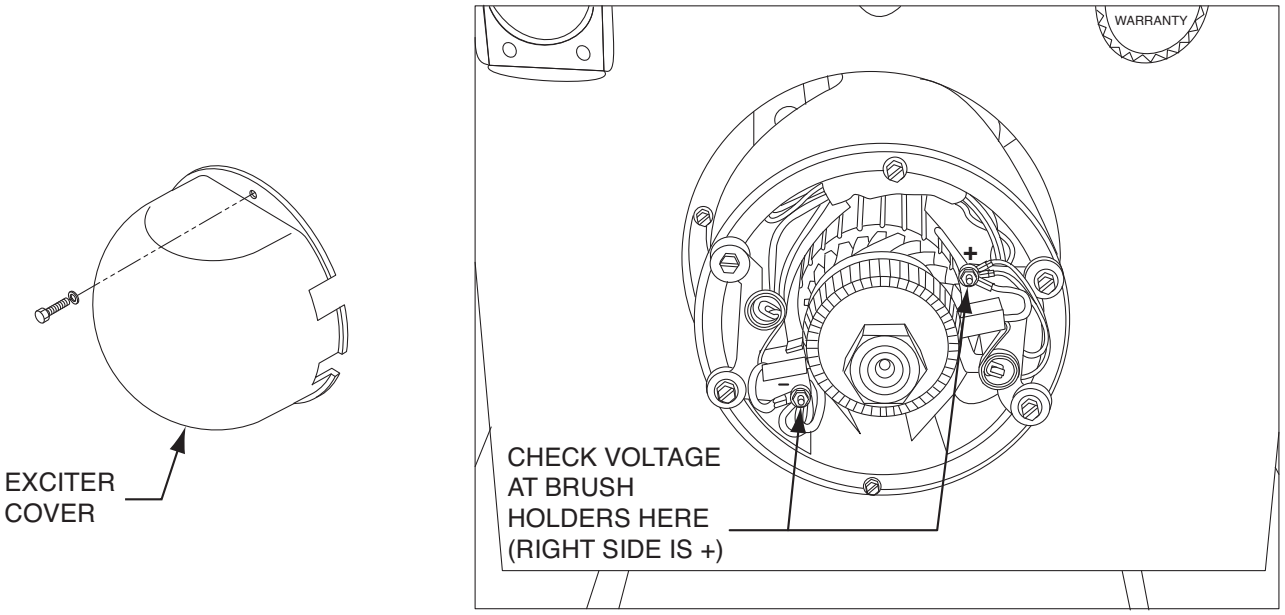
- Remove guards only when necessary to perform service, and replace them when the service requiring their removal is complete.
- Keep hands, hair, clothing and tools away from V-belts, gears, fans, and all other moving parts when starting, operating, or repairing equipment.
- If fan guards are missing 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.

Return to Section TOC
Return to Master TOC

DC EXCITER TEST (continued)

FIGURE F.2 – EXCITER COVER REMOVAL

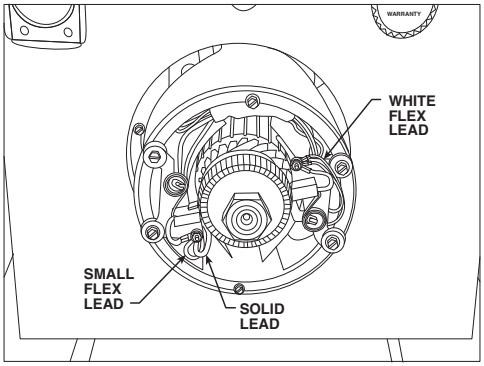


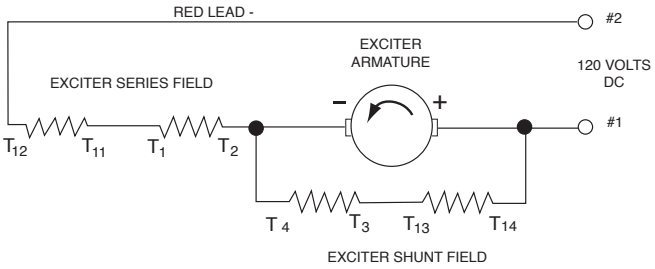
4. Turn off the engine. Using the 3/8" nutdriver, remove the exciter cover. See Figure F.2.
5. Start the engine. Using the volt/ohmmeter, carefully check the DC voltage at the brush holders. See Figure F.2. The right side brush holder is positive polarity. Normal DC voltage is 125 - 135VDC with the engine 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.

Return to Section TOC
Return to Master TOC

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" nutdriver, 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" nutdriver, remove the two flex leads from the right side brush holder.

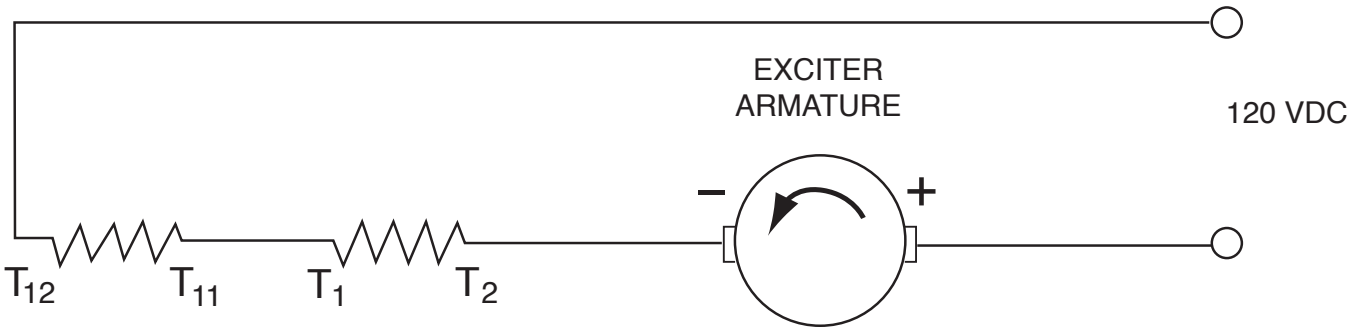
NOTE: Two coils make up a set (L8707), and each coil consists of two coils wound together; an Exciter Shunt Field Coil and an Exciter Series Coil.

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” nutdriver.

Return to Section TOC
Return to Master TOC

DC EXCITER TEST (continued)

FIGURE F.4 – STANDARD (SERIES) 1KW EXCITER



STANDARD (SERIES) 1KW EXCITER TEST - Code 445, 671, 960, 1122 & above

1. There are two exciter coils, in series, in the FBS exciter. One on each side of the barrel.
2. Each coil will measure 5 Ohms (T1-T2) and (T11-T12).
3. Total resistance of 10 Ohms can be measured from T2-T12.
4. Lift the left exciter brush (NEGATIVE), and find the bolted connection at the T12 to black exciter lead.
5. Disconnect the bolted T12 connection, and measure between the T12 lead and the negative brush holder (T2). The resistance should be 10 Ohms.
6. Check between T12 and a good ground point, resistance should be a minimum of 500 K Ohms.

NOTES

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

IDLER SOLENOID TEST

⚠ WARNING

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

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

TEST DESCRIPTION

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

MATERIALS NEEDED

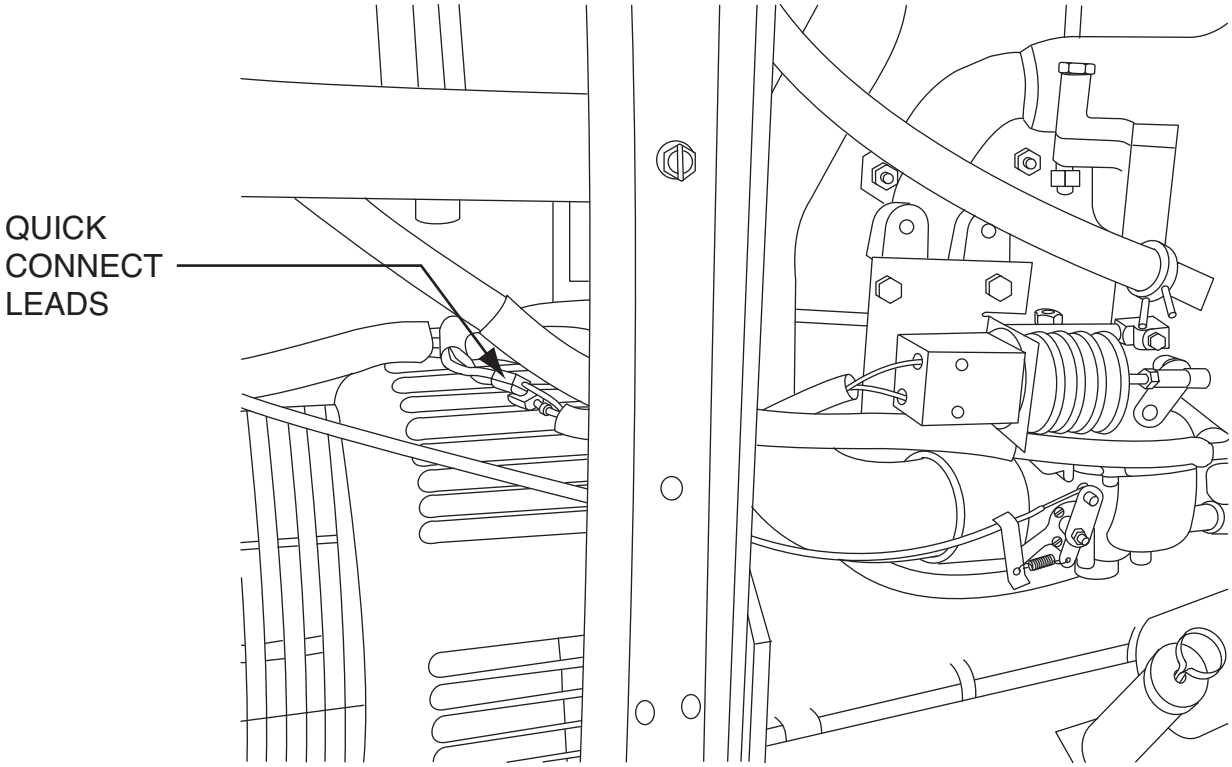
External 12VDC Supply
Wiring Diagram
Volt/ohmmeter (Multimeter)

Electronic Idler Codes - 7276 - 9530.

For older Idler Circuits and devices - See ***IM-117-B***, ***IM-277-A***, or ***IM-179-G***.

IDLER SOLENOID TEST (continued)

FIGURE F.5 – IDLER SOLENOID CONNECTIONS



PROCEDURE

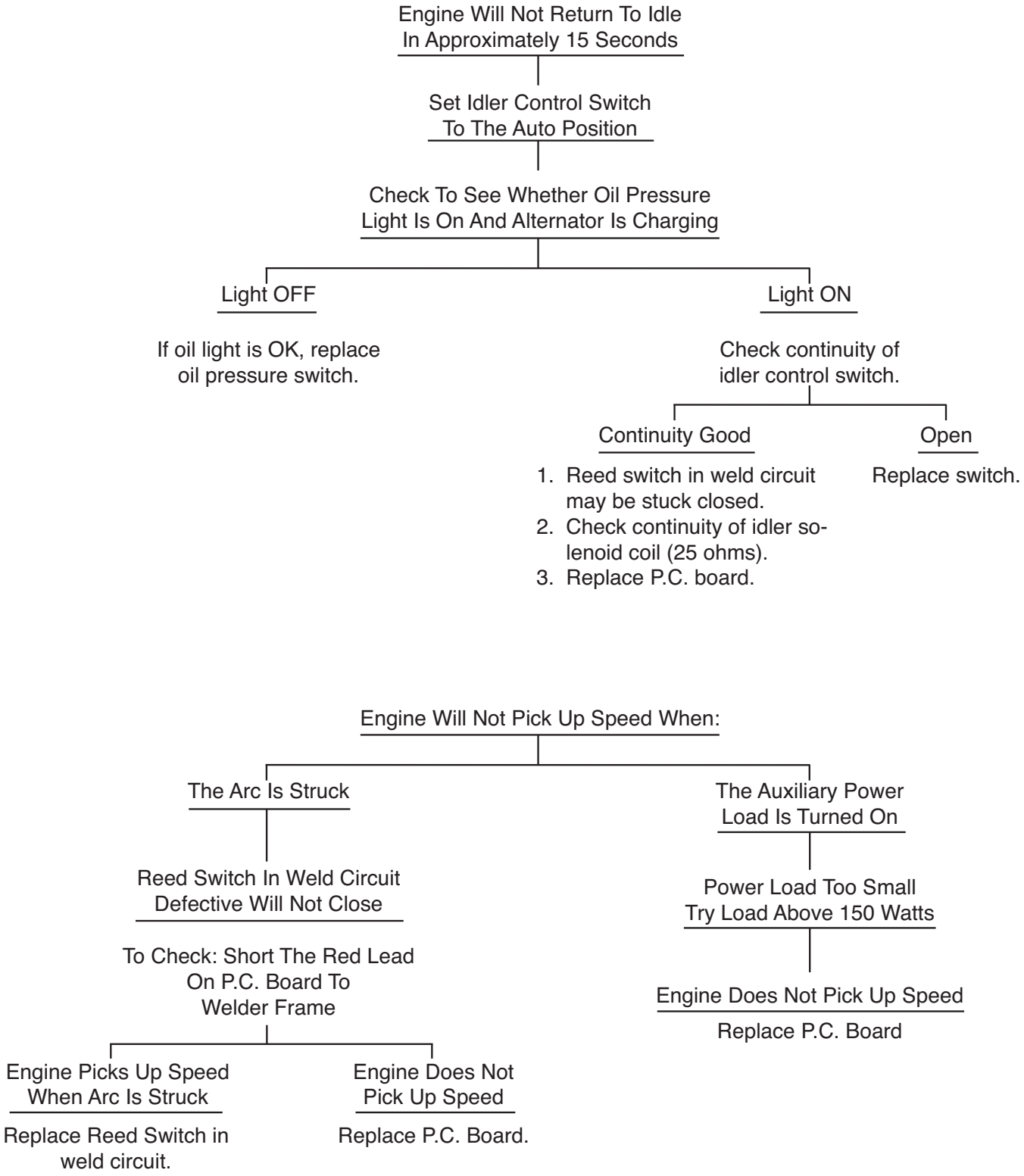
1. Turn the engine OFF.
2. Unlatch and secure the right side door.
3. Locate the idler solenoid and the two leads with quick connects. See Figure F.5.
4. Disconnect the two solenoid leads at the quick connection splices.
5. Using the external power supply, apply 12VDC to the idler solenoid leads. The 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.

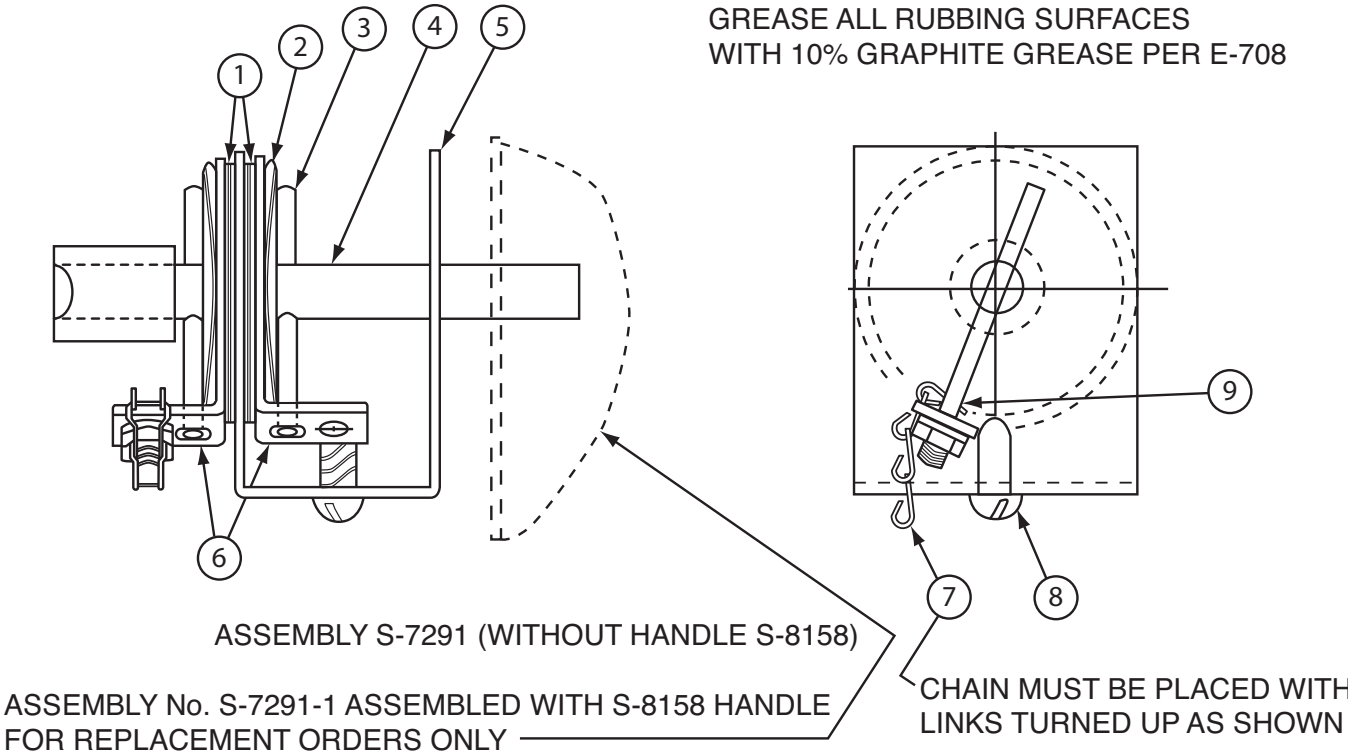
IDLER SOLENOID TEST (continued)

FIGURE F.6 – IDLER SOLENOID FLOWCHART CODE: 7276 & ABOVE



IDLER SOLENOID TEST (continued)

FIGURE F.7 – MANUAL SPEED CONTROL CODES 215-1122 STD. FBS EXCITER ONLY



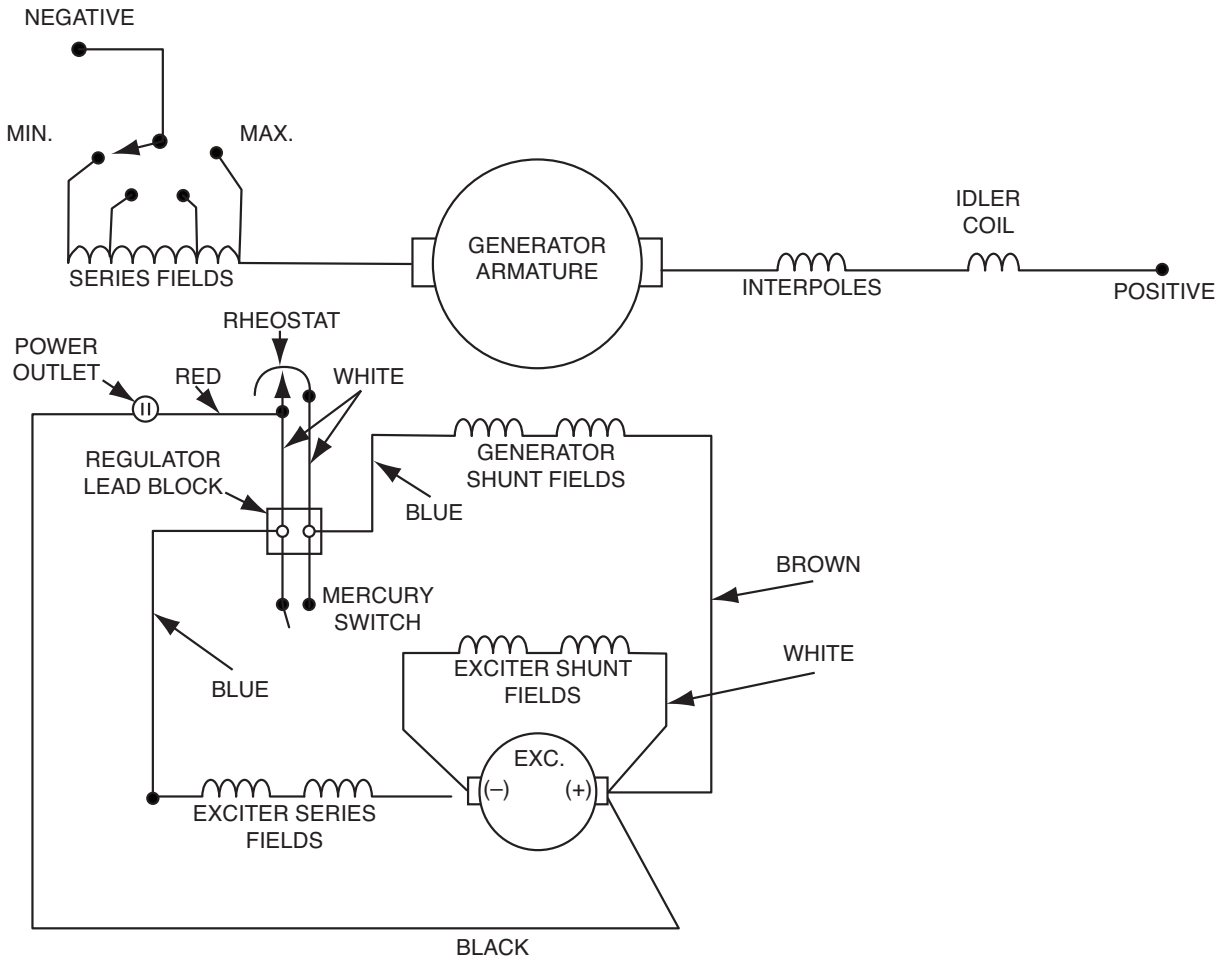
ITEM	DESCRIPTION	QTY.
1	T-8431	2
2	T-8095	2
3	1/8 X 1 3/4 TYPE #3 GROOV-PIN	2
4	T-8432	1
5	S-7292	1

ITEM	DESCRIPTION	QTY.
6	T-8430	2
7	T-8667	52”
8	S-8025-10	1
9	#10-24 X 3/8 R.H. MACH. SCR. NUT & LOCKWASHER	1

CODE 215-1

IDLER SOLENOID TEST (continued)

FIGURE F.8 – R51 BELLOWS IDLER CODE 445-3312 FBS OVERSIZE EXCITER ONLY



Watch connections on regulator lead block make sure rheostat is not in series with power outlet receptacle.

IDLER SOLENOID TEST (continued)

R57 Vacuum Code 3417 - 7242

R-51 Bellows Code 445-3312 @ FDW oversize exciter only.

TROUBLE SHOOTING AND MAINTENANCE – R51 AND R57 IDLERS

The idler has been carefully set and calibrated at the factory and should require a minimum of maintenance. When the idler "does not work" it either (1) does not slow the engine down after welding has stopped or (2) it does not permit the engine to pick up speed when the arc is struck.

There are two simple checks and adjustments that can easily be made and which will take care of practically all idlers that fail to operate. Be sure these checks are made and follow these instructions before tampering with the internal parts of the idler.

1. If the idler does not reduce engine speed about 10 seconds after the welding has stopped:

Loosen the sealing nut on the petcock (***item 11, Figure F.9***). Turn the adjusting screw counterclockwise to speed up the operation of idler until the time delay is about 10 seconds. Do not try and reduce the time delay to less than 8 seconds as this may prevent the engine from coming up to full speed when the arc is struck. Retighten the sealing nut while holding the adjusting screw at the desired setting. When tightening the sealing nut be sure that it is just snug. This should enable you to make future adjustments without loosening the sealing nut.

2. If the engine fails to pick up speed when the arc is struck:

The engine may be idling too slowly to provide the minimum required solenoid voltage. All Lincoln water cooled gas engine driven welders equipped with R51 and R57 idlers should idle at 1000 RPM.

Adjust idle speed if necessary with idle speed adjusting screw on carburetor.

If either of the above mentioned adjustments do not correct the difficulty, then the following procedures can serve as a guide in finding the source of trouble.

Trouble: Idler does not slow down engine

1. Adjust petcock per above instructions.
2. If the petcock is open but the idler still does not slow down the engine, then there is a leak in the vacuum system which prevents the vacuum from being applied to the diaphragm.

Sources of leaks are as follows:

a. Broken or cracked vacuum line or fittings.

b. Leaky diaphragm (***item 2, Figure F.9***).

c. Needle valve (***item 6, Figure F.9***) is not sealing. This can be caused by one of the following troubles:

1. Dirt is preventing valve from sealing.
2. The core and cap assembly (***item 8, Figure F.9***) is not pushing the needle valve closed. This will occur if the core spring (***item 9, Figure F.9***) is missing or if the residual magnetism in the solenoid is holding the core and cap assembly down. The residual magnetism will hold the core and cap assembly down if the spacer (***item 12, Figure F.9***) is missing. Late model idlers have a piece of plastic permanently inserted in the solenoid to act as a spacer while older idlers have a removable bronze disc. If there is a question as to whether there is a spacer in the solenoid a bronze disc, Part No. T-10172 can be added with no bad affect.

Trouble: Engine does not pick up speed when arc is struck

1. Check engine idle speed per above instructions.
2. Check to see if solenoid is pulling in when arc is struck. This can be done by lifting the rubber seal (***item 10, Figure F.9***) and seeing if the core and cap assembly moves down when the arc is struck.

a. If the solenoid is pulling in:

(1) Needle valve may be sticking closed. This will occur if there is not the proper spring (***item 7, Figure F.9***) in the valve.

b. If the solenoid is not pulling in:

Check the voltage across the solenoid coil when the arc is struck:

(1) If there is no voltage or insufficient voltage then there is an open in the connections or the connections were improperly made.

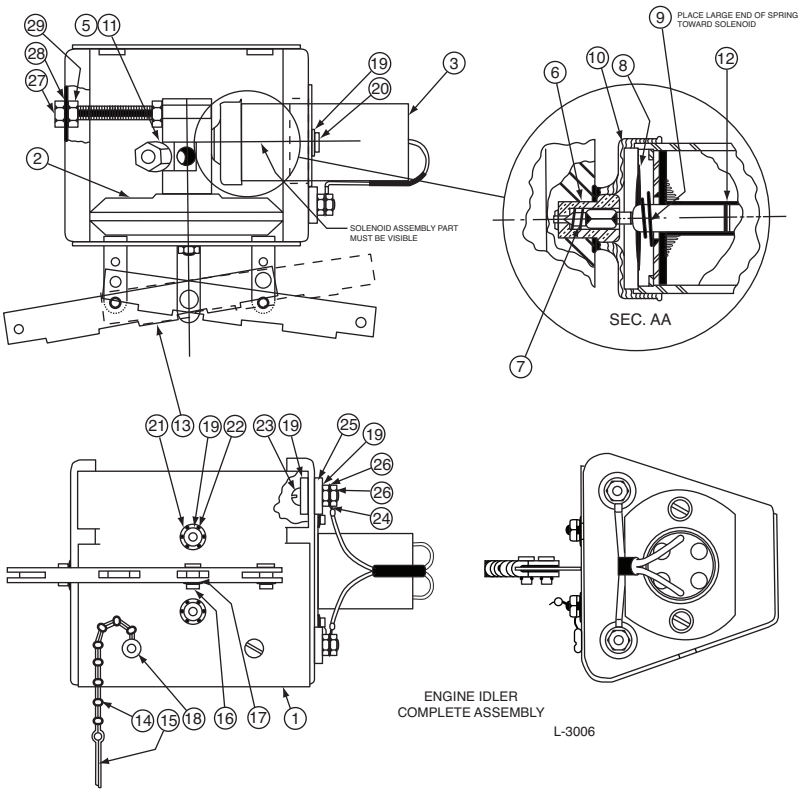
IDLER SOLENOID TEST (continued)

TROUBLE SHOOTING AND MAINTENANCE – R51 AND R57 IDLERS

(2) If there is voltage on the coil but it is still not pulling in, then the coil may either be burned out or the air gap between the core and cap assembly and the valve stem may be excessive. This air gap can be checked by lifting the edge of the rubber dust cap and inserting a feeler gauge between the core and cap assembly and the valve stem. The air gap should be between .018 and .022 and can be adjusted with adjusting screw (item 27, Figure F.9) and the locking nuts (item 29, Figure F.9).

Another trouble sometimes occurring in engines using idling devices is a stalling of the engine when the throttle is suddenly opened up. This will sometimes occur when the engine is not thoroughly warmed up. Also the carburetor may be set too lean or the accelerating pump in the carburetor may not be functioning properly.

FIGURE F.9 – IDLER TROUBLESHOOTING



Item	Part No.	Description	Qty
1	L-2946	CASE ASSEMBLY	1
2	SEE TABLE		1
3	SEE TABLE		1
4			
5	SEE TABLE		As Req'd
6	T-9746	FLOAT VALVE ASSBLY	1
7	T-9747	FLOAT SPRING	1
8	T-10454	CORE & CAP ASSEMBLY	1
9	T-9750	CORE SPRING	1
10	T-9732	DUST SEAL	1
11	SEE TABLE		1
12	T-10172	SPACER	1
13	S-8939	CONTROL LEVER	1
14	T-10122	CHAIN	1
15	S-10750-1	LATCHING PIN	1
16	T-9751-1	PIVOT PIN	2
17	T-9744	SPRING CUP	2
18	HEX. NUT	#10-24	1
19	S-9262-27	FLAT WASHER	8
20	S-8025-13	SELF TAPPING SCREW	2
21	E-106-A-1	LOCKWASHER	2
22	HEX. NUT	#10-24	2
23	T-10082-5	SEMS SCREW	2
24	T-4185-16	INSULATING BUSHING	2
25	S-10773-14	INSULATING WASHER	4
26	HEX. NUT	#10-24 STEEL NUT COPPER PLATED	4
27	HEX. HEAD CAP SCREW	1/4 - 20 X 2 1/2 (FULL THREAD)	1
28	S-9268-23	FLAT WASHER	1
29	HEX. NUT	1/4 - 20	2

L-3006-C	.50 TO .65 PULL IN VOLTS	S-9258-2	S-8951-A		S-10725-2	L-3006-A
L-3006-B	.30 TO .38 PULL IN VOLTS	S-9258-2	S-8951-B		S-10725-2	
L-3006-A	.50 TO .65 PULL IN VOLTS	S-3256-1	S-8951-A	S-10773-3	S-10725-1	
Part #	Type	2. Diaphragm Assembly	3. Solenoid Assembly	5. Gasket	11. Petcock	Supercedes

NOTES

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

MAIN GENERATOR SHUNT FIELD WINDING TEST

⚠ WARNING

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

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

TEST DESCRIPTION

This test will help determine whether or not the Main Shunt Field Coils are shorted, open, or grounded.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
Wiring Diagram

Return to Section TOC
Return to Master TOC

MAIN GENERATOR SHUNT FIELD WINDING TEST (continued)

PROCEDURE

1. Locate the blue and brown leads emerging from the welder lead block at the top of the main generating housing (On SA200 Short hood code 445-3312, the blue lead is connected to R51).
2. Open the Shunt lead to the SERIES EXCITER connection.
3. Ohm between the Shunt lead and the Shunt field at the mercury switch on the idler.
4. The resistance should be 42 Ohms, and a MINIMUM of 500,000 Ohms from one lead to ground.

On Vacuum Idler and Electronic Idler models above code 3312-

The BLUE lead is connected to the FINE CURRENT CONTROL RHEOSTAT, the Brown lead is connected to one side of the 115 VDC receptacle.

(On Electronic Idler models the BROWN and BLACK lead are bolted together; this connection should be unbolted).

Lift the rheostat wiper and place an insulator between the brush and the winding Ohm between the BLUE and BROWN leads.

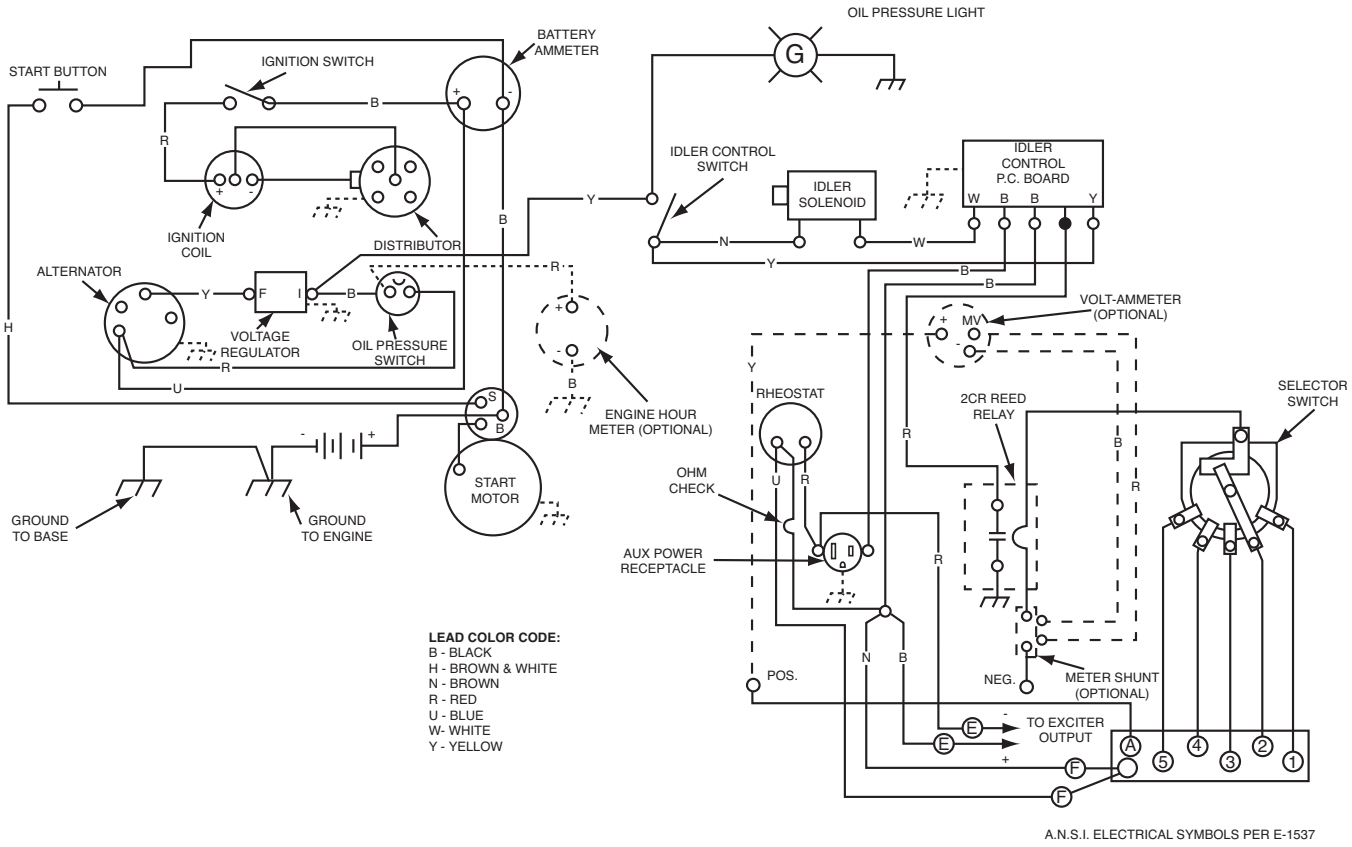
The resistance value @ 75 degrees F should be approximately 42 Ohms. Now Ohm between either lead and a good chassis ground.

The resistance value should be greater than 500,000 Ohms.

See diagrams on next pages.

MAIN GENERATOR SHUNT FIELD WINDING TEST (continued)

FIGURE F.10 – BATTERY IGNITION WIRING DIAGRAM



MAINTENANCE INSTRUCTIONS

Observe operating and maintenance instructions in engine manual. Blow out welders and controls with air hose at least once every two months - once every week in dirty locations.

Brushes should be replaced before the pigtails are within .12" of the commutator or before the limit of spring travel is reached.

Replace with the same kind of brushes as were originally furnished. Sand in brushes according to instructions in the instruction manuals. Commutators may be cleaned with fine sandpaper while the machine running to remove and grease or dirt that has accumulated. **DO NOT USE EMERY CLOTH**.

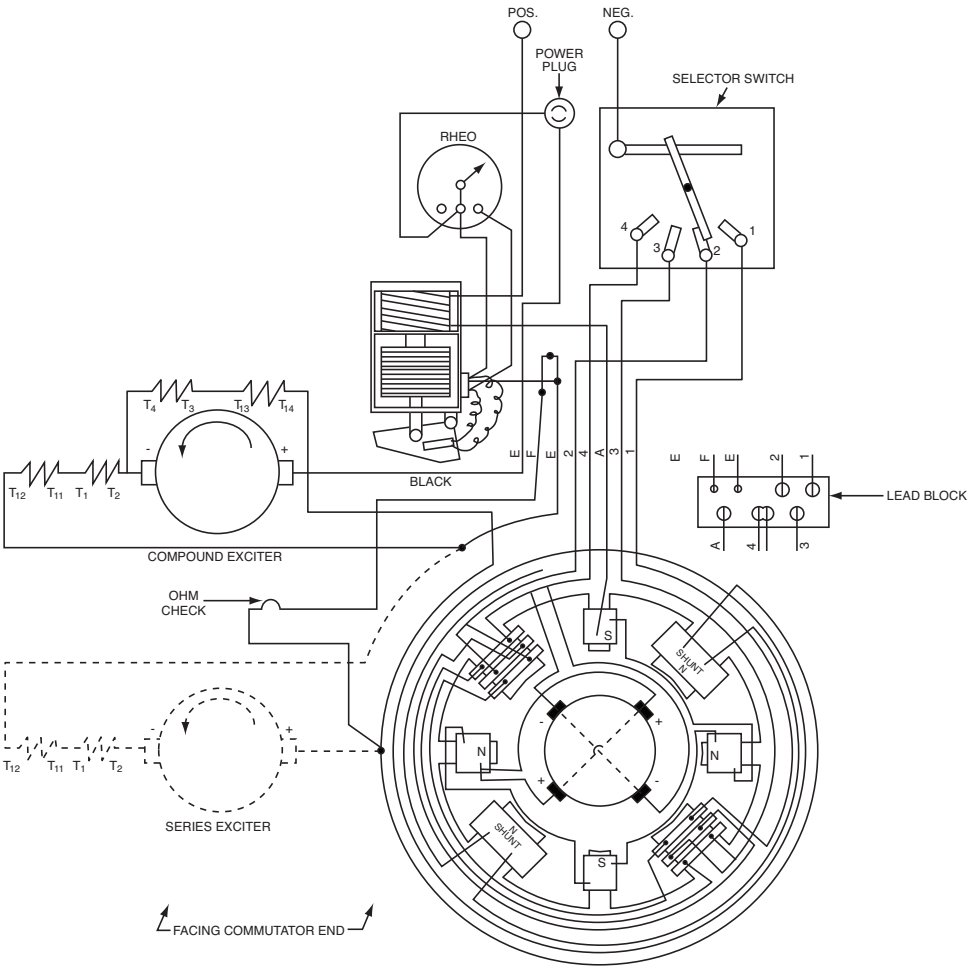
Ball bearings should not be greased more than once a year under normal service. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease, or use of improper kind of grease. **DO NOT OVERPACK WITH GREASE**.

Keep ground and electrode connections tight.

Return to Section TOC
Return to Master TOC

MAIN GENERATOR SHUNT FIELD WINDING TEST (continued)

FIGURE F.11 – ENGINE DRIVEN - TYPE 6090 CODE 445 - 3312



GOVERNOR CONTROL

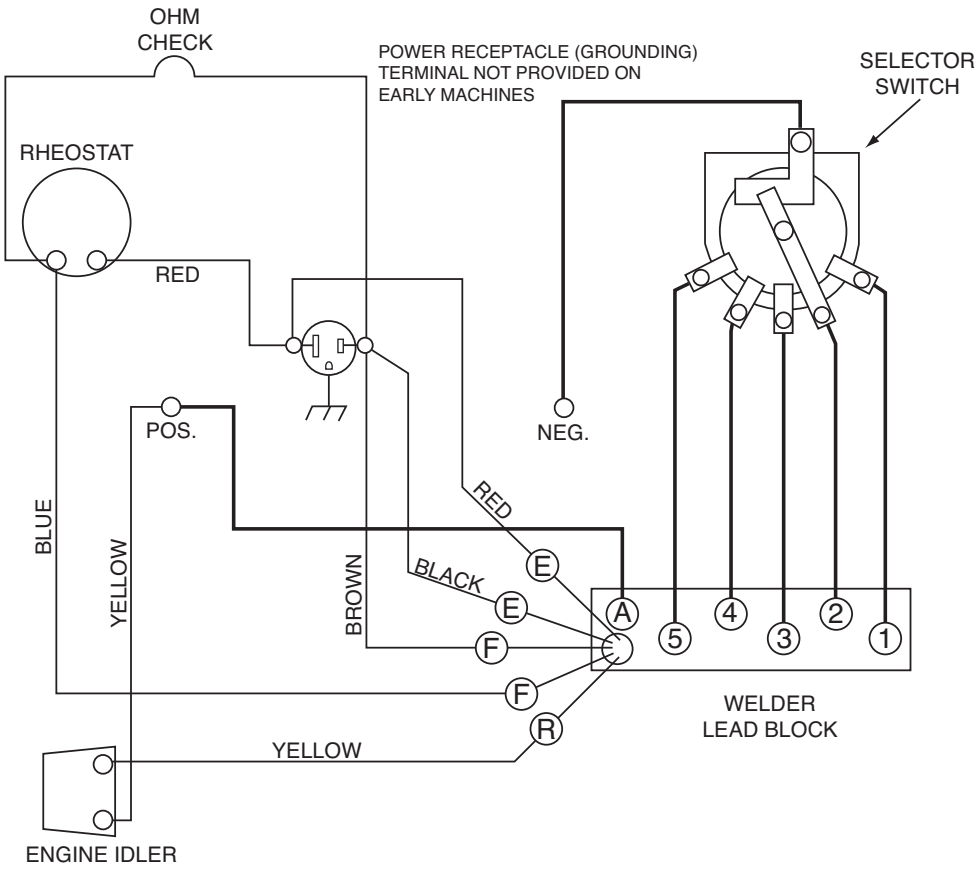
When governor control is used, leads “E” and “F” are brought out of generator through lead block and spliced together as shown by dotted lines.

RHEOSTAT CONTROL

When rheostat control is used, compound exciter and rheostat are wired as shown by solid lines. Leads “E” and “F” are connected to the engine regulator.

MAIN GENERATOR SHUNT FIELD WINDING TEST (continued)

FIGURE F.12 – L-200 FJW, FDW WELDER



NOTE: LIMIT OF ± 1/2° ON ALL ANGLES UNLESS OTHERWISE SPECIFIED.
LIMIT OF ± 1/64 ON ALL FRACTIONAL DIMENIONS UNLESS OTHERWISE SPECIFIED.
LIMIT OF ± .002 ON ALL DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

MAINTENANCE INSTRUCTION

Observe operating instructions in engine manual. Blow out welders and controls with air hose at least once every two months - once every week in dirty locations.

Brushes should be replaced before pigtails are within 1/8" of the commutator or before the limit of spring travel is reached. Replace with the same kind of brushes as were originally furnished. Sand in brushes according to instructions in the instructions manual.

Ball bearings should not be greased more than once a year under normal service - use type recommended in the instruction manual. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease, or use of improper kind of grease. **DO NOT OVERPACK WITH GREASE**.

Commutators may be cleaned with fine sandpaper while the machine is running to remove and grease or dirt that has accumulated, **DO NOT USE EMORY CLOTH**.

Keep ground and electrode connections tight.

Return to Section TOC
Return to Master TOC

NOTES

F-32

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

FLASHING THE FIELDS

⚠ WARNING

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

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

TEST DESCRIPTION

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

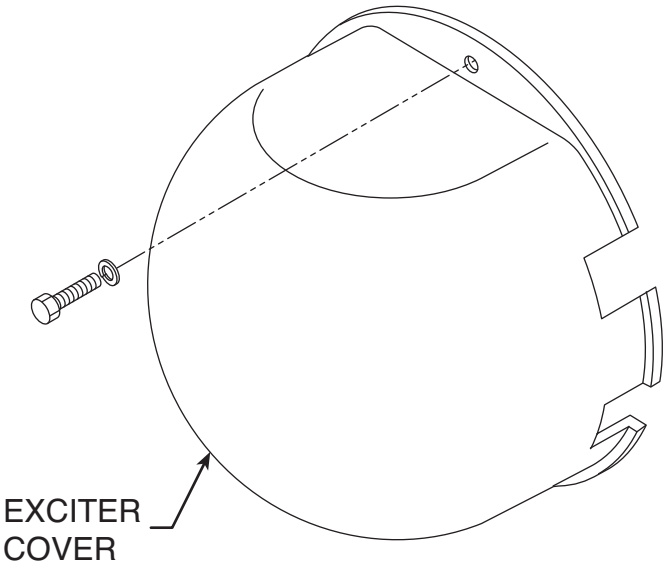
MATERIALS NEEDED

12-Volt Battery
Two Jumper Wires With Alligator Clips On Each End
Wiring Diagram
3/8” Nutdriver

Return to Section TOC
Return to Master TOC

FLASHING THE FIELDS (continued)

FIGURE F.13 – EXCITER COVER REMOVAL

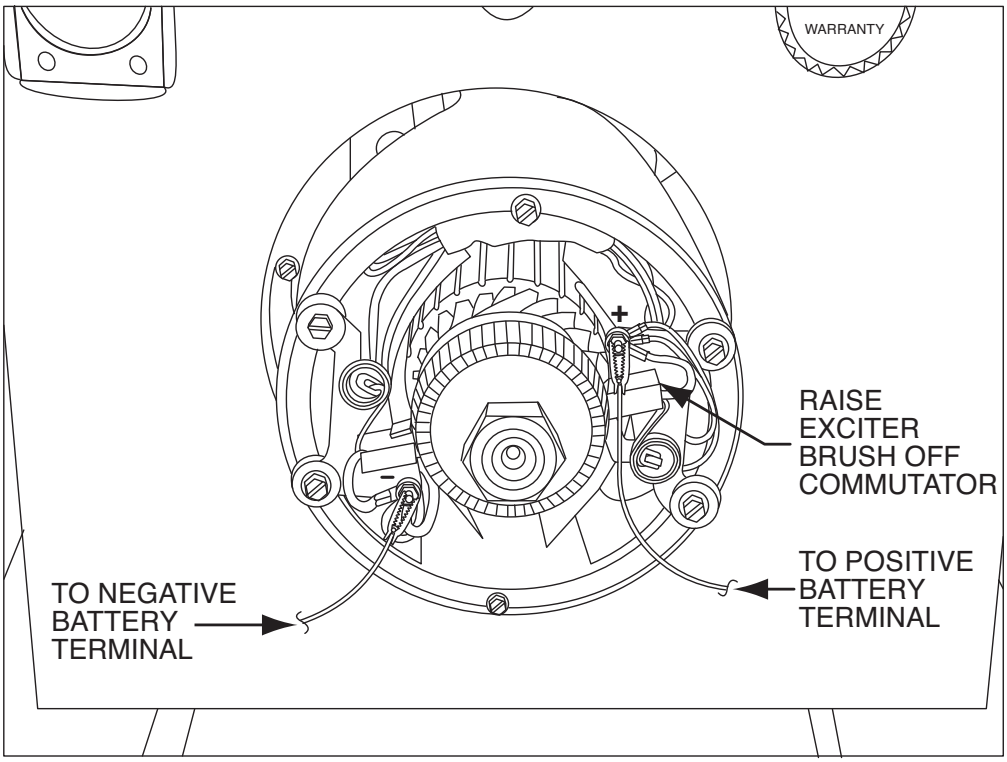


PROCEDURE

1. Turn the engine OFF.
2. Using a 3/8” Nutdriver, remove the exciter cover. See Figure F.13.

FLASHING THE FIELDS (continued)

FIGURE F.14 – 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.14.
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.14.
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” nutdriver.
9. Start the engine. The exciter should produce DC output voltage.

NOTES

F-36

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

RACK ADJUSTMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the adjustment of the Rack.

MATERIALS NEEDED

Flat Screwdriver
7/16” Wrench
Carbon Stone

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

RACK ADJUSTMENT PROCEDURE (continued)

PROCEDURE

1. Connect the SA 200 to a load bank, make sure the engine is adjusted to specifications and the machine is hot.
2. Set the machine for MAXIMUM TAP, Maximum Rheostat.
3. Set grid load for 300 Amps, adjust the rack position to achieve 33-39 Volts at 1440-1500 RPM.

⚠ WARNING

ELECTRIC SHOCK
can kill.

- **Do not operate with panels open.**
- **Disconnect NEGATIVE (-) Battery lead before servicing.**
- **Do not touch electrically live parts.**

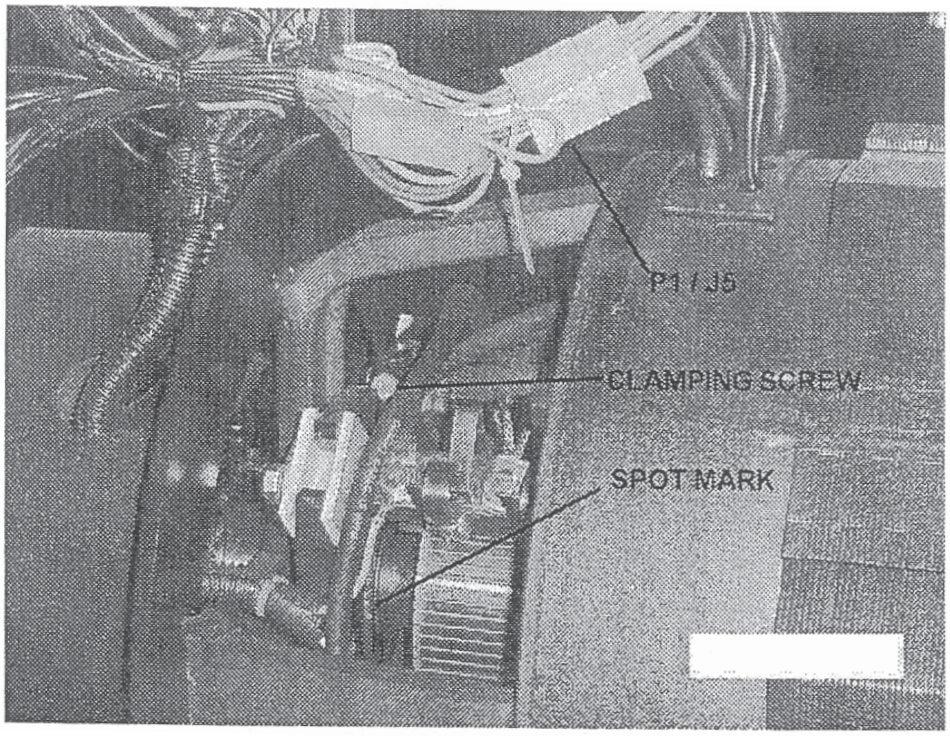
⚠ WARNING

MOVING PARTS
can injure.

- **Keep guards in place.**
- **Keep away from moving parts.**
- **Only qualified personnel should install, use or service this equipment.**

RACK ADJUSTMENT PROCEDURE (continued)

FIGURE F.15 – RACK



INSTRUCTIONS FOR ROTATING THE ROCKER ("RACK")

FOR: CLASSIC 300 D&G, CLASSIC II, SA-250, & SA 200 (Before adjusting the rocker, the machine must be set to factory spec. E3383)

1. With machine not running, remove the generator cover ("Wraparound") by removing the two 1/4-20 RH screws.
2. Disconnect jumper plug "P1" from receptacle "J5". (Ignore on SA-200).
3. Locate the rocker "spot mark". This mark is a 1/8" dia. drill mark that is placed on the rocker where it clamps to the bearing hub on the right side of the machine. (Looking at the nameplate).
4. Loosen the 1/4-20 HH rocker clamping screw approximately one turn. (Clamp screw is located on the right side at the top of the rocker.)
5. Gently rotate the rocker up or down 1/2 diameter of the "spot mark" depending on desired weld characteristics.

   Against Rotation – will give a "HOTTER ARC" (More Fluid)

   With Rotation – will give a "COLDER ARC" (Better Stacking)
6. Re-tighten the rocker clamp screw to 70-75 inch lbs.

NOTE: Rocker must be fully seated against the bearing hub shoulder.

7. Start the machine. Using a 120-150 grit carbon stone, re-seat the generator brushes by moving the stone back and forth over the commutator for approximately 1-2 min.

CAUTION: Do not allow the stone to rub against the armature coils while the machine is running.

8. Turn the machine off. Using compressed air, blow out the carbon dust from generator and armature area. (Turning the engine over with the starter will help in the process.)
9. Replace generator cover and reconnect jumper plug "P1 to J5". (Ignore on SA-200).

IT IS RECOMMENDED THAT AFTER ADJUSTING THE ROCKER, THE MACHINE BE RUN FOR 30-45 MINUTES AT HIGH IDLE / NO LOAD TO ALLOW THE BRUSHES TO COMPLETE THE SEATING PROCESS FOLLOWED BY A TEST WELD TO ENSURE THAT THE DESIRED WELD CHARACTERISTICS WERE ACHIEVED.

Return to Section TOC
Return to Master TOC

RACK ADJUSTMENT PROCEDURE (continued)

FIGURE F.16 – TEST AND INSPECTION

WELDER	MAX. IDLE				MIN. IDLE			MAX. 300 AMPS		200 AMPS		150 AMPS	100 AMPS	MIN. SHORT		ENGINE IDLE RPM	EXCITER		
	D.C. VOLTS	EXC. VOLTS	FIELD AMPS	RPM	D.C. VOLTS	EXC. VOLTS	FIELD AMPS	VOLTS	RPM	VOLTS	RPM	VOLTS	VOLTS	VOLTS	AMPS		AMPS	VOLTS	FIELD AMPS
SA200 F162 FJW 4 TAP	83 / 89	125 / 133	2.35 / 2.65	1490 / 1510	44 / 54	126 / 134	1.05 / 1.30	39 / 45	1300 / 1400	33 / 39	1390 / 1490	21 / 27		1 / 5	105 / 120	950 / 1050	10	123 / 131	.63 / .70
F163 OR C175 L200 FJW-FDW 5 TAP CODE 7699 & LOWER	87 / 93	121 / 129	2.35 / 2.65	1540 / 1560	47 / 57	121 / 129	1.00 / 1.25	35 / 41	1440 / 1500	37 / 43	1475 / 1535	36 / 42	37 / 43	1 / 5	105 / 120	1000 / 1050	10	122 / 130	FDW-5E .63/.70 FDW-5K .78/.85

WELDER	MAX. IDLE				MIN. IDLE			MAX. TAP 300 AMPS			SHORT OUTPUTS				ENGINE IDLE RPM	POWER PLUG EXCITER LOAD		
	O.C. VOLTS	EXC. VOLTS	FIELD AMPS	RPM	O.C. VOLTS	EXC. VOLTS	FIELD AMPS	VOLTS	RPM		200 TAP AMPS	150 TAP AMPS	100 TAP AMPS	MIN. AMPS		AMPS	VOLTS	FIELD AMPS
L200 F163 ABOVE CODE 7700 SA-200	88 / 95	123 / 132	2.35 / 2.65	1540 / 1560	47 / 57	124 / 133	1.00 / 1.25	33 / 39	1440 / 1500		325 / 385	245 / 285	165 / 195	110 / 130	1000 / 1050	15	115* / 125	.79Δ / .87
SA250 D3.152 DIESEL	94 / 100	121 / 130	2.3 / 2.6	1790 / 1810	47 / 57	122 / 130	.95 / 1.20	43 / 49	1700 / 1770		340 / 410	255 / 310	175 / 220	115 / 130	1325 / 1375	15	125** / 134	.85 / .94

* Taken at receptacle after removing generator field ammeter from the circuit (black exciter lead connected directly to right hand exciter brush holder.)

** Taken across exciter brush holders.

Δ Field amps limit for units other than SA-200: .85 / .94

Long Test:

If additional voltage for quick heating of fields is not available, run machine at max. control settings and no load until field current and open circuit voltage stops decreasing. This will take one hour or more. Then at this time short circuit the output terminals at max control settings for 30 seconds. Then proceed with rest of testing.

NOTE: If the welder under test does not fall within the above limits, and in the opinion & experience of the test and the Inspection Department the welder is still passable, a test sheet shall be made out and submitted to the Engineering Department for approval. If the Engineering Department approves the test, the welder may be passed. The serial number of the machine is to appear on the test sheet and the sheet will be filled in the Engineering Department.

Return to Section TOC
Return to Master TOC

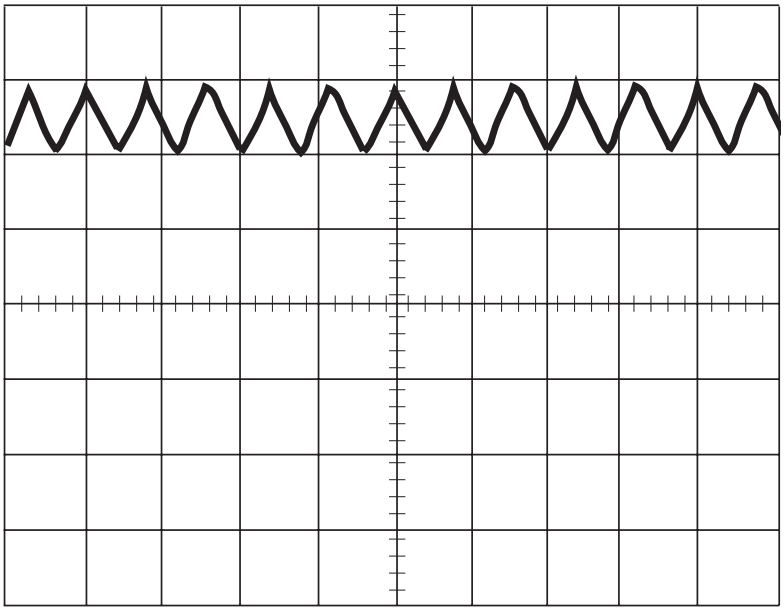
NOTES

F-41

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

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.

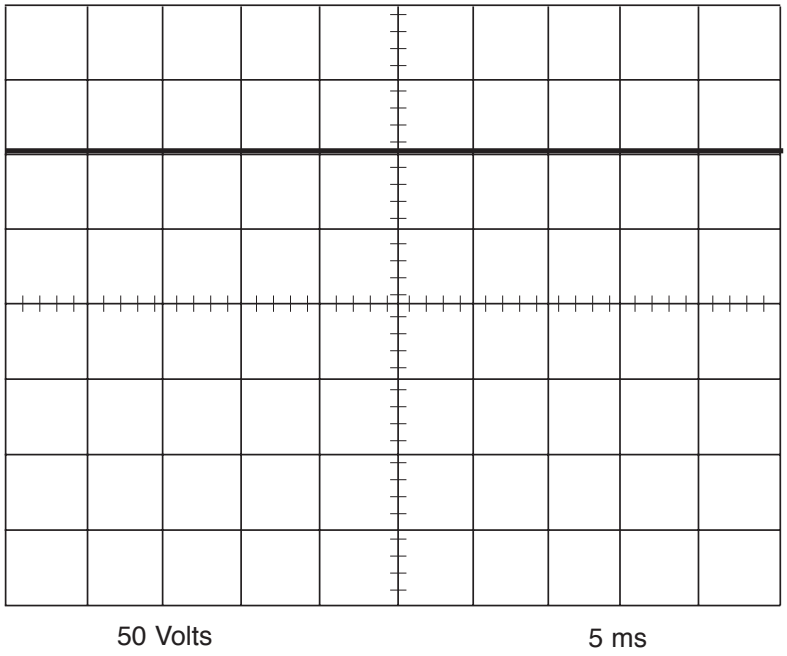
Note: Scope probes connected at machine 115VDC receptacle.

SCOPE SETTINGS

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

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.

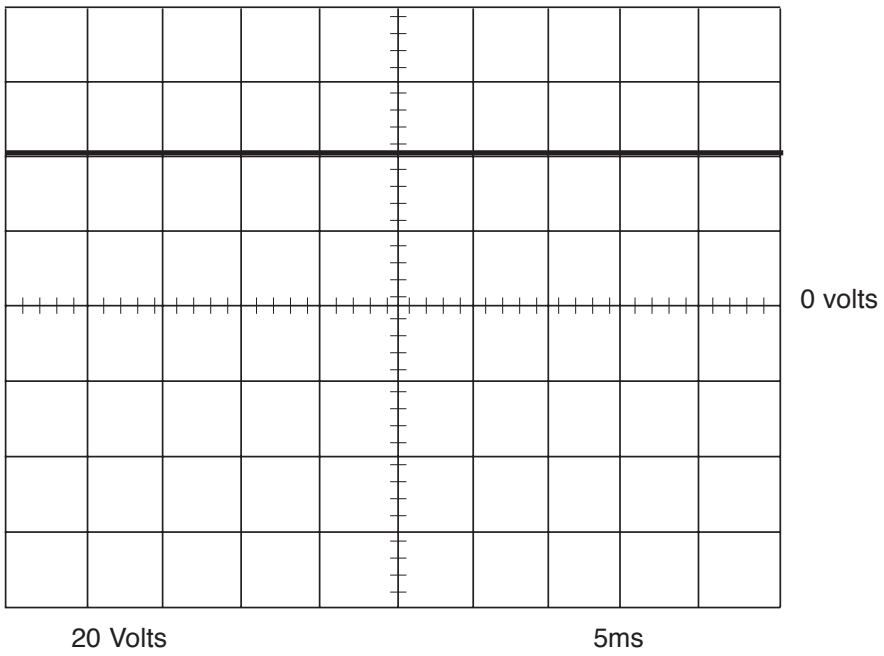
Note: Scope probes connected at machine output terminals.

SCOPE SETTINGS

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

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

Return to Section TOC
Return to Master TOC

DC EXCITER ARMATURE AND FIELD COILS REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Exciter Armature and Field Coils. This procedure is for later production models. Many of the procedures will apply to older models.

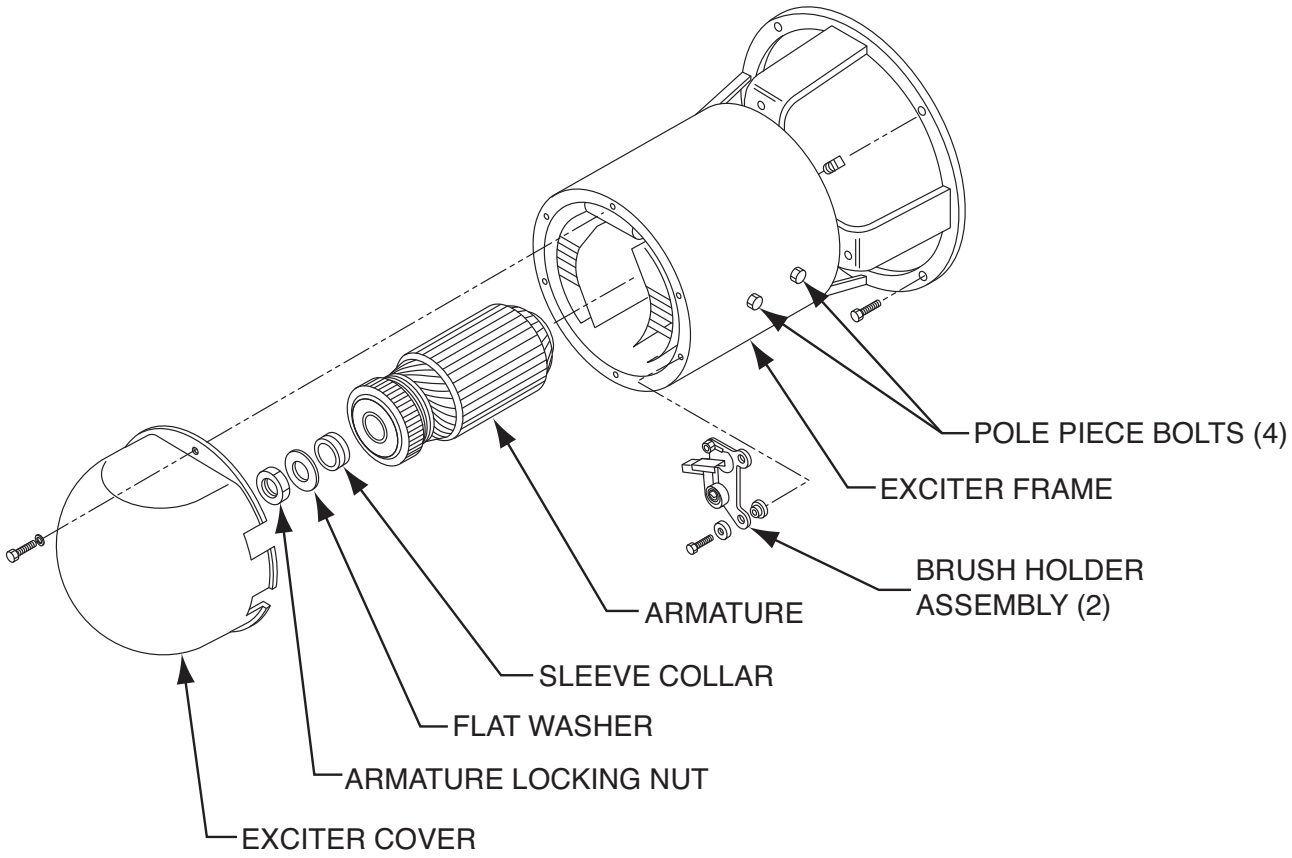
MATERIALS NEEDED

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

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

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

FIGURE F.17 – EXCITER COVER REMOVAL



PROCEDURE

DC Exciter Armature Removal Procedure

1. Turn the engine OFF.
2. Using the 3/8” nutdriver, remove the exciter cover. See Figure F.17.
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.

Return to Section TOC
Return to Master TOC

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

Field Coils Removal Procedure

1. Perform the ***DC Exciter Armature Removal Procedure.***
2. Using the 3/8" wrench, remove the leads from the brush holder. Note lead placement for reassembly.
3. Using the 1/2" wrench, remove the four bolts (two on each side) holding the pole pieces to the exciter frame. ***See Figure F.17.***
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 splices with tape.
10. Assemble the armature and brushes. See the ***DC Exciter Armature Removal Procedure.***

Return to Section TOC
Return to Master TOC

NOTES

F-48

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

MAIN GENERATOR FRAME REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Main DC Generator Frame. This procedure is for later production models. Many of the procedures will apply to older models.

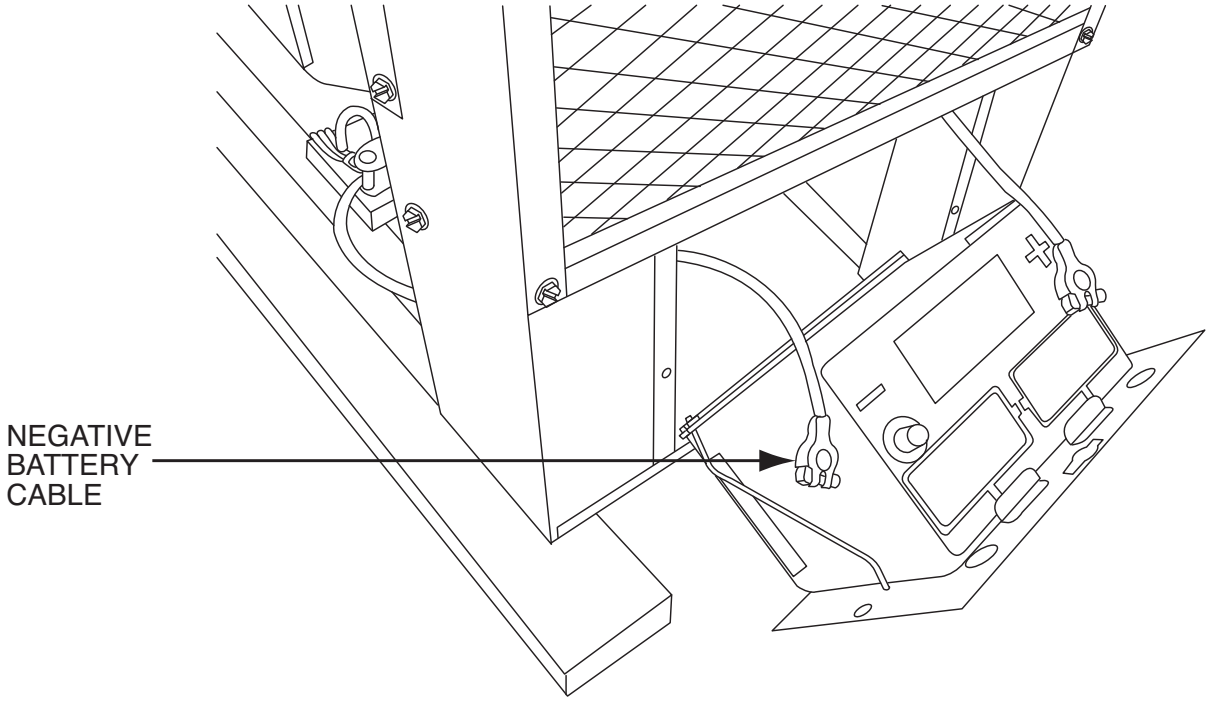
MATERIALS NEEDED

Rope Sling
Wood Or Steel Blocks
Pry Bars
9/16” Wrench
1/2” Wrench
7/16” Wrench
3/4” Wrench
Slot Head Screwdriver
Wiring Diagram

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

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.18 – BATTERY PANEL REMOVAL

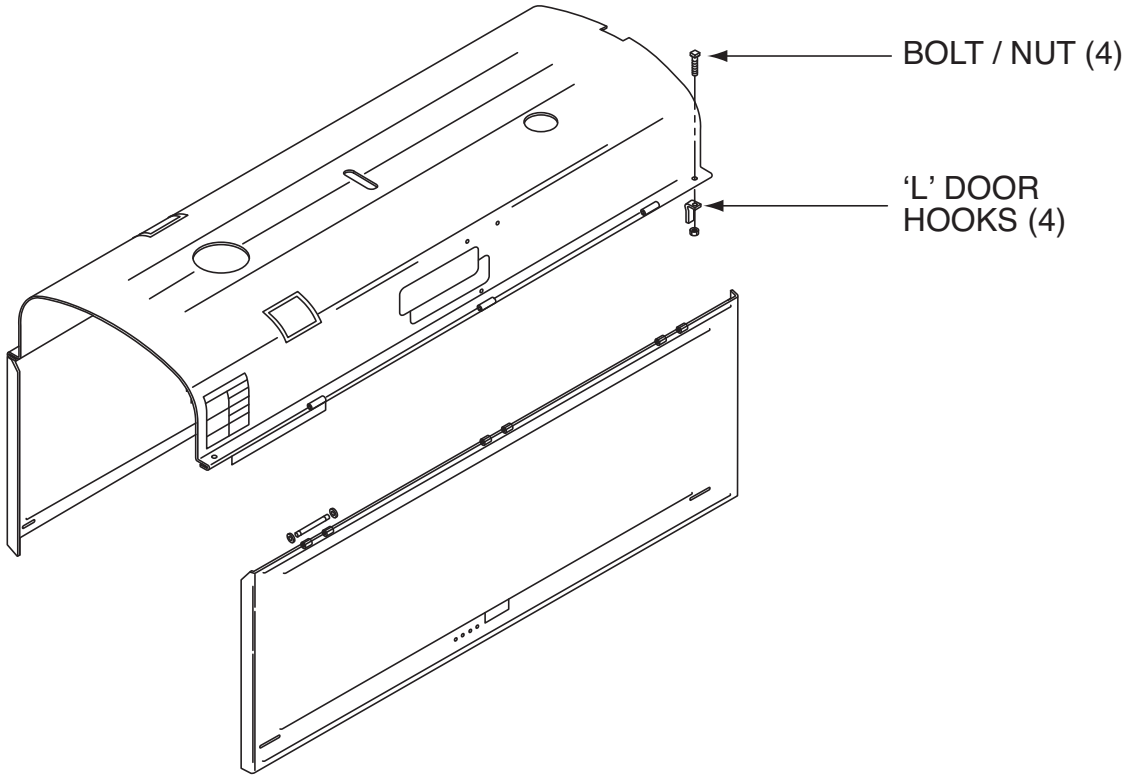


PROCEDURE

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.18.
3. Using the 1/2” wrench, remove the negative battery cable.

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

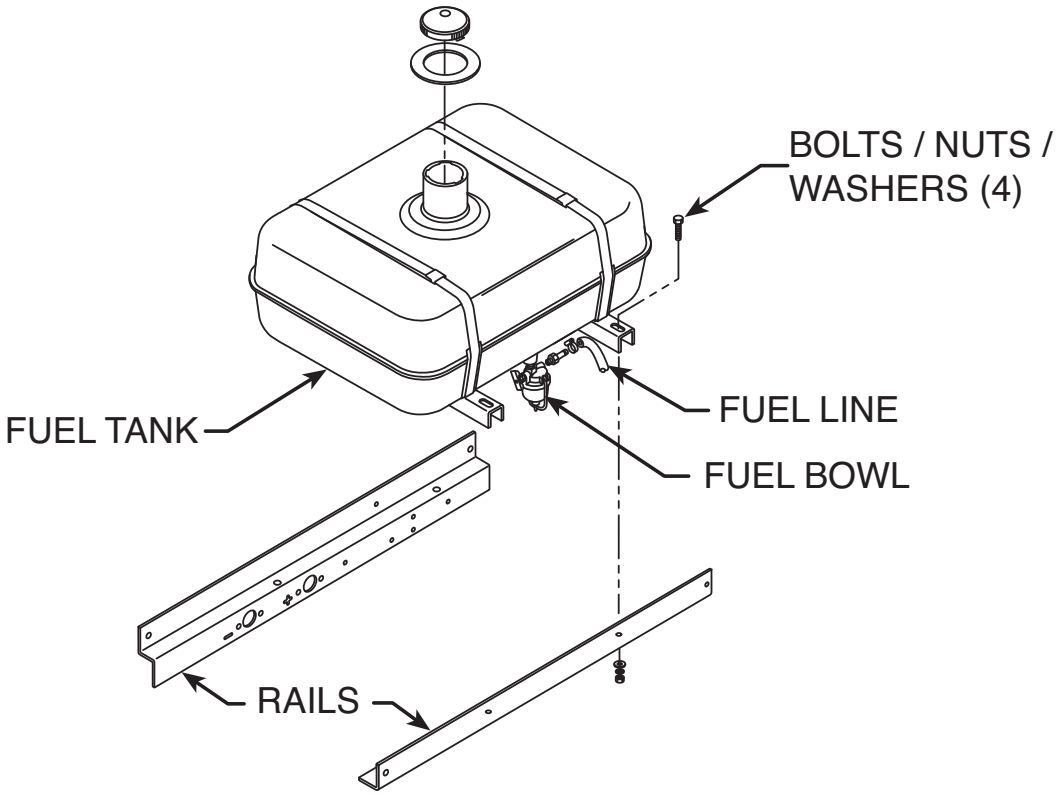
FIGURE F.19 – TOP AND DOORS ASSEMBLY DETAILS



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.19.

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.20 – FUEL TANK MOUNTING DETAILS

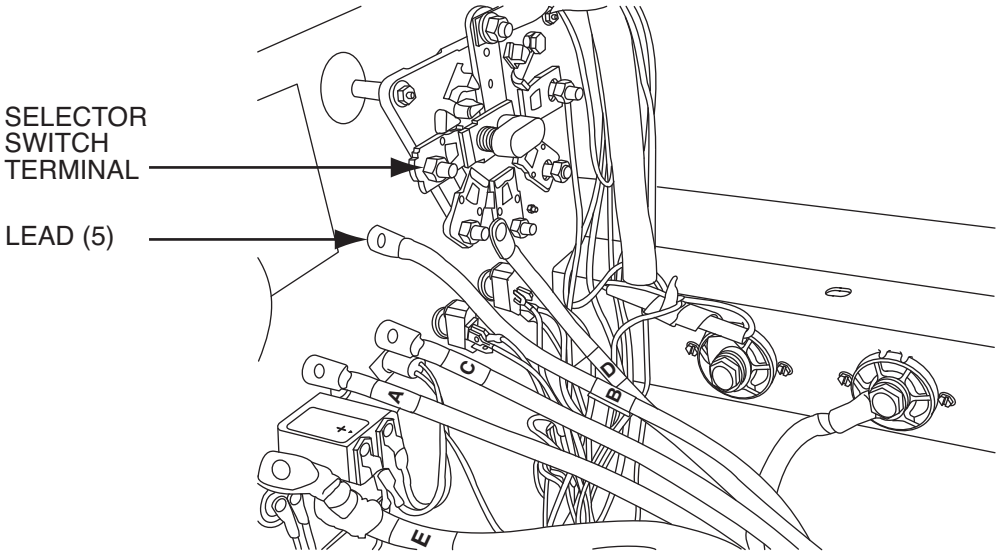


5. Perform the ***DC Exciter Armature Removal Procedure.***
6. Turn off the fuel supply at the fuel bowl and remove the fuel line. Plug the line to avoid spillage.
7. Using the 9/16" wrench, remove the four nuts, bolts, and washers holding the fuel tank assembly to the rails. See Figure F.20.
8. Carefully remove the fuel tank and set it aside in a safe area.

Return to Section TOC
Return to Master TOC

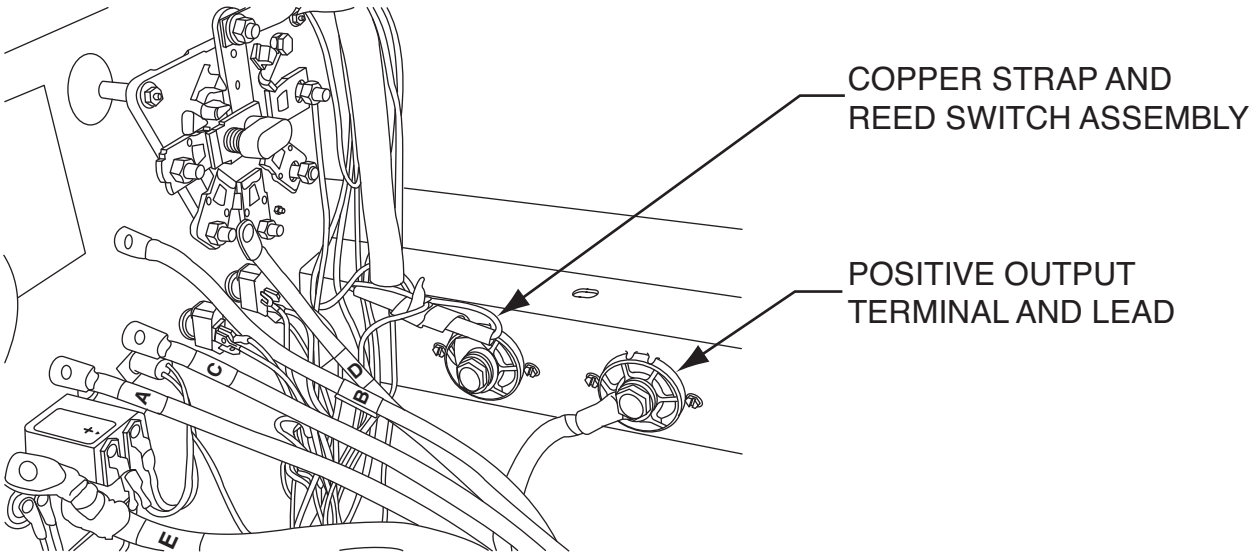
MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.21 – 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.21.

FIGURE F.22 – OUTPUT TERMINAL LEAD REMOVAL

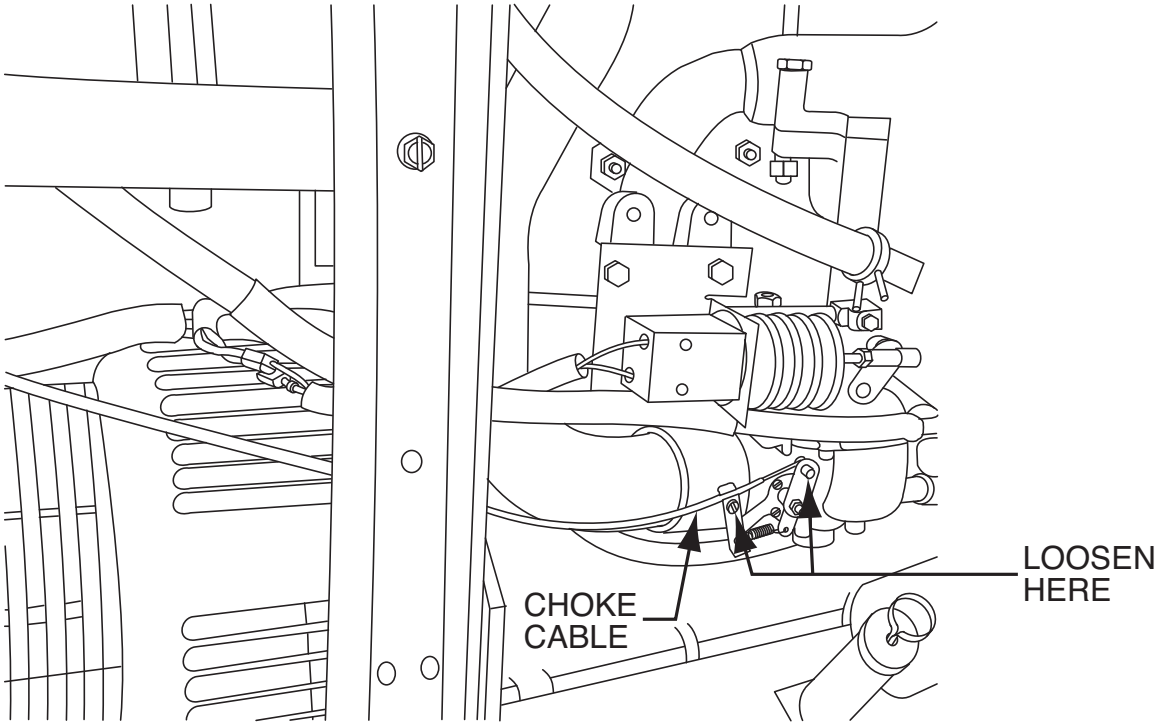


10. Using the 3/4” wrench, remove the copper strap lead and reed switch assembly from the negative output terminal. See Figure F.22.

11. Using the 3/4” wrench, remove the heavy lead from the positive output terminal. See Figure F.22.

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

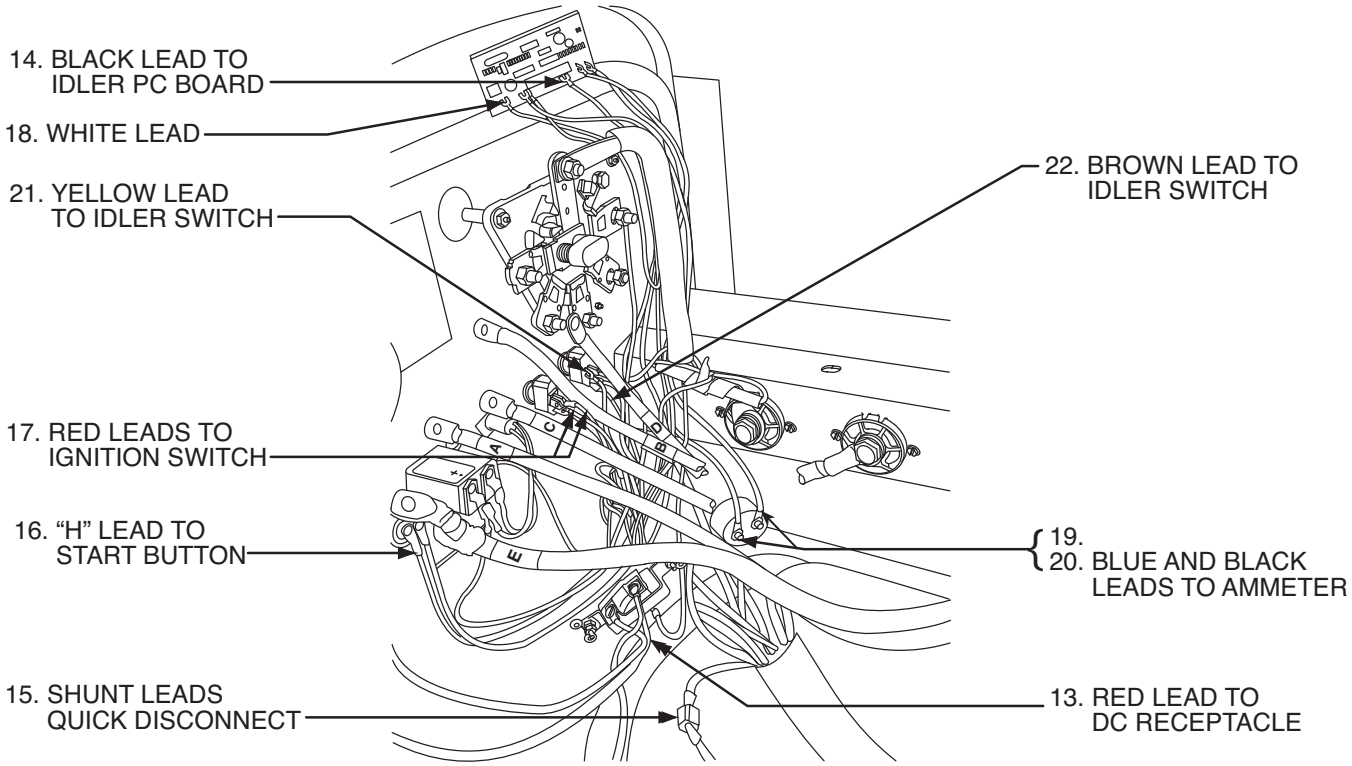
FIGURE F.23 – CHOKE CONTROL CABLE REMOVAL



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.23.

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.24 – FRONT PANEL WIRING CONNECTIONS

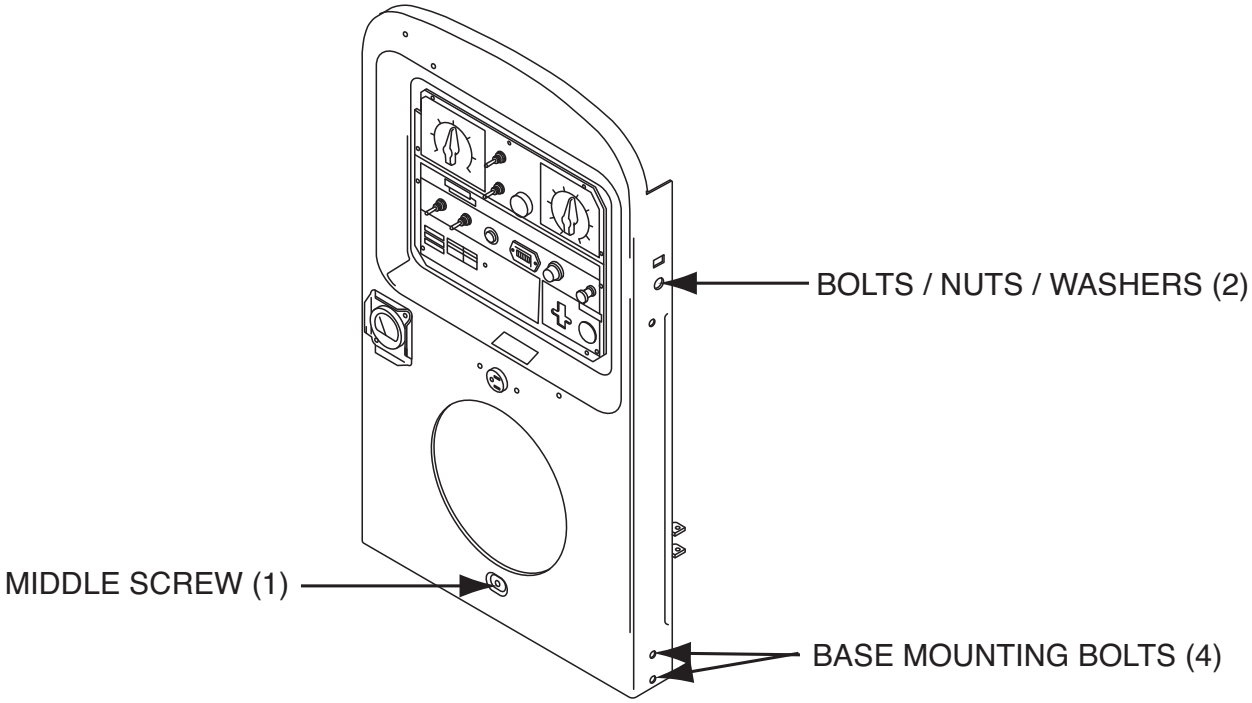


13. Using the slot head screw driver, remove the red lead connecting the 115VDC receptacle to the DC exciter. See Figure F.24 and the Wiring Diagram. Cut any necessary cable ties.
14. Remove the black lead connecting the idler PC board to the DC exciter. See Figure F.24 and the Wiring Diagram. Cut any necessary cable ties.
15. Disconnect the blue and brown main shunt leads from their quick disconnect splices. See the Wiring Diagram.
16. Disconnect the "H" lead from the START button switch. See Figure F.24 and the Wiring Diagram.
17. Remove the two red leads from the ignition switch. Label for reassembly. See Figure F.24 and the Wiring Diagram.
18. Remove the white lead from the idler PC board. See Figure F.24 and the Wiring Diagram.
19. Using the 3/8" nutdriver, remove the blue lead from the ammeter. Label for reassembly. See Figure F.24 and the Wiring Diagram.
20. Using the 3/8" nutdriver, remove the black lead from the ammeter. Label for reassembly. See Figure F.24 and the Wiring Diagram.
21. Label and remove the yellow lead from the idler switch. The yellow lead connects the idler switch to the oil pressure switch. See Figure F.24 and the Wiring Diagram.
22. Label and remove the brown lead from the idler switch. The brown lead connects the idler switch to the idler solenoid. See Figure F.24 and the Wiring Diagram.

Return to Section TOC
Return to Master TOC

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

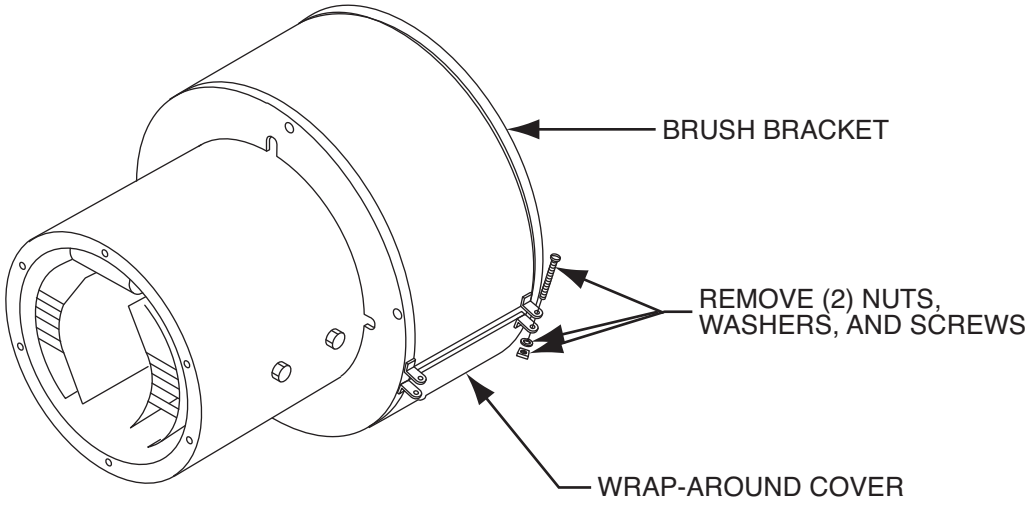
FIGURE F.25 – FRONT PANEL FASTENER REMOVAL



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.25.
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.25.
25. Using the 3/8” nutdriver, remove the screw from the lower middle of the front panel. See Figure F.25.
26. Carefully remove the front panel assembly.

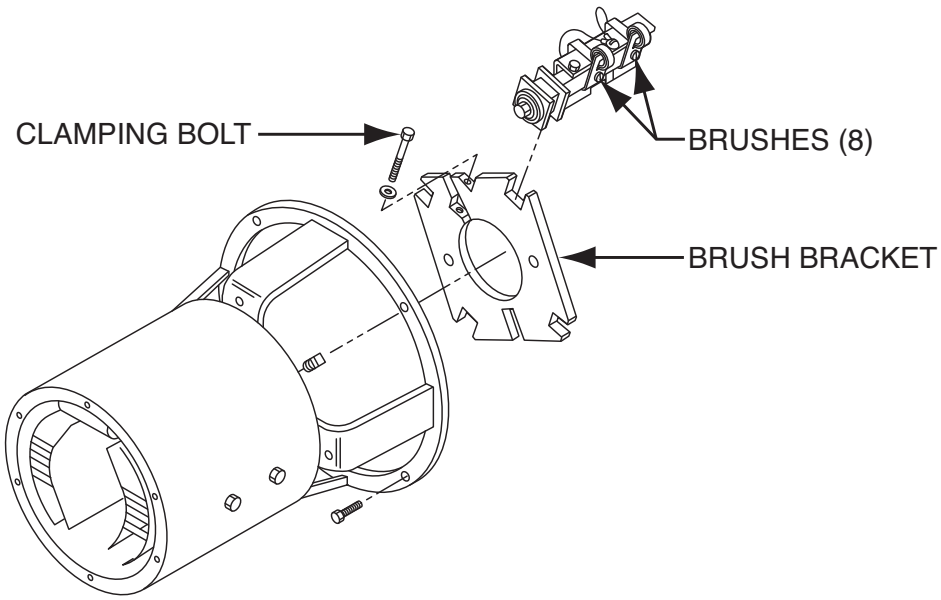
MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.26 – 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.26.

FIGURE F.27 – MAIN GENERATOR BRUSH BRACKET CLAMPING BOLT

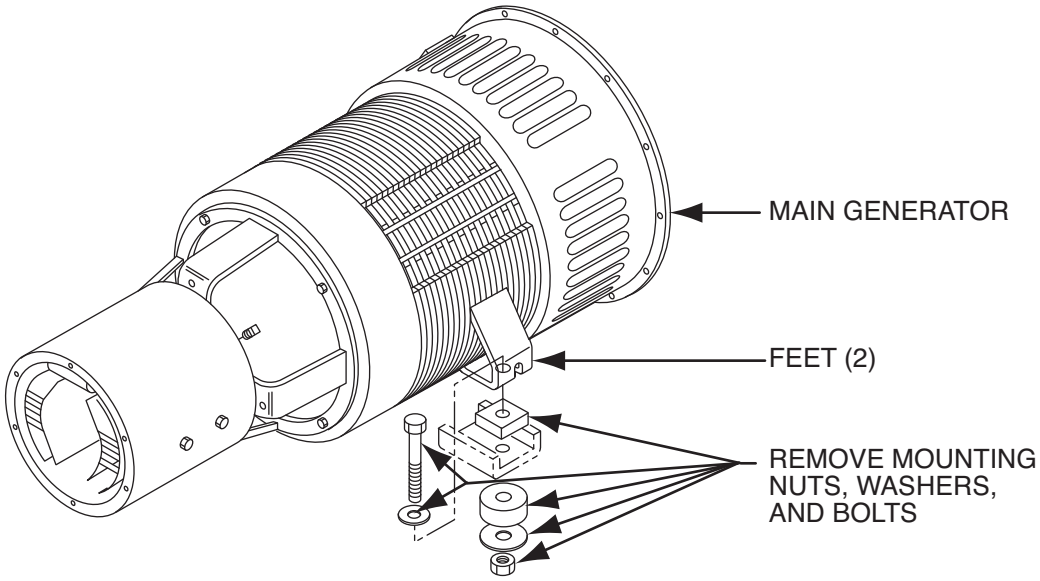


28. Lift the eight brushes from the main commutator. Note their positions for reassembly.

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.27.

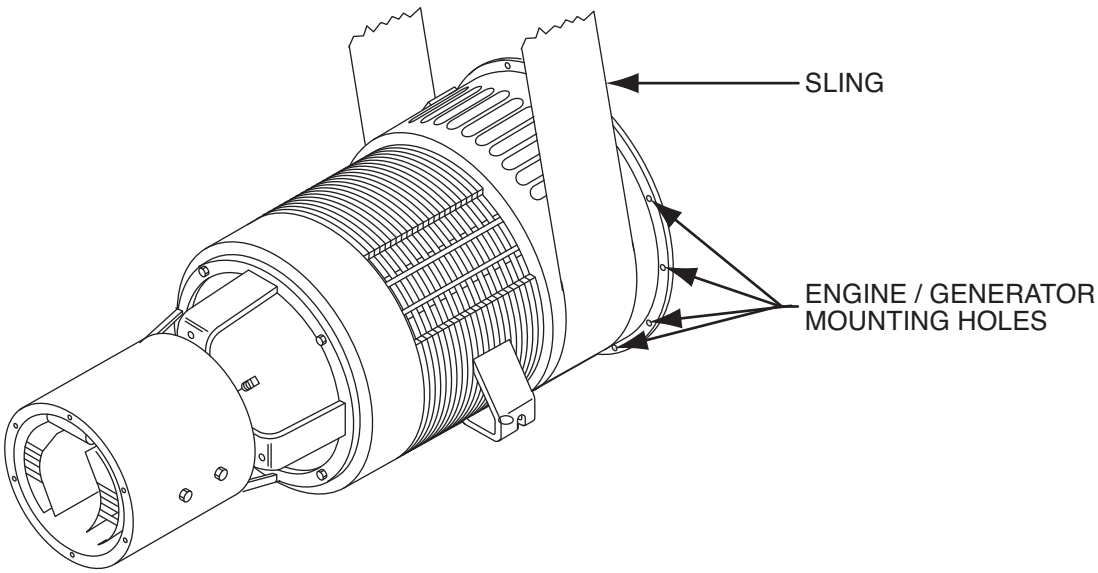
MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

FIGURE F.28 – 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.28.

FIGURE F.29 – 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.29.

32. Using the 9/16” wrench, remove the bolts and lock washers mounting the generator frame to the engine. See Figure F.29.

Return to Section TOC
Return to Master TOC

MAIN GENERATOR FRAME
REMOVAL AND REPLACEMENT (continued)

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

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

Reassembly**:** Refer to ***Figures F.18 - F.29*** 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. of .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" nutdriver, install the screw for the lower middle of the front panel. Using the 9/16" wrench, install the four bolts, nuts, and washers for the bottom of the front panel assembly. Then install the two bolts, nuts, and washers that hold the front panel assembly to the horizontal rails.
7. Using the 3/8" nutdriver, connect the yellow wire from the oil pressure switch and the brown wire from the idler solenoid to the idler switch. Connect the blue wire and the black wire to the ammeter. See the Wiring Diagram.
8. Connect the white wire to the idler PC board. Connect the two red wires to the ignition switch. Connect the "H" lead to the START button switch. Connect the blue and brown main shunt leads at their quick disconnect splices. Connect the black lead between the idler PC board and the DC exciter.
9. Using the slot head screw driver, connect the red lead between the 115VDC receptacle and the DC exciter. Replace any cable ties cut during disassembly.
10. Using the slot head screw driver, install the choke control cable to the engine carburetor assembly, noting placement mark.
11. Using the 3/4" wrench, install the heavy lead to the positive output terminal and the copper strap lead and reed switch assembly to the negative output terminal.
12. Using the 1/2" wrench, install the five heavy flex leads to the selector switch as labeled during disassembly.
13. Carefully position the fuel tank to the mounting rails. Using the 9/16" wrench, install the four nuts, bolts, and washers holding the fuel tank assembly to the rails. Remove the plug from the fuel line and attach it to the fuel bowl.
14. Perform the ***DC Exciter Armature Reassembly Procedure.***
15. Carefully set the top and doors assembly into place. Install the "L" shaped door hooks. Using the 1/2" wrench, install the four nuts and bolts holding the case top and doors assembly to the welder frame. Install the rubber gasket to the top.
16. Using the 1/2" wrench, install the negative battery cable. Slide the battery mounting panel back into place and using the 7/16" wrench, install the two bolts and washers that secure the panel.

NOTES

F-60

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

MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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

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

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Main Generator Armature. This procedure is for later production models. Many of the procedures will apply to older models.

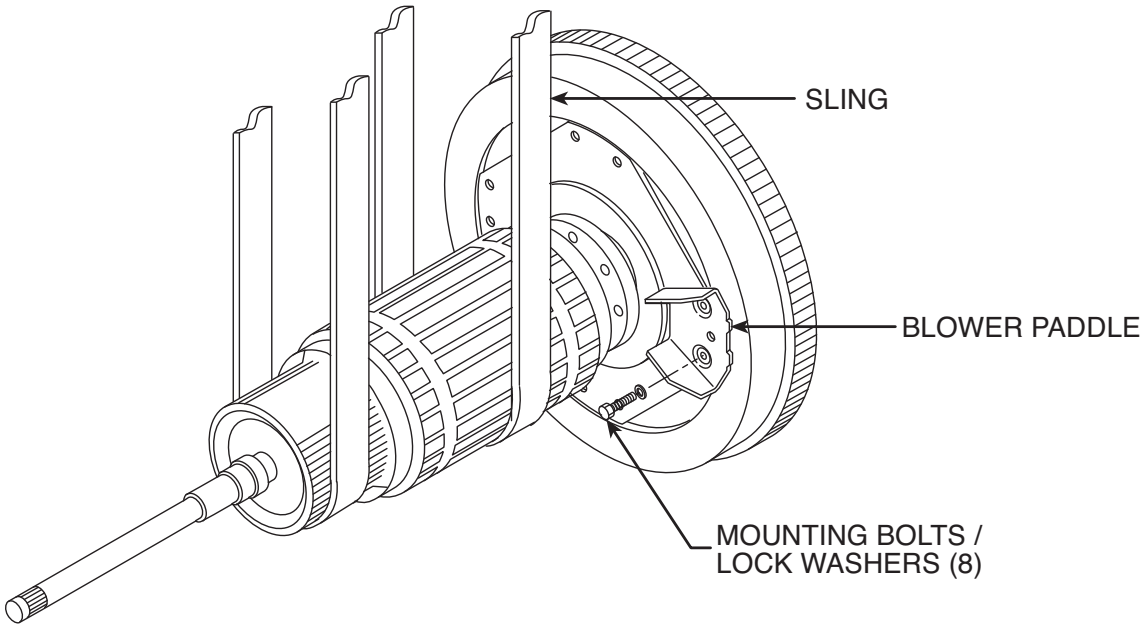
MATERIALS NEEDED

Rope Sling
5/8” Wrench
Wood Or Steel Blocks

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

MAIN GENERATOR ARMATURE REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.30 – 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 is 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.30.
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.30.*

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

Return to Section TOC
Return to Master TOC

RETEST AFTER REPAIR

WELDER	MAX. IDLE				MIN. IDLE			MAX. 300 AMPS		200 AMPS		150 AMPS	100 AMPS	MIN. SHORT		ENGINE IDLE RPM	EXCITER		
	D.C. VOLTS	EXC. VOLTS	FIELD AMPS	RPM	D.C. VOLTS	EXC. VOLTS	FIELD AMPS	VOLTS	RPM	VOLTS	RPM	VOLTS	VOLTS	VOLTS	AMPS		AMPS	VOLTS	FIELD AMPS
SA200 F162 FJW 4 TAP	83 / 89	125 / 133	2.35 / 2.65	1490 / 1510	44 / 54	126 / 134	1.05 / 1.30	39 / 45	1300 / 1400	33 / 39	1390 / 1490	21 / 27		1 / 5	105 / 120	950 / 1050	10	123 / 131	.63 / .70
F163 OR C175 L200 FJW-FDW 5 TAP CODE 7699 & LOWER	87 / 93	121 / 129	2.35 / 2.65	1540 / 1560	47 / 57	121 / 129	1.00 / 1.25	35 / 41	1440 / 1500	37 / 43	1475 / 1535	36 / 42	37 / 43	1 / 5	105 / 120	1000 / 1050	10	122 / 130	FDW-5E .63/.70 FDW-5K .78/.85

WELDER	MAX. IDLE				MIN. IDLE			MAX. TAP 300 AMPS			SHORT OUTPUTS				ENGINE IDLE RPM	POWER PLUG EXCITER LOAD		
	O.C. VOLTS	EXC. VOLTS	FIELD AMPS	RPM	O.C. VOLTS	EXC. VOLTS	FIELD AMPS	VOLTS	RPM		200 TAP AMPS	150 TAP AMPS	100 TAP AMPS	MIN. AMPS		AMPS	VOLTS	FIELD AMPS
L200 F163 ABOVE CODE 7700 SA-200	88 / 95	123 / 132	2.35 / 2.65	1540 / 1560	47 / 57	124 / 133	1.00 / 1.25	33 / 39	1440 / 1500		325 / 385	245 / 285	165 / 195	110 / 130	1000 / 1050	15	115* / 125	.79 Δ / .87
SA250 D3.152 DIESEL	94 / 100	121 / 130	2.3 / 2.6	1790 / 1810	47 / 57	122 / 130	.95 / 1.20	43 / 49	1700 / 1770		340 / 410	255 / 310	175 / 220	115 / 130	1325 / 1375	15	125** / 134	.85 / .94

* Taken at receptacle after removing generator field ammeter from the circuit (black exciter lead connected directly to right hand exciter brush holder.)

** Taken across exciter brush holders.

Δ Field amps limit for units other than SA--200: $\frac{.85}{.94}$

Long Test:

If additional voltage for quick heating of fields is not available, run machine at max. control settings and no load until field current and open circuit voltage stops decreasing. This will take one hour or more. Then at this time short circuit the output terminals at max control settings for 30 seconds. Then proceed with rest of testing.

NOTE: If the welder under test does not fall within the above limits, and in the opinion & experience of the test and the Inspection Department the welder is still passable, a test sheet shall be made out and submitted to the Engineering Department for approval. If the Engineering Department approves the test, the welder may be passed. The serial number of the machine is to appear on the test sheet and the sheet will be filled in the Engineering Department.

Return to Section TOC
Return to Master TOC

NOTES

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

TABLE OF CONTENTS - DIAGRAM SECTION

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

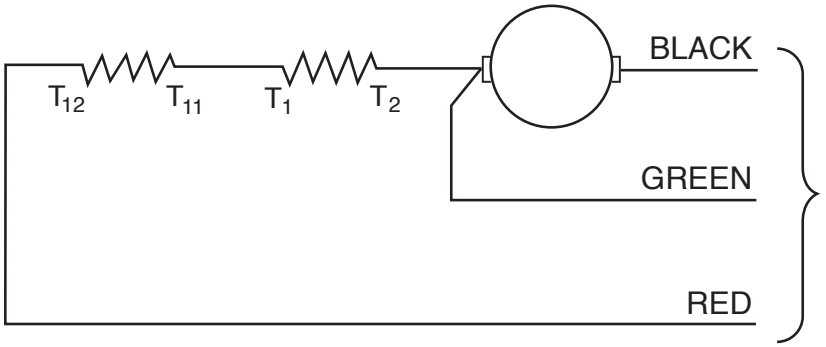
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CODES
215 - 3312
(Short Hood, Std. Exciter, Oversize Opt.)

STANDARD SPECIFICATIONS
FOR
MANUFACTURING

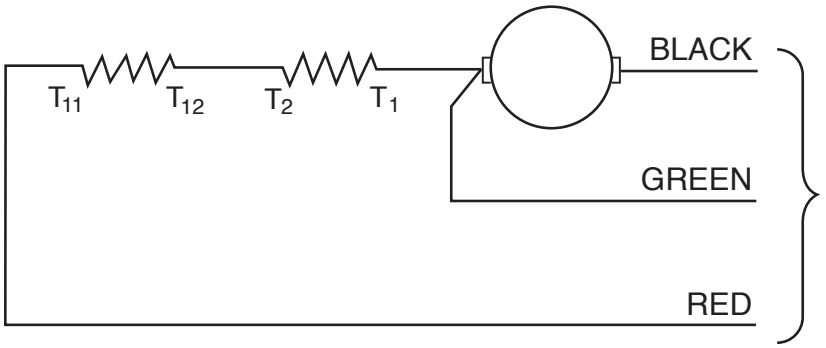
EXCITER WIRING DIAGRAMS

COUNTER CLOCKWISE ROTATION FACING EXCITER COMMUTATOR



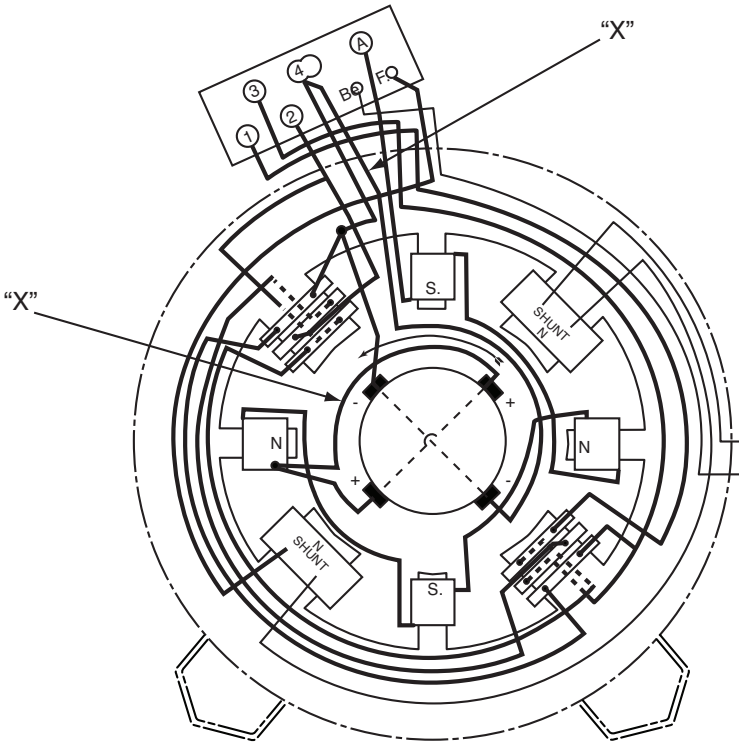
TO REVERSING SWITCH SEE CONTROL BOX WIRING DIAGRAM

CLOCKWISE ROTATION FACING EXCITER COMMUTATOR



TO REVERSING SWITCH SEE CONTROL BOX WIRING DIAGRAM

M-6478



TO RIGHT HAND
EXCITER BRUSH HOLDER

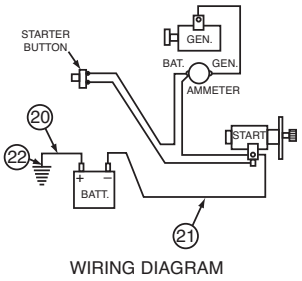
TO EXCITER SERIES
FIELD OUTPUT LEAD

NOTE: ON WELDERS HAVING CROSS CONNECTORS (SHOWN DOTTED) BETWEEN BRUSH HOLDER STUDS OF LIKE POLARITY, LEADS "X" WERE OMITTED.

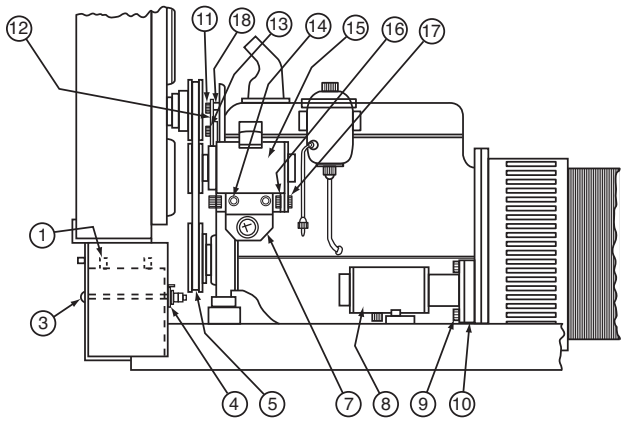
COUNTER-CLOCKWISE ROTATION

Return to Section TOC
Return to Master TOC

M-6996



WIRING DIAGRAM



ENGINE ASSEMBLY

MATERIAL REQ'D TO CHANGE OVER STD. MAGNETO HAND CRANK UNIT TO BATTERY SELF START UNIT WITH GENERATOR ETC.

ITEM	DESCRIPTION	PART NO.	REQ
1	BATTERY *	M-69622	1
2			
3	T-11827-16 CARRIAGE BOLT (2 REQ'D) S-9262-23 FLATWASHER (2 REQ'D) HEX. NUT (4 REQ'D)		
4	BATTERY STRAP	S-8069	1
5	FAN BELT	S-8074	1
6	INSTRUCTIONS	M-6996	1
7	AMMETER PANEL ASSEMBLY (INCLUDES SWITCH S-13145)	M-7010	1
Δ8	STARTER MOTOR DELCO #1109460	M-7010	1

ITEM	DESCRIPTION	PART NO.	REQ
9	7/16-14 HEX HD. CAP SCR. X 1 1/2 LG. 7/16 LOCKWASHER (E-106-A-B)	STARTER MTG.	2
10	STARTER SPACER	S-8073	1
11	3/8-16 HEX HD. CAP SCR X1 1/2 LG 3/8 LOCKWASHER (E-106-A-4)	ADJ. STRAP TO ENG.	1
12	ADJ. STRAP	S-8533	1
13	5/16 X 18 X 7/8 HEX HD. CAP SCR. 5/16 LOCKWASHER (E-106-A-3) S-9262-30 PLAIN WASHER	GEN. TO ADJ. STRAP	1
14	T-9087 STUD 3/8 - 16 HEX NUT	GEN. BRACKET TO ENG BLOCK	2
Δ15	GENERATOR DELCO #1100037 FAN DELCO #1866400 PULLEY DELCO #1881877		1 1 1

ITEM	DESCRIPTION	PART NO.	REQ
16	GENERATOR BRACKET	S-10249	1
17	5/16 - 18 X 1 HEX HD CAP SCR. 5/16 LOCKWASHER (E-106-A-3) 5/16 - 18 HEX NUT	GEN. BRKT TO GEN.	2
18	GEN. ADJ. SPACER	S-10731-3	1
19			
20	GROUND STRAP (POS.)	S-8070	1
21	BATTERY CABLE (NEG.)	S-8070-3	1
22	5/16 - 18 X 1/2 HEX SCREW AND WASHER TO BE USED GROUND STRAP TO GOVERNOR		1

INSTRUCTIONS (For F-162 FJW Engine Welders)

STARTER MOTOR: (PACK IN T-7396-8 CARTON)

1. Remove starter hole cover plate from engine housing plate.
2. Insert spacer ring between starter and housing plate. Mount starter motor to housing plate with two 7/16 - 14 x 1 1/2 hex. hd. cap screws and two lockwashers. Motor mounting plate and spacer rig must be flat to ensure proper alignment between starter motor gear and engine ring gear.

GENERATOR: (PACK IN T-7396-12 CARTON)

1. Remove and discard present fan belt.
2. Insert two 3/8 studs in side of engine block.
3. Attach generator mounting bracket and ammeter panel and fasten with two 3/8-16 hex. nuts.
4. Mount generator on bracket with two 5/16 - 18 x 1 hex. hd. cap screws, 5/16 lockwashers and 5/16 - 18 hex. nuts. Voltage regulator in generator to be at the top.
5. Attach adjustment strap to generator with 5/16 x 7/8 hex. hd. cap screw, 5/16 lockwasher and S-9262-30 plain washer.
6. Attach adjustment strap to front of engine with 3/8 - 16 x 7/8 hex. hd. cap screws and 3/8 lockwasher.
7. Install new fan belt and adjust to proper tension before tightening all generator mounting screws.

STARTER PUSH BUTTON:

1. Insert push button in hole in right front radiator support and tighten in place.

BATTERY:

1. Remove front center panel below radiator.
2. Attach positive and negative leads to battery and slide battery in position below radiator.
3. Replace center panel and tighten in place.
4. Clamp battery to front panel with battery strap, (2) T-11827-16 carriage bolts, (2) washers and (4) nuts. Put on washer and first nut finger tight so battery is snug. Second nut is to be jammed against first nut without further tightening against battery.

CONNECTIONS:

1. Connect negative battery lead to starter.
2. Connect battery ground lead to governor with 5/16 - 18 x 1/2 hex head cap screw and lockwasher. Use tapped hole on outside of governor just below adjusting screw.
3. Finish connections as shown by wiring diagram.

* For domestic use only include S-10590.

Δ L.E. CO. will not furnish these parts (obtain from Delco or any United Motors distributor).

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

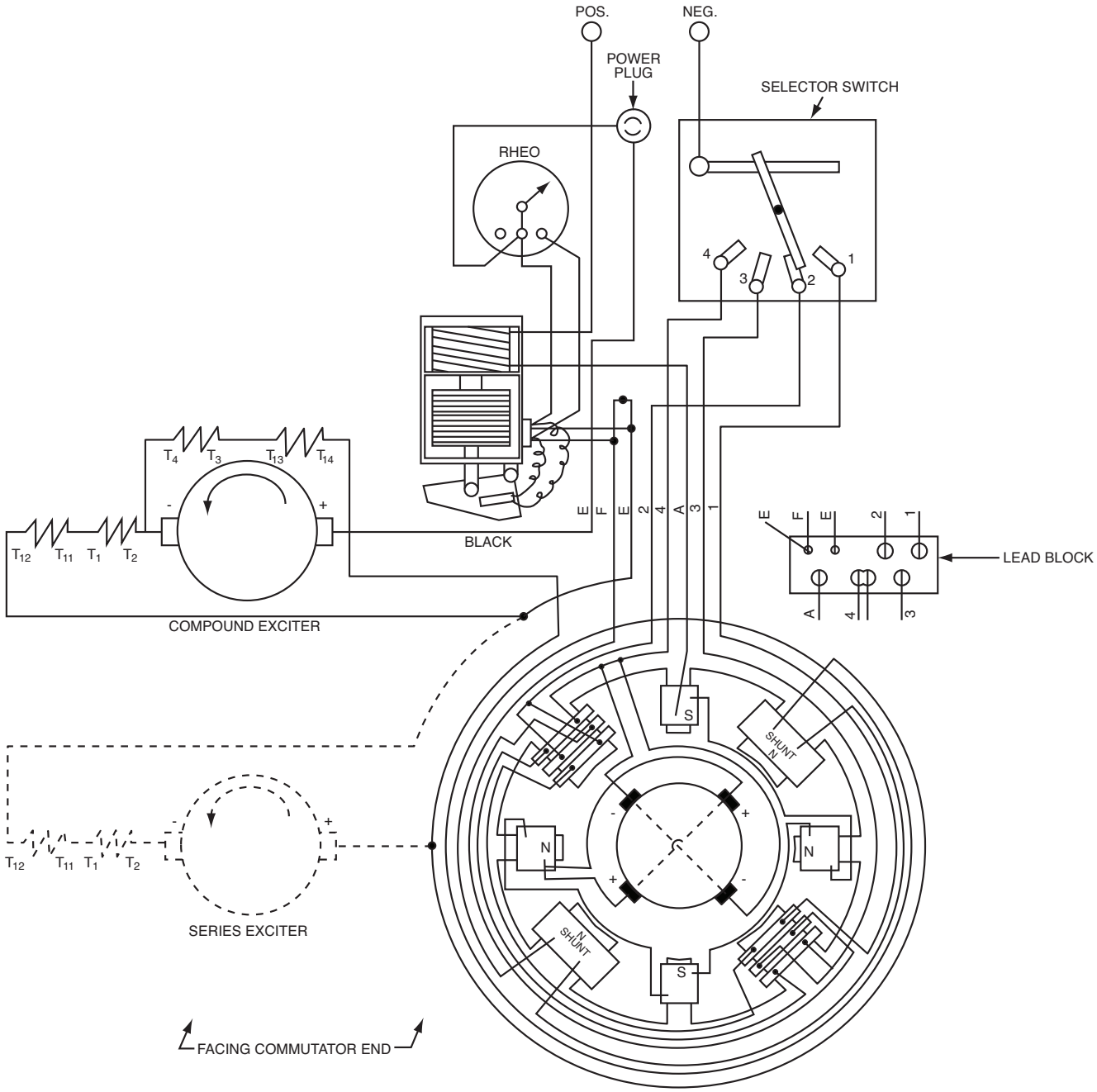
C-882 SA-200 ENGINE DRIVEN - TYPE 6090

GOVERNOR CONTROL

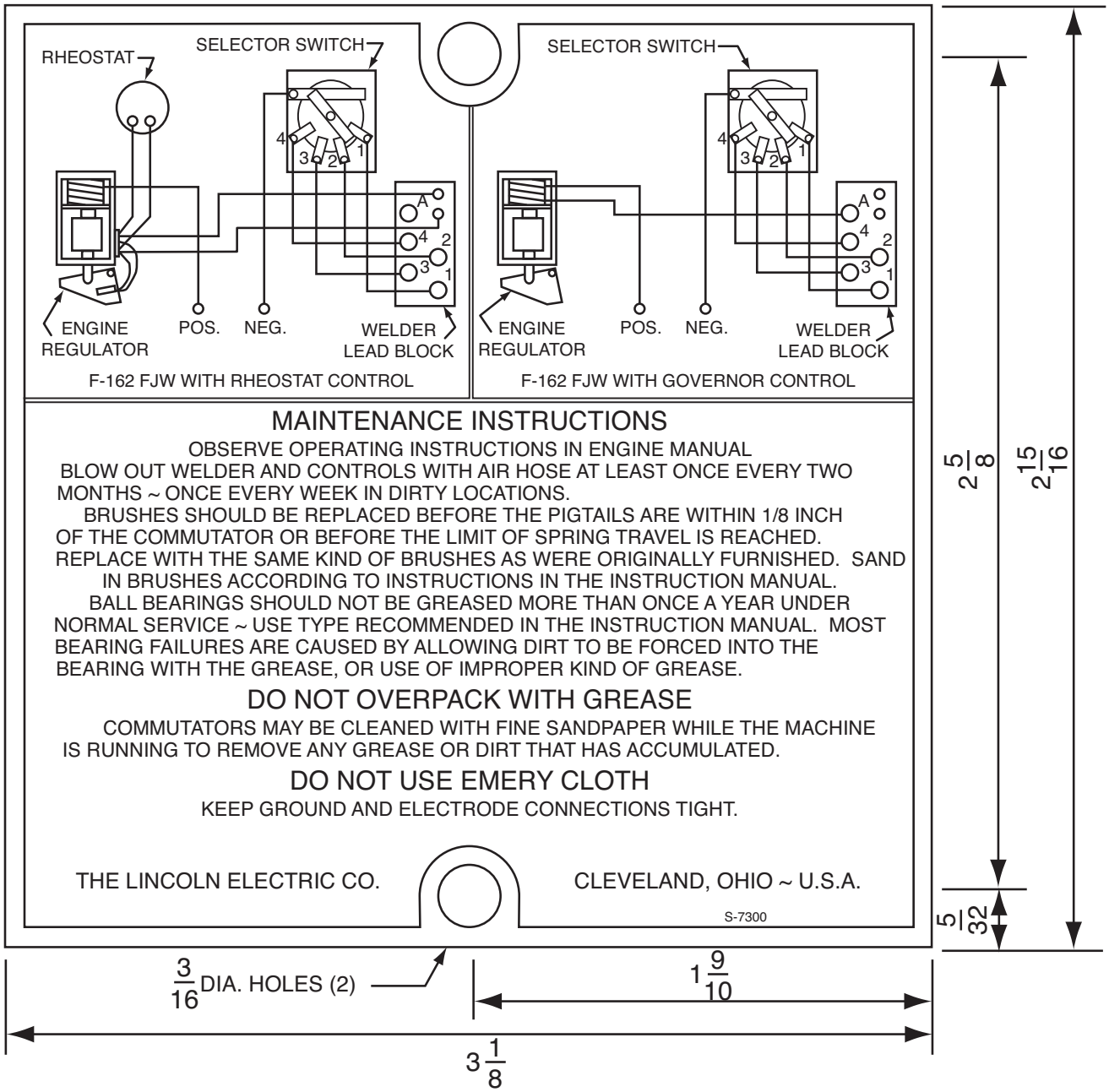
When governor control is used, leads “E” and “F” are brought out of generator through lead block and spliced together as shown by dotted lines.

RHEOSTAT CONTROL

When rheostat control is used, compound exciter and rheostat are wired as shown by solid lines. Leads “E” and “F” are connected to the engine regulator.



S-7300



NOTE: View shown double size.

.003” To .005” ETCH

All letters, figures, border & diagrams to be polished finish on a black background.

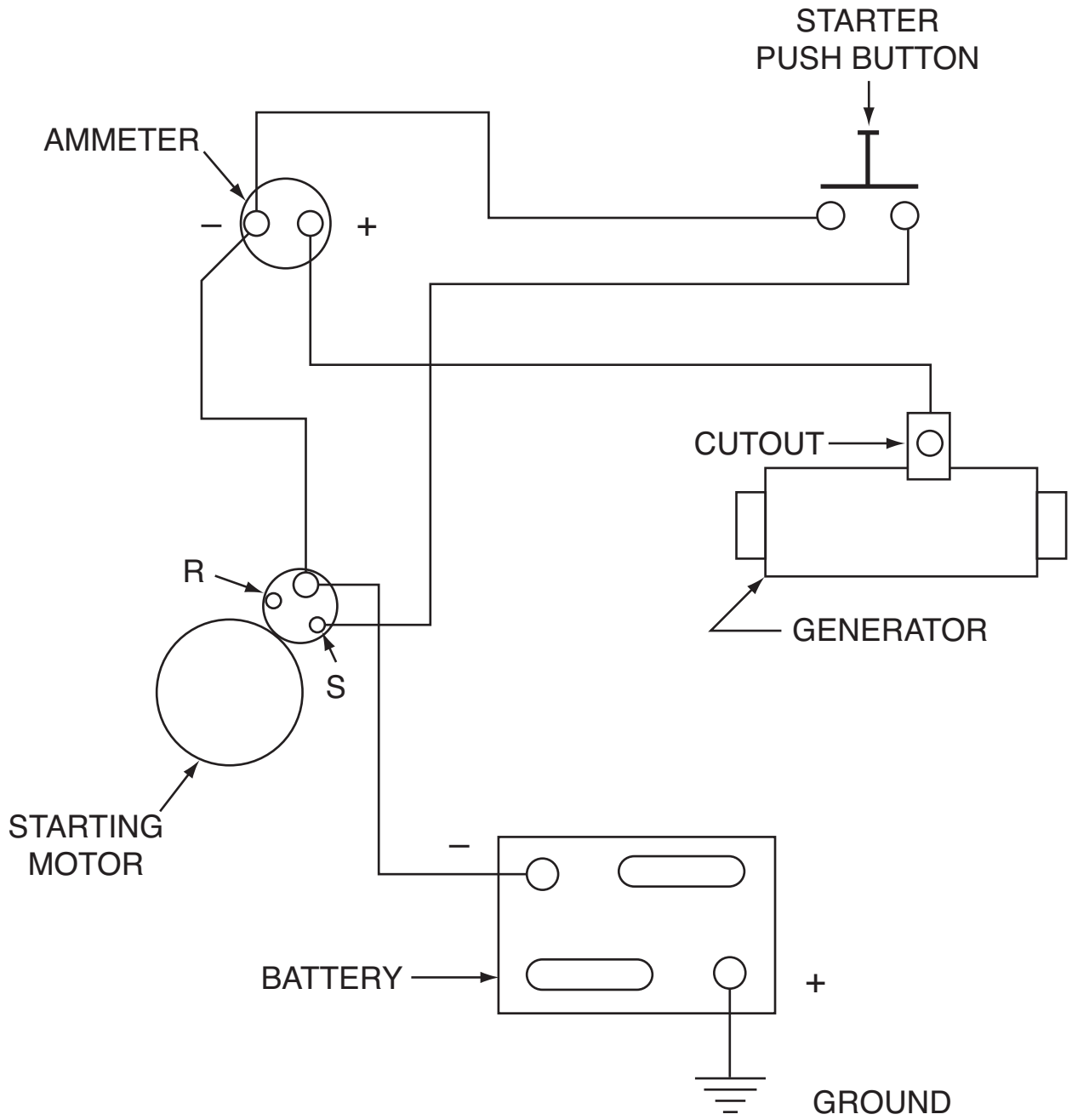
2 15/16 x .025” x 3 1/8 Aluminum

Part No. S-7300

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

CODES
3417 - 5841
(Red Face, Long Hood, Oversize Exciter Opt.)

T-12505



NOTE:

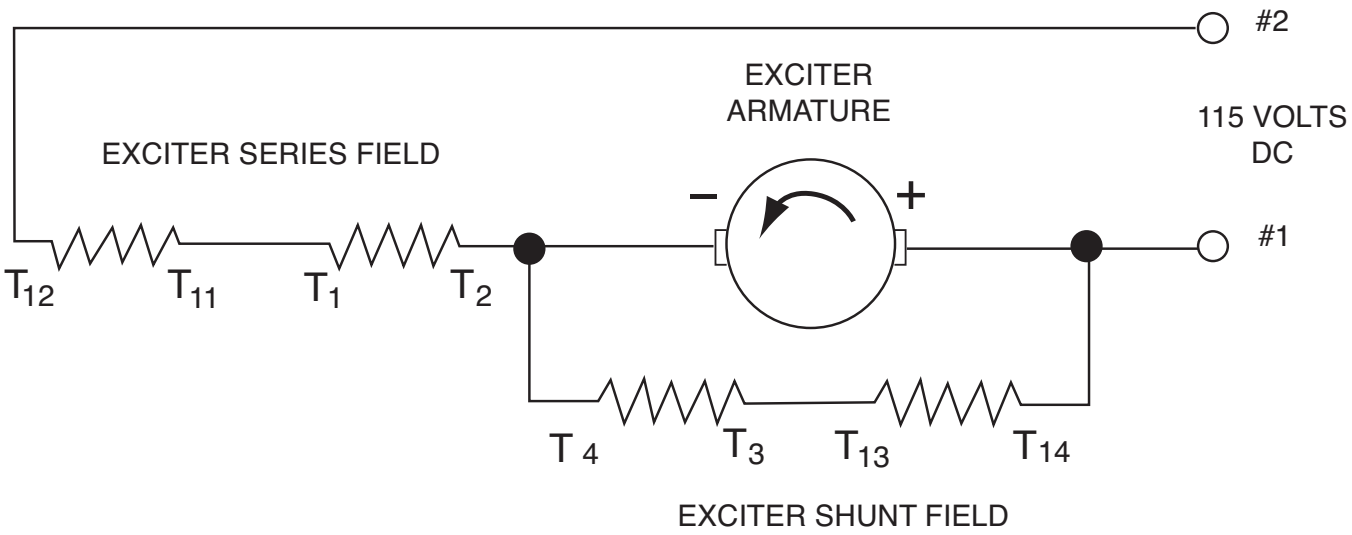
Limit of ± 1/2° on all angles unless otherwise specified.

Limit of ± 1/64 on all fractional dimensions unless otherwise specified.

Limit of ± .002 on all decimal dimensions unless otherwise specified.

E276-C

COMPOUND EXCITER CONNECTIONS FOR COUNTER CLOCKWISE ROTATION FACING THE EXCITER COMMUTATOR



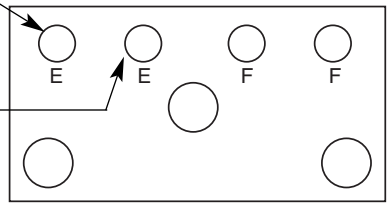
Series Field

* T1 Connect to T11.

T2 Connect to the left hand exciter brush holder.

T12 Bring out a lead through the lower or left hand lead block hole "E" and connect to the reversing switch or to power plug receptacle as shown in the control box diagram.

Bring out a lead from the right hand exciter brush holder through the top or right hand lead block hole "E" and to the reversing switch or power plug receptacle as shown in the control box diagram.



Coil with tags T1, T2, T3, T4 goes on the left hand pole piece. Coil with the tags T11, T12, T13, T14 goes on the right hand pole piece.

Shunt Field

* T3 Connect to T13.

T4 Connect to left hand exciter brush holder.

T14 Connect to the right hand exciter brush holder.

Leads for Accessory Drive or Power Plug

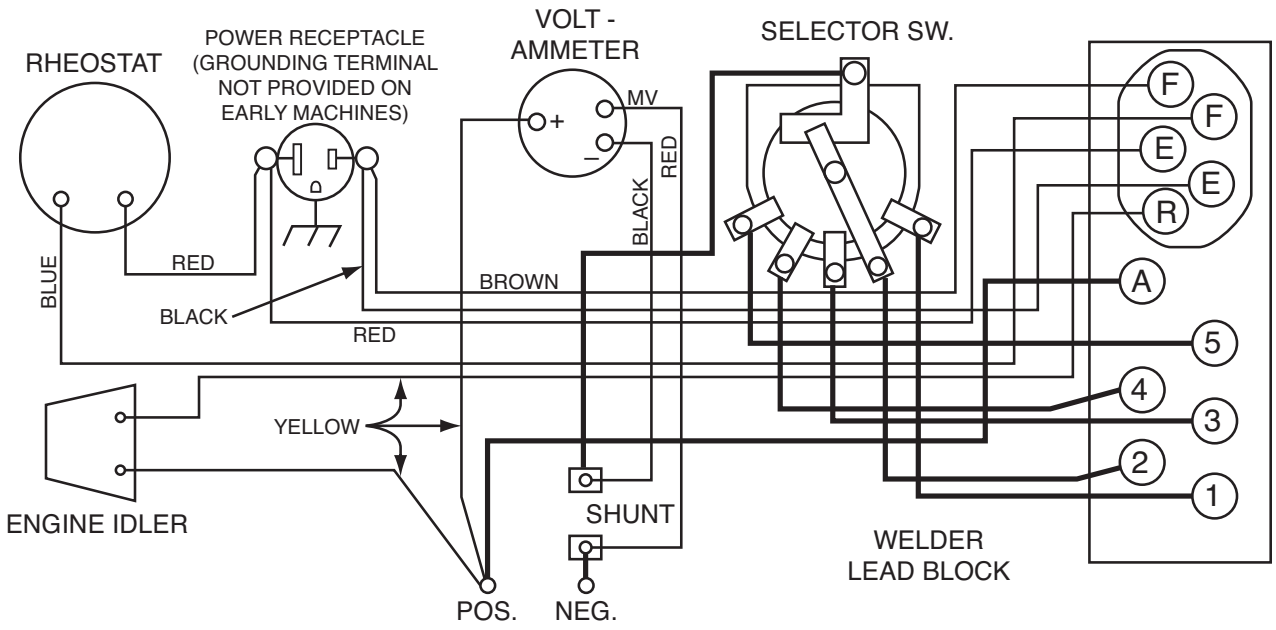
See control box diagram for connection when power plug is on right hand side of control box (standard for "L" & "E" control). Where power plug is in such a place that it is best to connect the leads at the exciter, connect the power plug leads to T12 and to the right hand exciter brush holder.

When using this diagram on M.G. set bring out and tag #1 and #2 as above.

For F162-FJW with power plug on panel, connect one side of receptacle to R.H. brush holder, and the other side of receptacle to exciter lead T12 at rheostat terminal.

* Should be soldered.

S-11319



MAINTENANCE INSTRUCTIONS

Observe operating instructions in engine manual.

Blow out welder and controls with air hose at least once every two months – once every week in dirty locations.

Brushes should be replaced before the pigtails are within 1/8 inch of the commutator or before the limit of spring travel is reached. Replace with the same kind of brushes as were originally furnished. Sand in brushes according to instructions in the instruction manual.

Ball bearings should not be greased more than once a year under normal service - use type recommended in the instruction manual. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease or use of improper kind of grease.

DO NOT OVERPACK WITH GREASE

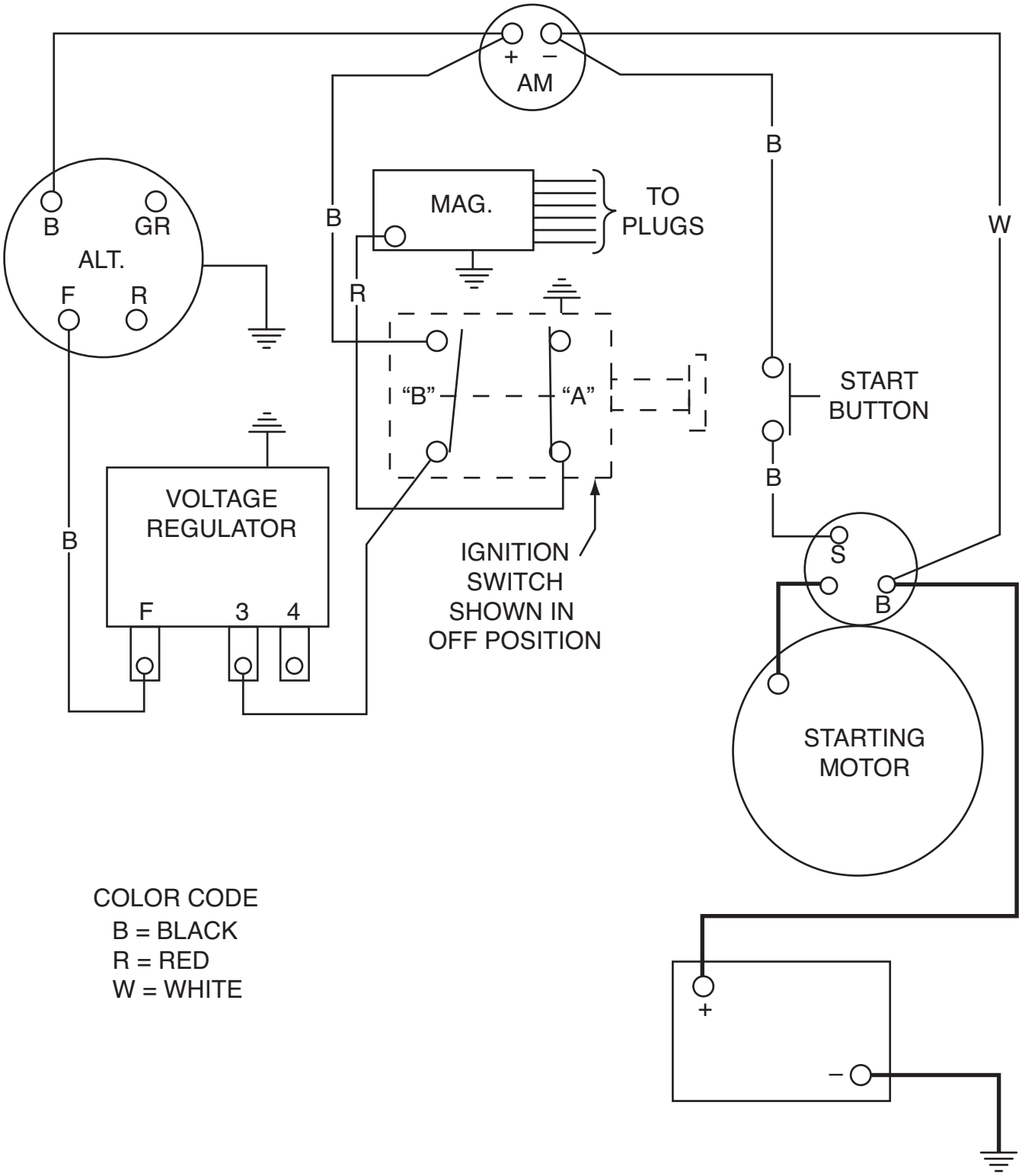
Commutators may be cleaned with fine sandpaper while the machine is running to remove any grease or dirt that has accumulated.

DO NOT USE EMERY CLOTH

Keep ground and electrode connections tight.

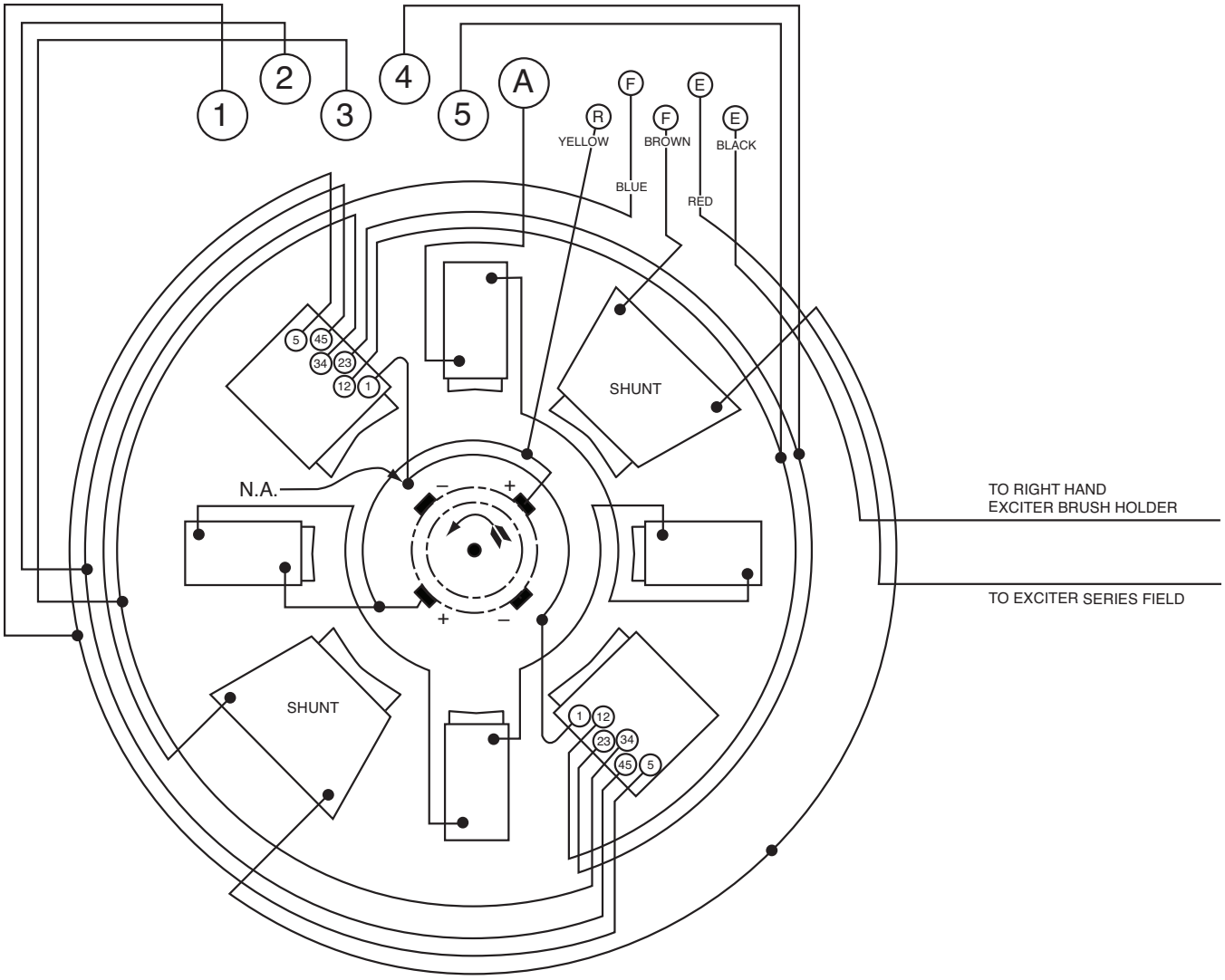
THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U.S.A.	L-200 FJW, FDW WELDER WITH “R” IDLER & METER S-11319

T-13076



A.S.A. ELECTRICAL SYMBOLS PER E-1537

M-8791



COUNTER CLOCKWISE ROTATION

NOTE: (R) LEAD USED ONLY ON UNITS WITH VACUUM IDLER.

N.A. When optional CV adapter is installed, the thermostat is connected to this brush holder.

S-11663

MAINTENANCE INSTRUCTIONS

OBSERVE OPERATING INSTRUCTIONS IN ENGINE MANUAL.

BLOW OUT WELDERS AND CONTROLS WITH AIR HOSE AT LEAST ONCE EVERY TWO MONTHS ~ ONCE EVERY WEEK IN DIRTY LOCATIONS.

BRUSHES SHOULD BE REPLACED BEFORE THE PIGTAILS ARE WITHIN 1/8 INCH OF THE COMMUTATOR OR BEFORE THE LIMIT OF SPRING TRAVEL IS REACHED. REPLACE WITH THE SAME KIND OF BRUSHES AS WERE ORIGINALLY FURNISHED. SAND IN BRUSHES ACCORDING TO INSTRUCTIONS IN THE INSTRUCTION MANUALS.

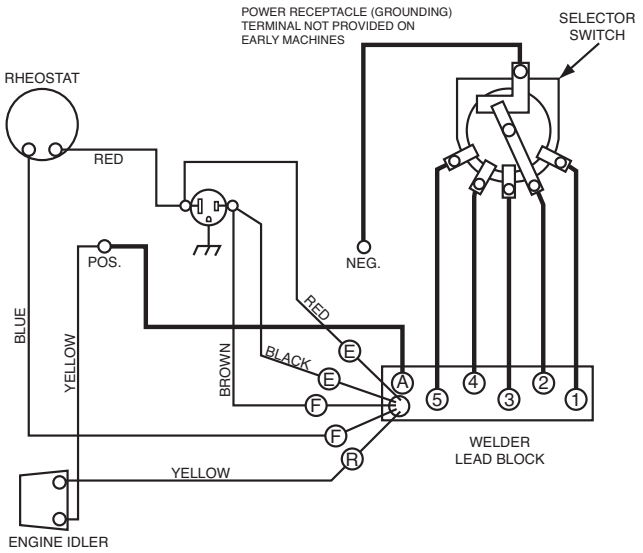
BALL BEARINGS SHOULD NOT BE GREASED MORE THAN ONCE A YEAR UNDER NORMAL SERVICE ~ USE TYPE RECOMMENDED IN THE INSTRUCTION MANUAL. MOST BEARING FAILURES ARE CAUSED BY ALLOWING DIRT TO BE FORCED INTO THE BEARING WITH THE GREASE, OR USE OF IMPROPER KIND OF GREASE.

DO NOT OVERPACK WITH GREASE

COMMUTATORS MAY BE CLEANED WITH FINE SANDPAPER WHILE THE MACHINE IS RUNNING TO REMOVE ANY GREASE OR DIRT THAT HAS ACCUMULATED.

DO NOT USE EMERY CLOTH

KEEP GROUND AND ELECTRODE CONNECTIONS TIGHT.



THE LINCOLN ELECTRIC CO.	CLEVELAND, OHIO	MADE IN U.S.A.	S-11663

PRINT ABOVE TO 4 1/2 TO 10 1/2 SIZE

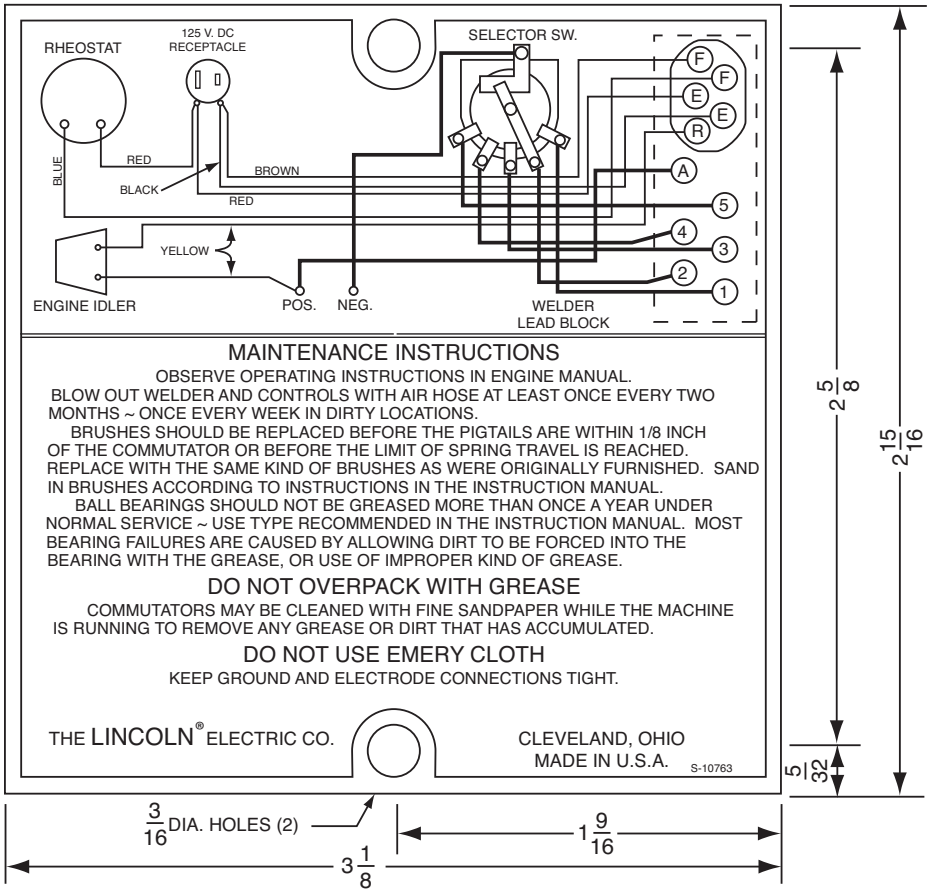
NOTE:

LIMIT OF ± 1/2º ON ALL ANGLES UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± 1/64 ON ALL FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± .002 ON ALL DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

S-10763



NOTE: View Shown

Double Size

Color per federal std. #595

Lithograph

All letters, figures, border & diagrams to be polished finish on a color #17038 background.

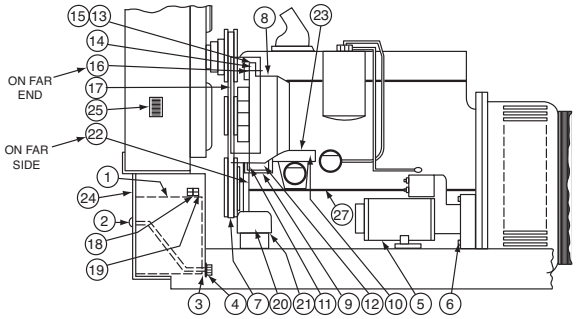
2 15/16 x .025 x 3 1/8 Aluminum.

NOTE:

LIMIT OF ± 1/64 ON ALL FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± .002 ON ALL DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

M-12078



NOTES

Item 4 - Attaches batt. to plate.
Item 6 - for attaching starter motor.
Item 10 - mounts amm. panel & atl. mtg. brkt. to engine block.
Item 12 - mts. alt. to brkt.
Item 14 - for alt. adj. strap to alternator.
Item 16 - mts. adj. strap to engine.
Item 17 - mtg. of alt. fan guard to adj. strap.
Item 21 - mounts volt. reg.
Item 22 - for attaching neg. batt. lead to gear cover.
Item 23 - (includes ignition, start switches and leads.)

MATERIAL REQD. TO CHANGE OVER STD. MAGNETO HAND CRANK UNIT TO BATTERY SELF START UNIT WITH ALTERNATOR ETC.

ITEM	DESCRIPTION	PART NO.	REQ
1	BATTERY*	M-9399-1	1
2	FORMED BOLT	T-11888	2
3	BATTERY BRACKET	S-12128	1
4	FLAT WASHER (1/4)	S-9262-23	2
	LOCK WASHER (1/4)	E-106-A-2	2
	HEX. NUT	1/4 - 20	2
5	STARTING MOTOR	L-4334	1
6	HEX. HD. CAP SCREW	T-8833-1	2
	LOCK WASHER (7/16)	E-106A-8	2
7	FAN BELT	T13274	1
8	ALTERNATOR ASBLY.	L-4722-3	1
9	ALTERNATOR MTG. BRKT.	S-14426	1
10	STUD	T-9087	3
	LOCK WASHER (3/8)	E-106-A-4	3
	HEX. NUT	3/8 - 16	3
	FLAT WASHER (3/8)	S-9262-36	1
11	SPACER (.75 LONG)	S-10731-3	1
	LOCK WASHER (3/8)	E-106-A-4	1
12	HEX. NUT	3/8 - 16	1
	HEX. HD. CAP SCR.	$\frac{3}{8}$- 16 x 3.75	1
13	ALT. ADJ. STRAP	M-11566	1
14	HEX. HD. BOLT	$\frac{5}{16}$- 18 x 1.00	1
	LOCK WASHER (5/16)	E-106A-3	1
	FLAT WASHER (5/16)	S-9262-30	1
15	SPACER (.75 LONG)	S-10731-3	1
16	HEX. HD. BOLT (3/8)	$\frac{3}{8}$- 16 x 1.50	1
	LOCKWASHER (3/8)	E-106A-4	1
17	ALT. FAN GUARD	M-12067	1
	HEX. HD. BOLT	$\frac{5}{16}$- 18 x .75	1
	FLAT WASHER	S-9262-30	1
	LOCK WASHER	E-106-A-3	1
	HEX. NUT	5/16 - 18	1
18	POS. BATTERY CABLE	S-13147-1	1
19	NEG. BATTERY CABLE	S-8070-28	1
20	VOLTAGE REGULATOR	M-11567	1
	HEX. HD. BOLT	$\frac{1}{4}$- 20 x .75	2
21	LOCK WASHER	T-9860-6	2
	HEX. NUT	1/4 - 20	2
22	HEX. HD. BOLT	$\frac{5}{16}$- 18 x .50	1
	WASHER (5/16)	S-9262-30	1
	LOCKWASHER (5/16)	E-106A-3	1
23	AMMETER PANEL ASBLY.	M-12040	1
24	SWITCH PLATE	T-9061-1	1
25	CAUTION DECAL	S-14108	1
26	WIRING DIAGRAM	T-13076	1
27	LEAD CLIP	T-9402	2
28	INSTRUCTIONS	M-12078	1
29	GROUND LEAD (NOT SHOWN)	B-10-10-22-36	1
*	FOR DOMESTIC USE ONLY INCLUDE		
	S-10590 ELECTROLYTE		

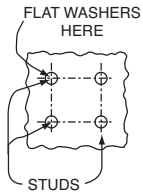
Instructions for F-163 FJW engine welders

Start Motor: (Pack in T-7396-6 carton)

1. Remove starter hole cover plate from engine housing plate.
2. Mount starter motor to housing plate with two 7/16-14 x 1.00 hex hd. cap screws and two 7/16 lockwashers. Motor mounting surface must be flat against housing plate to ensure proper alignment between starter motor gear and engine ring gear.

Alternator: (Pack in T-7396-4 carton)

1. Remove and discard fan belt.
2. Remove three hex hd. bolts in side of block. Apply thread sealant to the three studs and insert into engine block. Position flat washer (item 10) on upper stud. Position ammeter panel on lower two studs. Position alternator mounting bracket. Using the three 3/8 lockwashers and hex nuts, tighten panel and bracket securely into position.
3. Mount alternator to bracket using items 11 and 12.
4. Attach alternator adjusting strap to engine using items 15 and 16.
5. Attach alternator adjusting strap to alternator using items 14.
6. Install new fan belt and adjust to proper tension before tightening all alternator mounting bolts.
7. Attach alternator fan guard to alternator adjusting strap. Use mountings in item 17.
8. Attach voltage regulator to front engine support channel using items 21. The regulator is to be positioned so that connection tabs are pointing away from radiator fan. If holes are not present in front engine support channel, drill per sketch #2 below.



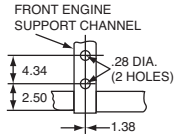
SKETCH #1

Start Button and Ignition Switch:

1. Disconnect low voltage lead from magneto and remove ignition switch. Discard old ignition switch plate.
2. Route leads (with ignition switch) between front mount and oil pan. Using new switch plate, mount ignition switch in proper sized hole in left front radiator support.
3. Insert start button in hole in right front radiator support and tighten in place.

Connections: (See Wiring Diagram)

1. Connect red lead from ignition switch to magneto.
2. Connect green lead from ammeter to alternator.
3. Snap connector into alternator completing the regulator to field circuit.
4. Connect the black lead to the "F" terminal on the voltage regulator.
5. Connect the yellow lead to the #3 terminal on the voltage regulator.
6. Connect the black lead and the white lead to the starting motor. See diagram.
7. Two lead clips are provided. One is to be placed under the pan bolt directly under the oil filter tube. The other one is to be placed behind the governor on the front end plate screw. Crimp lead clips so as to support the leads.
8. Connect positive battery cable to starter.
9. Connect negative battery cable to governor with 5/16-18 x .50 hex head screw and lock washer. Use tapped hole on outside of governor just below adjusting screw. Attach grounding lead from regulator mounting bolt to a pan bolt. Make sure area in contact with lead is free of paint.

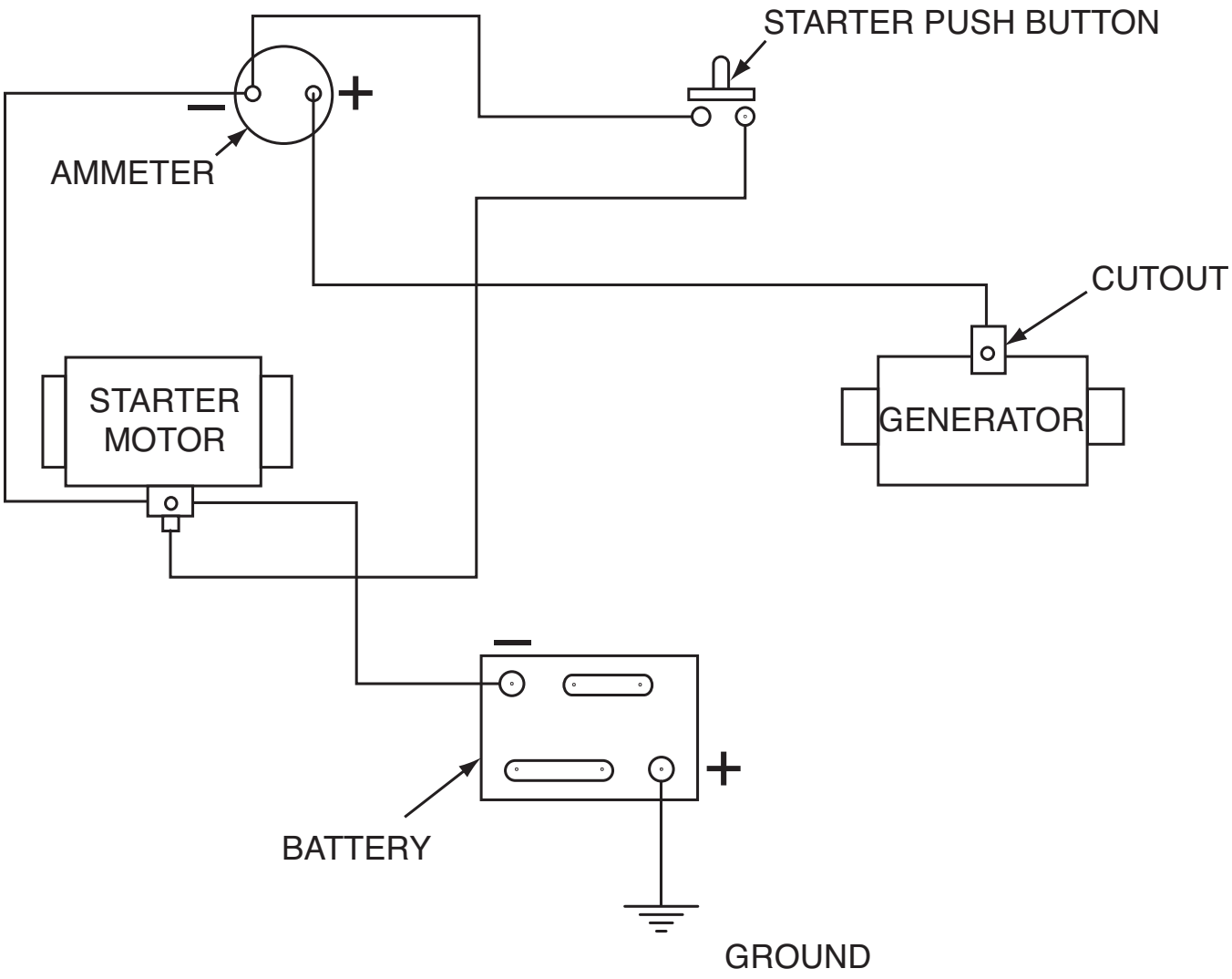


SKETCH #2

Battery:

1. Remove front cover panel below radiator.
2. Service battery with weld.
3. Clamp battery to center panel with battery strap and two formed carriage bolts, flat washers, lockwashers and nuts. Be sure battery is positioned properly so that battery polarity matches the lead polarity.
4. Attach leads to battery.
5. Replace center panel and tighten in place.
6. Attach caution decal provided to side of radiator shroud in area of alternator.

T-9088

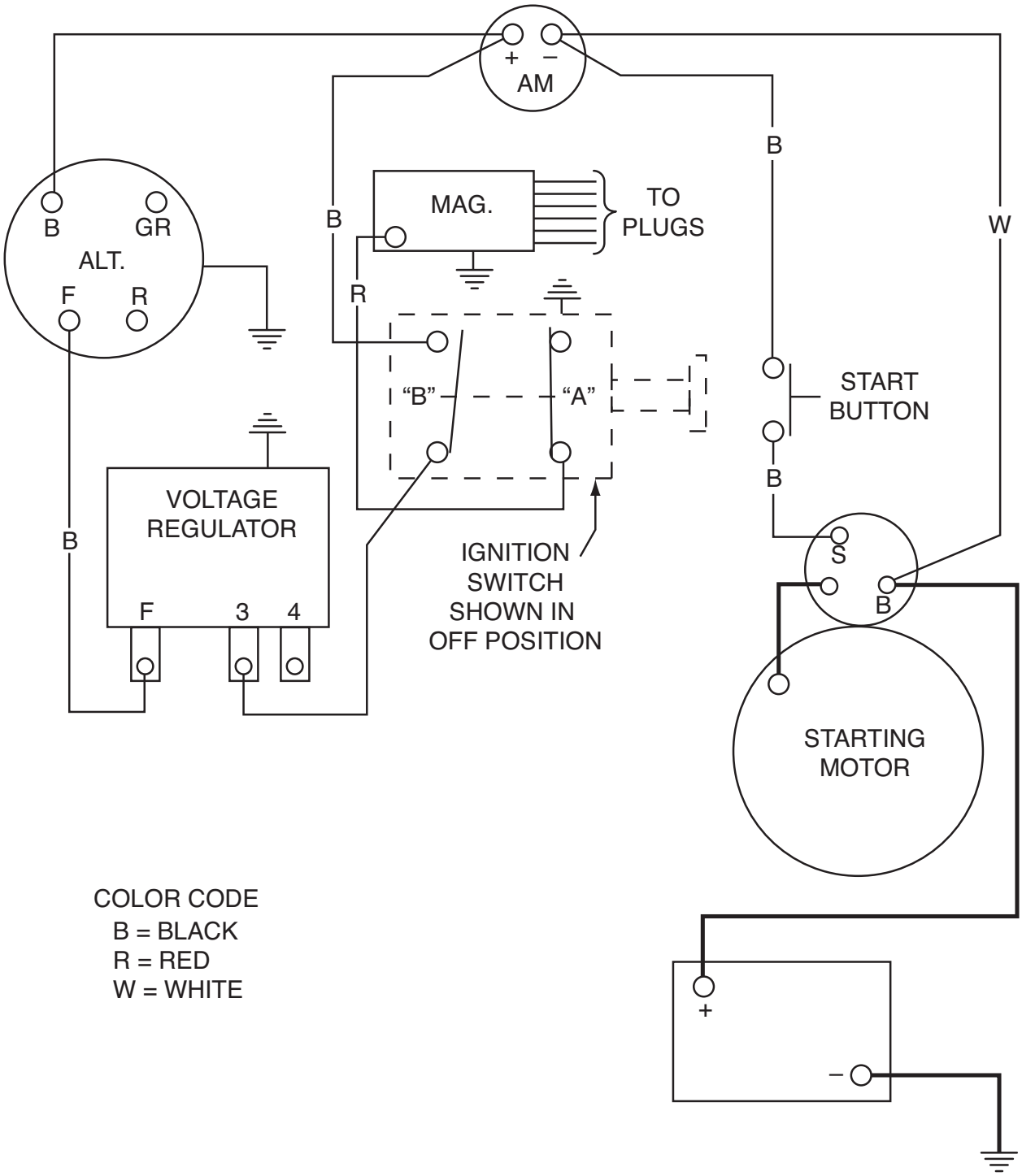


NOTE: Limit of ± 1/64 on all dimensions.

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

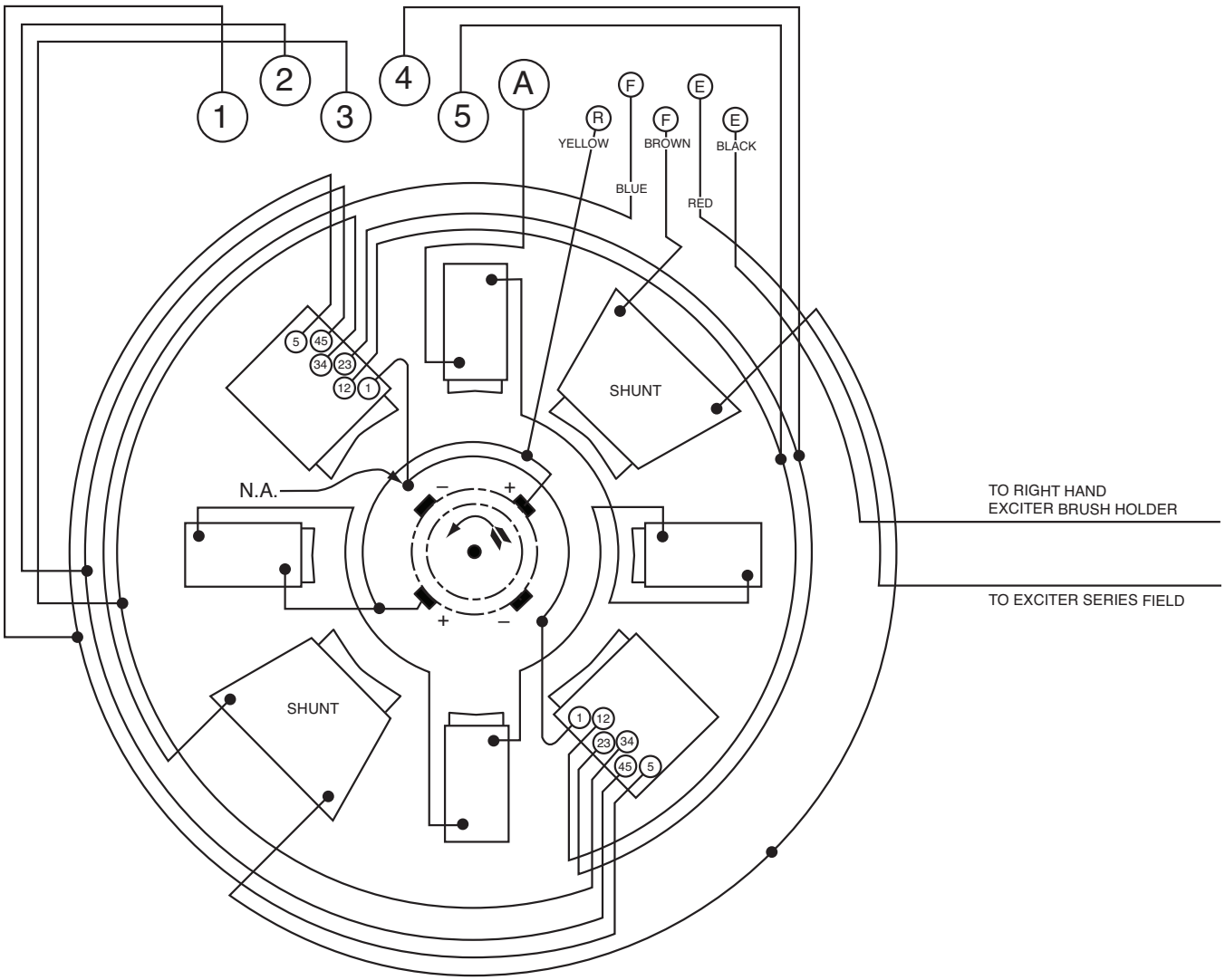
CODES
5957 - 7242
(Black Face, Vacuum Idler, P-23 Parts)

T-13076



A.S.A. ELECTRICAL SYMBOLS PER E-1537

M-8791



COUNTER CLOCKWISE ROTATION

NOTE: (R) LEAD USED ONLY ON UNITS WITH VACUUM IDLER.

N.A. When optional CV adapter is installed, the thermostat is connected to this brush holder.

S-11663

MAINTENANCE INSTRUCTIONS

OBSERVE OPERATING INSTRUCTIONS IN ENGINE MANUAL.

BLOW OUT WELDERS AND CONTROLS WITH AIR HOSE AT LEAST ONCE EVERY TWO MONTHS ~ ONCE EVERY WEEK IN DIRTY LOCATIONS.

BRUSHES SHOULD BE REPLACED BEFORE THE PIGTAILS ARE WITHIN 1/8 INCH OF THE COMMUTATOR OR BEFORE THE LIMIT OF SPRING TRAVEL IS REACHED. REPLACE WITH THE SAME KIND OF BRUSHES AS WERE ORIGINALLY FURNISHED. SAND IN BRUSHES ACCORDING TO INSTRUCTIONS IN THE INSTRUCTION MANUALS.

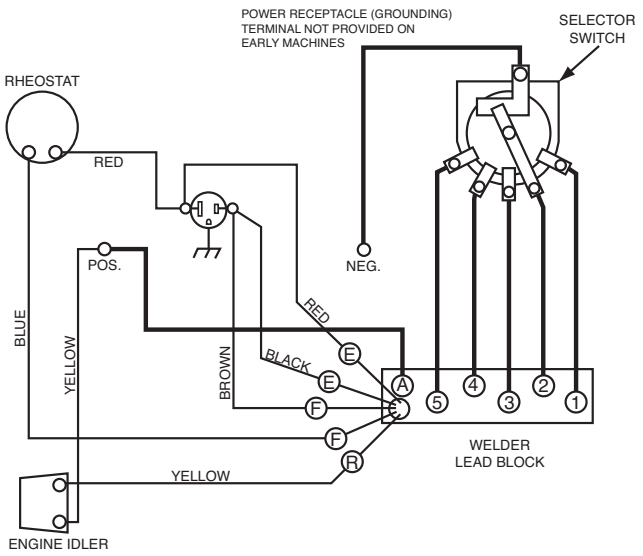
BALL BEARINGS SHOULD NOT BE GREASED MORE THAN ONCE A YEAR UNDER NORMAL SERVICE ~ USE TYPE RECOMMENDED IN THE INSTRUCTION MANUAL. MOST BEARING FAILURES ARE CAUSED BY ALLOWING DIRT TO BE FORCED INTO THE BEARING WITH THE GREASE, OR USE OF IMPROPER KIND OF GREASE.

DO NOT OVERPACK WITH GREASE

COMMUTATORS MAY BE CLEANED WITH FINE SANDPAPER WHILE THE MACHINE IS RUNNING TO REMOVE ANY GREASE OR DIRT THAT HAS ACCUMULATED.

DO NOT USE EMERY CLOTH

KEEP GROUND AND ELECTRODE CONNECTIONS TIGHT.



THE LINCOLN ELECTRIC CO.	CLEVELAND, OHIO	MADE IN U.S.A.	S-11663

PRINT ABOVE TO 4 1/2 X 10 1/2 SIZE

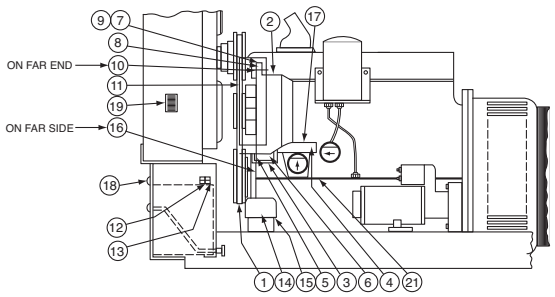
NOTE:

LIMIT OF ± 1/2º ON ALL ANGLES UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± 1/64 ON ALL FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± .002 ON ALL DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

M-12103



NOTES

Item 6 mounts alt. to brkt.
Item 8 for alt. adj. strap to alternator.
Item 10 mts. adj. strap to engine.
Item 11 mtg. of alt. fan guard to adj. strap.
Item 15 mounts volt regulator.
Item 16 for attaching neg. batt. lead to gear cover.
Item 17 includes ignition, start switches and leads.

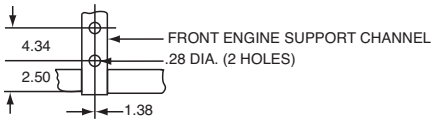
MATERIAL REQD. TO CHANGE OVER BATTERY CHARGING GENERATOR TO ALTERNATOR

ITEM	DESCRIPTION	PART NO.	REQ
1	FAN BELT	T-13274	1
2	ALTERNATOR ASBLY.	L-4722-3	1
3	ALTERNATOR MTG. BRKT.	S-14426	1
4	STUD	T-9087	1
	LOCKWASHER (3/8)	E-106-A-4	3
	HEX NUT	3/8 - 16	3
	PLAINWASHER (3/8)	S-9262-56	1
5	SPACER (3/4 LONG)	S-10731-3	1
6	LOCKWASHER (3/8)	E-106-A-4	1
	HEX NUT	3/8 - 16	1
	HEX HD CAP SCREW	$\frac{3}{8}$- 16 x 3$\frac{3}{4}$	1
7	ALT. ADJ. STRAP	M-11566	1
8	HEX HD. BOLT	$\frac{5}{16}$- 18 x 1.0	1
	LOCKWASHER (5/16)	E-106-A-3	1
	PLAINWASHER (5/16)	S-9262-121	1
9	SPACER (3/4 LONG)	S-10731-3	1
10	HEX HD. BOLT (3/8)	$\frac{3}{8}$- 16 x 1$\frac{1}{2}$	1
	LOCKWASHER (3/8)	E-106-A-4	1
11	ALT. FAN GUARD	M-12067	1
	HEX HD. BOLT	$\frac{5}{16}$- 18 x $\frac{3}{4}$	1
	PLAINWASHER	S-9262-121	1
	LOCKWASHER	E-106-A-3	1
	HEX NUT	$\frac{5}{16}$ x 18	1
12	POS. BATTERY CABLE	S-13147-1	1
13	NEG. BATTERY CABLE	S-8070-28	1
14	VOLTAGE REGULATOR	M-11567	1
15	HEX. HD. BOLT	$\frac{1}{4}$- 20 x $\frac{3}{4}$	2
	LOCKWASHER	T-9860-6	2
	HEX. NUT	1/4 - 20	2
16	HEX. HD. BOLT	$\frac{5}{16}$- 18 x $\frac{1}{2}$	1
	PLAINWASHER (5/16)	S-9262-121	1
	LOCKWASHER (5/16)	E-106-A-3	1
17	AMMETER PANEL ASBLY.	M-12040-1	1
18	SWITCH PLATE	T-9061-1	1
19	CAUTION DECAL	S-17851	1
20	WIRING DIAGRAM	T-13076	1
21	LEAD CLIP	T-9402	2
22	INSTRUCTIONS	M-12103	1
23	GROUND LEAD (NOT SHOWN)	B-10-10-22-36	1

INSTRUCTIONS FOR F-163 FJW ENGINE WELDERS

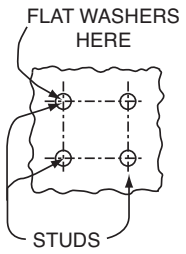
ALTERNATOR:

1. Remove the following items from the engine.
   A. Fan belt.
   B. Remove battery. Disconnect and discard battery cables.
   C. Battery charging generator, adjusting strap, ammeter panel, leads, and generator mounting bracket.
   D. Ignition switch and related wiring. Discard old ignition switch plate.
2. Drill two holes in the front engine support channel (alternator side -- see sketch below).



SKETCH #2

3. Enlarge ignition switch mounting hole to .51 diameter.
4. Remove one hex hd. bolt to upper left of studs used to mount generator bracket. Apply thread sealant to the stud supplied and insert into engine block. Position plain washer (item 4) on upper stud. See sketch. Position ammeter panel on lower two studs. Position alternator mounting bracket. Using the three 3/8 lock washers and hex nuts, tighten panel and bracket securely into position.
5. Mount alternator to bracket using items 5 and 6.
6. Attach alternator adjusting strap to engine using items 9 and 10.
7. Attach alternator adjusting strap to alternator using item 8.
8. Install new fan belt and adjust to proper tension before tightening all alternator mounting bolts.
9. Attach alternator fan guard to alternator adjusting strap. Use mounting in item 11.
10. Attach voltage regulator to front engine support channel using item 15. The regulator is to be positioned so that connection tabs are pointing away from radiator fan.



CONNECTIONS: (See wiring diagram.)

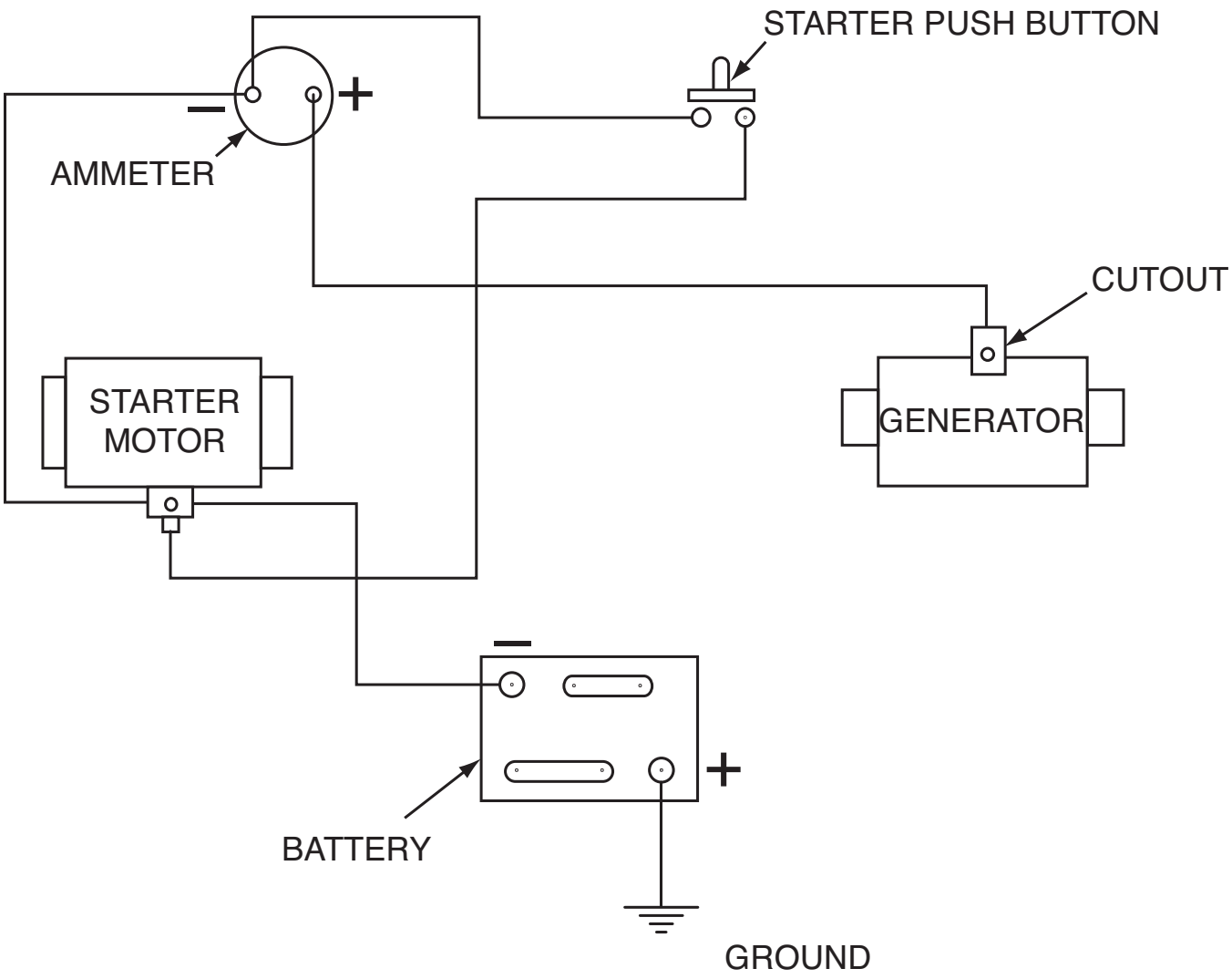
1. Route leads (with ignition switch) between front mount and oil pan. Using new switch plate, mount ignition switch in
2. two black leads to start button.
3. red lead from ignition switch to magneto.
4. green lead from ammeter to alternator.
5. ctor into alternator completing the regulator to field circuit.
6. black lead to the "F" terminal on the voltage regulator.
7. yellow lead to the #3 terminal on the voltage regulator.
8. black lead and the white lead to the starting motor. See diagram.
9. are provided. One is to be placed under the pan bolt directly under the oil filter tube. The other one ced behind the governor on the front end plate screw. Crimp lead clips so as to support the leads.
10. ive battery cable to starter.
11. ive battery cable to governor with 5/16-18 x 1/2 hex head screw and lock washer. Use tapped hole on outside st below adjusting screw.
12. ng lead from regulator mounting bolt to a pan bolt. Make sure area in contact with lead is free of paint.

OBSOLETE
NO REPLACEMENT
AVAILABLE

Bat

1. in its holder 180° so that battery polarity matches the lead polarity.
2. Attach leads to battery.
3. Replace center panel and tighten in place.
4. Attach caution decal provided to side of radiator shroud in area of alternator.

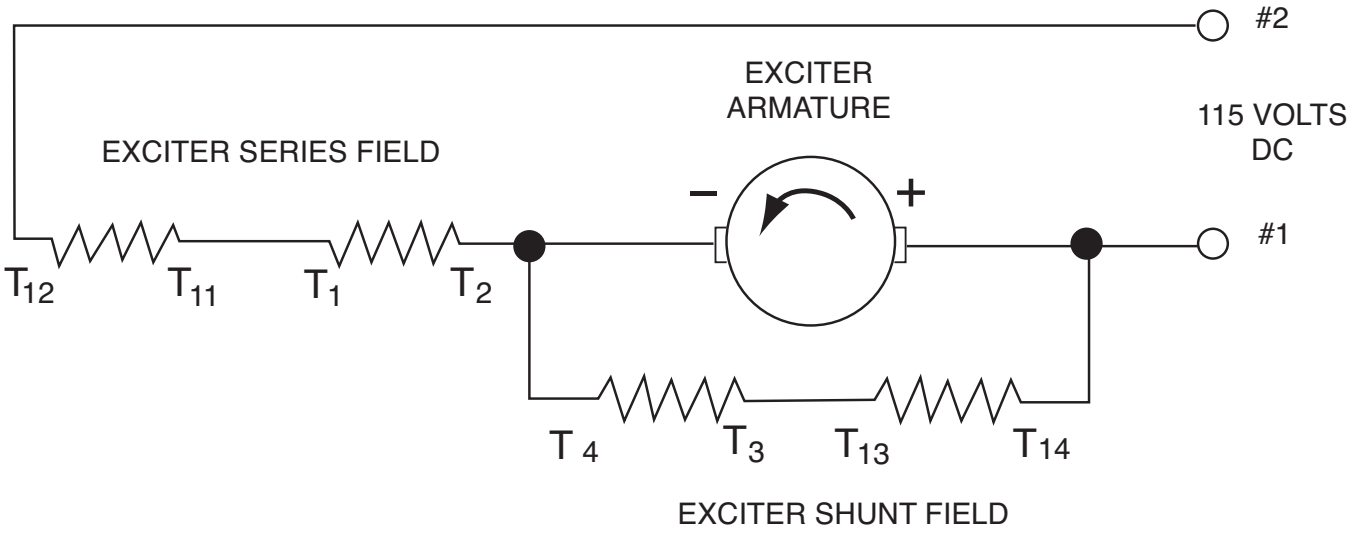
T-9088



NOTE: Limit of ± 1/64 on all dimensions.

E276-C

COMPOUND EXCITER CONNECTIONS FOR COUNTER CLOCKWISE ROTATION FACING THE EXCITER COMMUTATOR



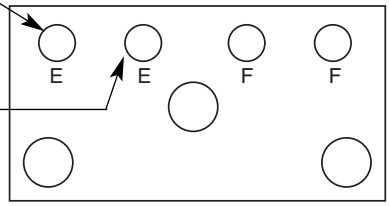
Series Field

* T1 Connect to T11.

T2 Connect to the left hand exciter brush holder.

T12 Bring out a lead through the lower or left hand lead block hole "E" and connect to the reversing switch or to power plug receptacle as shown in the control box diagram.

Bring out a lead from the right hand exciter brush holder through the top or right hand lead block hole "E" and to the reversing switch or power plug receptacle as shown in the control box diagram.



Coil with tags T1, T2, T3, T4 goes on the left hand pole piece. Coil with the tags T11, T12, T13, T14 goes on the right hand pole piece.

Shunt Field

* T3 Connect to T13.

T4 Connect to left hand exciter brush holder.

T14 Connect to the right hand exciter brush holder.

Leads for Accessory Drive or Power Plug

See control box diagram for connection when power plug is on right hand side of control box (standard for "L" & "E" control). Where power plug is in such a place that it is best to connect the leads at the exciter, connect the power plug leads to T12 and to the right hand exciter brush holder.

When using this diagram on M.G. set bring out and tag #1 and #2 as above.

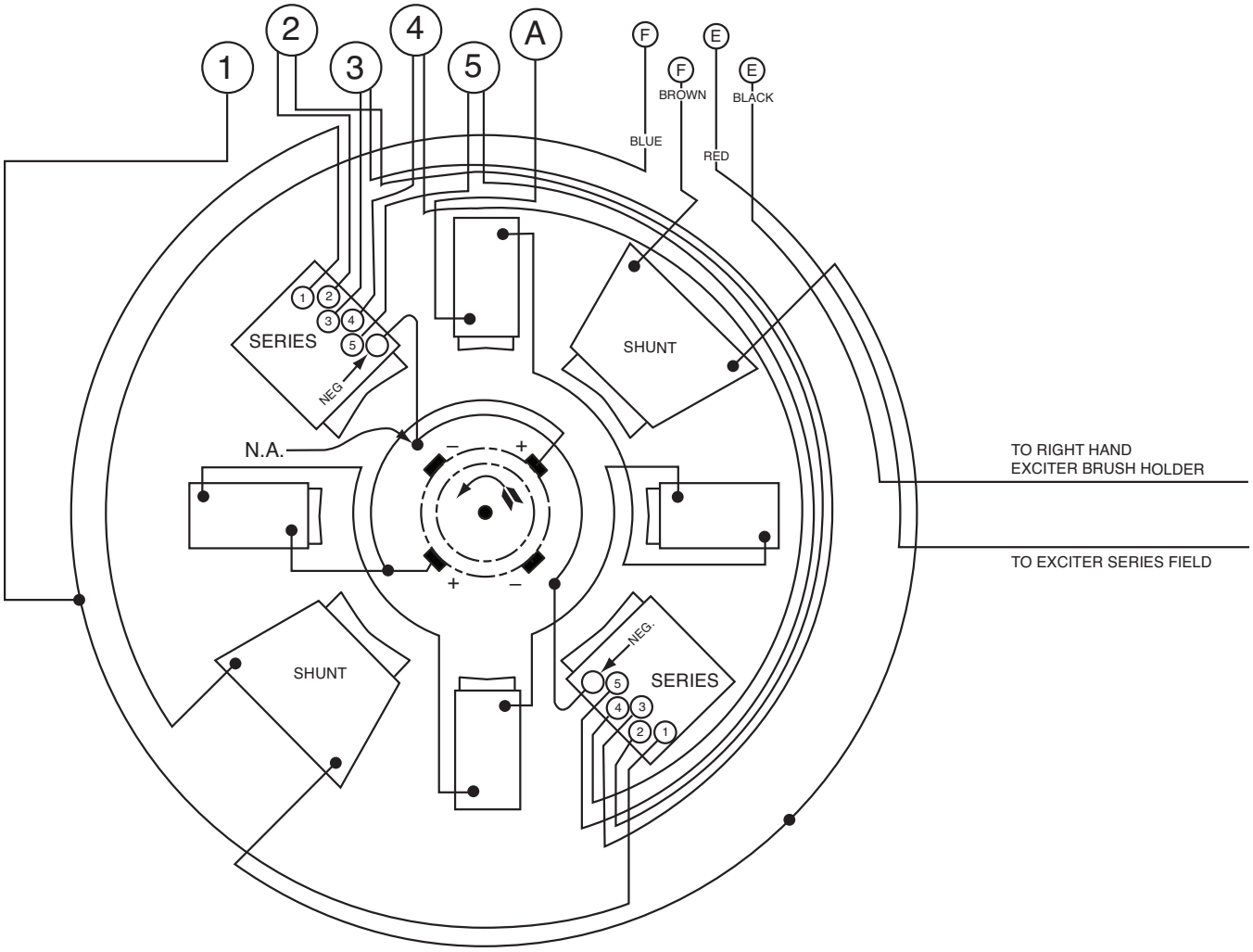
For F162-FJW with power plug on panel, connect one side of receptacle to R.H. brush holder, and the other side of receptacle to exciter lead T12 at rheostat terminal.

* Should be soldered.

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

CODES
7276 - 9530
(Electronic Idler, P-111 Parts)

M-15733

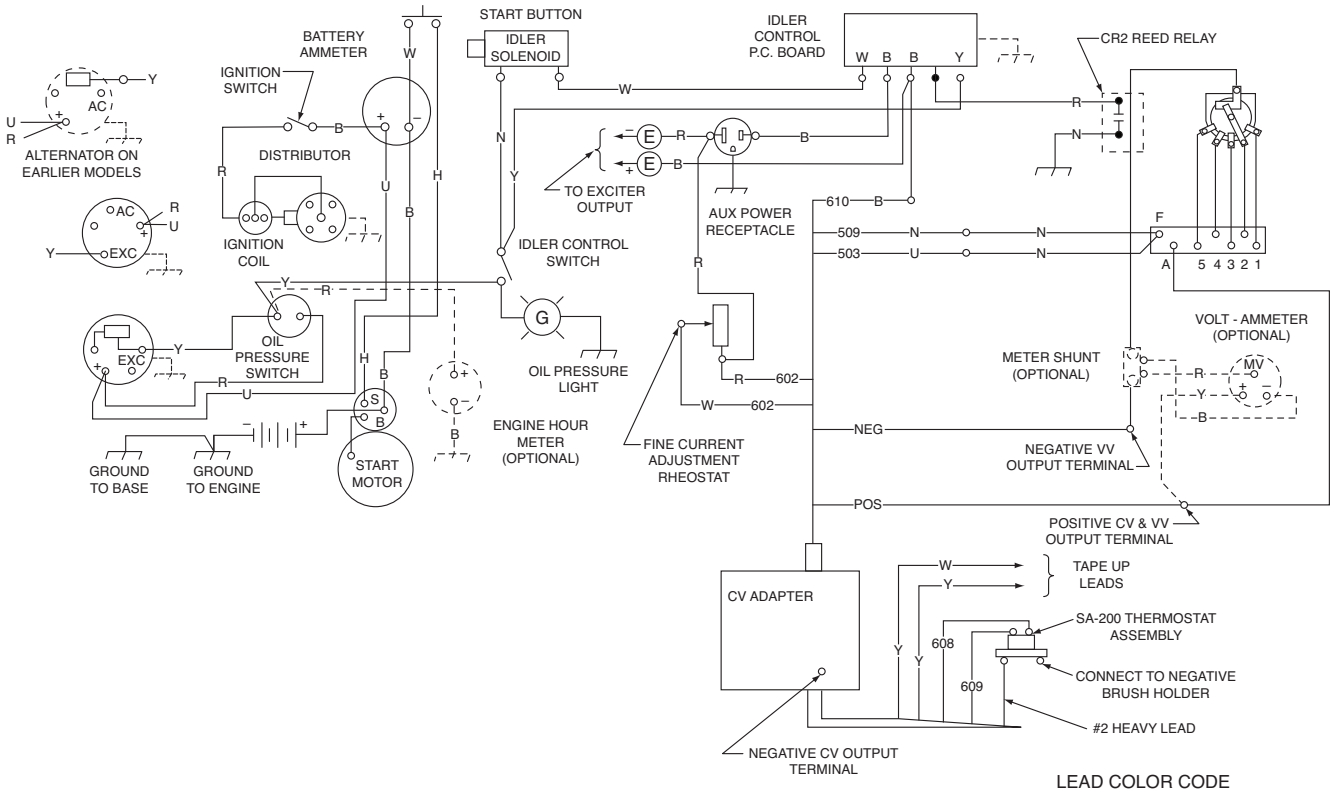


COUNTER CLOCKWISE ROTATION

N.A. When optional CV adapter is installed, the thermostat is connected to this brush holder.

N.B. Flex lead connections to interpoles may be bolted or soldered depending on type of interpoles.

S-17701



ELECTRICAL SYMBOLS PER E-1537

GENERAL MAINTENANCE INSTRUCTIONS FOR ENGINE DRIVEN ARC WELDING POWER SOURCES

⚠ WARNING

ELECTRIC SHOCK CAN KILL

MOVING PARTS CAN INJURE

- Turn engine off before maintenance work unless the maintenance work requires it to be running.
- Keep hands, hair, clothing and tools away from moving parts.
- Ensure all guards or covers are replaced after servicing.
- Only qualified persons should install, use or service this machine.

Maintenance Instructions

Daily Checks:

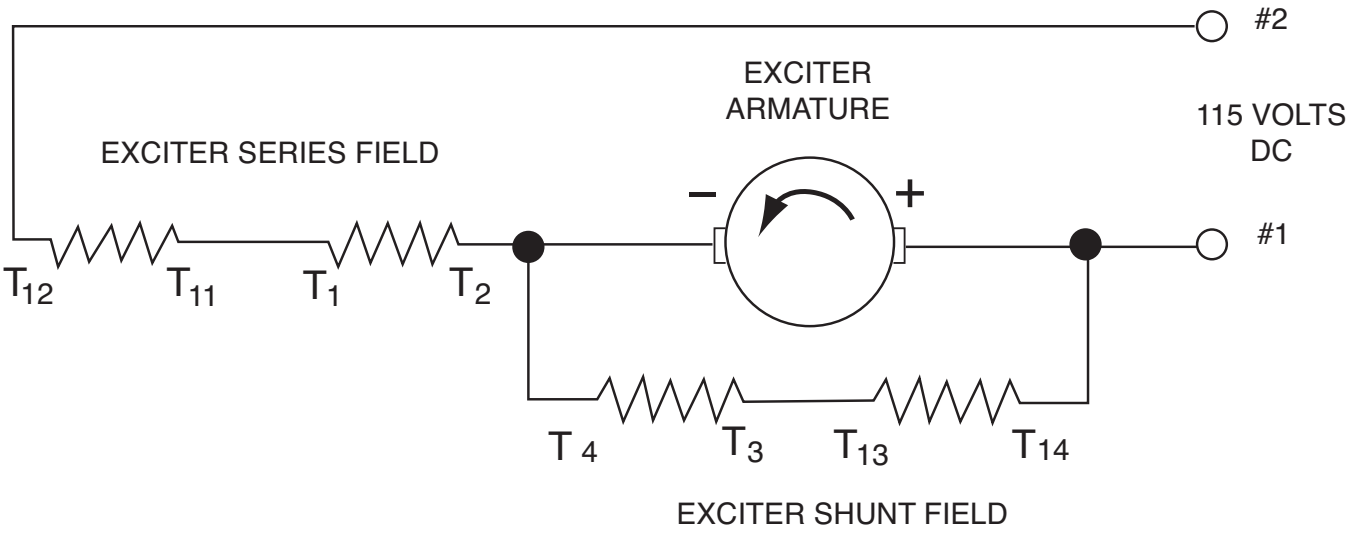
- Electrode and work connections are tight
- Rotate the current control twice to clean contacts
- All equipment in serviceable condition
- Engine oil, coolant, air cleaner and fuel strainer are at proper operating level and clean

As Required:

- Blow dust from the machine using clean low-pressure air
- Clean commutators or slip rings with fine sandpaper--not emery cloth
- Replace brushes before the pigtail is within .25" of the commutator
- Grease may be added to bearings no more than once a year.

E276-C

COMPOUND EXCITER CONNECTIONS FOR COUNTER CLOCKWISE ROTATION FACING THE EXCITER COMMUTATOR



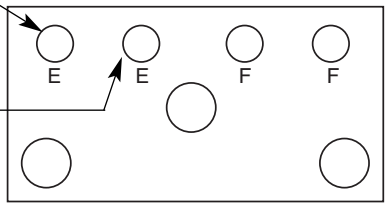
Series Field

* T1 Connect to T11.

T2 Connect to the left hand exciter brush holder.

T12 Bring out a lead through the lower or left hand lead block hole "E" and connect to the reversing switch or to power plug receptacle as shown in the control box diagram.

Bring out a lead from the right hand exciter brush holder through the top or right hand lead block hole "E" and to the reversing switch or power plug receptacle as shown in the control box diagram.



Coil with tags T1, T2, T3, T4 goes on the left hand pole piece. Coil with the tags T11, T12, T13, T14 goes on the right hand pole piece.

Shunt Field

* T3 Connect to T13.

T4 Connect to left hand exciter brush holder.

T14 Connect to the right hand exciter brush holder.

Leads for Accessory Drive or Power Plug

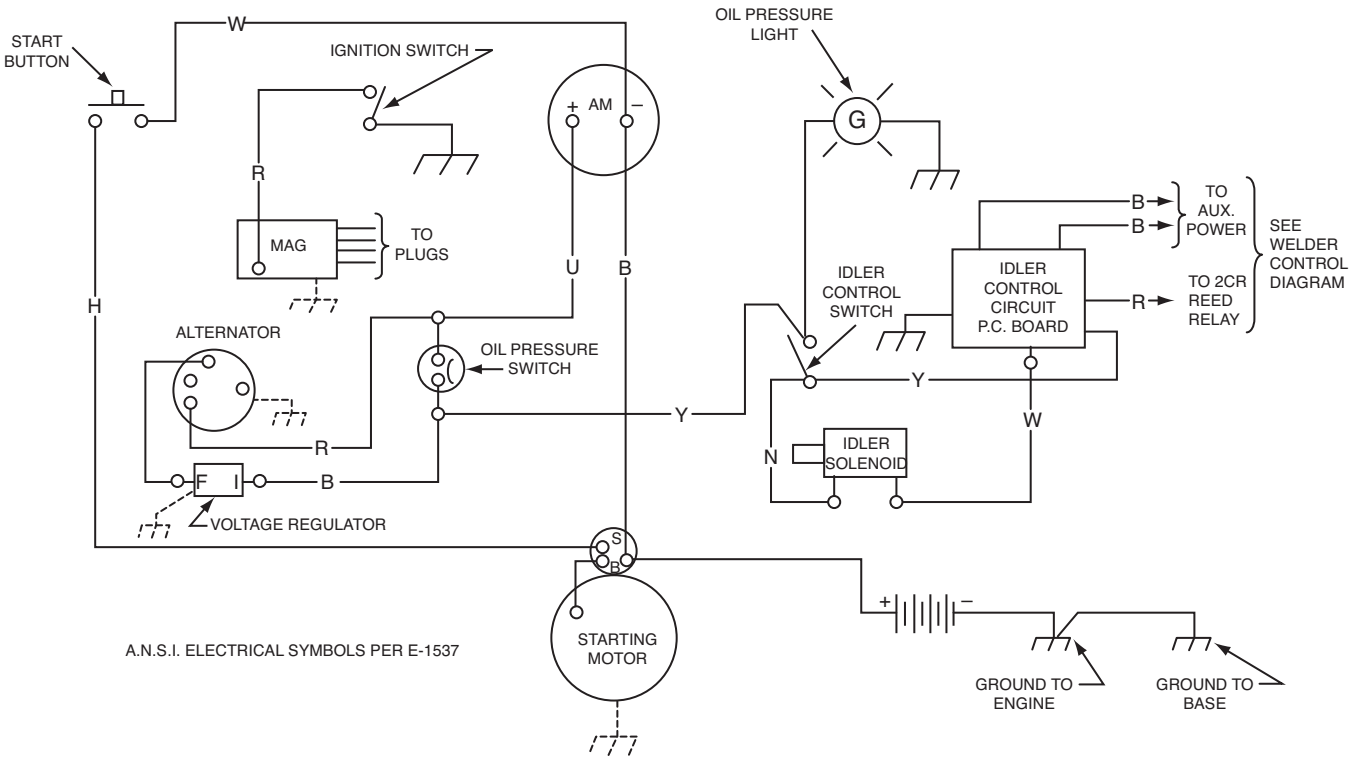
See control box diagram for connection when power plug is on right hand side of control box (standard for "L" & "E" control). Where power plug is in such a place that it is best to connect the leads at the exciter, connect the power plug leads to T12 and to the right hand exciter brush holder.

When using this diagram on M.G. set bring out and tag #1 and #2 as above.

For F162-FJW with power plug on panel, connect one side of receptacle to R.H. brush holder, and the other side of receptacle to exciter lead T12 at rheostat terminal.

* Should be soldered.

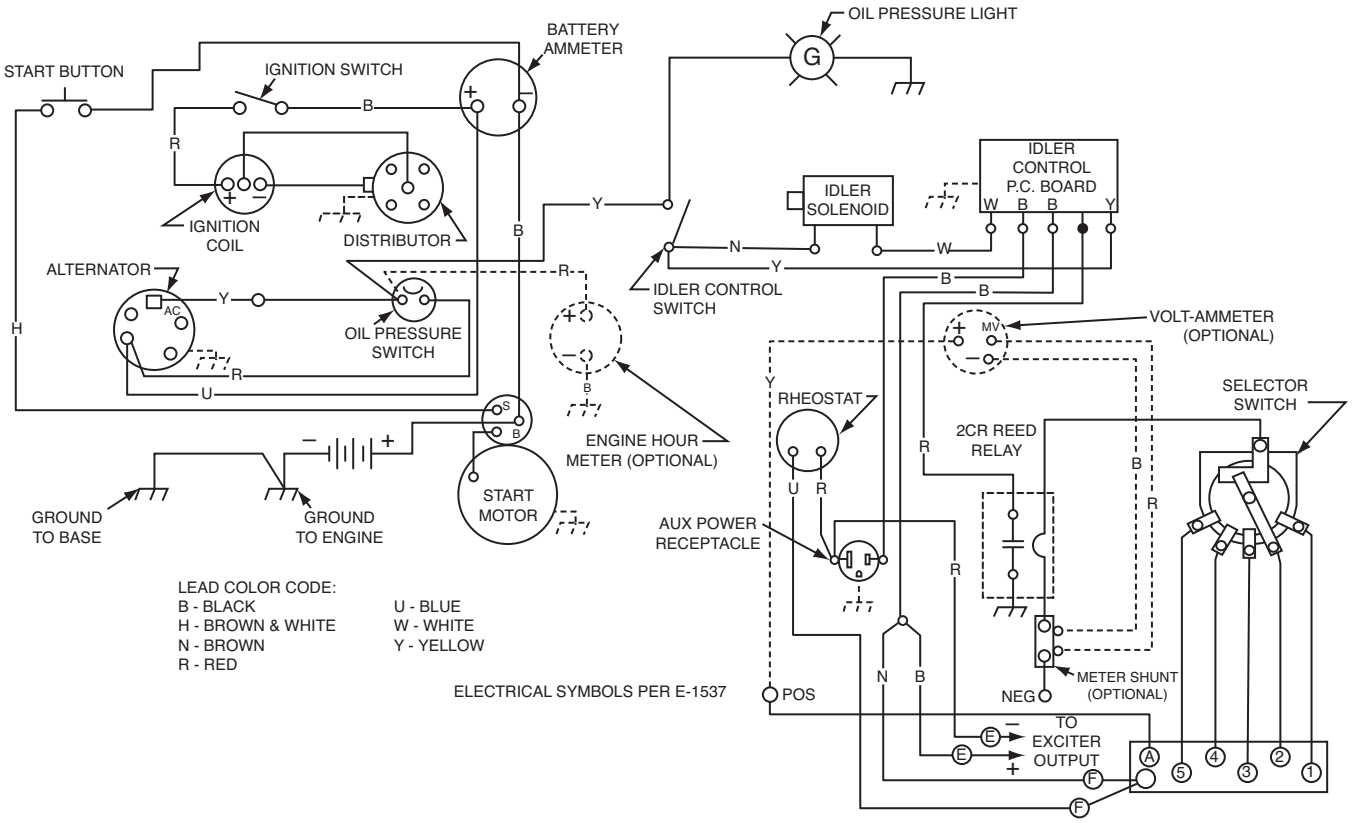
S-14919



LEAD COLOR CODE

B = Black	N = Brown
R = Red	Y = Yellow
W = White	B = Blue
H = Brown & White	

S-17298



MAINTENANCE INSTRUCTIONS

Observe operating and maintenance instructions in engine manual.
Blow out welders and controls with air hose at least once every two months – once every week in dirty locations.
Brushes should be replaced before the pigtails are within .12” of the commutator or before the limit of spring travel is reached.
Replace with the same kind of brushes as were originally furnished.
Sand in brushes according to instructions in the instruction manuals. Commutators may be cleaned with fine sandpaper while the machine is running to remove any grease or dirt that has accumulated.
DO NOT USE EMERY CLOTH
Ball bearings should not be greased more than once a year under normal service. Most bearing failures are caused by allowing dirt to be forced onto the bearing with the grease, or use of improper kind of grease. DO NOT OVERPACK WITH GREASE
Keep ground and electrode connections tight.

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

S-11663

MAINTENANCE INSTRUCTIONS

OBSERVE OPERATING INSTRUCTIONS IN ENGINE MANUAL.

BLOW OUT WELDERS AND CONTROLS WITH AIR HOSE AT LEAST ONCE EVERY TWO MONTHS ~ ONCE EVERY WEEK IN DIRTY LOCATIONS.

BRUSHES SHOULD BE REPLACED BEFORE THE PIGTAILS ARE WITHIN 1/8 INCH OF THE COMMUTATOR OR BEFORE THE LIMIT OF SPRING TRAVEL IS REACHED. REPLACE WITH THE SAME KIND OF BRUSHES AS WERE ORIGINALLY FURNISHED. SAND IN BRUSHES ACCORDING TO INSTRUCTIONS IN THE INSTRUCTION MANUALS.

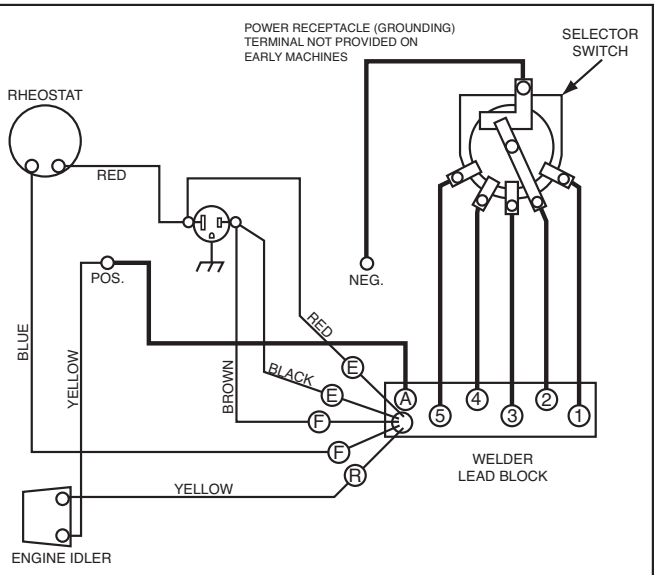
BALL BEARINGS SHOULD NOT BE GREASED MORE THAN ONCE A YEAR UNDER NORMAL SERVICE ~ USE TYPE RECOMMENDED IN THE INSTRUCTION MANUAL. MOST BEARING FAILURES ARE CAUSED BY ALLOWING DIRT TO BE FORCED INTO THE BEARING WITH THE GREASE, OR USE OF IMPROPER KIND OF GREASE.

DO NOT OVERPACK WITH GREASE

COMMUTATORS MAY BE CLEANED WITH FINE SANDPAPER WHILE THE MACHINE IS RUNNING TO REMOVE ANY GREASE OR DIRT THAT HAS ACCUMULATED.

DO NOT USE EMERY CLOTH

KEEP GROUND AND ELECTRODE CONNECTIONS TIGHT.



THE LINCOLN ELECTRIC CO.	CLEVELAND, OHIO	MADE IN U.S.A.	S-11663

PRINT ABOVE TO 4 1/2 X 10 1/2 SIZE

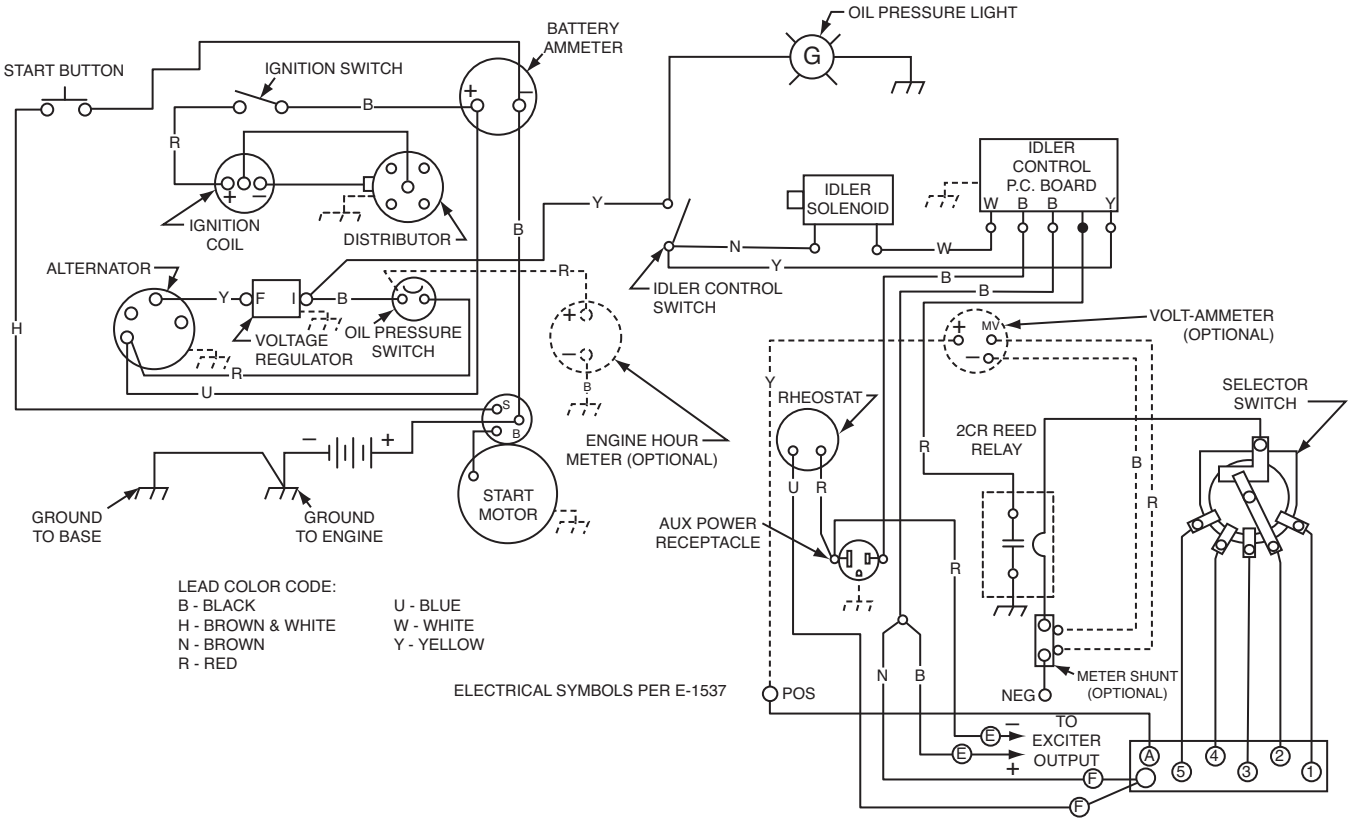
NOTE:

LIMIT OF ± 1/2º ON ALL ANGLES UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± 1/64 ON ALL FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

LIMIT OF ± .002 ON ALL DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED.

S-16483

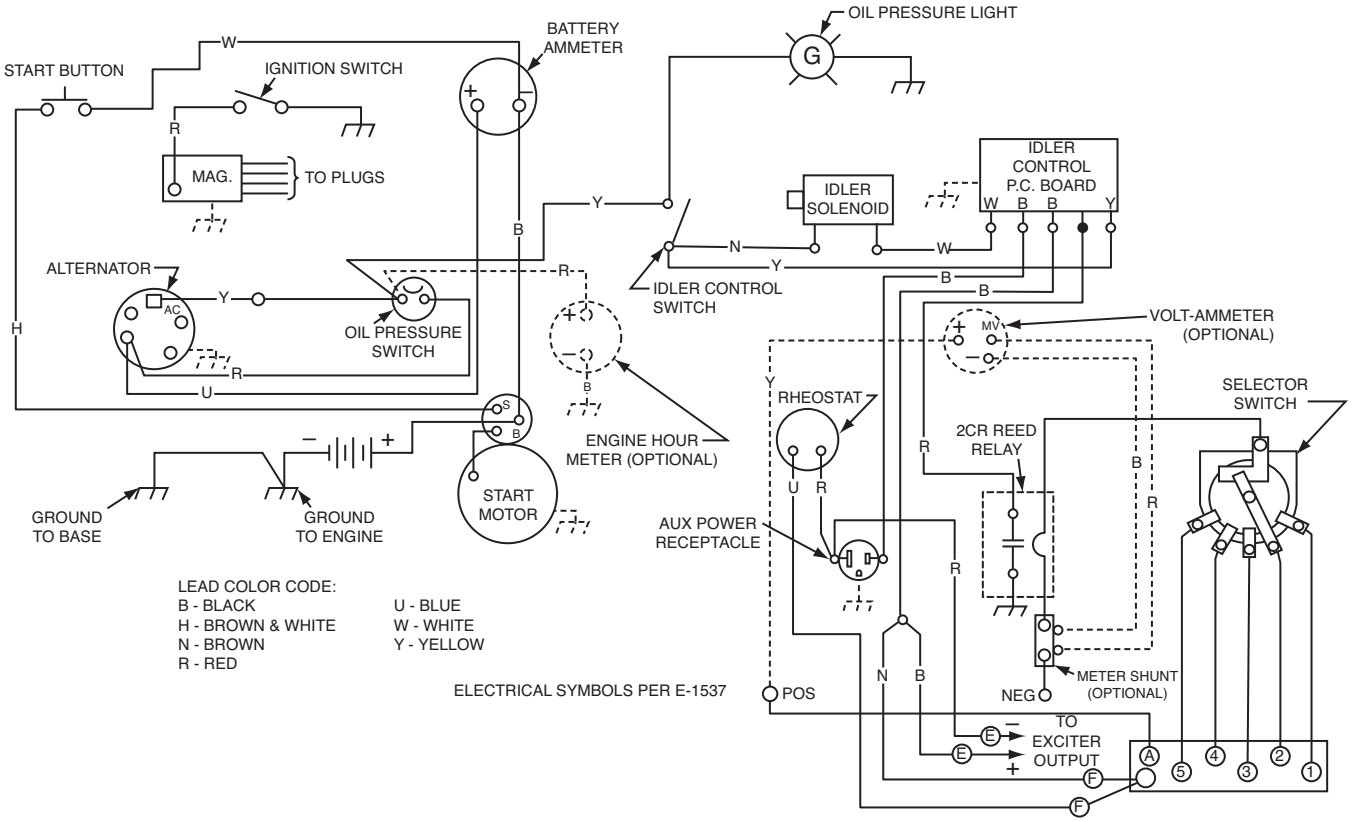


MAINTENANCE INSTRUCTIONS

Observe operating and maintenance instructions in engine manual.
Blow out welders and controls with air hose at least once every two months – once every week in dirty locations.
Brushes should be replaced before the pigtails are within .12” of the commutator or before the limit of spring travel is reached.
Replace with the same kind of brushes as were originally furnished.
Sand in brushes according to instructions in the instruction manuals. Commutators may be cleaned with fine sandpaper while the machine is running to remove any grease or dirt that has accumulated.
DO NOT USE EMERY CLOTH
Ball bearings should not be greased more than once a year under normal service. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease, or use of improper kind of grease. DO NOT OVERPACK WITH GREASE
Keep ground and electrode connections tight.

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

S-17297



MAINTENANCE INSTRUCTIONS

WARNING: Only qualified personnel should service this equipment. Stop engine before servicing. Read maintenance instructions in power source and engine operating manuals.

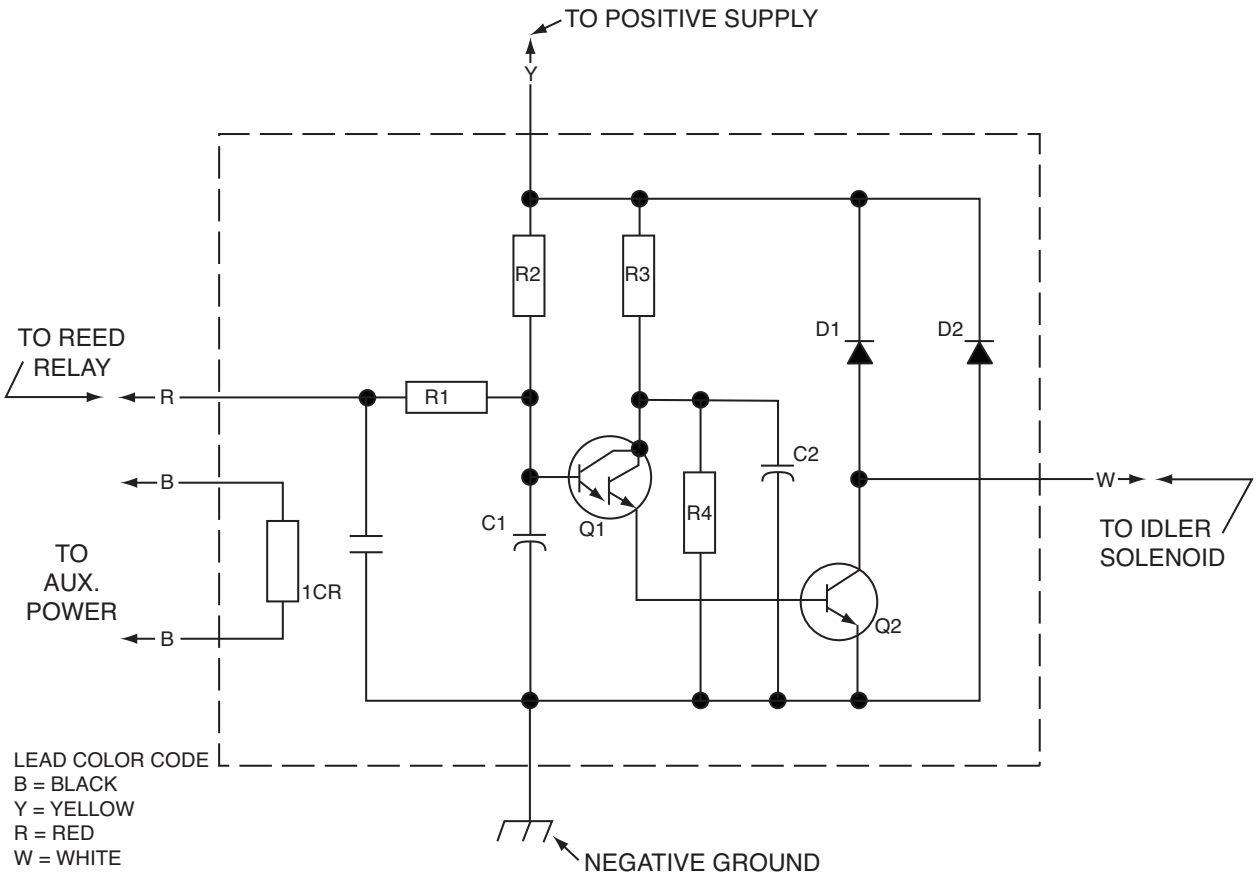
Blow out welders and controls with air hose at least once every two months – once every week in dirty locations.

Brushes should be replaced before the pigtails are within .12" of the commutator or before the limit of spring travel is reached. Replace with the same kind of brushes as were originally furnished. Sand in brushes according to instructions in the instruction manuals.

Ball bearings should not be greased more than once a year under normal service. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease, or use of improper kind of grease. DO NOT OVERPACK WITH GREASE

Keep work and electrode connections tight.

S-16129

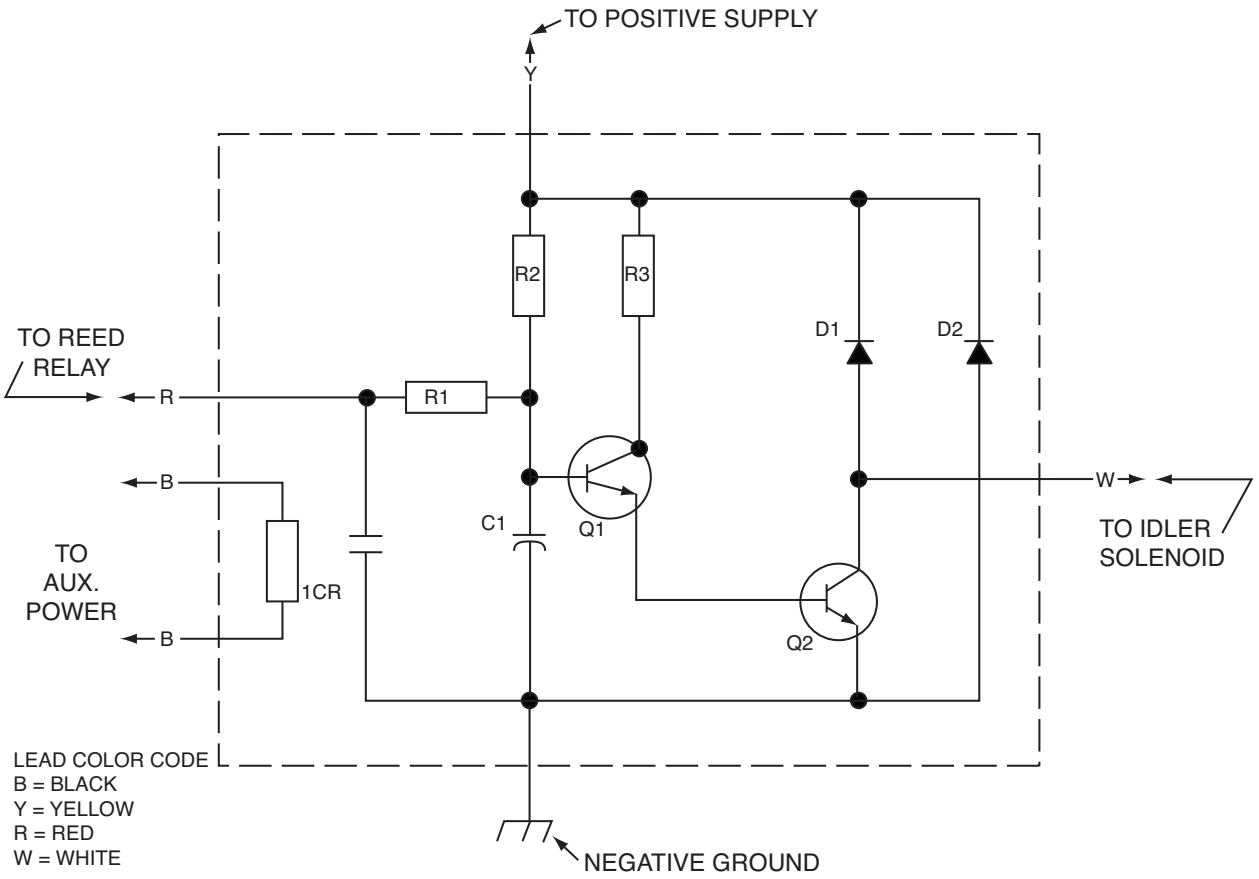


ELECTRICAL SYMBOLS PER E-1537

LEGEND

C1	200MFD
C2	.22 MFD
R1	47 Ω
R2	270 Ω
R3	220 Ω
R4	150 Ω
D1	1 AMP.
D2	1 AMP.
Q1	.5 AMP., 30 VOLT
Q2	3 AMP., 80 VOLT
1CR	REED RELAY

S-14931

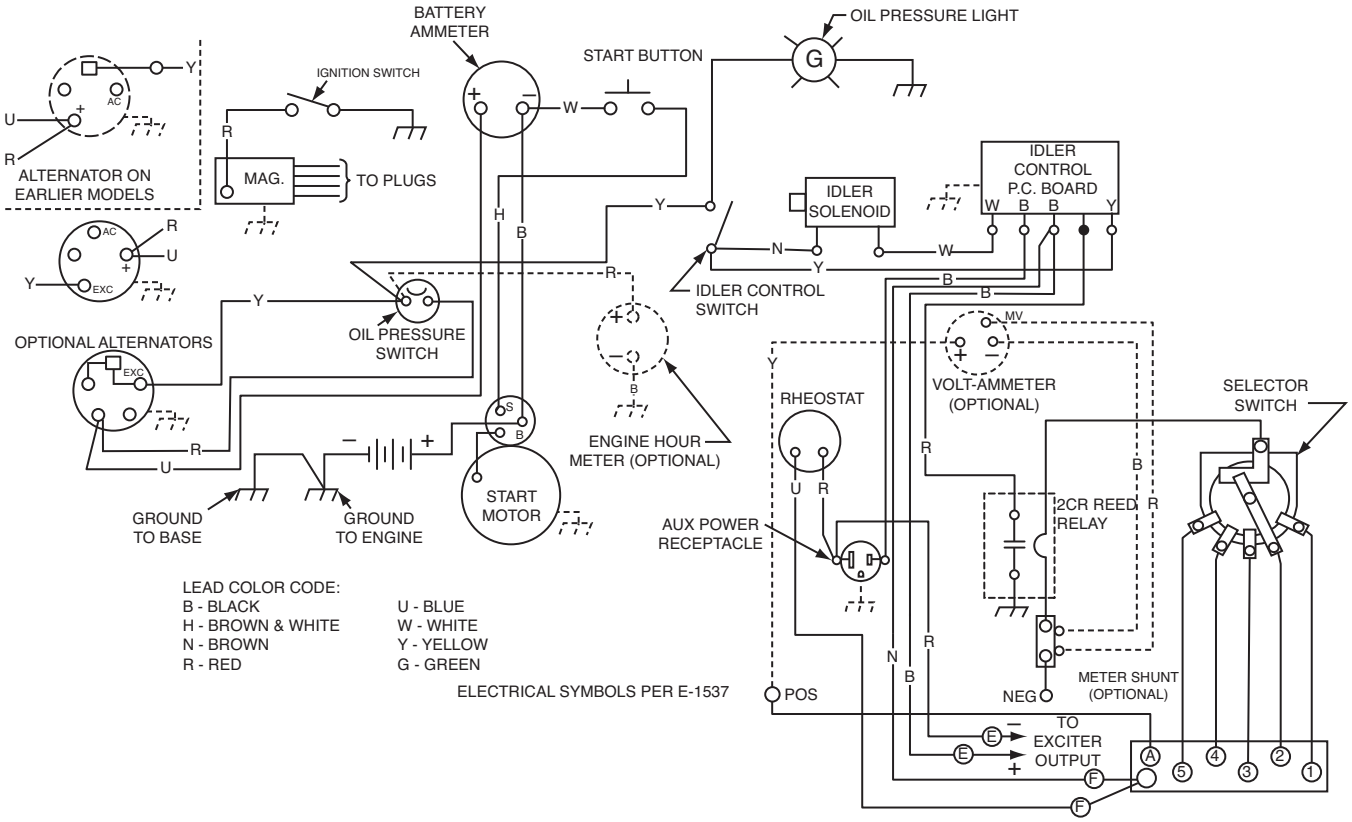


ELECTRICAL SYMBOLS PER E-1537

LEGEND

C1	200MFD
1CR	REED RELAY
R1	47 Ω
R2	470 K Ω
R3	470 Ω
D1	1 AMP
D2	1 AMP
Q1	2N3390
Q2	D40D3

S-17382



GENERAL MAINTENANCE INSTRUCTIONS FOR ENGINE DRIVEN ARC WELDING POWER SOURCES

⚠ WARNING

MOVING PARTS CAN INJURE

- Have only qualified personnel perform maintenance work.
- Turn the engine OFF before maintenance work unless the maintenance work requires it to be running.
- Keep hands, hair, clothing and tools away from moving parts, and ensure all guards or covers are replaced after servicing.

Maintenance Instructions

Daily Checks:

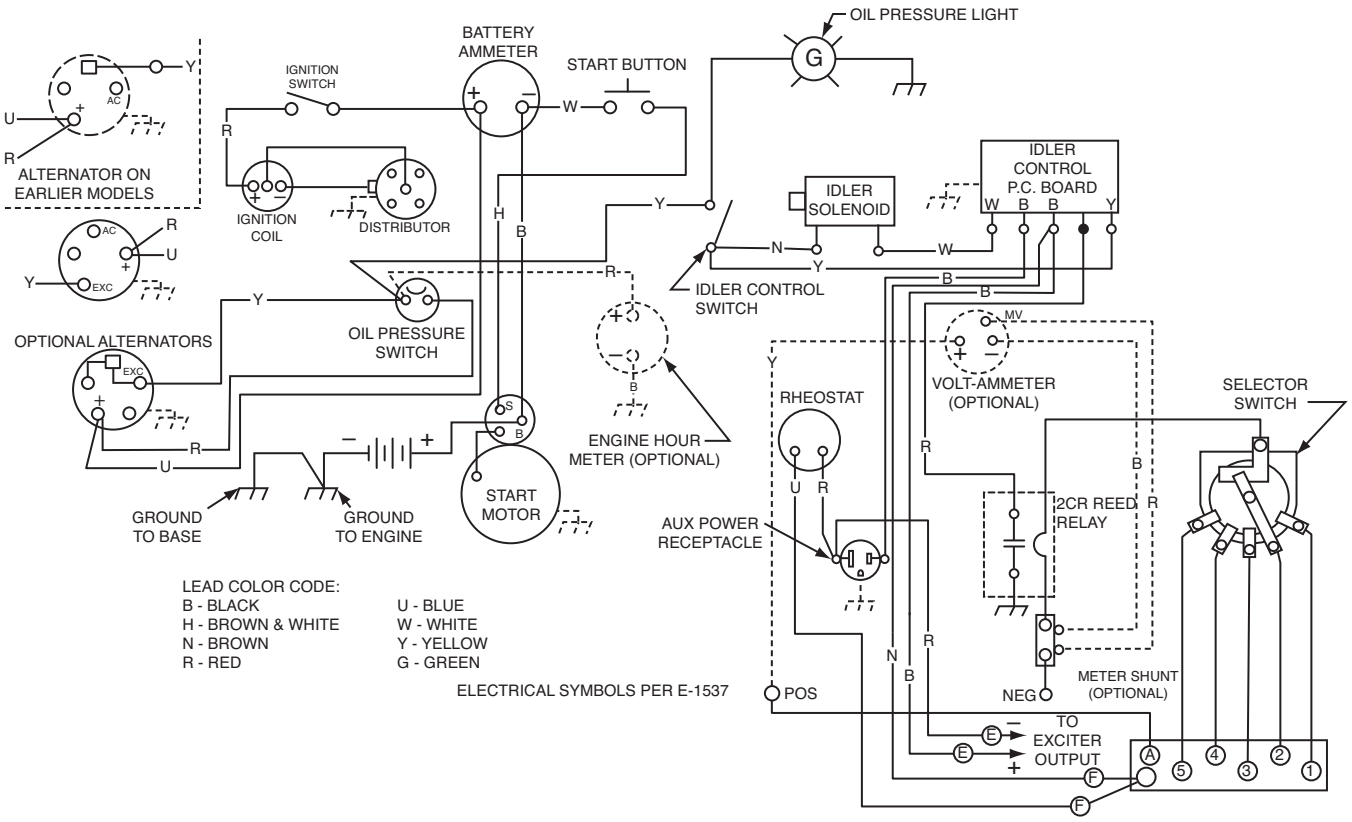
- Electrode and work connections are tight
- Rotate the current control twice to clean contacts
- All equipment in serviceable condition
- Engine oil, coolant, air cleaner and fuel strainer are at proper operating level and clean

As Required:

- Blow dust from the machine using clean low pressure air
- Clean commutators or slip rings with fine sandpaper--not emery cloth
- Replace brushes before the pigtail is within .25” of the commutator
- Grease may be added to bearings no more than once a year.

Return to Section TOC
Return to Master TOC

S-17383



GENERAL MAINTENANCE INSTRUCTIONS FOR ENGINE DRIVEN ARC WELDING POWER SOURCES

⚠ WARNING

MOVING PARTS CAN INJURE

- Have only qualified personnel perform maintenance work.
- Turn the engine OFF before maintenance work unless the maintenance work requires it to be running.
- Keep hands, hair, clothing and tools away from moving parts, and ensure all guards or covers are replaced after servicing.

Maintenance Instructions

Daily Checks:

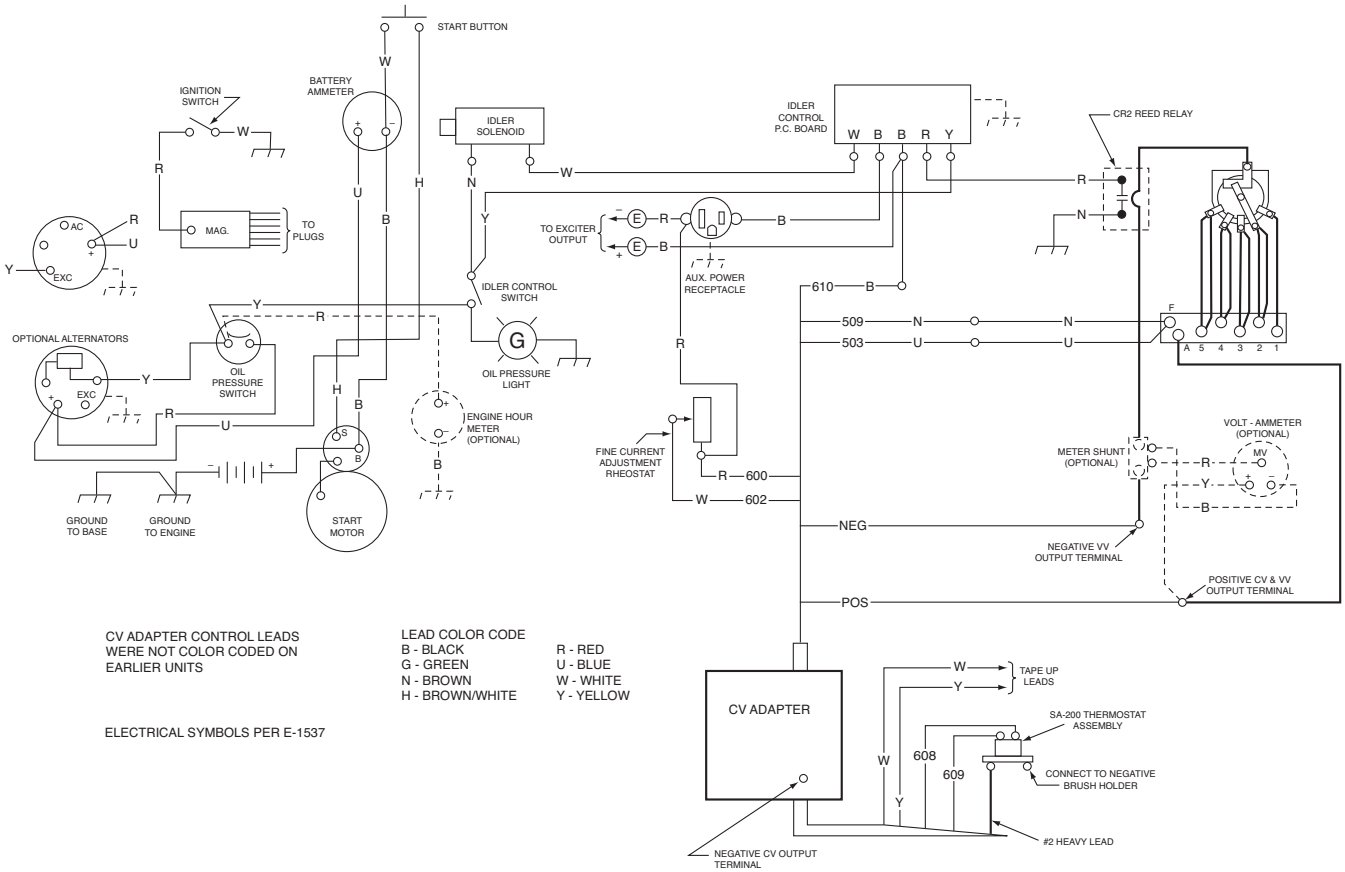
- Electrode and work connections are tight
- Rotate the current control twice to clean contacts
- All equipment in serviceable condition
- Engine oil, coolant, air cleaner and fuel strainer are at proper operating level and clean

As Required:

- Blow dust from the machine using clean low pressure air
- Clean commutators or slip rings with fine sandpaper--not emery cloth
- Replace brushes before the pigtail is within .25” of the commutator
- Grease may be added to bearings no more than once a year.

Return to Section TOC
Return to Master TOC

S-18866



GENERAL MAINTENANCE INSTRUCTIONS FOR ENGINE DRIVEN ARC WELDING POWER SOURCES

⚠ WARNING

MOVING PARTS CAN INJURE

- Have only qualified personnel perform maintenance work.
- Turn the engine OFF before maintenance work unless the maintenance work requires it to be running.
- Keep hands, hair, clothing and tools away from moving parts, and ensure all guards or covers are replaced after servicing.

intenance Instructions

Daily Checks:

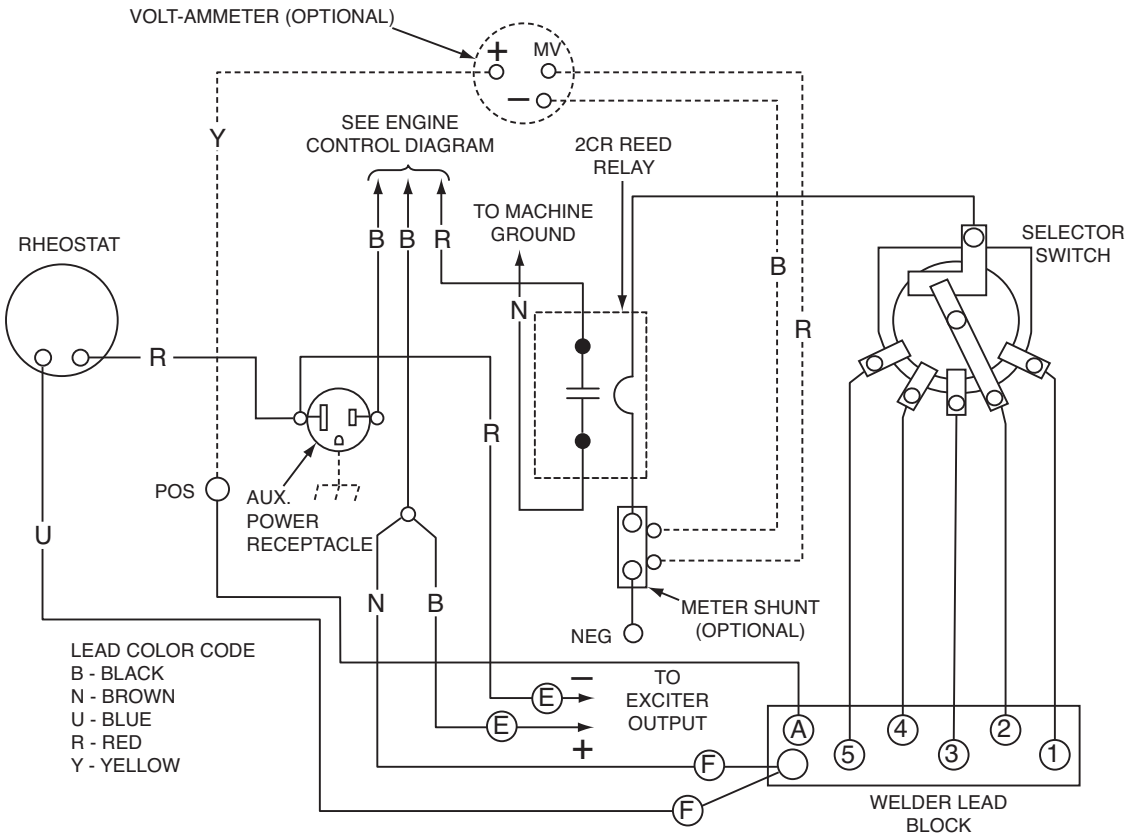
- Electrode and work connections are tight
- Rotate the current control twice to clean contacts
- All equipment in serviceable condition
- Engine oil, coolant, air cleaner and fuel strainer are at proper operating level and clean

As Required:

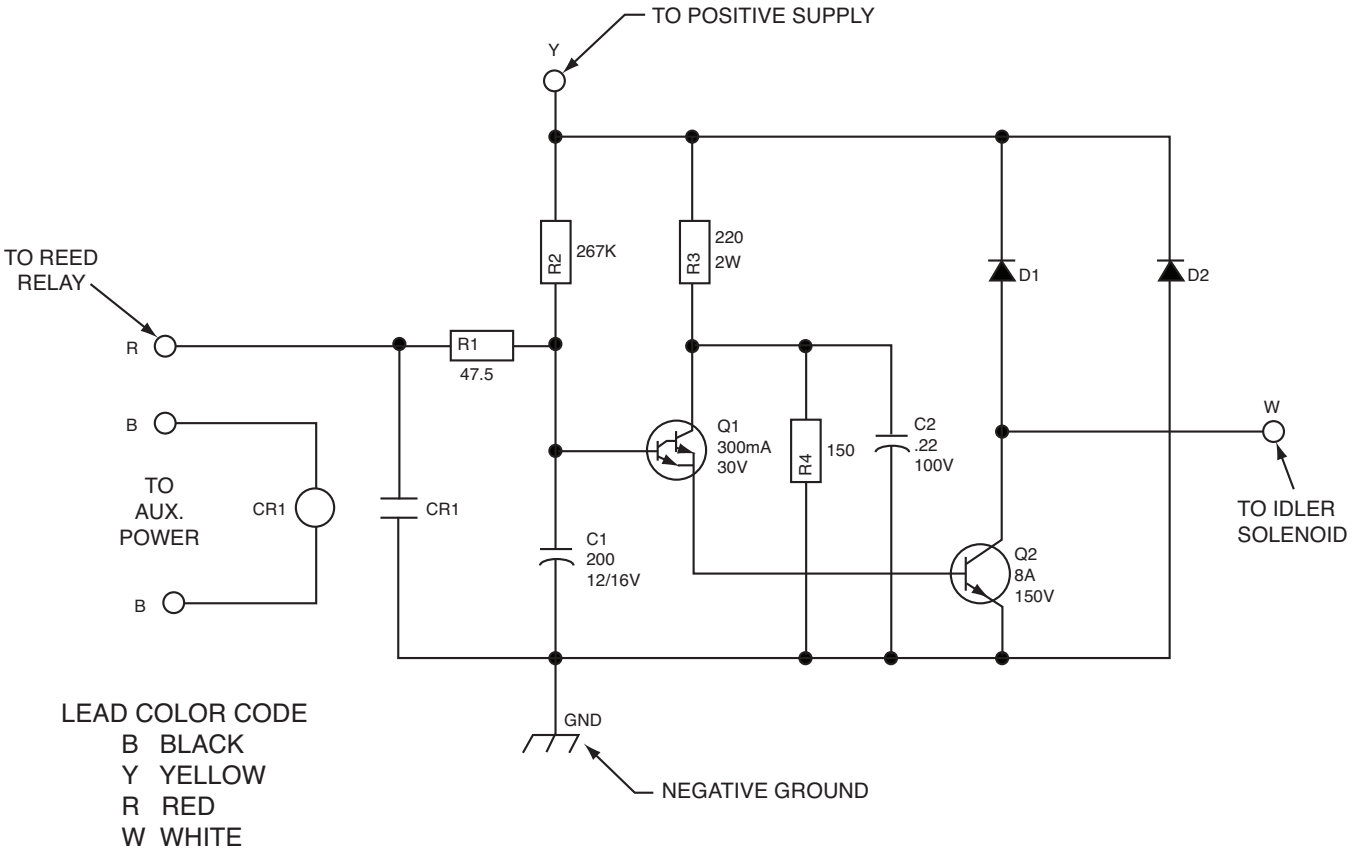
- Blow dust from the machine using clean low pressure air
- Clean commutators or slip rings with fine sandpaper--not emery cloth
- Replace brushes before the pigtail is within .25” of the commutator
- Grease may be added to bearings no more than once a year.

Return to Section TOC
Return to Master TOC

S-14930



S-20334



NOTES:

N.A. Since components or circuitry on a printed circuit board may change without affecting the interchangeability of a complete board, this diagram may not show the exact components or circuitry of controls having a common code number.

GENERAL INFORMATION

Electrical symbols per E1537

Capacitors = MFD (.022/50V unless otherwise specified)

Resistors = Ohms (1/4W unless otherwise specified)

Diodes = 1A, 400V (unless otherwise specified)

LABELS

Supply Voltage Net

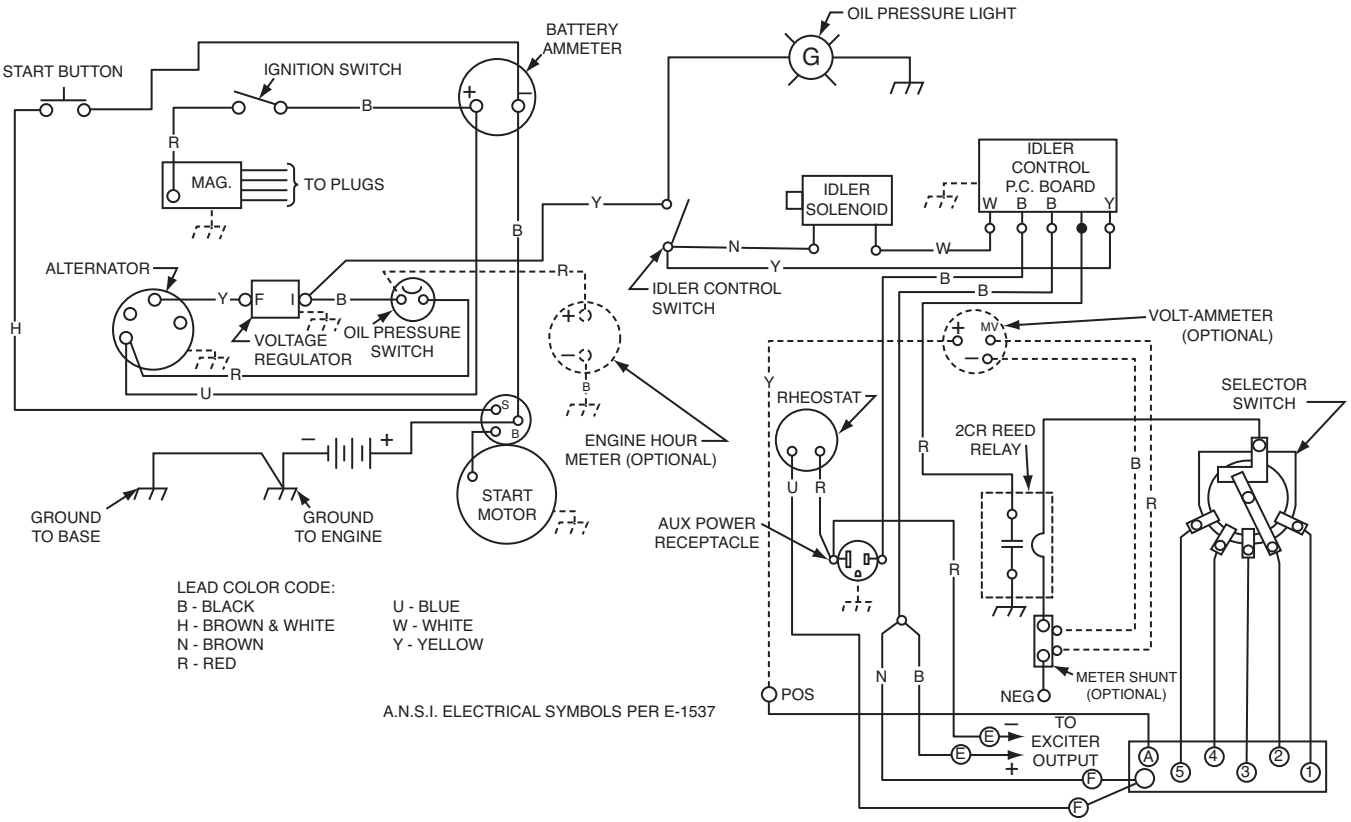
Common Connection

Frame Connection

Earth Ground Connection

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

S-15197

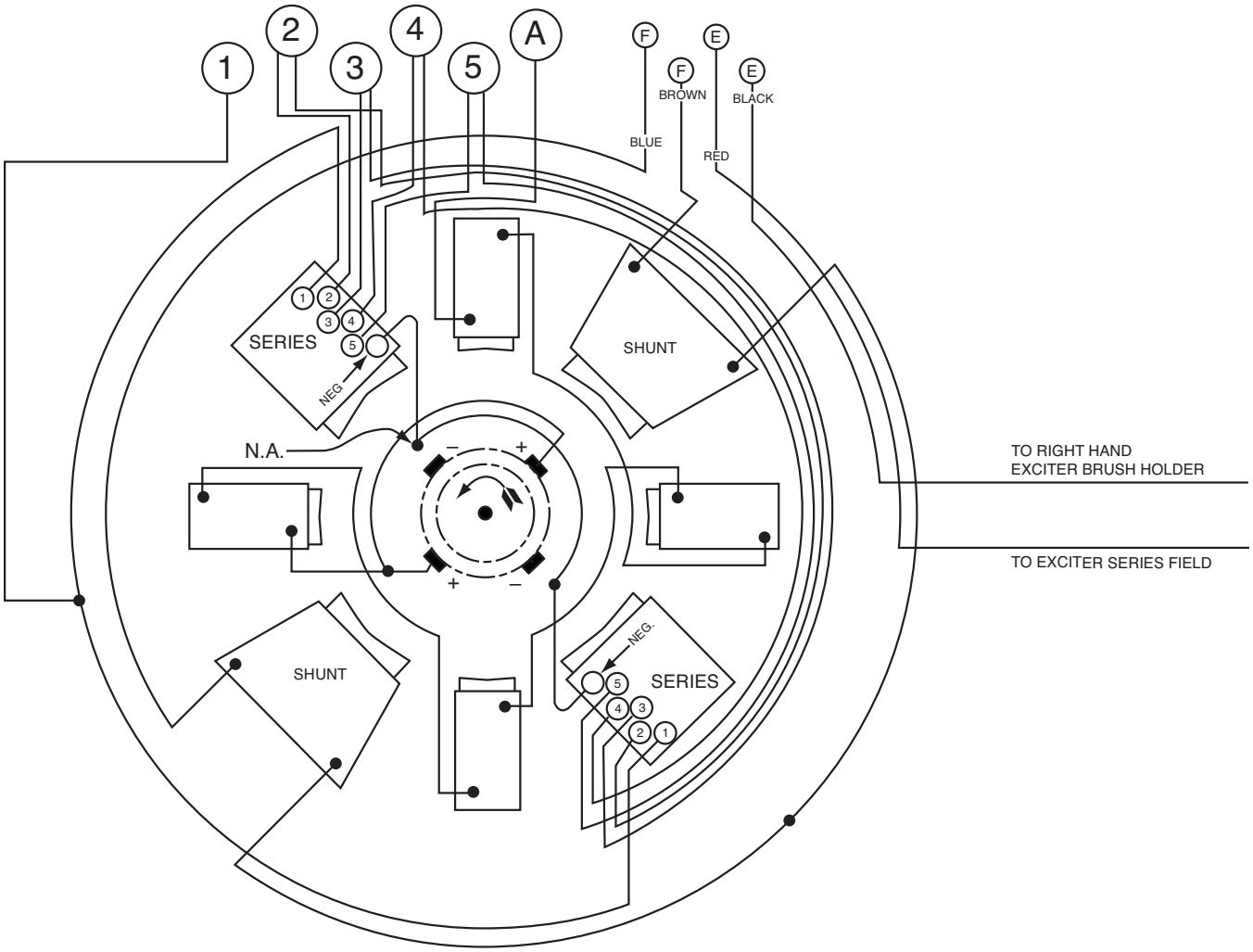


MAINTENANCE INSTRUCTIONS

WARNING: Only qualified personnel should service this equipment.
Stop engine before servicing. Read maintenance instructions in power source and engine operating manuals.
Blow out welders and controls with air hose at least once every two months – once every week in dirty locations.
Brushes should be replaced before the pigtails are within .12" of the commutator or before the limit of spring travel is reached.
Replace with the same kind of brushes as were originally furnished.
Sand in brushes according to instructions in the instruction manuals.
Ball bearings should not be greased more than once a year under normal service. Most bearing failures are caused by allowing dirt to be forced into the bearing with the grease, or use of improper kind of grease. DO NOT OVERPACK WITH GREASE
Keep work and electrode connections tight.

Return to Section TOC
Return to Master TOC

M-15733

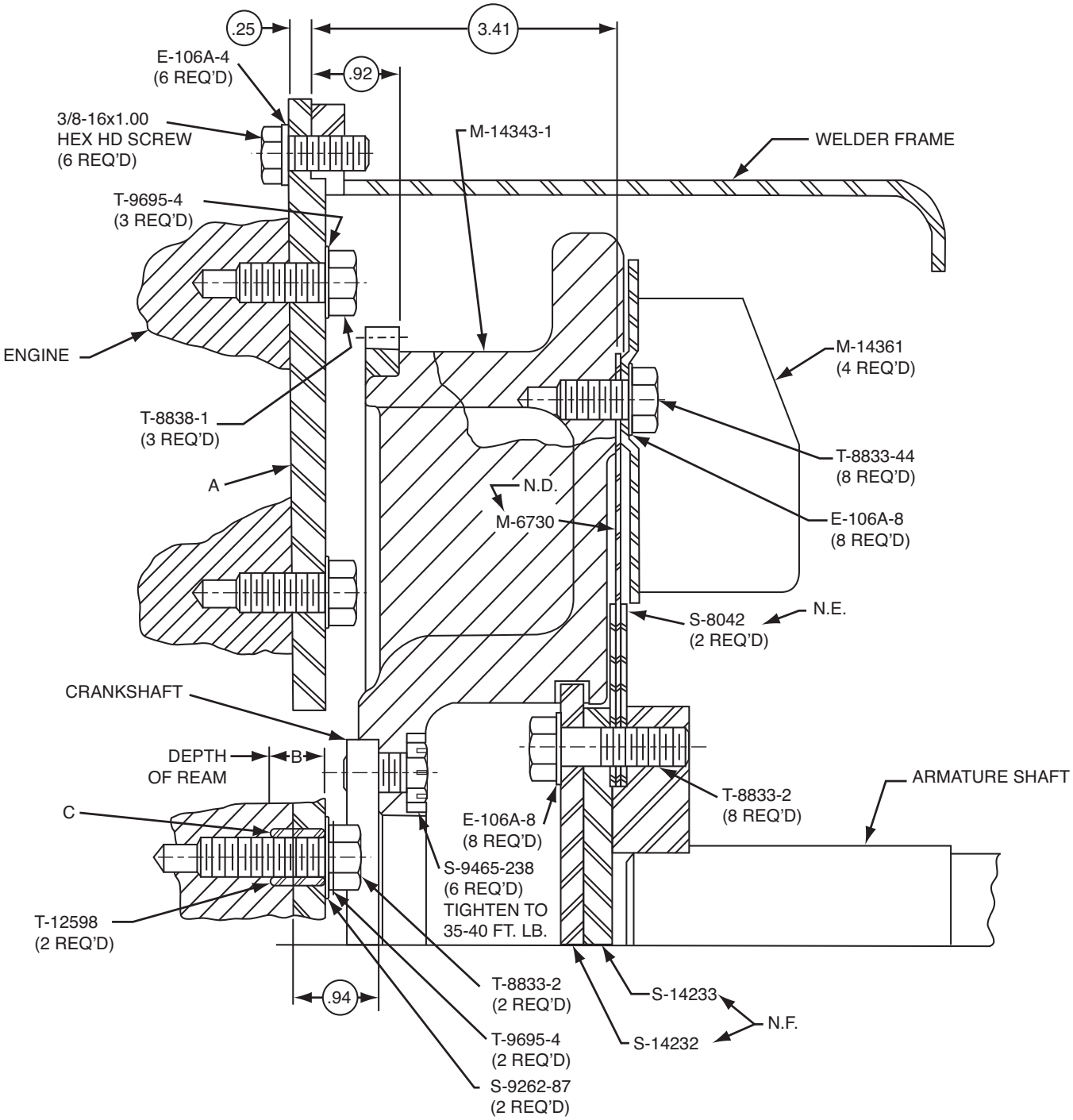


COUNTER CLOCKWISE ROTATION

N.A. When optional CV adapter is installed, the thermostat is connected to this brush holder.

N.B. Flex lead connections to interpoles may be bolted or soldered depending on type of interpoles.

L-6099



NOTES:

N.A. Runout of flywheel diameter and face not to exceed .010 max. f.1.m after assembly.

N.B. Flywheel housing face runout from flywheel not to exceed .020 max f.1.m after assembly.

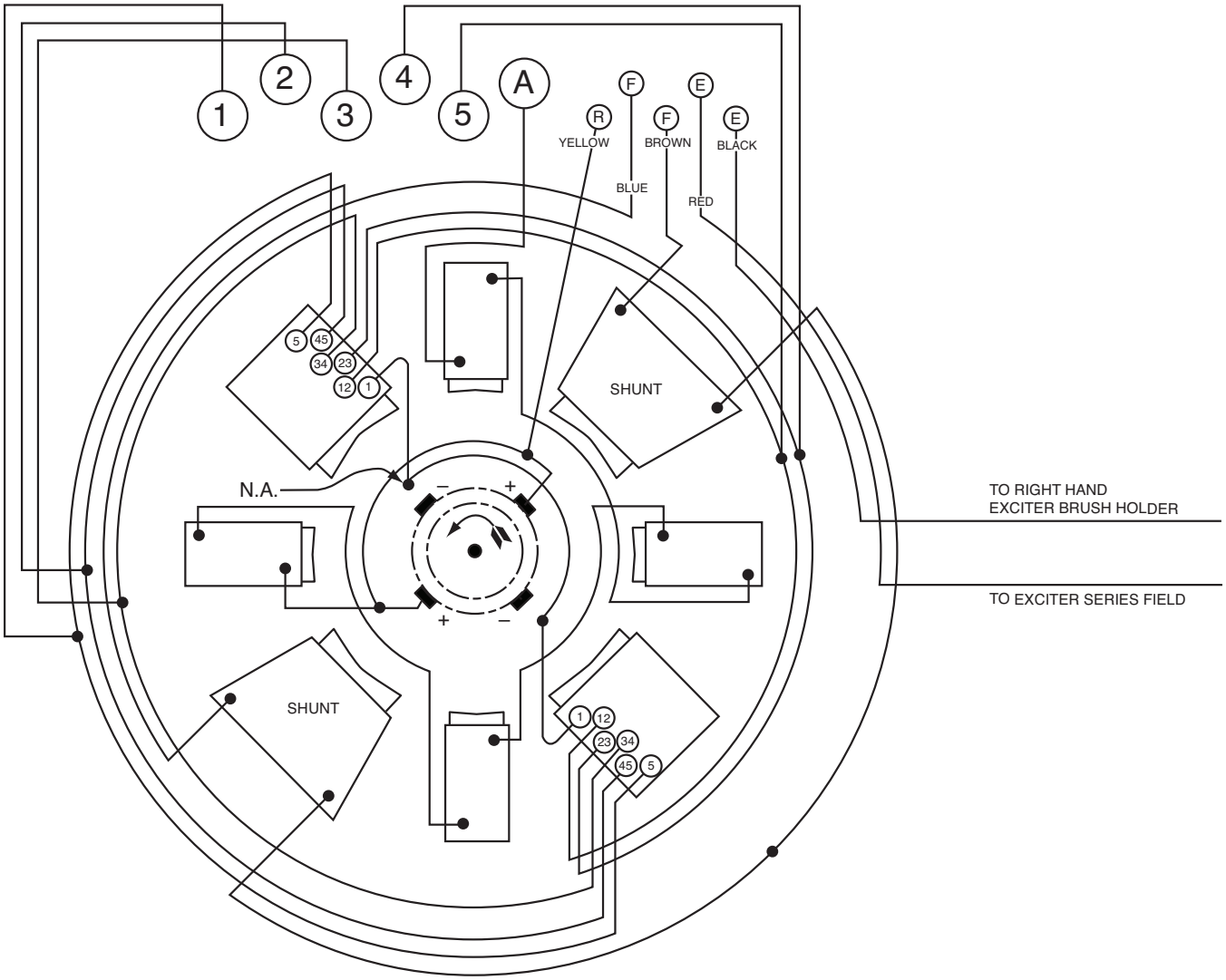
N.C. Flywheel housing diameter runout from flywheel not to exceed .010 max f.1.m after assembly.

N.D. Burr on coupling disc to face blower paddles.

N.E. Burr on both backing plates to face away from coupling disc.

N.F. Burr on both clamp rings to face each other.

M-8791



COUNTER CLOCKWISE ROTATION

NOTE: (R) LEAD USED ONLY ON UNITS WITH VACUUM IDLER.