LINCOLN ELECTRIC

GENUINE LINCOLN PARTS™

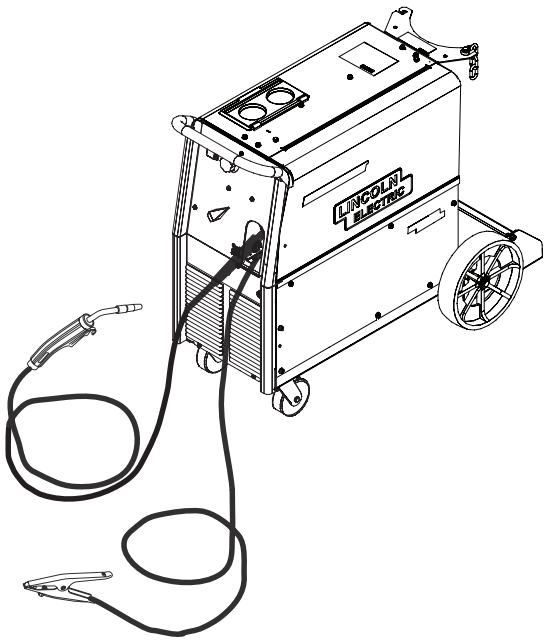
**NOTE:** This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

# *POWER MIG® 216*

For use with machines having Code Numbers:

**11558, 11817**

# *SERVICE MANUAL*

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# ⚠ WARNING

## ⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

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

The Above For Diesel Engines

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

The Above For Gasoline Engines

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

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

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

## FOR ENGINE powered equipment.

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

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

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

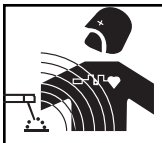
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

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

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

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

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



## ELECTRIC AND MAGNETIC FIELDS may be dangerous

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

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

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

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

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

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

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

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

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

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.

## 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.

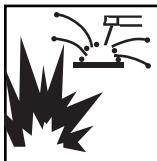
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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

## Electromagnetic Compatibility (EMC)

**Conformance**
Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

**Introduction**
All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

**Installation and Use**
The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to access whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

**Assessment of Area**
Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b) radio and television transmitters and receivers;

c) computer and other control equipment;

d) safety critical equipment, e.g., guarding of industrial equipment;

e) the health of the people around, e.g., the use of pacemakers and hearing aids;

f) equipment used for calibration or measurement

g) the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h) the time of day that welding or other activities are to be carried out.

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

## Electromagnetic Compatibility (EMC)

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

**Methods of Reducing Emissions**

**Mains Supply**
Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

**Maintenance of the Welding Equipment**
The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturers instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

**Welding Cables**
The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

**Equipotential Bonding**
Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

**Earthing of the Workpiece**
Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

**Screening and Shielding**
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications. [1]

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[1] Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

# - MASTER TABLE OF CONTENTS FOR ALL SECTIONS -

# TABLE OF CONTENTS - INSTALLATION SECTION





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

## TECHNICAL SPECIFICATIONS – POWER MIG® 216

| INPUT – SINGLE PHASE ONLY | | |
|---|---|---|
| **Standard Voltage/Phase/Frequency** | **Input Current @ 170 Amp Rated Output** | **Input Current @ 216 Amp Rated Output** |
| 208/230/1/60 Hz | 33/29 Amps | 40/36 Amps |
| 220/1/50 Hz | 30 Amps | 37 Amps |

| RATED OUTPUT | | |
|---|---|---|
| **Duty Cycle** | **Amps** | **Volts at Rated Amperes** |
| 30% | 216 Amps | 22 Volts |
| 40% | 190 Amps | 23 Volts |
| 60% | 170 Amps | 24* Volts |

| OUTPUT | | |
|---|---|---|
| **Welding Current Range** | **Maximum Open Circuit Voltage** | **Welding Voltage Range** |
| 30 – 250Amps | 36 Volts | 13-24 Volts |

| RECOMMENDED INPUT WIRE AND FUSE SIZES | | | |
|---|---|---|---|
| **Input Voltage/ Frequency (Hz)** | **Fuse or Breaker Size (Super Lag)** | **Input Ampere Rating On Nameplate (30% Duty Cycle)** | **Power Cord** |
| 208/60<br>230/60<br>220/50 | 50<br>50<br>50 | 40A<br>36A<br>37A | 50 Amp, 250V<br>Three Prong Plug<br>(NEMA) Type 6-50P |

| WIRE SPEED RANGE | |
|---|---|
| **Wire Speed** | 50 – 700 IPM (1.27 – 17.8 m/minute) |

| PHYSICAL DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| **Height** | **Width** | | **Depth** | **Weight** | |
| | With Coil Claw™ | Without Coil Claw™ | | With Gun and Cable and Work Cable | Without Gun and Cable and Work Cable |
| 32.56 in.<br>827 mm | 20.12 in.<br>512 mm | 19.15 in.<br>487 mm | 39.92 in.<br>1014 mm | 215.5 lbs.<br>97.8 kg. | 206.5 lbs.<br>93.7 kg. |

| TEMPERATURE RANGES | |
|---|---|
| **OPERATING TEMPERATURE RANGE**<br>-4°F to 104°F(-20°C to +40°C) | **STORAGE TEMPERATURE RANGE**<br>-40°F to 185°F(-40°C to +40°C) |

* **23 Volts at 50 Hz.**



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

**Read entire installation section before starting installation.**

## SAFETY PRECAUTIONS

**⚠ WARNING**

**ELECTRIC SHOCK can kill.**

- **Only qualified personnel should perform this installation.**
- **Only personnel that have read and understood the POWER MIG® 216 Operator's Manual should install and operate this equipment.**
- **Machine must be grounded per any national, local or other applicable electrical codes.**
- **The POWER MIG® 216 power switch is to be in the OFF position when installing work cable and gun and when connecting other equipment.**

## UNCRATING THE POWER MIG® 216

Cut banding and lift off cardboard carton. Cut banding holding the machine to the skid. Remove foam and corrugated packing material. Untape accessories from Gas Bottle Platform. Unscrew the two wood screws (at the Gas Bottle Platform) holding the machine to the skid. Roll the machine off the skid assembly.

## LOCATION

Locate the welder in a dry location where there is free circulation of clean air into the brickwork in the back and the louvers out the front. A location that minimizes the amount of smoke and dirt drawn into the rear brickwork reduces the chance of dirt accumulation that can block air passages and cause overheating.

## INPUT POWER, GROUNDING AND CONNECTION DIAGRAM

**⚠ WARNING**

**ELECTRIC SHOCK can kill.**

- **Do not touch electrically live parts such as output terminals or internal wiring.**
- **All input power must be electrically disconnected before proceeding.**

1. Before starting the installation, check with the local power company if there is any question about whether your power supply is adequate for the voltage, amperes, phase, and frequency specified on the welder rating plate. Also be sure the planned installation will meet the U.S. National Electrical Code and local code requirements. This welder may be operated from a single phase line or from one phase of a two or three phase line.
2. Models that have multiple input voltages specified on the rating plate (e.g. 208/230) are shipped connected for the highest voltage. If the welder is to be operated on lower voltage, it must be reconnected according to the instructions in ***Figure A.1*** for dual voltage machines.

**⚠ WARNING**

**Make certain that the input power is electrically disconnected before removing the screw on the reconnect panel access cover.**



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

**FIGURE A.1 — DUAL VOLTAGE MACHINE INPUT CONNECTIONS**


3. The 208/230 volts 50/60 Hz model POWER MIG is shipped with a 10ft.(3.0m) input cable and plug connected to the welder.

4. Have a qualified electrician connect a receptacle (Customer Supplied) or cable to the input power lines and the system ground per the U.S. National Electrical Code and any applicable local codes.

## OUTPUT POLARITY CONNECTIONS

The welder, as shipped from the factory, is connected for electrode positive (+) polarity. This is the normal polarity for GMAW.

If negative (–) polarity is required, interchange the connection of the two cables located in the wire drive compartment near the front panel. The electrode cable, which is attached to the wire drive, is to be connected to the negative (–) labeled terminal and the work lead, which is attached to the work clamp, is to be connected to the positive (+) labeled terminal.

Return to Section TOC
Return to Master TOC

## GUN AND CABLE INSTALLATION

The Magnum 250L gun and cable provided with the POWER MIG® 216 is factory installed with a liner for .035 - .045" (0.9 - 1.1 mm) electrode and an .035" (0.9 mm) contact tip. Be sure that the contact tip, liner, and drive rolls all match the size of the wire being used.

**⚠ WARNING**

**Turn the welder power switch off before installing gun and cable.**

1. Lay the cable out straight.
2. Unscrew the Hand Screw on the drive unit front end (inside wire feed compartment) until tip of screw no longer protrudes into Gun Adapter opening as seen from front of machine. (See Figure A.2)
3. Insert the male end of gun cable into the Gun Adapter through the opening in front panel. Make sure connector is fully inserted and tighten Hand Screw.
4. Connect the Gun Trigger Connector from the gun and cable to the mating Receptacle outside the compartment located left of the opening on the Front Panel. Make sure that the keyways are aligned; insert and tighten retaining ring.

## SHIELDING GAS

[For **Gas Metal Arc Welding** (**GMAW**) Processes]

Customer must provide cylinder of appropriate type shielding gas for the process being used.

A gas flow regulator, for Argon blend gas, and an inlet gas hose are factory provided with the POWER MIG® 216. When using 100% CO2 an additional adapter will be required to connect the regulator to the gas bottle.

**⚠ WARNING**

**CYLINDER may explode if damaged.**

- **Gas under pressure is explosive. Always keep gas cylinders in an upright position and always keep chained to undercarriage or stationary support.**

**See American National Standard Z-49.1, "Safety in Welding and Cutting" published by the American Welding Society.**

---

**Install shielding gas supply as follows:**

1. Set gas cylinder on rear platform of POWER MIG® 216. Hook chain in place to secure cylinder to rear of welder.
2. Remove the cylinder cap. Inspect the cylinder valves and regulator for damaged threads, dirt, dust, oil or grease. Remove dust and dirt with a clean cloth.

   DO NOT ATTACH THE REGULATOR IF OIL, GREASE OR DAMAGE IS PRESENT! Inform your gas supplier of this condition. Oil or grease in the presence of high pressure oxygen is explosive.
3. Stand to one side away from the outlet and open the cylinder valve for an instant. This blows away any dust or dirt which may have accumulated in the valve outlet.

**⚠ WARNING**

**Be sure to keep your face away from the valve outlet when "cracking" the valve.**

4. Attach the flow regulator to the cylinder valve and tighten the union nut(s) securely with a wrench.

**NOTE:** If connecting to 100% CO2 cylinder, an additional regulator adapter must be installed between the regulator and cylinder valve. If adapter is equipped with a plastic washer, be sure it is seated for connection to the CO2 cylinder.

5. Attach one end of the inlet gas hose to the outlet fitting of the flow regulator, the other end to the POWER MIG® 216 rear fitting, and tighten the union nuts securely with a wrench.
6. Before opening the cylinder valve, turn the regulator adjusting knob counterclockwise until the adjusting spring pressure is released.
7. Standing to one side, open the cylinder valve slowly a fraction of a turn. When the cylinder pressure gauge pointer stops moving, open the valve fully.

**⚠ WARNING**

**Never stand directly in front of or behind the flow regulator when opening the cylinder valve. Always stand to one side.**

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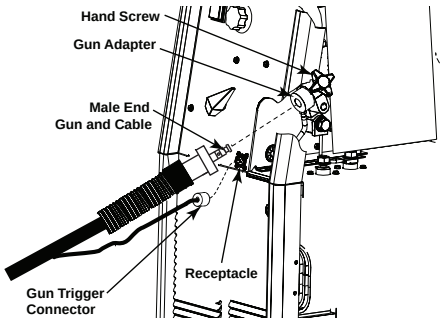
8. The flow regulator is adjustable. Adjust it to the flow rate recommended for the procedure and process being used before making the weld.

**FIGURE A.2**



## COIL CLAW™ INSTALLATION

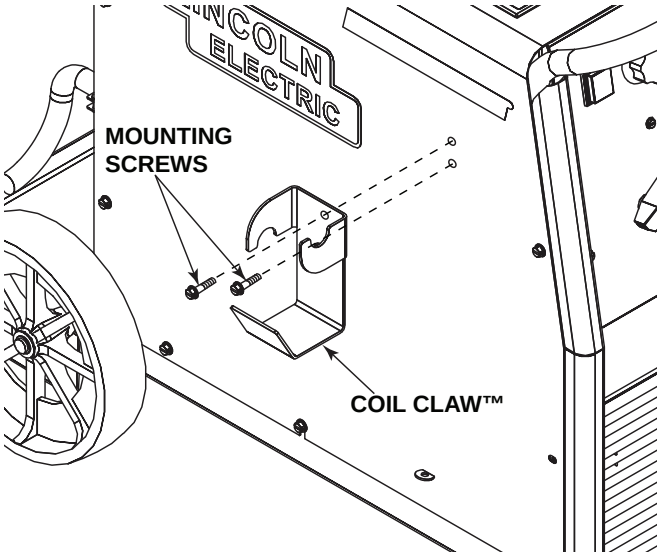
The Coil Claw™ and mounting screws are provided as an optional accessory for the POWER MIG® 216. This user-install accessory provides cable management for the machine.

**⚠ WARNING**

**Turn the welder power switch OFF before installing Coil Claw™.**

1. Unwrap Coil Claw™ from its protective paper and remove the bag of mounting screws from the back of the Coil Claw™.
2. Mount the Coil Claw™ using the provided mounting screws to the left side of the machine, when viewed from the front. Make sure the Coil Claw™ is firmly mounted. (See Figure A.3)

**FIGURE A.3**






Return to Section TOC
Return to Master TOC

# TABLE OF CONTENTS - OPERATION SECTION





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

**Read entire Operation section before operating the POWER MIG® 216.**

## ⚠ WARNING

### ELECTRIC SHOCK can kill.

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

### FUMES AND GASES can be dangerous.

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

### WELDING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not weld on closed containers.

### ARC RAYS can burn eyes and skin.

- Wear eye, ear and body protection.

**Observe all safety information throughout this manual.**



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

## PRODUCT DESCRIPTION

The POWER MIG® 216 is a complete semiautomatic DC voltage arc welding machine built to meet NEMA specifications. It combines a tapped transformer voltage power source with a constant speed wire feeder to form a reliable and robust performance welding system. A simple control scheme, consisting of continuous full range wire feed speed control, and 7 output voltage tap selections provides versatility with ease of use and accuracy. An enhanced feature to the POWER MIG® 216, is that it is Magnum 100SG Spool Gun ready.

Other features include a 2" (51 mm) O.D. wire reel spindle with adjustable brake, an integral gas cylinder mounting undercarriage, an adjustable Argon blend flow regulator with cylinder pressure gauge and inlet hose, a 15 ft. (3.6 m) Magnum 250L GMAW gun and cable with fixed (flush) nozzle, a 10 ft. (3.0 m) power cable with plug, and a 10 ft. (3.0 m) work cable with clamp.

Optional Magnum Spool Gun, Adapter kits and Dual Cylinder Mounting kit for push feeding with standard built in feeder are also available.

## RECOMMENDED PROCESSES AND EQUIPMENT

The POWER MIG® 216 is recommended for GMAW processes using 10 to 44 lb (4.5 to 20 kg) 2" (51 mm) I.D. spools of .025" through .045" (0.6 to 1.1 mm) solid wire, .035" (0.9 mm) stainless, 3/64" (1.2 mm) aluminum, .035" (0.9 mm), .045" (1.1 mm) Outershield® and .045" (1.1 mm) Ultracore® as well as .035" (0.9 mm) and .045" (1.1 mm) Innershield® self-shielding electrodes.

The POWER MIG® 216 is factory equipped to feed .035" (0.9 mm) electrodes. It also includes a 200A, 60% duty cycle (or 250A, 40% duty cycle) rated, 15 ft. (3.6 m) GMAW gun and cable assembly equipped for these wire sizes. Use of GMAW processes requires a supply of shielding gas.

## WELDING CAPABILITY

The POWER MIG® 216 is rated at 216 amps @ 22 volts, at a 30% duty cycle based on a ten minute cycle time. It is capable of higher duty cycles at lower output currents. The tapped transformer design makes it well suited for use with most portable or in-plant generating systems.

## LIMITATIONS

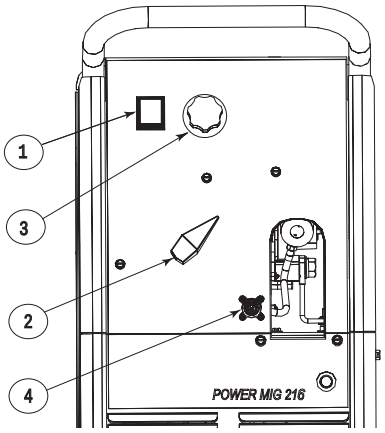
The output voltage/current of the POWER MIG® 216 is subject to vary if the input power to the machine varies, due to its tapped transformer power topology. In some cases an adjustment of WFS preset and/or voltage tap selection may be required to accommodate a significant drift in input power.

## DESCRIPTION OF CONTROLS

See Figure B.1

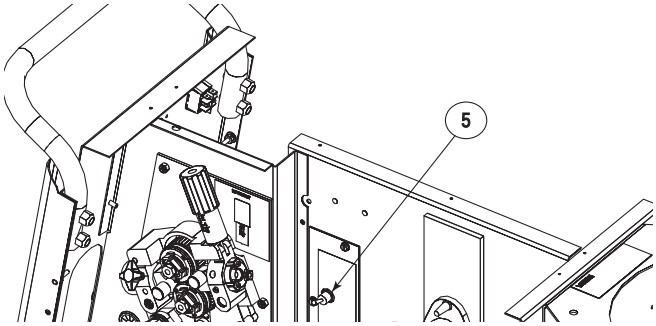
1. **Power ON/OFF Switch -** Press the switch to "ON" position to energize the POWER MIG® 216.
2. **Voltage Control -** Seven voltage tap selections are provided labeled "A" (minimum voltage) through "G" (maximum voltage). **It should only be adjusted when NOT welding**. The control selection can be preset to the setting specified on the Application Chart / Procedure Decal on the inside of the wire compartment door or ***Troubleshooting*** of this Instruction Manual.
3. **Wire Speed Control -** This controls the wire feed speed from 50 – 700 inches per minute (1.2 – 17.8 m/min). Wire speed is not affected when changes are made in the voltage control.
4. **4-Pin Connector -** For Push Gun and Spool Gun Operations.

**FIGURE B.1**




5. **Magnum Push Gun and Spool Gun toggle switch -** Toggle the switch (**Item 5** see Figure B.2) to select between push gun and spool gun. When either operation is selected, insert the cable to 4-pin Connector. (**Item 4**, See Figure B.1)

**FIGURE B.2**



Return to Section TOC
Return to Master TOC

## WIRE DRIVE ROLL

The drive rolls installed with the POWER MIG® 216 have two grooves, one for .035”(0.9mm) wire and the other for .045”(1.1mm) wire. Drive roll size is indicated by the stenciling on the exposed side of the drive roll.

## WIRE SIZE CONVERSION PARTS

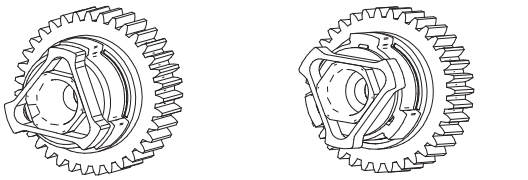
The POWER MIG® 216 is rated to feed .025” through .045" (0.6-1.1mm) solid or cored electrode sizes.

The drive roll kits and Magnum 250L gun and cable parts are available to feed different sizes and types of electrodes. See ***Accessories*** and ***Maintenance*** sections of this Instruction Manual.

## PROCEDURE FOR CHANGING DRIVE AND IDLE ROLL SETS

1. Turn OFF the power source.
2. Release the pressure on the idle roll by swinging the adjustable pressure arm down toward the back of the machine. Lift the cast idle roll assembly and allow it to sit in an upright position.
3. Remove the outside wire guide retaining plate by loosening the two large knurled screws.
4. Twist the drive roll retaining mechanism to the unlocked position as shown below and remove the drive rolls. (See Figure B.3)

**FIGURE B.3**




5. Remove the inside wire guide plate.
6. Replace the drive rolls and inside wire guide with a set marked for the new wire size.

   **NOTE:** Be sure that the gun liner and contact tip are also sized to match the selected wire size.

7. Manually feed the wire from the wire reel, over the drive roll groove and through the wire guide and then into the brass bushing of the gun and cable assembly.
8. Replace the outside wire guide retaining plate by tightening the two large knurled screws. Reposition the adjustable pressure arm to its original position to apply pressure. Adjust pressure as necessary.

## WIRE REEL LOADING - SPOOLS OR COILS

**To Mount 10 to 44 Lb. (4.5-20 kg) Spools (12"/ 300 mm Diameter) or 14Lb. (6 Kg) Innershield Coils:**

(For 13-14 lb. (6 Kg) Innershield coils, a K435 Coil Adapter must be used).

1. Open the Wire Drive Compartment Door.
2. Depress the Release Bar on the Retaining Collar and remove it from the spindle.
3. Place the spool on the spindle making certain the spindle brake pin enters one of the holes in the back side of the spool.

   **NOTE:** The arrow marked on the spindle lines up with the brake holding pin to assist in lining up a hole. Be certain the wire comes off the reel in a direction so as to de-reel from the top of the coil.

4. Re-install the Retaining Collar. Make sure that the Release Bar “pops up” and that the collar retainers fully engage the retaining ring groove on the spindle.

Return to Section TOC
Return to Master TOC

## TO START THE WELDER

Turn the "Power Switch" switch to "ON". With the desired voltage and wire speed selected, operate the gun trigger for welder output and to energize the wire feed motor.

## FEEDING WIRE ELECTRODE

**⚠ WARNING**

**When triggering, the electrode and drive mechanism are electrically "hot" relative to work and ground and remain "hot" for several seconds after the gun trigger is released.**

**NOTE:** Check that drive rolls, guide plates and gun parts are proper for the wire size and type being used. Refer to ***Table C.1*** in Accessories section.

1. Turn the spool until the free end of the electrode is accessible.
2. While securely holding the electrode, cut off the bent end and straighten the first six inches. If the electrode is not properly straightened, it may not feed properly through the wire drive system.
3. Release the pressure on the idle roll by swinging the adjustable pressure arm down toward the back of the machine. Lift the cast idle roll assembly and allow it to sit in an upright position. Leave the outer wire guide plate installed. Manually feed the wire through the incoming guide bushing and through the guide plates (over the drive roll groove). Push a sufficient wire length to assure that the wire has fed into the gun and cable assembly without restriction. Reposition the adjustable pressure arm to its original position to apply pressure to the wire.
4. Press gun trigger to feed the electrode wire through the gun.

## IDLE ROLL PRESSURE SETTING

**⚠ WARNING**

**ELECTRIC SHOCK can kill.**

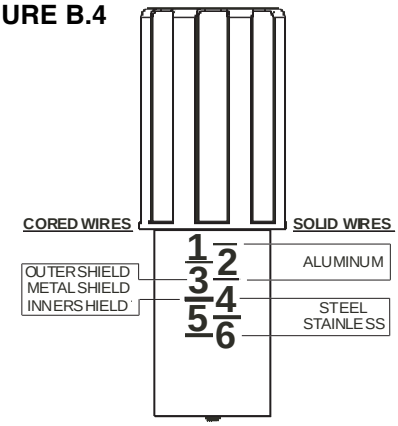
- **Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.**
- **Do not touch electrically live parts.**
- **When inching with the gun trigger, electrode and drive mechanism are "hot" to work and ground and could remain energized several seconds after the gun trigger is released.**
- **Only qualified personnel should perform maintenance work.**

The pressure arm controls the amount of force the drive rolls exert on the wire. Proper adjustment of pressure arm gives the best welding performance. For best results, set pressure arm to the suggested value.

Set the pressure arm as follows (See Figure B.4):

| | |
|---|---|
| Aluminum wires | between 1 and 3 |
| Cored wires | between 3 and 4 |
| Steel, Stainless wires | between 4 and 6 |

**FIGURE B.4**




## WIRE DRIVE CONFIGURATION

***See Figure B.5***

### CHANGING THE GUN ADAPTER

**⚠ WARNING**

**ELECTRIC SHOCK can kill.**

- **Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.**
- **Do not touch electrically live parts.**
- **When inching with the gun trigger, electrode and drive mechanism are "hot" to work and ground and could remain energized several seconds after the gun trigger is released.**
- **Only qualified personnel should perform maintenance work.**

Tools required:

- 1/4" Hex Key Wrench.

**NOTE:** Some gun adapters do not require the use of the hand screw.

1. Turn power OFF at the welding power source.
2. Remove the welding wire from the wire drive.
3. Remove the hand screw from the wire drive.
4. Remove the welding gun from the wire drive.

5. Loosen the socket head cap screw that holds the connector bar against the gun adapter.

   **Important: Do not attempt to completely remove the socket head cap screw.**

6. Remove the outer wire guide, and push the gun adapter out of the wire drive. Because of the precision fit, light tapping may be required to remove the gun adapter.
7. Disconnect the shielding gas hose from the gun adapter, if required.
8. Connect the shielding gas hose to the new gun adapter, if required.
9. Rotate the gun adapter until the hand screw hole aligns with the hand screw hole in the feed plate. Slide the gun adapter into the wire drive and verify the hand screw holes are aligned.
10. Tighten the socket head cap screw.
11. Insert the welding gun into the gun adapter and tighten the hand screw.

## MAKING A WELD

1. Check that the electrode polarity is correct for the process being used, then turn the power switch ON.
2. Set desired arc voltage tap and wire speed for the particular electrode wire, material type and thickness, and gas (for MIG and Outershield®) being used. Use the Application Chart on the door inside the wire compartment as a quick reference for some common welding procedures.

**NOTE:** Application Chart can also be found in the ***Troubleshooting*** section of this manual.

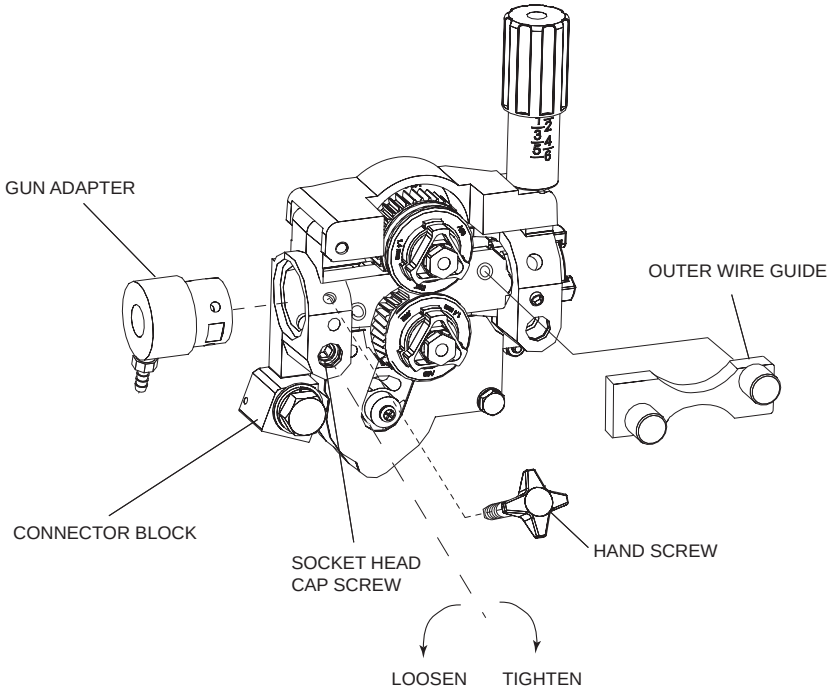
3. Press the trigger to feed the wire electrode through the gun and cable. For solid wire, cut the electrode within approximately 3/8" (10 mm) of the end of the contact tip [3/4" (20 mm) for Outershield®].
4. When welding with gas, turn on the gas supply and set the required flow rate (typically 30-40 CFH; 14-19 liters/min).
5. Connect work cable to metal to be welded. Work clamp must make good electrical contact to the work. The work must also be properly grounded.

**⚠ WARNING**

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

6. Position electrode over joint. End of electrode may be lightly touching the work.
7. Lower welding helmet, close gun trigger, and begin welding. Hold the gun so that the contact tip to work distance is about 3/8" (10 mm) [3/4" (20 mm) for Outershield®].
8. To stop welding, release the gun trigger and then pull the gun away from the work after the arc goes out.

**FIGURE B.5**






Return to Section TOC
Return to Master TOC

9. When no more welding is to be done, close valve on gas cylinder (if used), momentarily operate gun trigger to release gas pressure, and turn OFF POWER MIG® 216.

**NOTE:** When using Innershield electrode, the gas nozzle may be removed from the insulation on the end of the gun and replaced with the gasless nozzle. This will give improved visibility and eliminate the possibility of the gas nozzle overheating.

## AVOIDING WIRE FEEDING PROBLEMS

Wire feeding problems can be avoided by observing the following gun handling procedures:

1. Do not kink or pull cable around sharp corners.
2. Keep the gun cable as straight as possible when welding or loading electrode through cable.
3. Do not allow dolly wheels or trucks to run over cables.
4. Keep cable clean by following maintenance instructions.
5. Use only clean, rust-free electrode. The Lincoln electrodes have proper surface lubrication.
6. Replace contact tip when the arc starts to become unstable or the contact tip end is fused or deformed.
7. Keep wire reel spindle brake tension to minimum required to prevent excess reel over-travel which may cause wire “loop-offs” from coil.
8. Use proper drive rolls and wire drive idle roll pressure for wire size and type being used.

## FAN CONTROL

The fan is designed to come on when input power is applied to the POWER MIG® 216 and goes off when power is removed.

## INPUT LINE VOLTAGE VARIATIONS

**High Line Voltage** — Higher than rated input voltage will result in output voltages higher than normal for a given tap setting. If your input line is high, you may want to select a lower voltage tap than given on the recommended procedure chart.

**Low Line Voltage** — You may not be able to get maximum output from the machine if the line voltage is less than rated input. The unit will continue to weld, but the output may be less than normal for a given tap setting. If your input line is low, you may want to select a higher voltage tap than given on the recommended procedure chart.

## WIRE FEED OVERLOAD PROTECTION

The POWER MIG® 216 has solid state overload protection of the wire drive motor. If the motor becomes overloaded, the protection circuitry turns off the wire drive motor and gas solenoid. Check for proper size tip, liner, and drive rolls, for any obstructions or bends in the gun cable, and any other factors that would impede the wire feeding. To resume welding, simply pull the trigger. There is no circuit breaker to reset, as the protection is done with reliable solid state electronics.

## WELDING THERMAL OVERLOAD PROTECTION

The POWER MIG® 216 has built-in protective thermostats that respond to excessive temperature. They open the wire feed and welder output circuits if the machine exceeds the maximum safe operating temperature because of a frequent overload, or high ambient temperature plus overload. The thermostats automatically reset when the temperature reaches a safe operating level and welding and feeding are allowed again, when gun is retriggered.

## WELDING PROCEDURE INFORMATION

**NOTE:** See inside cover of machine or ***Troubleshooting*** section of this manual for additional, commonly used welding procedures.

## LEARNING TO WELD

Welding is a skill that can only be learned by practicing. No one can become an accomplished welder simply by reading about it. The following link “Learning to Weld” document will help the inexperienced operator to understand the basics about wire welding and provide guidance to help develop this skill.

“Learning to Weld” link:
http://www.lincolnelectric.com/assets/servicenavigator-public/LINCOLN3/LTW1TRI.pdf



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 - ACCESSORIES 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

## DRIVE ROLL KITS

Refer to Table C.1 for various drive roll kits that are available for the POWER MIG® 216. The item in **Bold** is supplied standard with the POWER MIG® 216.

**TABLE C.1**

| Wire | Size | Drive Roll Kit |
|---|---|---|
| Solid Steel | .023"-.030" (0.6-0.8 mm)<br>.035" (0.9 mm)<br>.045" (1.1 mm)<br>**.035"-.045" (0.9-1.1mm)**<br>.040" (1.0mm) | KP1696-030S<br>KP1696-035S<br>KP1696-045S<br>**KP1696-1**<br>KP1696-2 |
| Cored | .035" (0.9 mm)<br>.045" (1.1 mm) | KP1697-035C<br>KP1697-045C |
| Aluminum | 3/64" (1.2 mm) | KP1695-3/64A |

## DUAL CYLINDER MOUNTING KIT (K1702-1)

Permits stable side-by-side mounting of two full size 228.6mm dia x 1.524m high (9" dia. x 5' high) gas cylinders with "no lift" loading. Simple installation and easy instructions provided. Includes upper and lower cylinder supports, wheel axles and mounting hardware.

## SMALL SPOOL SPINDLE ADAPTER (K468)

The K468 spindle adapter allows the use of 8" diameter small spools.

## SPINDLE ADAPTER FOR 14 LBS. COILS (K435)

The K435 spindle adapter allows 14lbs. (6kg.) Innershield Coils to be mounted on 2" (51mm) O.D. spindle.

## ALTERNATIVE MAGNUM GMAW GUN AND CABLE ASSEMBLIES

The following Magnum 250L gun and cable assemblies are separately available for use with the POWER MIG® 216. Each is rated at 250 amps 40% duty cycle and is equipped with the integrated connector, twist-lock trigger connector, fixed nozzle and insulator, and includes a liner, diffuser, and contact tips for the wire sizes specified:

| Length | Part No. | English Wire Size | Metric Wire Size |
|---|---|---|---|
| 10' (3.0 m)<br>12' (3.6 m)<br>15' (4.5 m) | KP42-4045-15 | .035" – .045" | 0.9 – 1.1 mm |

**⚠ WARNING**

- **Unplug or Disconnect all input power from the POWER MIG® 216 before installing the Spool Gun and Kit.**

## MAGNUM GUN CONNECTION KIT (K466-6)

Using the optional K466-6 Magnum Connection kit for the POWER MIG® 216 permits use of standard Magnum 200, 300 or 400 gun and cable assemblies.

## OPTIONAL SPOOL GUNS AND ADAPTERS

The POWER MIG® 216 is capable of operating with the following optional spool guns:

| SPOOL GUN | RATING | ADAPTER |
|---|---|---|
| Magnum 100SG (K2532-1) | Light Duty 130amp 30% Duty Cycle | Factory Ready No Adapter Required |
| Magnum SG (K487-25) | Medium Duty 250Amp 60% Duty Cycle | Spool Gun Adapter K2703-1 |
| Magnum 250LX (K2490-1) | Heavy Duty 300 Amp 60% Duty Cycle | |

**Spool gun Adapter (K2703-1)**

This kit is designed to allow the Magnum SG or Magnum 250LX spool gun to operate with the POWER MIG® 216. The kit includes the gas solenoid, gas lines, wiring harness and gun connection panel. The gun connection panel features a 6 pin ms-type connector for the Magnum SG spool gun and a 7 pin ms-type connector for the Magnum 250LX spool gun and a selector switch to choose which gun you are using.

**NOTE: The K2703-1 spool gun adapter disables the Magnum 100SG capability.**

Return to Section TOC
Return to Master TOC

## MAKING A WELD WITH THE SPOOL GUN ADAPTER KIT AND SPOOL GUN INSTALLED

**⚠ CAUTION**

**In either toggle switch position, closing either gun trigger will cause the electrode of both guns to be electrically "HOT". Be sure unused gun is positioned so electrode or tip will not contact metal case or other metal common to work.**

1. Setting the toggle switch to "Push Gun" position disables the spool gun operation and spool gun gas solenoid valve. Closing the gun trigger enables the push gun welding and both electrodes will be electrically "HOT".
2. Setting the toggle switch to the "Spool Gun" position disables the built-in push gun operation and feeder gas solenoid valve. It will also enables the spool gun operation and spool gun gas solenoid valve. Closing the spool gun trigger enables spool gun welding and both electrodes will be electrically "HOT".
3. Operation with POWER MIG® 216:
   - Turn the POWER MIG® 216 input power ON.
   - Adjusting the voltage tap control will increase or decrease your welding voltage.
   - Adjusting the wire speed control on the spool gun will increase or decrease the spool gun wire feed speed.

**NOTE:** Adjusting the wire feed speed control on the Machine's Front Panel has no affect on the spool gun's wire feed speed.

4. Refer to the welding procedure on the machine or ***Troubleshooting*** section of this manual for initial aluminum settings. Make a test weld to determine the final settings.
5. Set the spool gun selector switch to "Push Gun" position to return to push gun operation.

# 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 - MAINTENANCE 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
Return to Section TOC
Return to Master TOC

## SAFETY PRECAUTIONS

**⚠ 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.**

## GENERAL MAINTENANCE

In extremely dusty locations, dirt may clog the air passages causing the welder to run hot. Blow dirt out of the welder with low-pressure air at regular intervals to eliminate excessive dirt and dust build-up on internal parts.

The fan motors have sealed ball bearings which require no service.

## DRIVE ROLLS AND GUIDE PLATES

After every coil of wire, inspect the wire drive mechanism. Clean it as necessary by blowing with low pressure compressed air. Do not use solvents for cleaning the idle roll because it may wash the lubricant out of the bearing. All drive rolls are stamped with the wire sizes they will feed. If a wire size other than that stamped on the roll is used, the drive roll must be changed.

For instructions on replacing or changing drive roll, see “Wire Drive Rolls” in ***Operation Section***.

## CONTACT TIP AND GAS NOZZLE INSTALLATION

1. Choose the correct size contact tip for the electrode being used (wire size is stenciled on the side of the contact tip) and screw it snugly into the gas diffuser.
2. Screw the appropriate fixed gas nozzle fully onto the diffuser. Either the standard .50" (12.7 mm) flush nozzle or other optional flush or recessed (spray arc) nozzle sizes may be used. ( ***See Table D.2*** )
3. If using optional adjustable slip-on nozzles, ***See Table D.2*** in this section.
   - Be sure the nozzle insulator is fully screwed onto the gun tube and does not block the gas holes in the diffuser.
   - Slip the appropriate gas nozzle onto the nozzle insulator. Either a standard .50" (12.7 mm) or optional .62" (15.9 mm) I.D. slip-on gas nozzle may be used and should be selected based on the welding application.
   - Adjust the gas nozzle as appropriate for the GMAW process to be used. Typically, the contact tip end should be flush to .12" (3.2 mm) extended for the short-circuiting transfer process and .12" (3.2 mm) recessed for spray transfer.

## GUN TUBES AND NOZZLES

1. Replace worn contact tips as required.
2. Remove spatter from inside of gas nozzle and from tip after each 10 minutes of arc time or as required.

## GUN CABLE CLEANING

To help prevent feeding problems, clean cable liner after using approximately 300 pounds (136 kg) of electrode. Remove the cable from the wire feeder and lay it out straight on the floor. Remove the contact tip from the gun. Using an air hose and only partial pressure, gently blow out the cable liner from the gas diffuser end.

**⚠ CAUTION**

**Excessive pressure at the beginning of the cleaning procedure may cause the dirt to form a plug.**

Flex the cable over its entire length and again blow out the cable. Repeat this procedure until no further dirt comes out. If this has been done and feed problems are experienced, try liner replacement, and refer to trouble shooting section on rough wire feeding.

Return to Section TOC
Return to Master TOC

## LINER REMOVAL AND REPLACEMENT

**NOTE:** Changing the liner for a **different** wire size requires replacement of the gas diffuser per Table D.1 to properly secure the different liner.

**TABLE D.1**

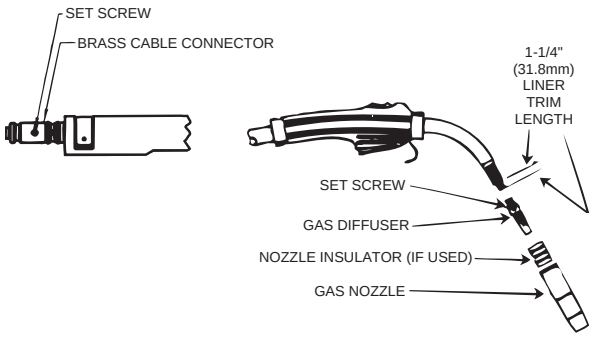
| Diameter of Electrodes Used | Replacement Liner Part Number | Size Stencilled on End of Liner Bushing | Fixed Nozzle Gas Diffuser Part No. (and Stencil) | Adjustable Nozzle Gas Diffuser Part No. (and Stencil) |
|---|---|---|---|---|
| .025"-.030" Steel (0.6-0.8 mm) | KP42-25-15 | .030" (0.8 mm) | KP52-23(KP32) | KP22-37 .38"/ KP22-50 .50" |
| .035"-.045" Steel (0.9-1.1 mm) | KP42-4045-15 | .045" (1.1 mm) | KP52-FN | |
| 3/64" Aluminum (1.2 mm) | KP42-4045-15 | 3/64" (1.2 mm) | KP52-FN | |

### LINER REMOVAL, INSTALLATION AND TRIMMING INSTRUCTIONS FOR MAGNUM 250L

**NOTE:** The variation in cable lengths prevents the interchangeability of liners between guns. Once a liner has been cut for a particular gun, it should not be installed in another gun unless it can meet the liner cutoff length requirement. Liners are shipped with the jacket of the liner extended the proper amount.

1. Remove the gas nozzle and nozzle insulator, if used, to locate the set screw in the gas diffuser which is used to hold the old liner in place. Loosen the set screw with a 5/64" (2.0 mm) Allen wrench.
2. Remove the gas diffuser from the gun tube.
3. Lay the gun and cable out straight on a flat surface. Loosen the set screw located in the brass connector at the feeder end of the cable and pull the liner out of the cable.
4. Insert a new untrimmed liner into the connector end of the cable. Be sure the liner bushing is stencilled appropriately for the wire size being used.
5. Fully seat the liner bushing into the connector. tighten the set screw on the brass cable connector. The gas diffuser, at this time, should **not** be installed onto the end of the gun tube.
6. With the gas diffuser still removed from the gun tube, be sure the cable is straight, and then trim the liner to the length shown in Figure D.1. Remove any burrs from the end of the liner.
7. Screw the gas diffuser onto the end of the gun tube and securely tighten. Be sure the gas diffuser is correct for the liner being used. (See Table D.1 and Figure D.1)
8. Tighten the set screw in the side of the gas diffuser against the cable liner using a 5/64" (2.0 mm) Allen wrench.

**FIGURE D.1**




**⚠ CAUTION**

**This screw should only be gently tightened. Overtightening will split or collapse the liner and cause poor wire feeding.**

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

## GUN HANDLE DISASSEMBLY

The internal parts of the gun handle may be inspected or serviced if necessary.

The gun handle consists of two halves that are held together with a collar on each end. To open up the handle, turn the collars approximately 60 degrees counterclockwise (the same direction as removing a right hand thread) until the collar reaches a stop. Then pull the collar off the gun handle. If the collars are difficult to turn, position the gun handle against a corner, place a screwdriver against the tab on the collar and give the screwdriver a sharp blow to turn the collar past an internal locking rib.

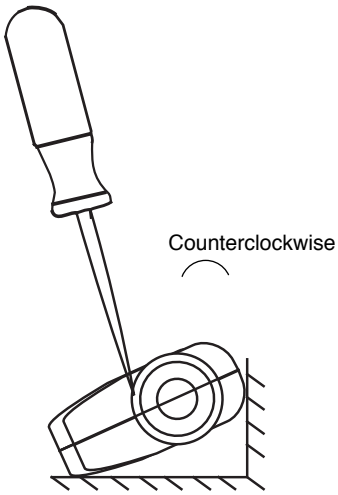


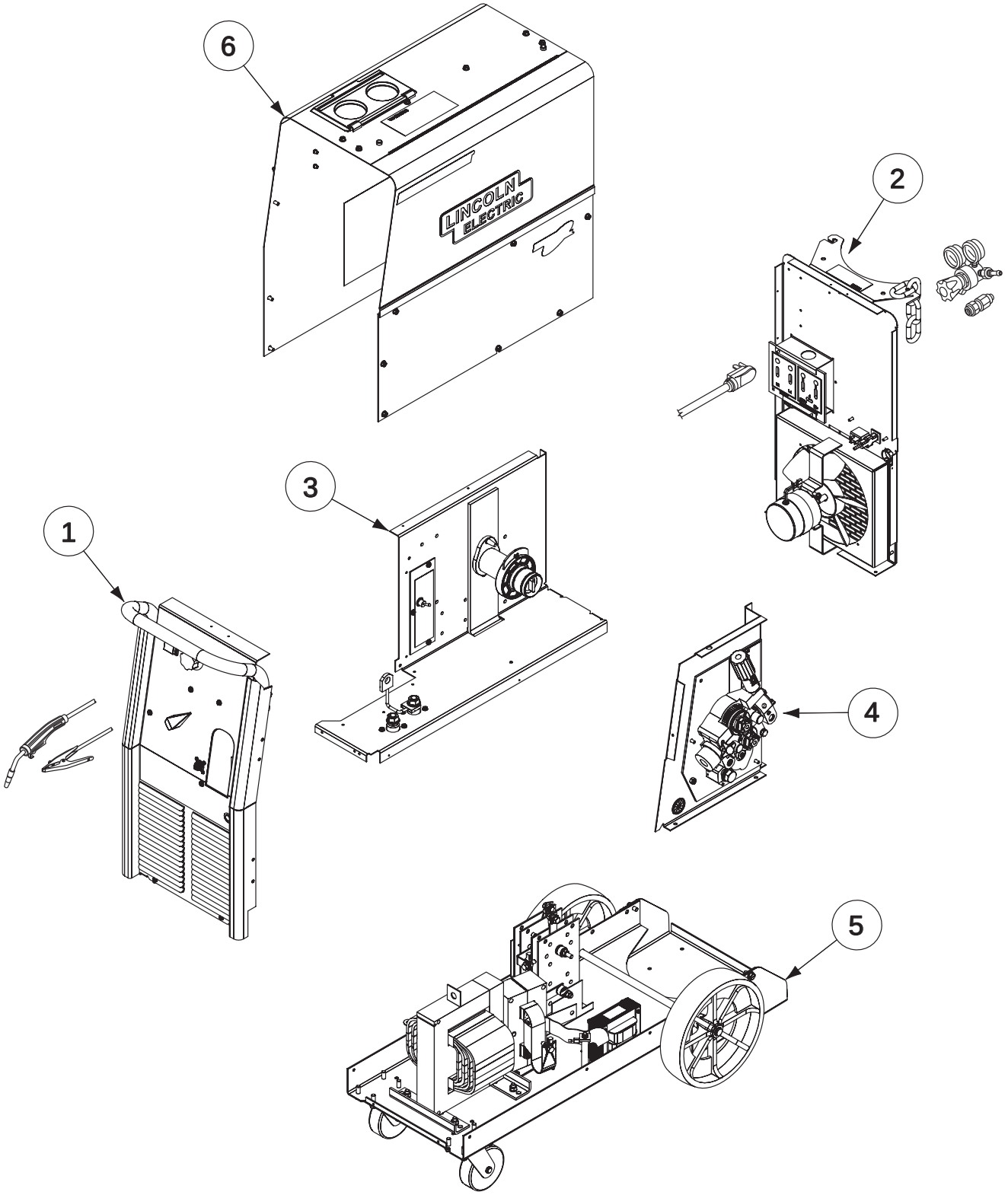

**TABLE D.2**
**ACCESSORIES AND EXPENDABLE REPLACEMENT PARTS FOR MAGNUM 250L GUN AND CABLE ASSEMBLIES**

| Description | Part No. | English Size | Metric Size |
|---|---|---|---|
| CABLE LINER | | | |
| For 15' (4.5 m) or shorter Cable | KP42-25-15 | .025" – .030" | 0.6 – 0.8 mm |
| | KP42-4045-15 | .035" – .045" | 0.9 – 1.1 mm |
| | KP42-4045-15 | 3/64" (Alum. wire) | 1.2 mm (Alum. wire) |
| CONTACT TIPS | | | |
| Standard Duty | KP14-25 | .025" | 0.6 mm |
| | KP14-30 | .030" | 0.8 mm |
| | KP14-35* | .035" | 0.9 mm |
| | KP14-45 | .045" | 1.1 mm |
| Heavy Duty | KP14H-35 | .035" | 0.9 mm |
| | KP14H-45 | .045" | 1.1 mm |
| Tapered | KP14T-25 | .025" | 0.6 mm |
| | KP14T-30 | .030" | 0.8 mm |
| | KP14T-35 | .035" | 0.9 mm |
| | KP14T-45 | .045" | 1.1 mm |
| Tab (For Aluminum) | KP2010-5B1 | 3/64" (Alum. Wire) | 1.2 mm (Alum. Wire) |
| GAS NOZZLES | | | |
| Fixed (Flush) | KP23-37F | 3/8" | 9.5 mm |
| | KP23-50F* | 1/2" | 12.7 mm |
| | KP23-62F | 5/8" | 15.9 mm |
| (Recessed) | KP23-37 | 3/8" | 9.5 mm |
| | KP23-50 | 1/2" | 12.7 mm |
| | KP23-62 | 5/8" | 15.9 mm |
| Requires: Gas Diffuser As'bly | KP52-FN * | .025" – .045" | 0.6 – 1.1 mm |
| Adjustable Slip-On | KP22-50 | 1/2" | 12.7 mm |
| | KP22-62 | 5/8" | 15.9 mm |
| Requires: Nozzle Insulator As'bly | KP32 | | |
| Requires: Gas Diffuser As'bly | KP52-23 | .025" – .030" | 0.6 – 0.8 mm |
| | KP52 | .035" – .045" | 0.9 – 1.1 mm |
| Gasless Nozzle (For Innershield) | KP1947-1 Δ | | |
| GUN TUBE ASSEMBLIES | | | |
| Standard (60°) | KP2015-1 * | | |
| 45° | KP2041-1 | | |

* Included with POWER MIG® 216
Δ Requires KP52 Gas Diffuser Assembly.

FIGURE D.2 – MAJOR COMPONENT LOCATIONS

1. Case Front Assembly
2. Case Back Assembly
3. Center Assembly
4. Wire Drive Assembly
5. Base & Power Component Assembly
6. Covers Assembly






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-THEORY OF OPERATION SECTION





Return to Master TOC

Return to Master TOC

Return to Master TOC

**FIGURE E.1 BLOCK LOGIC DIAGRAM**

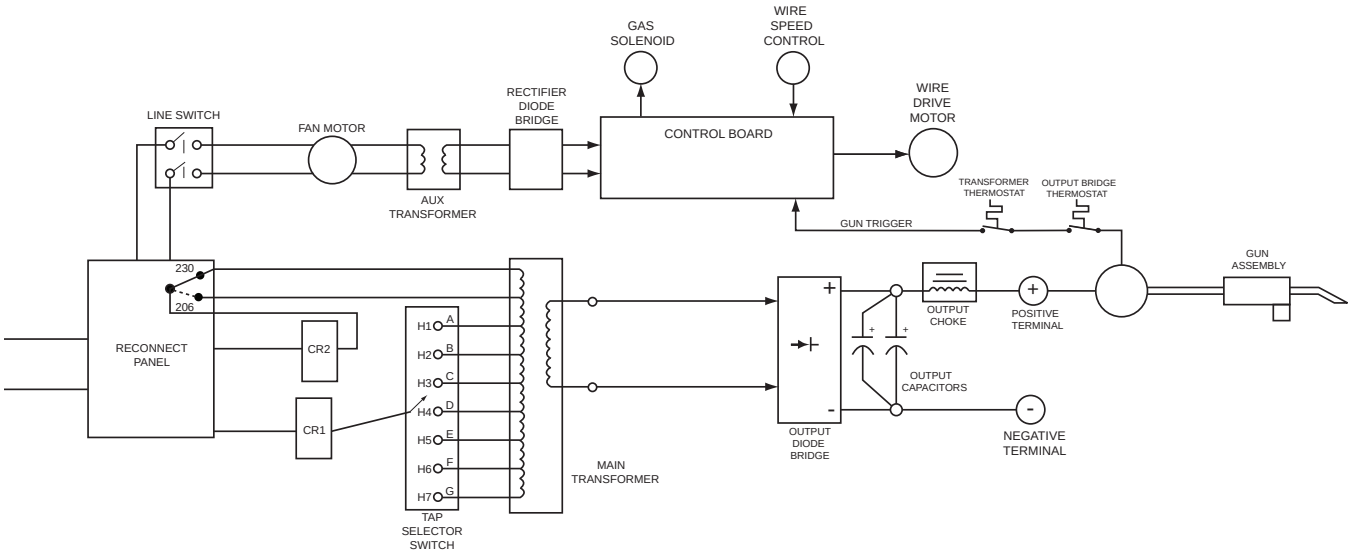
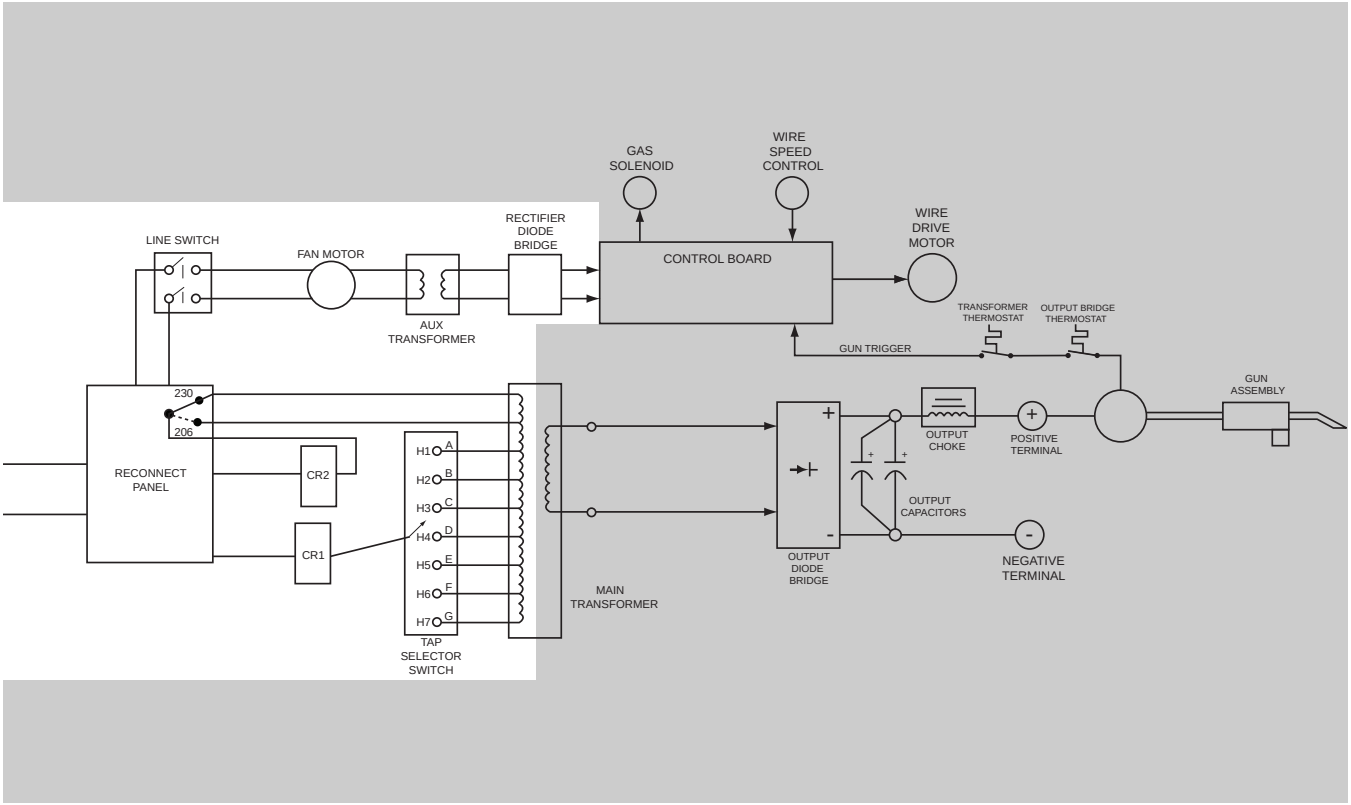


FIGURE E.2 - INPUT POWER CIRCUIT




## INPUT LINE VOLTAGE, VOLTAGE SELECTOR SWITCH, MAIN TRANSFORMER, AUXILIARY TRANSFORMER AND CENTER PANEL MOUNTED DIODE BRIDGE

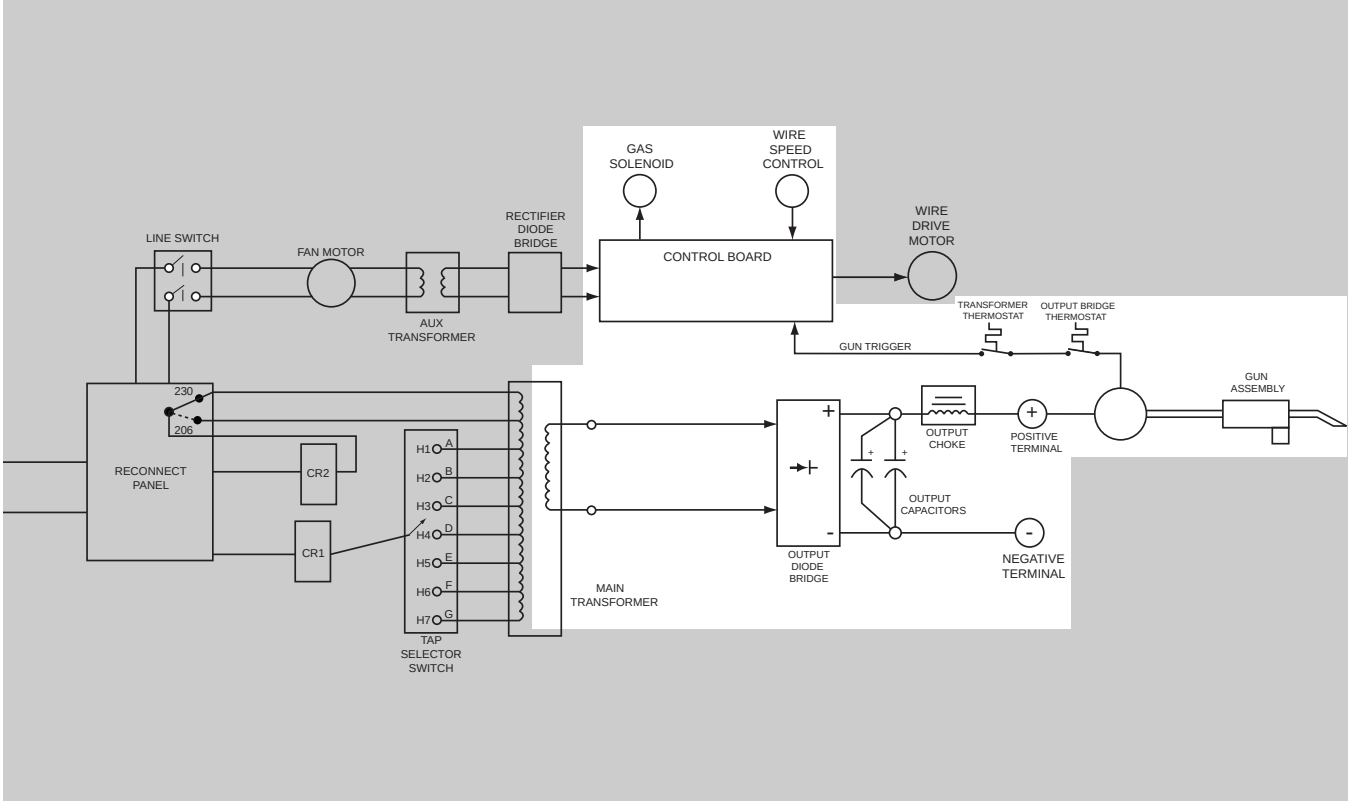
The single phase input power is connected to the POWER MIG® 216 through a line switch and a pair of relays located on the front panel and located on the center panel.

A reconnect panel allows the user to configure the machine for the desired input voltage. When the line switch is closed, the AC input voltage is applied to the continuously on cooling fan motor and then to a auxiliary transformer. The auxiliary transformer is used to send AC voltage (approx. 32VAC) to a diode bridge mounted on the center panel. The AC voltage is rectified at this center panel mounted diode bridge and the resultant DC voltage (approx. 43VDC) is used to power the control board.

With the trigger controlled closure of the two relays, the AC voltage which is configured by the reconnect panel is applied to the tap selector switch. For welding purposes, the tapped selector switch is coupled to the primary winding of the main transformer. By selecting one of the seven positions on the switch, the user can preset the desired voltage output from a minimum setting (A) to a maximum voltage setting (G). The main transformer converts the high voltage, low current input power to a low voltage, high current output.

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

FIGURE E.3 - CONTROL CIRCUITS

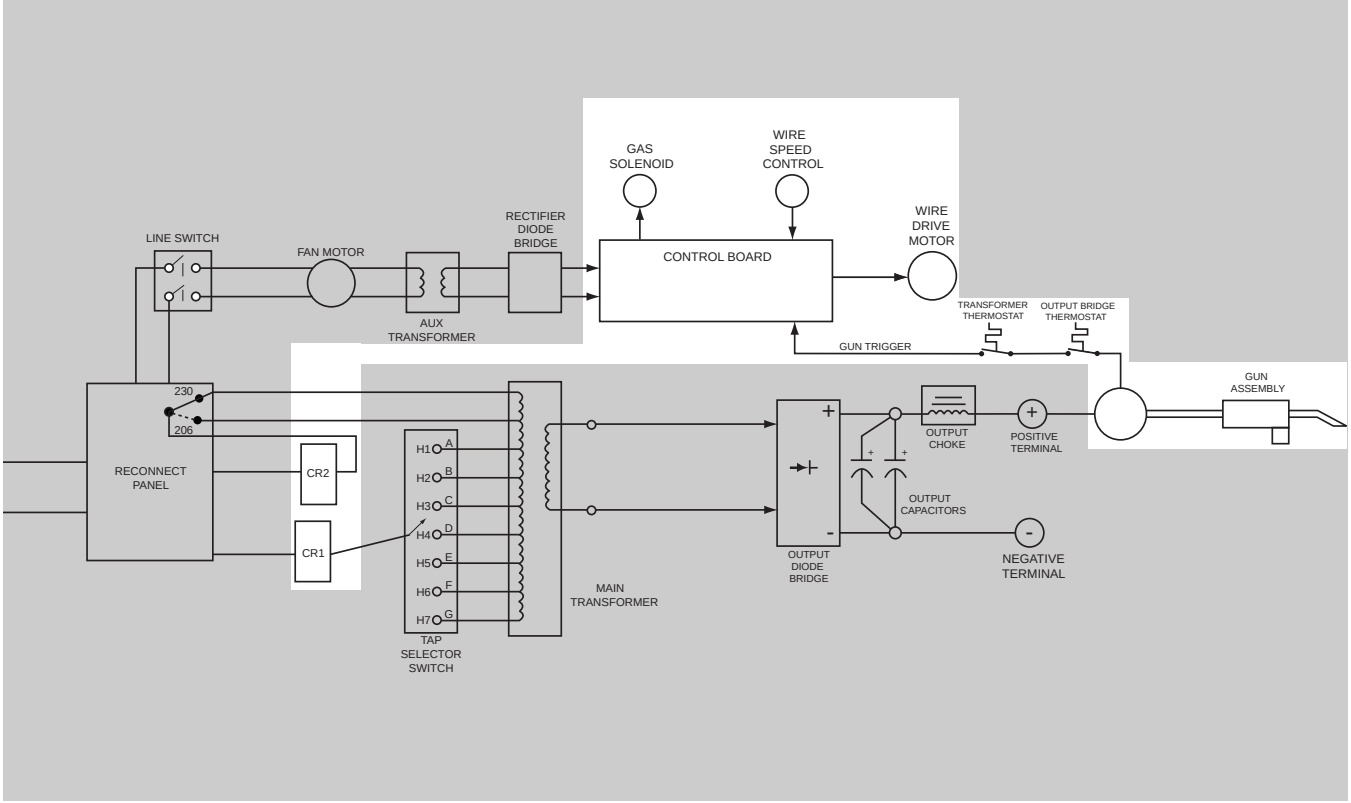



## OUTPUT RECTIFICATION AND CONTROL BOARD

The AC voltage developed on the secondary windings of the main transformer is applied to the output rectifier bridge. This DC welding voltage is filtered by the output capacitors and applied to the output terminals and welding gun. Since the output choke is in series with the positive leg of the output rectifier and also in series with the gun and welding load, a filtered constant voltage output is applied to the output terminals of the machine.

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

FIGURE E.4 - OPERATIONAL CIRCUITS




## CONTROL BOARD, GUN TRIGGER, GAS SOLENOID AND WIRE DRIVE MOTOR

When the control board receives an activation command from the trigger circuit, the control board supplies 12VDC which activates the gas solenoid. It also supplies 2 to 27 VDC (depending on the wire speed setting) to the wire drive motor.

The self re-setting thermostats are included in the trigger circuitry. If either of these thermostats would “open” due to excessive heat, the trigger would be interrupted and the machine’s output and the wire feed would be disabled. The board also contains overload protection circuitry which protects the drive motor from excessive current draw.

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



Return to Section TOC
Return to Master TOC

# PROTECTIVE DEVICES AND CIRCUITS

## THERMAL AND OVERLOAD PROTECTION

The POWER MIG® 216 has two built-in protective thermostats that respond to excessive temperatures. One is located on the main transformer. The other thermostat is located on the output rectifier heat sink assembly. They open the wire feed and welder output circuits if the machine exceeds the maximum safe operating temperature. This can be caused by a frequent overload or high ambient temperature.

The thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown is caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louver is obstructed, then the input power must be removed and the fan problem or air obstruction must be corrected.

## WIREFEED OVERLOAD PROTECTION

The POWER MIG® 216 has solid state overload protection of the wire drive motor. If the motor becomes overloaded, the protection circuitry turns off the wire feed speed and gas solenoid. Check for proper size tip liner, drive rolls, and any obstructions or ends in the gun cable. Check for any other factors that would impede the wire feeding. To resume welding, simply pull the trigger. There is no circuit breaker to reset, as the protection is done with reliable solid state electronics.



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, wire feeding 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** | | |
| Major physical or electrical damage is evident. | 1. Contact your local Lincoln Electric authorized field service facility. | 1. Contact Lincoln Electric Service Department 1-888-935-3877. |
| The machine is dead--no open circuit voltage and no wire feed when the gun trigger is activated. The cooling fan is not running. | 1. Make certain the input power switch (S1) is in the "ON" position.<br>2. Check the input voltage at the machine. The input voltage must match the rating plate and the reconnect panel.<br>3. Check for blown or missing fuses in the input lines. | 1. Check the input power switch (S1). It may be faulty.<br>2. Check for broken or missing wires at the reconnect panel. |
| There is no open circuit voltage or wire feed when the gun trigger is activated. The cooling fan is running. | 1. Make sure the input voltage is correct and matches the nameplate rating and reconnect panel configuration.<br>2. One of the two thermostats may be open due to machine overheating. If the machine operates normally after a cooling off period, then check for proper fan operation and ventilation. Make certain the machine's duty cycle is not being exceeded. | 1. The baffle mounted rectifier bridge may be faulty. Check and replace if necessary.<br>2. Perform the ***Auxiliary Transformer Test.***<br>3. Check the thermostats and associated leads for loose or faulty connections. See the Wiring Diagram.<br>4. The internal triggering circuit / plugs may be faulty. See the Wiring Diagram.<br>5. The control board may be faulty. |

**⚠ 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** | | |
| (continued from previous page) | 3. Check the gun trigger leads. Leads #324 to #325 should have continuity (zero ohms) when the gun trigger is activated. If not, the gun trigger or cable may be faulty. Check or replace.<br>5. If a spool gun option kit is installed, check to make sure it is set to the "Push Gun" if pulling the gun trigger associated with built in feeder, and "Spool Gun" if pulling spool gun trigger. | |
| When the gun trigger is activated and the wire feeds normally, but there is no open circuit voltage. | 1. Make sure the gun cable and work cables are connected properly and in good condition.<br>2. Make sure the output selector switch is in a good condition position and not between positions.<br>3. Check the leads between the coils of CR1 and CR2 and the PC board and from the relay to the rectifier diode bridge and between the reconnect panel to the relays for loose or faulty connections. See Wiring Diagram. | 1. Check the output selector switch for proper operation and good connections.<br>2. Perform the ***CR Relay Test.***<br>3. Perform the ***Output Bridge Rectifier Test.***<br>4. Perform the ***Main Transformer Test.***<br>5. Check the heavy current carrying leads between the output selector switch, output contactor, output bridge rectifier, and the output terminals for loose or faulty connections. 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** | | |
| Output voltage and wire feed speed is present when the gun trigger is NOT activated. | 1. Remove the gun assembly. If the problem is resolved, the gun assembly is faulty. Repair or replace. If the problem is NOT resolved, the fault is within the Power MIG® 216 machine. | 1. Check for "shorts" in the trigger circuitry within the Power MIG® 216 machine. See the Wiring Diagram.<br>2. The control board may be faulty. |
| The machine's output is low. Welds are "cold". The weld beads are rounded or "humped" demonstrating poor wetting into the plate. The machine cannot obtain full rated output of 200 amps at 22VDC. | 1. Check the input voltage. Make sure the machine is configured properly for the input voltage being applied.<br>2. Make sure the settings for wire feed speed and voltage are correct for the process being used.<br>3. Make sure the electrode polarity is correct for the process being used.<br>4. Check the welding cables and gun for loose or faulty connections. | 1. Check for loose or faulty connections on the heavy current carrying leads inside the Power MIG® 216. See the Wiring Diagram.<br>2. The output capacitors may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary.<br>**WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.**<br>3. The output selector switch may be faulty. Check for good contact and continuity (zero ohms) through the switch. See the Wiring Diagram.<br>4. Perform the ***Output Bridge Rectifier Test.***<br>5. Perform the ***Main Transformer Test.*** |
| The output voltage is continuous when the gun trigger is NOT activated. The wire feed functions normally. | 1. CR1 or CR2 relay may be stuck closed. | 1. Perform the ***CR Relay 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 |
|---|---|---|
| **FUNCTION PROBLEMS** | | |
| There is no gas flow when the gun trigger is activated. The wire feeds and the arc voltage is present. | 1. If a spool gun adapter is installed, make certain the toggle switch in the spool gun kit is in the correct position.<br>2. Check the gas source and hoses for kinks or leaks. | 1. Check plug J1 on the control board for loose or faulty connections. See Wiring Diagram.<br>2. Check the gas solenoid by disconnecting it from leads 1108A and 1116A&B. Apply a 12VDC external supply to the solenoid. If the solenoid does NOT activate then it may be faulty. Replace. |
| The machine stops feeding wire while welding. When the gun trigger is released and pulled again, the wire feed starts. | 1. Check for a mechanical restriction in the wire feed path. The gun may be clogged.<br>2. Make sure the drive rolls and guide plates are clean and are the correct size.<br>3. Check the spindle for ease of rotation. | 1. Check the motor armature current. Normal armature current is 2.0 to 3.4 amps maximum. If the motor armature current is normal, and the motor continues to shut-off, the control board may be faulty. Replace.<br>2. If the motor armature current is high (over 3.4 amps) and there are NO restrictions in the wire feeding path, then the motor or gearbox may be defective. Replace. |

**⚠ 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 |
|---|---|---|
| **WIRE FEEDING PROBLEMS** | | |
| Rough wire feeding or the wire will not feed but the drive rolls are turning. | 1. The gun cable may be kinked or twisted.<br>2. Check the drive roll tension and the position of the grooves.<br>3. Electrode may be rusted or dirty.<br>4. The contact tip may be damaged or not the correct size.<br>5. Check the wire spindle for ease of rotation.<br>6. Make certain the gun is pushed all the way into the gun mount and properly seated. | |
| No control of wire feed speed. Other machine functions are normal. | 1. The wire feed speed control may be dirty. Rotate several times and check if the problem is resolved. | 1. The wire speed control potentiometer may be faulty. Check or replace. Normal potentiometer resistance is 10K ohms.<br>2. Perform the ***Wire Drive Motor Test.***<br>3. The control board may be faulty. |
| There is no wire feed when the gun trigger is activated. Normal open circuit weld voltage is present and the gas solenoid functions normally. | 1. Check for adequate wire supply.<br>2. If the drive rolls are turning, check for a mechanical restriction in the wire feed path.<br>3. The gun liner may be clogged. Check or replace.<br>4. If the drive rolls are not turning when the gun trigger is activated, contact your local Lincoln Electric Authorized Field Service Facility. | 1. Perform the ***Wire Drive Motor Test.***<br>2. The wire speed control potentiometer may be faulty. Check or replace. Normal potentiometer resistance is 10K ohms.<br>3. The control board may be faulty. |

**⚠ 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** | | |
| Poor arc striking with electrode sticking or blasting off. | 1. Make sure the settings for wire feed speed and voltage are correct for the process being used.<br>2. Make certain the gas shielding is correct for the process being used.<br>3. Make sure the machine's reconnect panel is configured properly for the input voltage being applied. | 1. The output capacitors may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary.<br>**WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.**<br>2. Perform the ***Output Diode Rectifier Test.*** |
| The arc is unstable and or "hunting." | 1. Check for a worn or melted contact tip.<br>2. Check for loose or faulty connections on the work and gun cables.<br>3. Make sure the electrode polarity is correct for the welding process being used.<br>4. Check for rusted or dirty electrode wire.<br>5. Make sure the machine's settings and shielding gas are correct for the process being used. | 1. Check for loose or faulty connections at the output terminals, choke, output capacitors, output selector switch, output contactor, and all heavy current carrying leads. See the Wiring Diagram.<br>2. Check the output selector switch for proper operation and good connections.<br>3. The output capacitors may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary.<br>**WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.**<br>4. Perform the ***Output Bridge Rectifier 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 |
|---|---|---|
| **WELDING PROBLEMS** | | |
| The weld bead is narrow or ropy. May have porosity with the electrode stubbing into the plate. | 1. Make sure the welding procedures and electrode polarity are correct for the process being used.<br>2. Make certain the shielding gas is correct and the flow is proper.<br>3. Make sure the weld joint is not “contaminated”. | 1. Perform the ***Output Bridge Rectifier Test***.<br>2. The output capacitors may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary.<br>**WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.**<br>3. Perform ***Choke Test***. |
| The contact tip seizes in the gas diffuser. | 1. The tip is being over heated due to excessive current and/or high duty cycle.<br>2. A light application of high temperature anti-seize lubricant may be applied to the contact tip threads. | |

**⚠ 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

# AUXILIARY TRANSFORMER TEST

**⚠ WARNING**

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

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

## TEST DESCRIPTION

This procedure will determine if the correct voltage is being applied to the Primary of Auxiliary Transformer and also if the correct voltage is being induced on the Secondary Windings of the Transformer.

## MATERIALS NEEDED

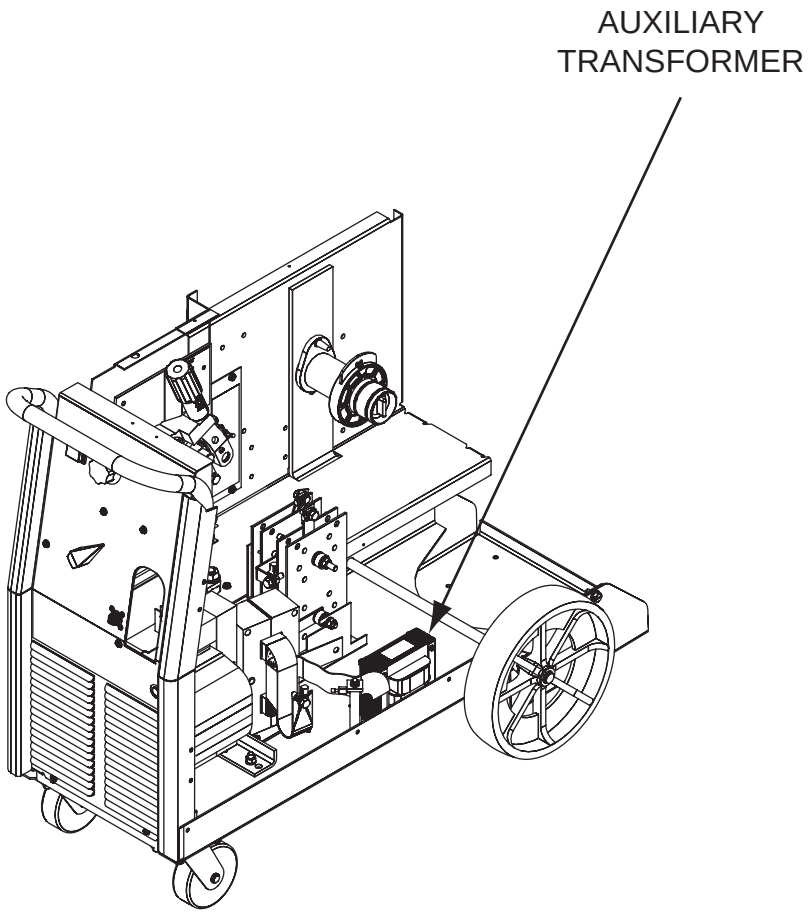
Volt / Ohmmeter (Multimeter)
3/8” Nutdriver
Wiring Diagram



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

## AUXILIARY TRANSFORMER TEST (continued)

**FIGURE F.1 – AUXILIARY TRANSFORMER**




### PROCEDURE

1. Remove input power to the POWER MIG® 216.
2. Using a 3/8” Nutdriver, remove the case wrap-around cover.
3. Locate the Auxiliary Transformer. See Figure F.1.
4. Locate the secondary leads X10 and X9 and primary leads H13B and H12B.



Return to Section TOC
Return to Master TOC

## AUXILIARY TRANSFORMER TEST (continued)

**TABLE F.1**

| LEAD IDENTIFICATION | NORMAL EXPECTED VOLTAGE |
|---|---|
| X9 TO X10 | 32 VAC |

5. Carefully apply the correct input voltage to the POWER MIG® 216 and check for the correct secondary voltages. See Table F.1.
   **NOTE:** The secondary voltages will vary if the input line voltage varies. Tests were conducted with 230 VAC at the primary.
6. If the correct secondary voltage is present, the Auxiliary Transformer is functioning properly. If the secondary voltage is missing or low, check to make certain the primary is configured correctly for the input voltage applied. See Wiring Diagram.

**⚠ WARNING**

**High voltage 230VAC is present at primary of auxiliary transformer.**

7. If the correct input voltage is applied to the primary, and the secondary voltage is not correct, the Auxiliary Transformer may be faulty.
8. Remove the input power to the POWER MIG® 216.
9. Install the case wraparound cover using a 3/8" nutdriver.

# 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

# CR1 AND CR2 RELAY TEST

**⚠ WARNING**

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

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

## TEST DESCRIPTION

This test will determine if the CR1 and CR2 Relays are functioning properly by measuring resistance across the contacts when the Relay is energized and de-energized.

## MATERIALS NEEDED

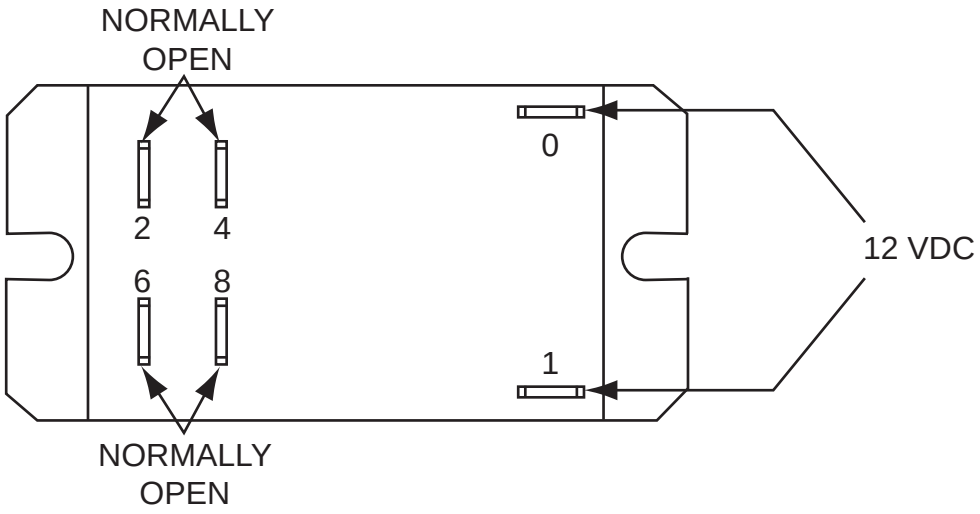
3/8" Nutdriver
Volt / Ohmmeter
12 VDC Power Supply



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

## CR1 AND CR2 RELAY TEST (continued)

**FIGURE F.2 – RELAY TEST POINTS**




### PROCEDURE

1. Using a 3/8" nutdriver, remove the left side of the case wraparound.
2. Remove the leads from the relay being tested.
3. Connect a 12VDC supply to terminals 0 and 1. See Figure F.2. Do not energize the power supply at this time.
4. Connect a multimeter across terminals 2 and 4. See Figure F.2.
5. Measure resistance across the contacts. An infinite resistance indicates that the contacts are open.
6. Connect on terminals 6 and 8, and measure resistance.
7. Energize the 12 VDC power supply and measure the resistance again. A resistance of less that 1 Ohm indicates that the contact are closed.
8. De-energize the 12 VDC power supply and repeat the procedure to the second relay.

## MAIN TRANSFORMER TEST

**⚠ WARNING**

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

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

### TEST DESCRIPTION

This test will determine if the correct voltages are being applied.

A. Applied to the Primary Windings of the Main Transformers.

B. Induced on the Secondary Windings of the Main Transformer.

### MATERIALS NEEDED

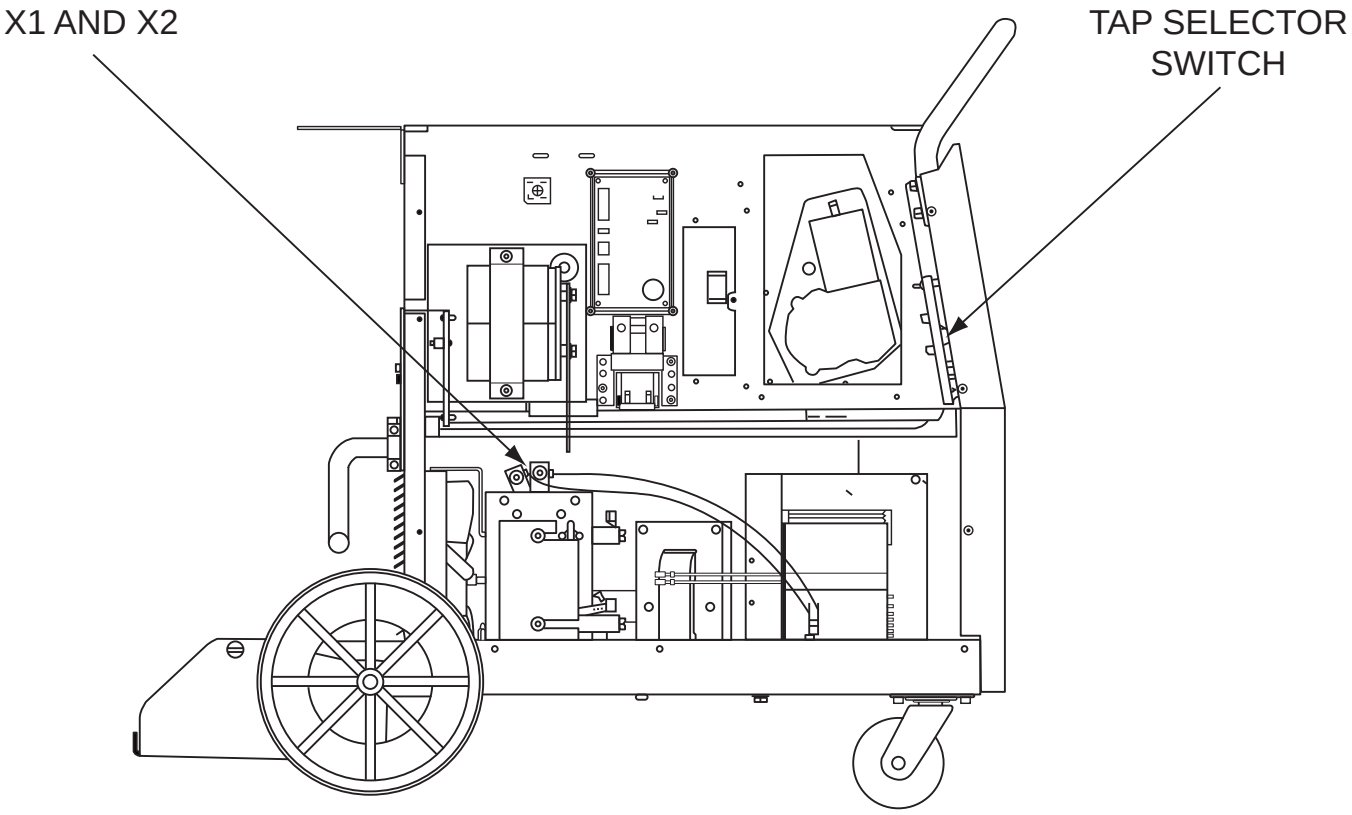
3/8" Nutdriver
Volt / Ohmmeter



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 TRANSFORMER TEST (continued)

**FIGURE F.3 – X1 AND X2 LOCATION**




### PROCEDURE

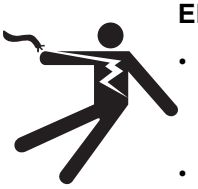
**⚠ WARNING**

**THE ON/OFF POWER SWITCH will be "hot" during these tests.**

**NOTE:** Secondary voltages will vary proportionately with the primary input voltage.

1. Disconnect the main input power supply to the machine.
2. Remove the case top and side panels with a 3/8" nutdriver.
3. Locate X1 and X2 on the output rectifier. See Figure F.3.
4. Connect main input power to the machine.
5. Turn the POWER MIG® 216 ON/OFF power switch to the ON position.

**⚠ WARNING**



**ELECTRIC SHOCK can kill**

- **Do not touch electrically live parts such as output terminals or internal wiring.**
- **All input power must be electrically disconnected before proceeding.**

6. Carefully make the following voltage test with trigger closed. ***See Table F.2***.
7. Turn OFF the machine.
8. If any of the voltages are incorrect or missing, check for loose or broken connections between the Main Transformer and voltage selector switch.



Return to Section TOC
Return to Master TOC

## MAIN TRANSFORMER TEST (continued)

**TABLE F.2 – TEST POINTS**

| INPUT VOLTAGE | TAP SELECTOR SWITCH | TEST POINTS | EXPECTED VOLTAGE READING |
|---|---|---|---|
| 230 VAC | A | X1-X2 | 12.23 VAC |
| 230 VAC | B | X1-X2 | 14.26 VAC |
| 230 VAC | C | X1-X2 | 16.43 VAC |
| 230 VAC | D | X1-X2 | 18.69 VAC |
| 230 VAC | E | X1-X2 | 20.89 VAC |
| 230 VAC | F | X1-X2 | 23.10 VAC |
| 230 VAC | G | X1-X2 | 25.50 VAC |

9. If ALL the voltages tested are incorrect or missing, test for correct nameplate input voltage from H10A, H10B at the tap selector switch and H11A, H11B at the reconnect panel. Voltage tested will vary depending on input voltage connection. See Wiring Diagram for test point locations.
10. If the correct nameplate voltage is being applied at test points, check leads from the reconnect panel to the Main Transformer and the tap selector switch.
11. If incorrect or missing voltage is at test points, perform CR1 and CR2 test.



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

## OUTPUT RECTIFIER TEST

**⚠ WARNING**

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

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

### TEST DESCRIPTION

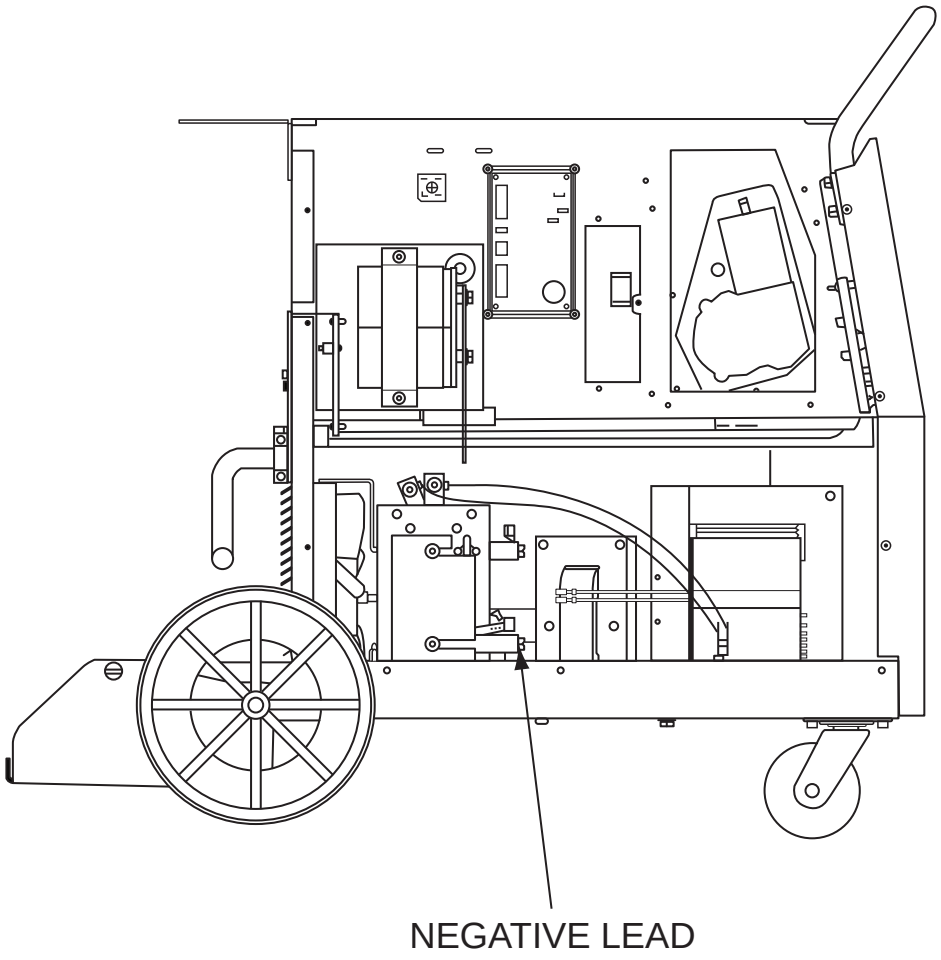
This test will determine if a Diode is “shorted” or “leaky”. See the machine waveform section in this manual for normal and abnormal output waveforms.

### MATERIALS NEEDED

Analog Volt / Ohmmeter or Diode Tester
3/8” Nutdriver
1/2” Nutdriver

## OUTPUT RECTIFIER TEST (continued)

**FIGURE F.4 – RECTIFIER TEST POINTS**




### PROCEDURE

1. Remove input power to the Power MIG® 216 machine.
2. Using the 3/8" nutdriver, remove the left case side.
3. Locate and disconnect the negative lead from the Output Rectifier bridge assembly. Be sure there is no electrical contact between the Rectifier and the lead. See Figure F.4.

**NOTE:** Do not disassemble the Rectifier assembly.

4. Test for "shorted" or "leaky" diodes by checking from the anodes to the cathodes of the diode heatsink plates. The readings should be high resistance in one polarity and low resistance in the opposite polarity.
5. If any of the diodes are "leaky" or "shorted" the Output Rectifier assembly should be replaced.
6. When the test is complete, replace the negative output lead previously removed.
7. Replace the left case side.



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

## WIRE DRIVE MOTOR TEST

**⚠ WARNING**

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

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

### TEST DESCRIPTION

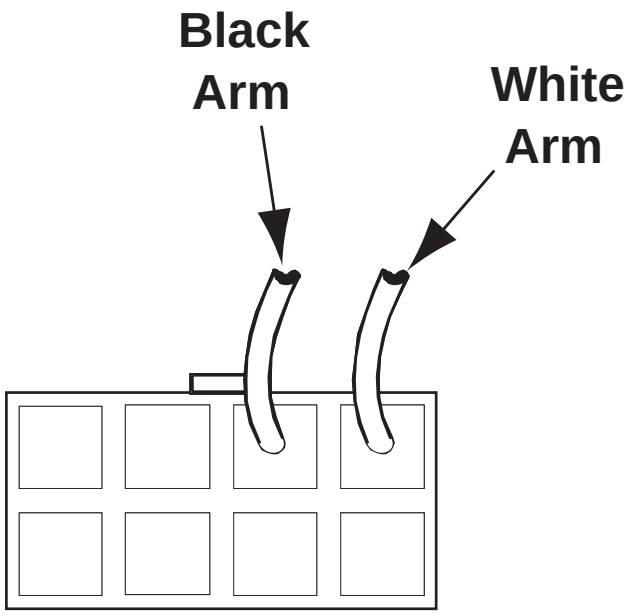
This test will determine if the Wire Drive Motor Circuit is functioning properly.

### MATERIALS NEEDED

3/8" Nutdriver
Volt / Ohmmeter

## WIRE DRIVE MOTOR TEST (continued)

FIGURE F.5 – PLUG J4




### PROCEDURE

**NOTE:** POLARITY MUST BE OBSERVED FOR THESE TESTS.

Test for correct wire drive motor armature voltage.

1. Disconnect main input power to the machine.
2. Using a 3/8” nutdriver, remove the left side of the case wraparound cover.
3. Locate plug J4 on the wiring harness. See Wiring Diagram.
4. Locate the black and white armature leads on plug J4. See Figure F.5.

## WIRE DRIVE MOTOR TEST (continued)

5. Make the following voltage tests:

**⚠ WARNING**

**ELECTRIC SHOCK can kill.**

- **Do not touch electrically live parts such as output terminals or internal wiring.**
- **All input power must be electrically disconnected before proceeding.**

a. Turn the machine OFF between each test.

b. Carefully insert the meter probes into the lead side of plug J4. ***See Figure F.5.***

c. Turn the machine ON and pull the gun trigger to conduct the voltage test.

| FROM LEAD | FROM LEAD | FROM LEAD |
|---|---|---|
| Black Armature Lead | White Armature Lead | 2-29 VDC (varies depending on wire feed speed) |

6. If the voltage to the Wire Drive Motor armature is zero, check the wires between plug J4 and the Wire Drive Motor. Also check the electrical connector J5 for proper connections and jumper plug. See the Wiring Diagram.

7. If all wires and connectors are good and the voltage to the Drive Motor Armature is zero, the control PC board may be faulty. Replace the control PC board.

# 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

# CHOKE TEST 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

The Weld Choke is located between the Main Transformer and Output Rectifier. This test will help determine if the Choke is shorted to ground or is open.

## MATERIALS NEEDED

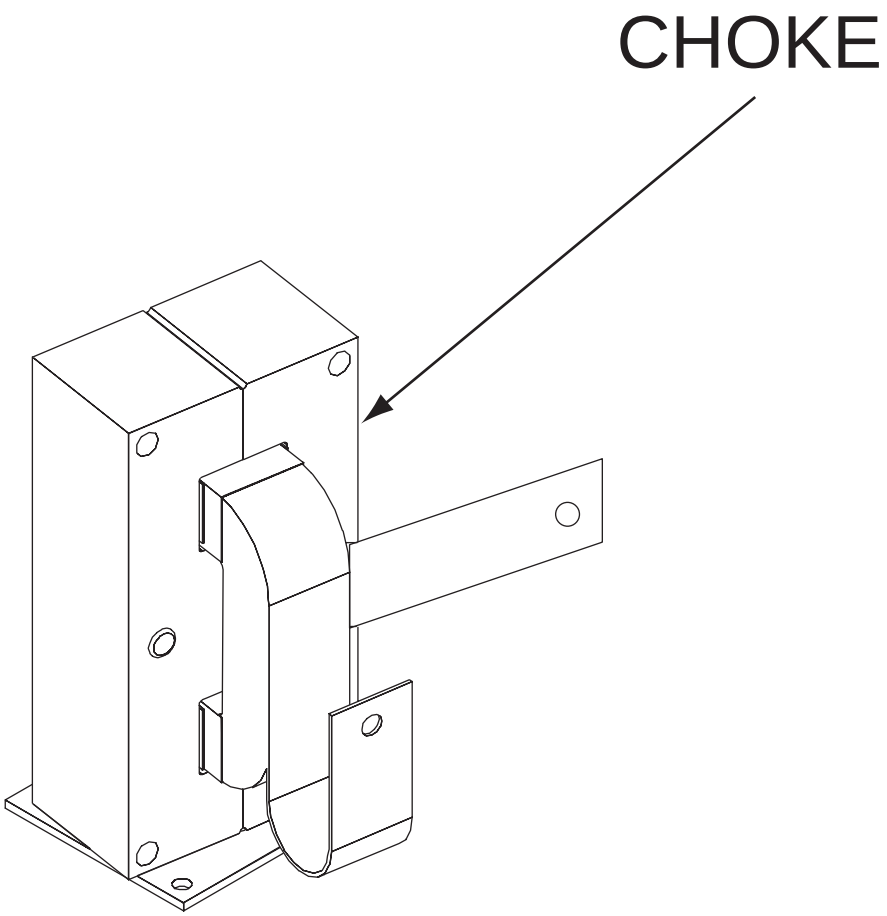
Digital Volt / Ohmmeter



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

## CHOKE TEST PROCEDURE (continued)

**FIGURE F.6 – CHOKE**




### PROCEDURE

1. Using a digital ohmmeter, make sure that the Choke windings are not grounded to the lamination (> 1megohm).

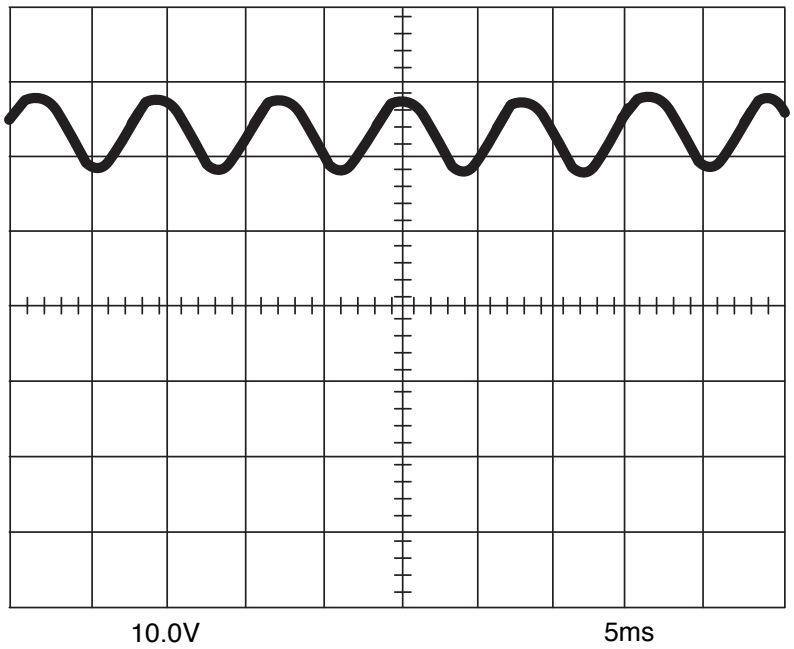
No windings or terminal connections should look burned or over-heated. Welding may cause Choke to buzz slightly.



Return to Section TOC
Return to Master TOC

# TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED

## (MAX TAP "G")




## MACHINE LOADED TO 200 AMPS AT 22 VDC

This is a typical DC output voltage waveform generated from a properly operating machine. Note that each vertical division represents 10 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: (+) probe to electrode, (-) probe to work.

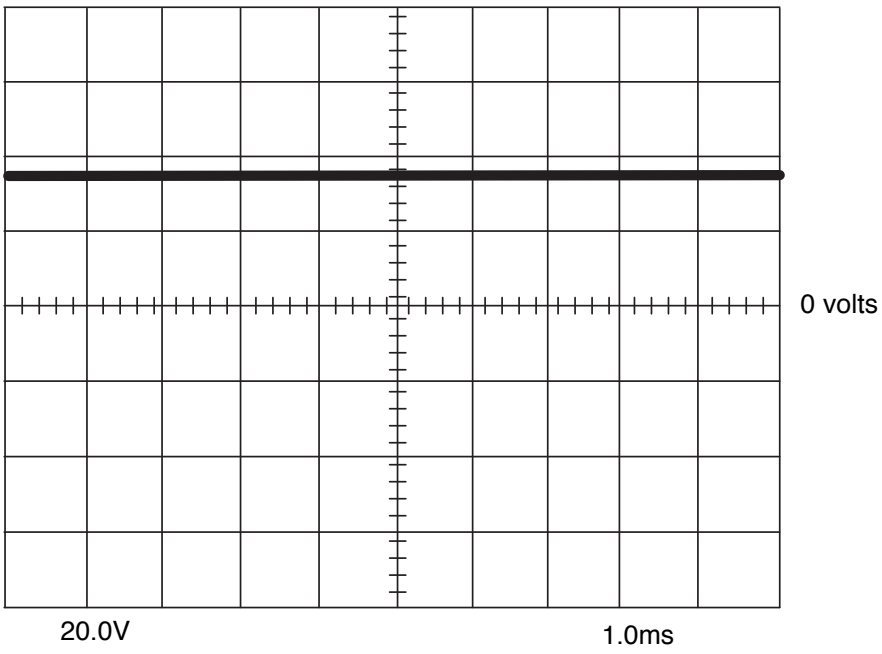
## SCOPE SETTINGS

| | |
|---|---|
| Volts/Div | 10V/Div. |
| Horizontal Sweep | 5 ms/Div. |
| Coupling | DC |
| Trigger | Internal |



Return to Section TOC
Return to Master TOC

## NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM (MAX TAP "G")




This is a typical DC output voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 1.0 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

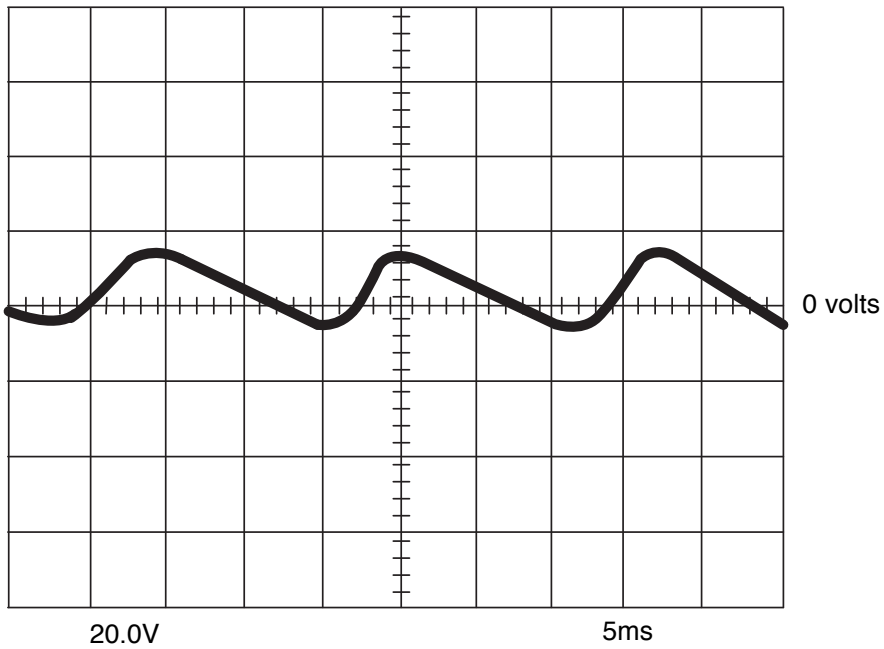
| | |
|---|---|
| Volts/Div | 20V/Div. |
| Horizontal Sweep | 1.0 ms/Div. |
| Coupling | DC |
| Trigger | Internal |



Return to Section TOC
Return to Master TOC

# ABNORMAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED (MAX TAP "G")

## ONE OUTPUT DIODE NOT FUNCTIONING




## MACHINE LOADED TO 180 AMPS AT 16 VDC

This is NOT a typical DC output voltage waveform. One output diode is not functioning. Note the increased ripple content. One diode was disconnected to simulate an open or non-functioning output diode. Each vertical division represents 20 volts and 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: (+) probe to electrode, (-) probe to work.

## SCOPE SETTINGS

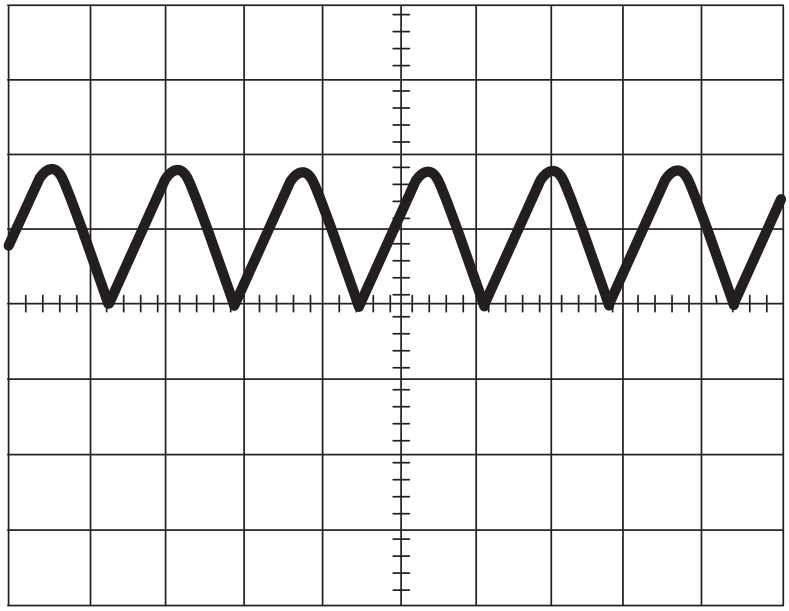
| | |
|---|---|
| Volts/Div | 20V/Div. |
| Horizontal Sweep | 5 ms/Div. |
| Coupling | DC |
| Trigger | Internal |



Return to Section TOC
Return to Master TOC

## ABNORMAL OPEN CIRCUIT VOLTAGE

## OUTPUT CAPACITOR BANK NOT FUNCTIONING (MAX TAP "G")




This is NOT a typical DC output voltage waveform. The output capacitors are not functioning. Note the lack of "filtering" in the output waveform. The output capacitor bank was disconnected. Each vertical division represents 20 volts and each horizontal division represents 5 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

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



Return to Section TOC
Return to Master TOC

# OUTPUT DIODE BRIDGE 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

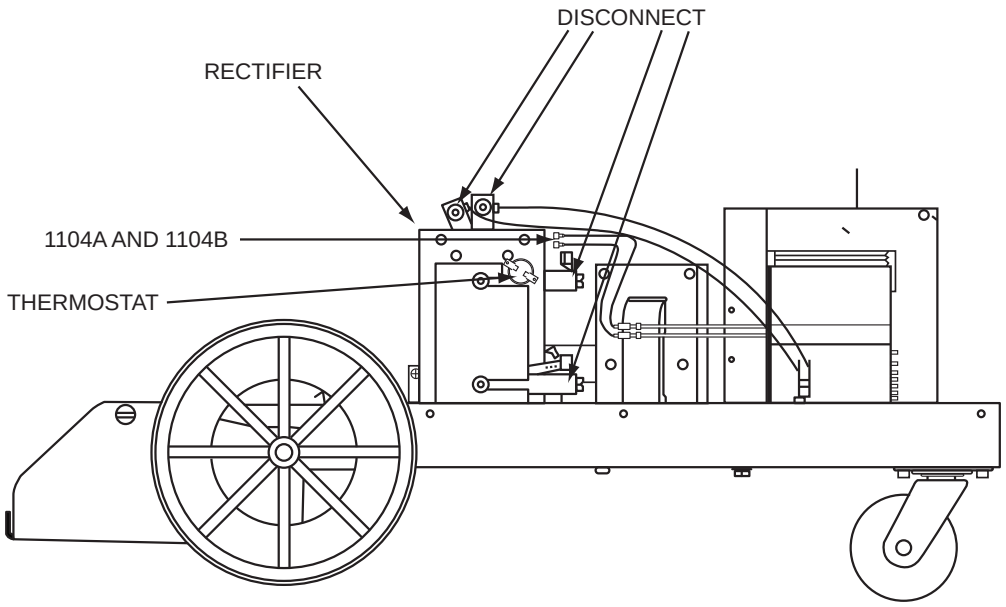
This procedure will aid the technician in the removal and replacement of the Output Diode Bridge.

## MATERIALS NEEDED

3/8" Nutdriver
1/2” Socket and Wrench
3/8” Wrench
Penetrox Electrical Joint Compound
In-Lbs. Torque Wrench

# OUTPUT DIODE BRIDGE
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.7 – OUTPUT DIODE BRIDGE LEADS**




## REMOVAL PROCEDURE

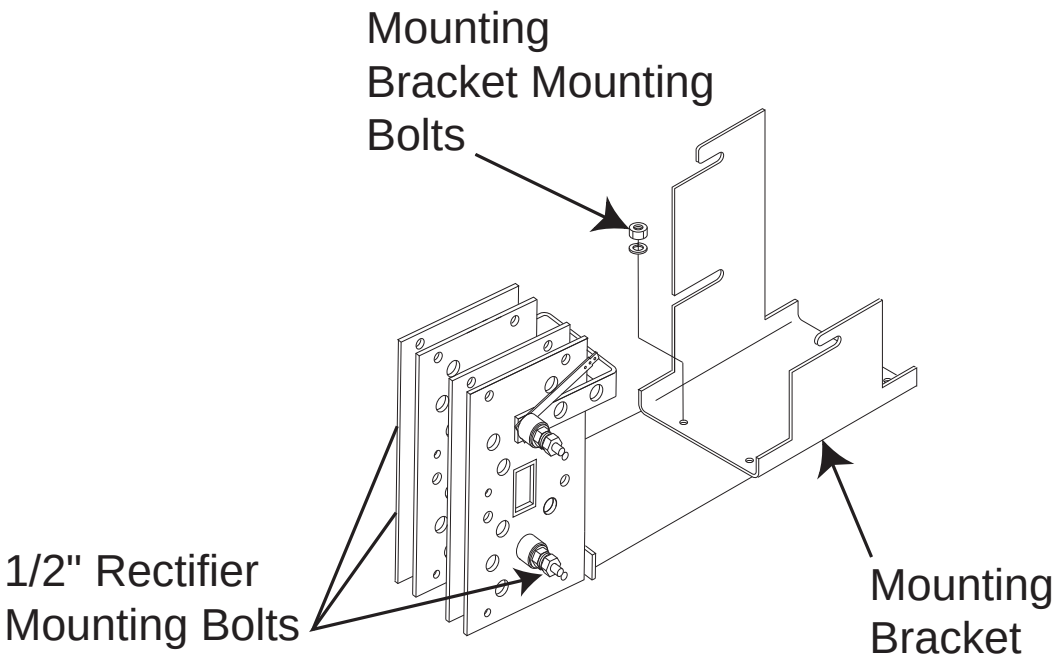
1. Using a 3/8” nutdriver, remove both sides of the case wraparound cover.
2. Locate the Output Diode Bridge Rectifier. See Figure F.7.
3. Using a 1/2” socket and 1/2” wrench, label and remove the two secondary leads at the top of the Rectifier and also remove the leads at the positive and negative terminals at the Rectifier. See Figure F.7.
   **NOTE:** Take note of washer placement upon removal.
4. Unplug leads 1104A and 1104B from the thermostat. See Figure F.7.
5. Using a 3/8” nutdriver and a 3/8” wrench, locate and remove the four nuts mounting the Rectifier bracket to the bottom of the machine. ***See Figure F.8***.
6. Carefully manipulate the Output Diode Bridge Rectifier and the mounting bracket out of the left side of the machine.
7. Using a 1/2” nutdriver, remove the three bolts mounting the bracket to the Rectifier. The Rectifier is now ready for repair or replacement. ***See Figure F.8***.



Return to Section TOC
Return to Master TOC

## OUTPUT DIODE BRIDGE
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.8 – OUTPUT DIODE BRIDGE RECTIFIER MOUNTING BRACKET**




### REPLACEMENT PROCEDURE

1. Mount the new Rectifier to the mounting bracket using the three 1/2” nuts and washers.
2. Carefully manipulate the Rectifier and mounting bracket back into the machine and to its proper location.
3. Mount the unit to the bottom of the machine using the four 3/8” mounting nuts and washers previously removed.
4. Torque the four mounting nuts to 24 IN-LBS.
5. Reconnect the two thermostat leads previously removed.
6. Apply a thin film of Penetrox electrical joint compound to the four terminals on the Output Rectifier.
7. Reconnect the four leads and the choke strap to the Rectifier as previously labeled.
8. Replace the case wraparound covers.



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

# MAIN TRANSFORMER 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 Transformer.

## MATERIALS NEEDED

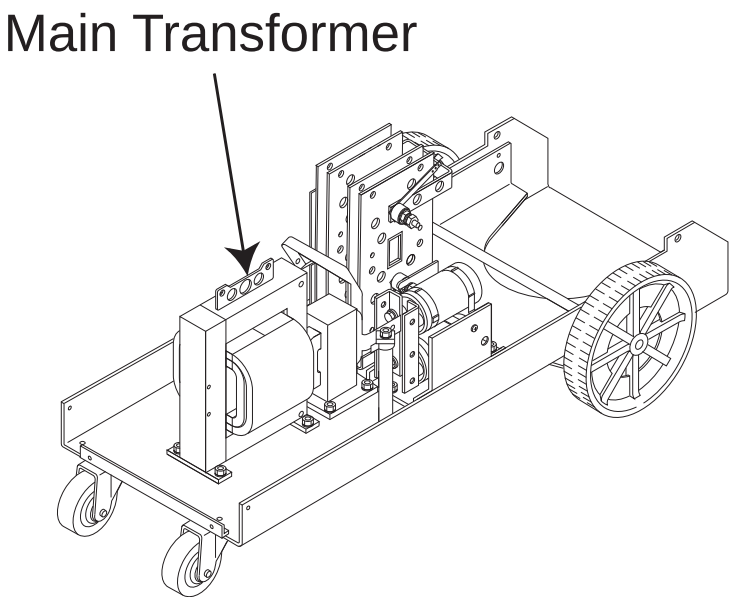
3/8" Nutdriver
7/16” Socket and Ratchet
7/16” Wrench
1/2” Socket and Ratchet
1/2” Wrench
Side Cutters
Penetrox Electrical Joint Compound



Return to Section TOC
Return to Master TOC

# MAIN TRANSFORMER
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.9 – MAIN TRANSFORMER LOCATION**




## REMOVAL PROCEDURE

1. Using a 3/8” nutdriver, remove both sides of the case wraparound cover.
2. Locate the Main Transformer. See Figure F.9.
3. Label and using a 7/16” socket and 7/16” wrench, disconnect leads H1 through H7 on the voltage control switch. ***See Figure F.10***.
4. Label and using a 1/2” socket and 1/2” wrench, disconnect the two secondary leads at the rectifier. Use side cutters to remove any necessary cable ties. ***See Figure F.11***.
5. Unplug the two thermostat wires. ***See Figure F.11***.
6. Open rear access panel. ***See Figure F.12***.
7. Using a 3/8” nutdriver, label and remove leads H8 and H9 from the reconnect panel. ***See Figure F.13***.
8. Feed leads H8 and H9 toward the inside of the machine. Cut any necessary cable ties.
9. Using a 1/2” socket, remove the four Main Transformer mounting nuts and associated wires. ***See Figure F.14***.
10. Carefully maneuver the Main Transformer out the side of the machine.

**NOTE:** Two people may be needed to maneuver the Main Transformer out of the machine.



Return to Section TOC
Return to Master TOC

## MAIN TRANSFORMER
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.10 – VOLTAGE CONTROL SWITCH LEADS**

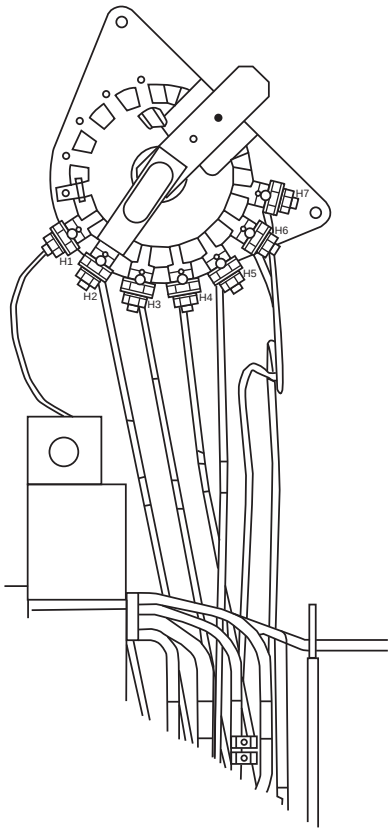
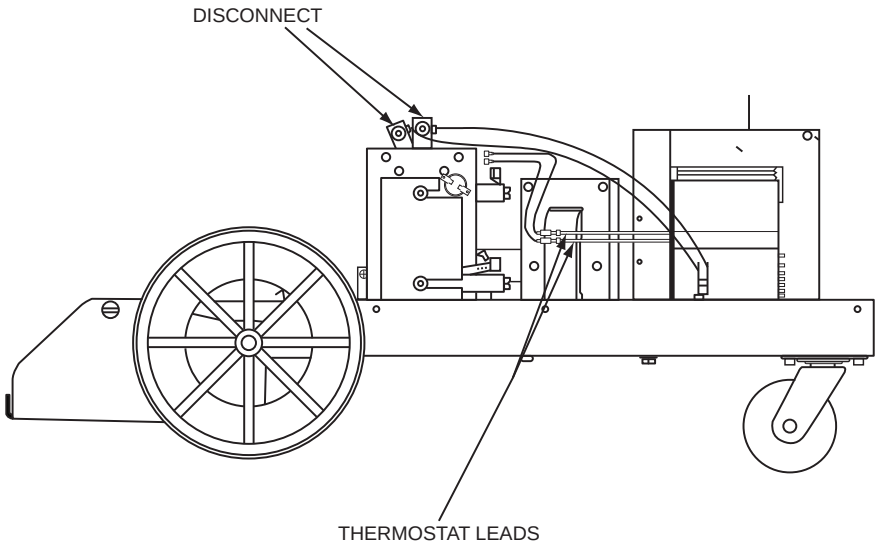



**FIGURE F.11 – THERMOSTAT LEADS**



## MAIN TRANSFORMER
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.12 – REAR ACCESS PANEL

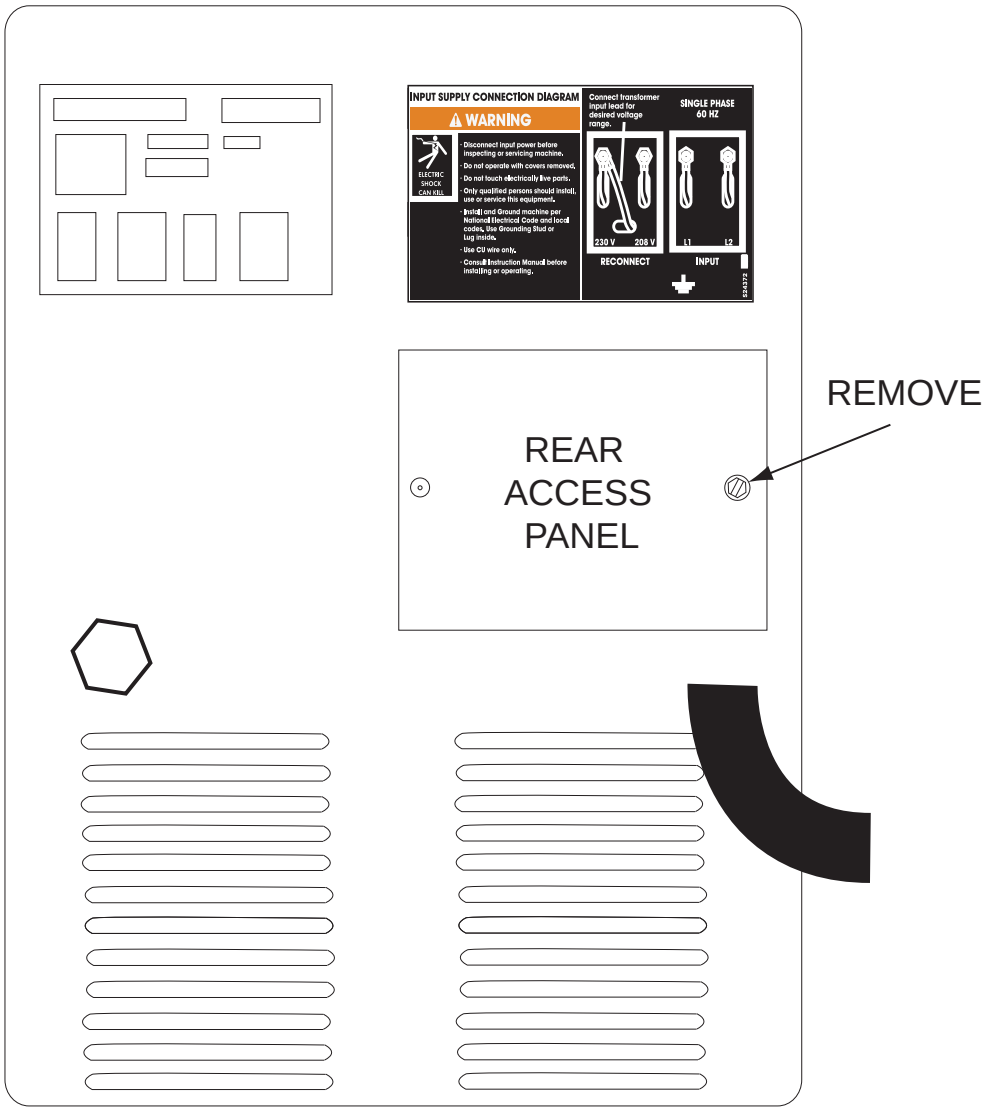
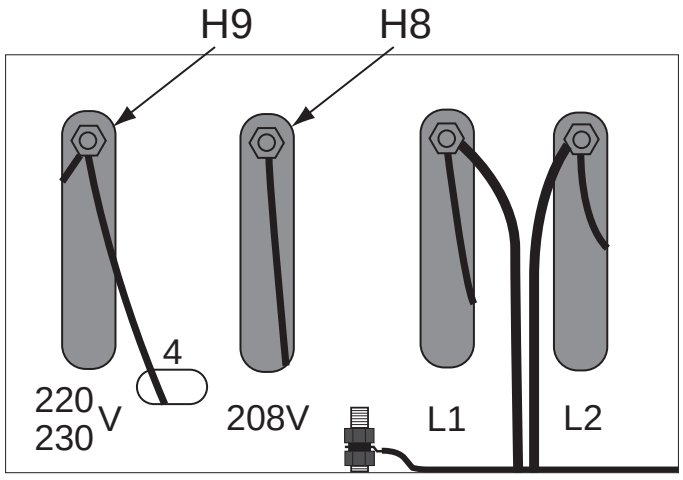
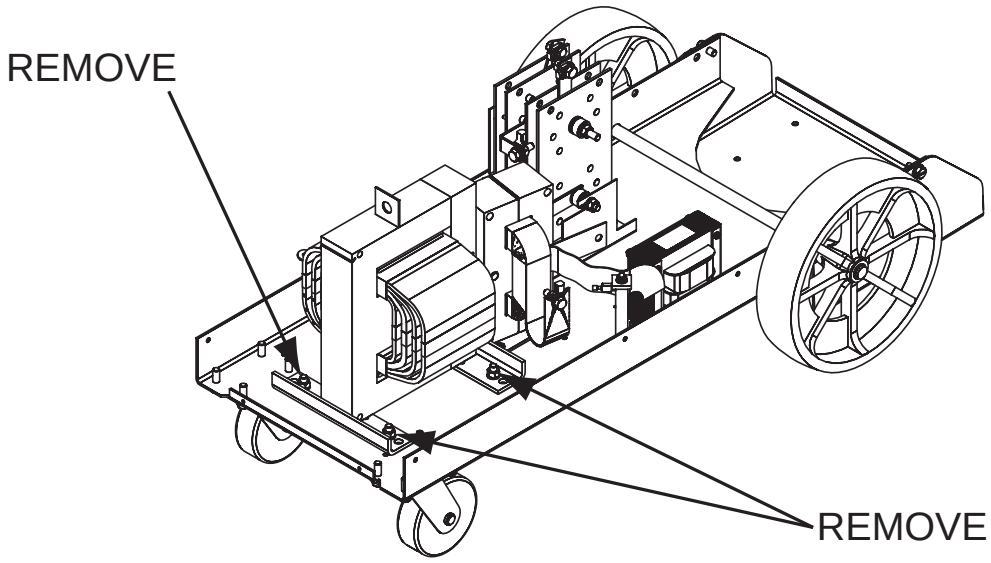



FIGURE F.13 – REAR ACCESS PANEL (CLOSE-UP)



## MAIN TRANSFORMER
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.14 – MAIN TRANSFORMER MOUNTING NUTS**




### REPLACEMENT PROCEDURE

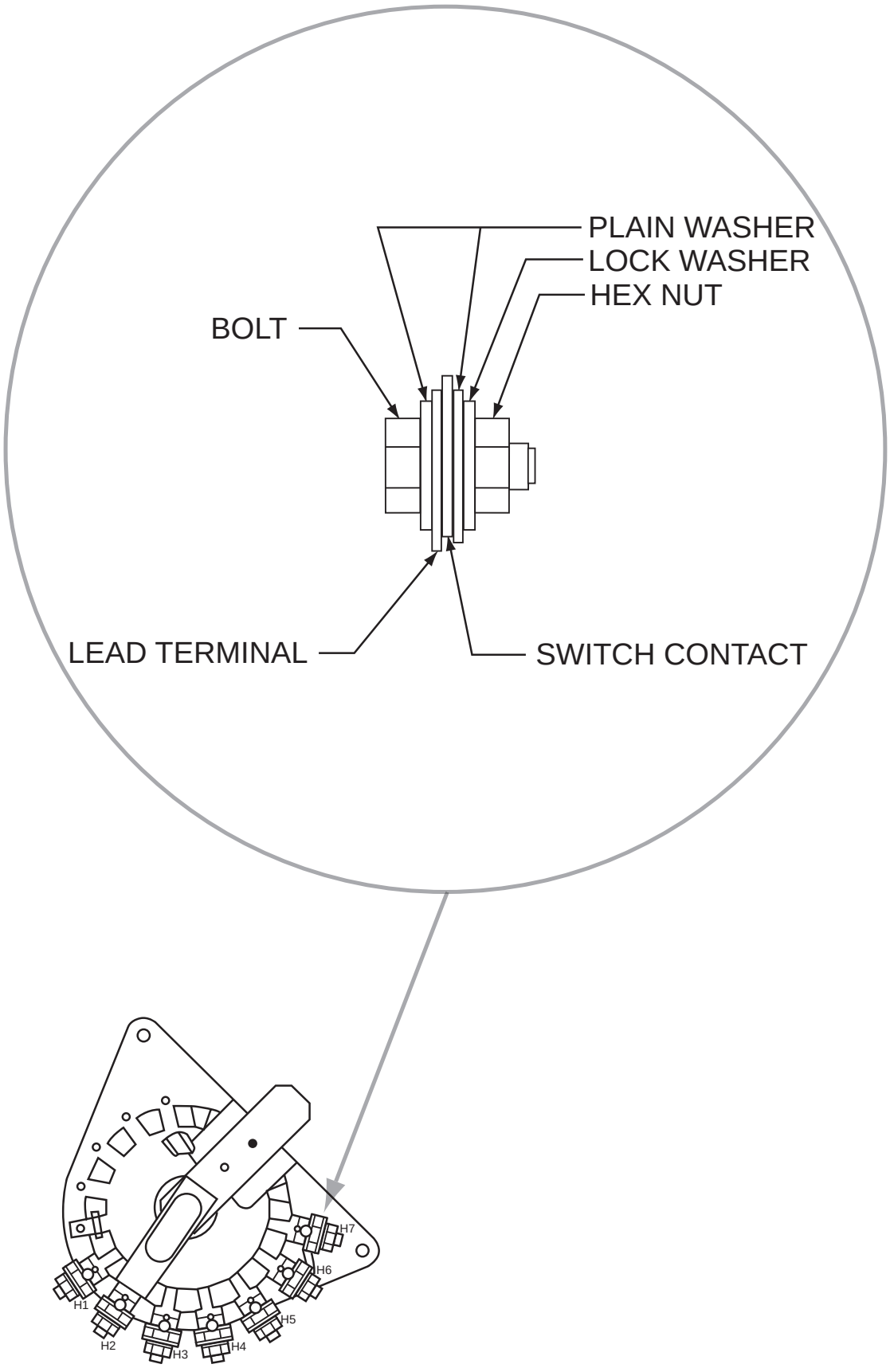
1. Carefully maneuver the new Main Transformer back into the machine and onto its mounting studs.
2. Using a 1/2” socket, mount the Main Transformer in its proper position.
3. Rout and reconnect leads H8 and H9 previously removed.
4. Close the rear access panel door.
5. Reconnect the two thermostat leads.
6. Apply a thin film of Penetrox A-13 to the rectifier bridge assembly and reconnect the two secondary leads from the Transformer.
7. Replace any necessary cable ties.
8. Reconnect leads H1 through H7 onto voltage control switch. ***See Figure F.15***.
9. Replace both sides of the case wraparound cover.



Return to Section TOC
Return to Master TOC

## MAIN TRANSFORMER
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

FIGURE F.15 – TYPICAL LEAD MOUNTING HARDWARE CONFIGURATION



# CONTROL BOARD 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 Control Board.

## MATERIALS NEEDED

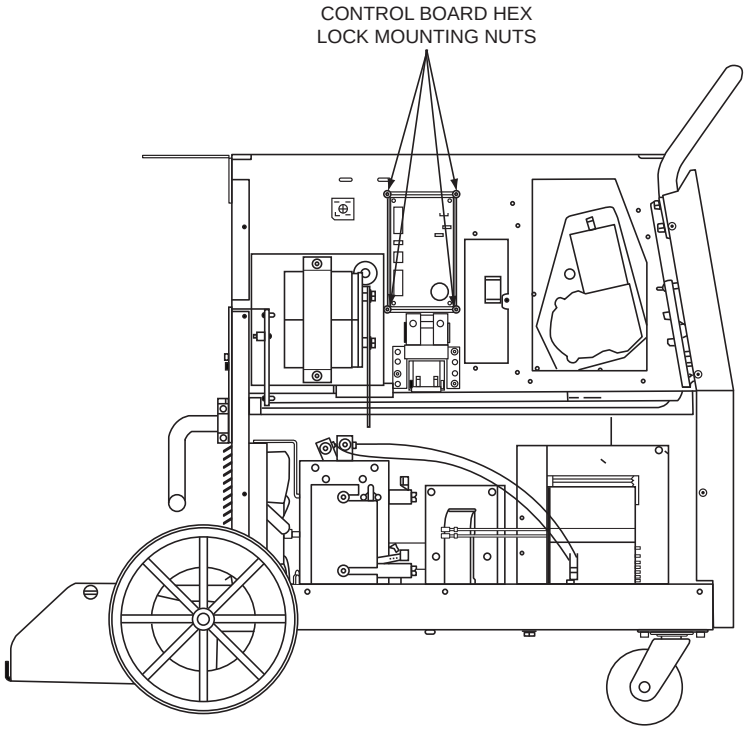
3/8" Nutdriver
In-Lbs. Torque Wrench
Anti-Static Wrist Strap



Return to Section TOC
Return to Master TOC

# CONTROL BOARD
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.16 – CONTROL BOARD MOUNTING NUTS**




## REMOVAL PROCEDURE

1. Remove power to the machine.
2. Using a 3/8” nutdriver, remove the left side of the case wraparound cover.
3. Locate the Control Board.
4. Label and disconnect all associated plugs and leads connected to the Control Board.
5. Remove the four 3/8” hex lock nuts from the Control Board. See Figure F.16.
6. Carefully remove the Control Board.

## REPLACEMENT PROCEDURE

1. Mount the new board to the existing mounting studs. Torque the four hex lock nuts to 10-12 in-lbs.
2. Reconnect any plugs or leads previously removed.
3. Replace the case wraparound cover.



Return to Section TOC
Return to Master TOC

# WIRE DRIVE ASSEMBLY 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 Wire Drive Assembly.

## MATERIALS NEEDED

3/8” Nutdriver
Pliers
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

# WIRE DRIVE ASSEMBLY
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

## REMOVAL PROCEDURE

1. Disconnect main input power to the machine.
2. Remove gun cable and remove the wire.
3. Using the 3/8" nutdriver, remove the left side of the case wraparound.
4. Disconnect the wire connector J4 to the Wire Drive Motor. See Wiring Diagram.
5. Remove the bolt from the electrode lead. ***See Figure F.17***.
6. Use pliers to remove the hose clamp and flex hose from the Wire Drive Assembly.
7. Remove the outer guide assembly from the Wire Drive Assembly by loosening the thumb screws until the outer guide can be removed.
8. Rotate the adjustment arm assembly counter-clockwise to release the tension on the idle arm.
9. Swing the idle arm up and away from the Wire Drive Assembly.
10. Rotate the twist lock ring until the ears line up with the slots on the drive roll, then pull the drive roll off the shaft. Now slide off the inner guide.
11. Remove nut that holds the molded drive roll shaft assembly to the Wire Drive Assembly. Remove the molded drive roll shaft assembly form the Wire Drive Assembly.
12. Remove panel covering the gear.
13. Using a screwdriver remove gear.
14. Using screwdriver, remove the three pan head screws and lock washers securing the motor / gearbox assembly to the Wire Drive Assembly.
15. Grasp the motor / gearbox assembly and wiggle it gently back and forth until it separates from the Wire Drive Assembly.

## REPLACEMENT PROCEDURE

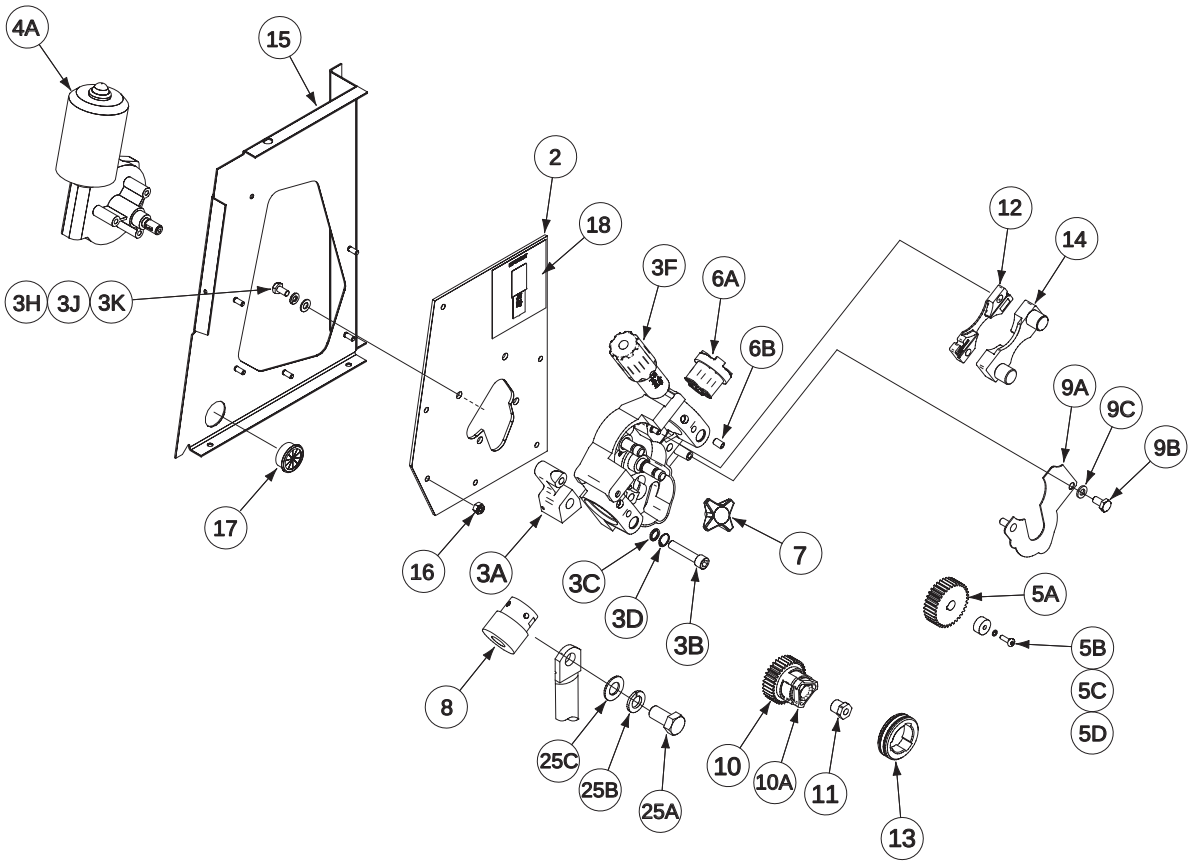
1. Bolt the Wire Drive Assembly to the wire drive compartment.
2. Secure the wire drive compartment to the divider panel welded assembly.
3. Mount the motor / gearbox assembly to the Wire Drive Assembly and attach with screws.
4. Assemble the drive roll components to the Wire Drive Assembly.
5. Attach the flex hose and clamp.
6. Reinstall case wraparound.
7. Attach the wire gun and wire.



Return to Section TOC
Return to Master TOC

## WIRE DRIVE ASSEMBLY
## REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.17 – WIRE DRIVE ASSEMBLY REMOVAL**




2. Gearbox Mounting Panel
3. Feedplate Assembly
3A. Connection Bar
3B. Socket Head Cap Screw
3C. Plain Washer
3D. Retaining Ring
3F. Adjustment Arm Assembly
3H. 1/4-20 x .50 HHCS
3J. Lock Washer
3K. Plain Washer
4A. Motor Gearbox Assembly
5A. Drive Gear
5B. Collar
5C. Lock Washer
5D. Metric Screw
6A. Ball Housing
6B. Set Screw
7. Molded Hand Screw
8. Gun Adapter Assembly
9A. Feedplate Cover
9B. 1/4-20 x .50 HHCS
9C. Lock Washer
10. Drive Roll Shaft Assembly
10A. Twist Lock Ring
11. Drive Hub Retainer
12. Inner Wire Guide
13. Drive Roll
14. Outer Guide Assembly
15. Wire Drive Compartment
16. #10-24 HLN - Nylon Insert
17. Grommet
18. Decal
19. Decal
25A. 1/2-13 x 1.00 HHCS
25B. Lock Washer
25C. Plain Washer

# 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

# CR-1 AND CR-2 RELAYS 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 CR-1 and CR-2 Relays.

## MATERIALS NEEDED

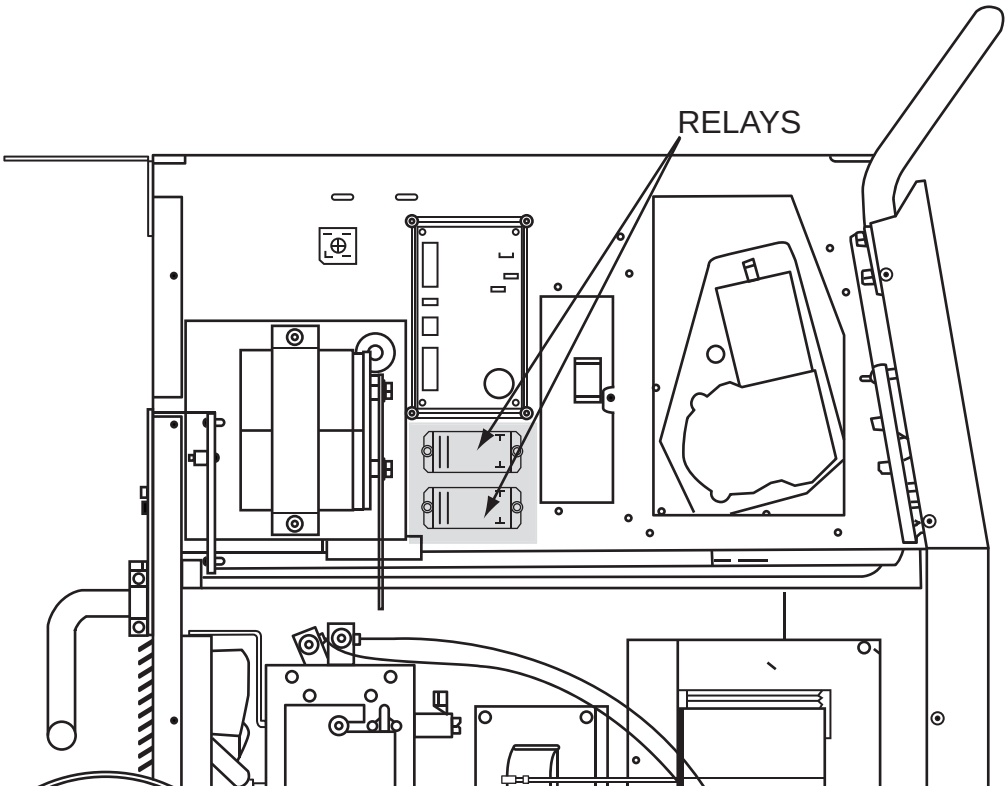
3/8" Nutdriver
11/32” Nutdriver
In-Lbs Torque Wrench



Return to Section TOC
Return to Master TOC

# CR-1 AND CR-2 RELAYS
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.18 – RELAY LOCATION**




## REMOVAL PROCEDURE

1. Remove power to the machine.
2. Using a 3/8” nutdriver, remove the left side of the case wraparound cover.
3. Locate the Relays. See Figure F.18.
4. Label and disconnect all associated plugs and leads connected to the Relays.
5. Using the 11/32” nutdriver, remove the two hex nuts on each Relay.
6. Carefully remove the Relays.

## REPLACEMENT PROCEDURE

1. Mount the new Relays to the existing mounting studs. Install hex nuts along with the lock and plain washers and torque to 10-12 in-lbs.
2. Reconnect any plugs or leads previously removed.
3. Replace the case wraparound cover.



Return to Section TOC
Return to Master TOC

# FAN BLADE / MOTOR 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 Fan Blade and Fan Motor.

## MATERIALS NEEDED

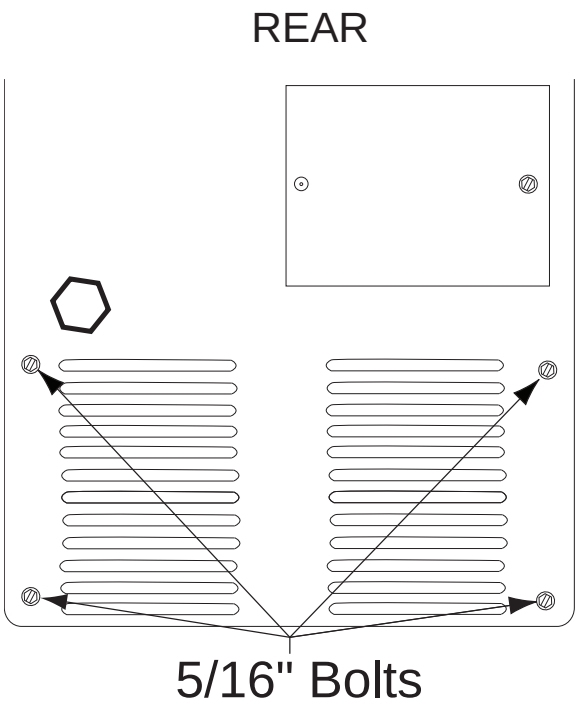
3/8" Nutdriver
5/16” Nutdriver
11/32” Open-End Wrench
Flathead Screwdriver

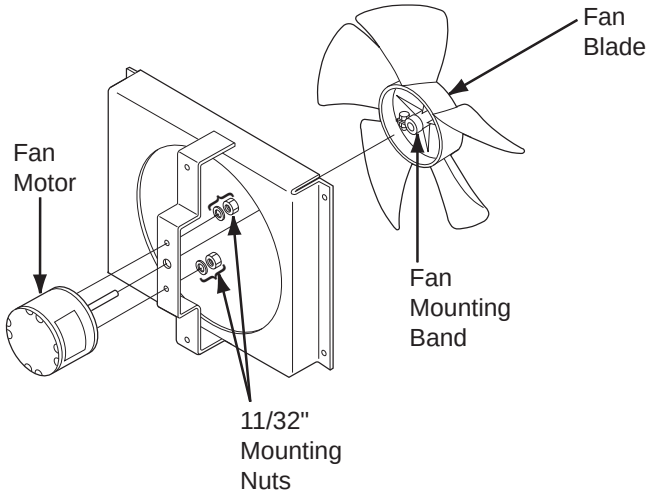


Return to Section TOC
Return to Master TOC

# FAN BLADE / MOTOR
# REMOVAL AND REPLACEMENT PROCEDURE (continued)

**FIGURE F.19 – FAN MOUNTING BOLTS**




## REMOVAL PROCEDURE

1. Using a 3/8” nutdriver, remove case wrap-around cover.
2. Using a 5/16” nutdriver, remove the four Fan mounting screws from the rear of the machine. See Figure F.19.
3. Using an open end 11/32” wrench, remove the two Fan Motor mounting nuts and lockwashers. See Figure F.19.
4. Using a flathead screwdriver, loosen the Fan Blade mounting band. See Figure F.19.
5. Pry the Fan Blade off of the mounting shaft.

   **NOTE:** If Fan Blade cracks or breaks upon removal, replace it.
6. Carefully maneuver the Fan Motor and Fan Blade out of the right side of the machine.
7. Replace the Fan Motor and Fan Blade if necessary.

## REPLACEMENT PROCEDURE

1. Tighten the Fan Blade mounting band.
2. Carefully maneuver the Fan Assembly into its original position.
3. Replace the two 11/32” Fan Motor mounting nuts and lockwashers.
4. Replace the four 5/16” Fan Assembly mounting screws in the rear of the machine.

**NOTE:** Make sure the Fan Blade is free to rotate when all of the mounting bolts are replaced.

5. Replace the lower right case cover.



Return to Section TOC
Return to Master TOC

## RETEST AFTER REPAIR

### INPUT IDLE AMPS AND WATTS

| Input Volts / Hertz | Maximum Idle Amps | Maximum Idle Watts |
|---|---|---|
| 230 / 60 | 2.0 | 150 |

### OPEN CIRCUIT VOLTAGE

| 36 VDC |
|---|

### WIRE SPEED RANGE

| 50 - 700 IPM (1.27 - 17.8 m/minute) |
|---|

# 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





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

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

## WIRING DIAGRAM - (L15096)

# POWER MIG 216 (208/220/230V)

CAVITY NUMBERING SEQUENCE
(COMPONENT SIDE OF P.C. BOARD)

J1 (1–8 / 9–16) J2 (1–3 / 4–6) J3 (1–2)

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537

COLOR CODE
B - BLACK
W - WHITE
R - RED
U - BLUE

INDICATES CONNECTOR CAVITY No.

** CAVITY

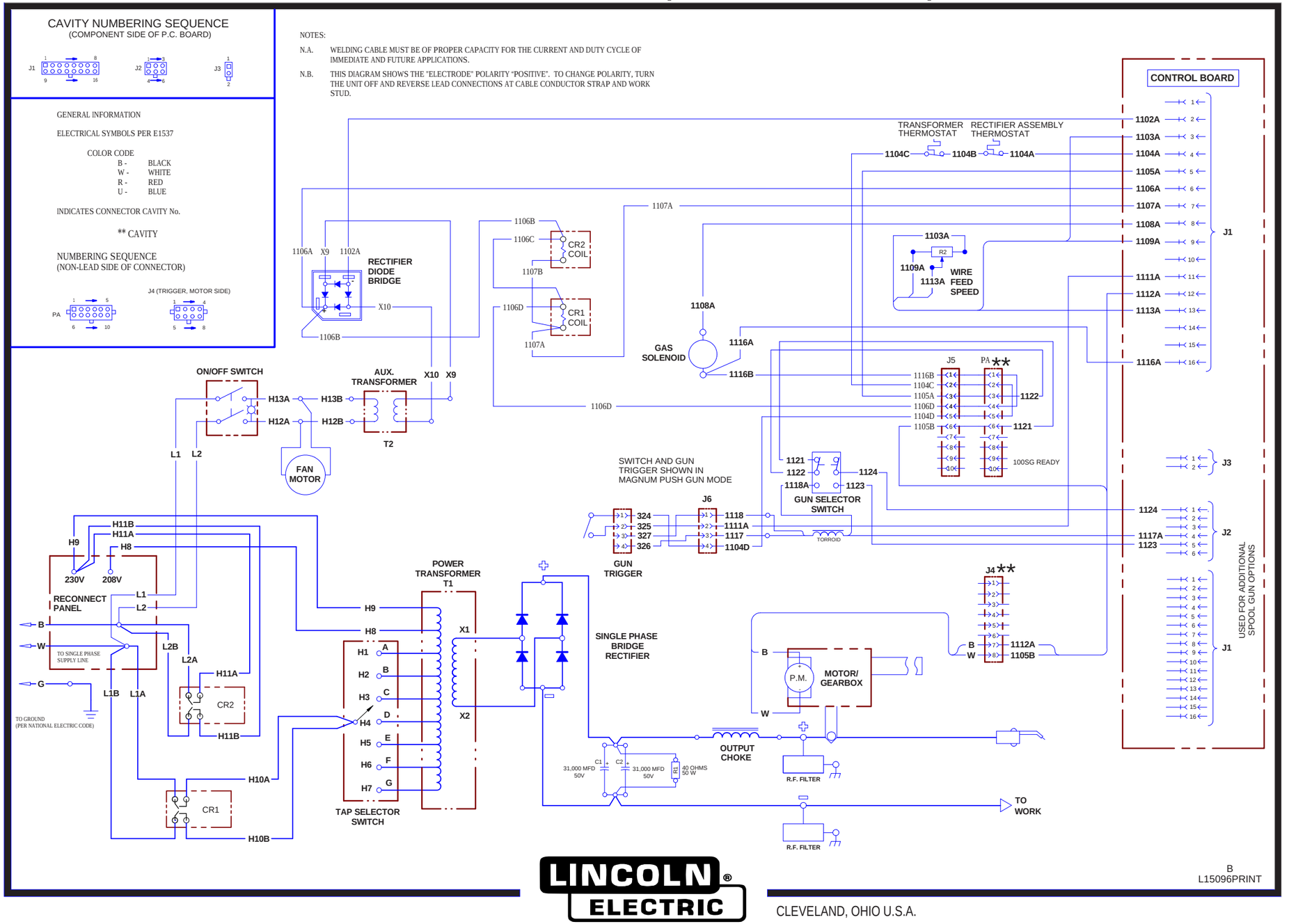
NUMBERING SEQUENCE
(NON-LEAD SIDE OF CONNECTOR)

PA (1–5 / 6–10) J4 (TRIGGER, MOTOR SIDE) (1–4 / 5–8)

NOTES:

N.A. WELDING CABLE MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS.

N.B. THIS DIAGRAM SHOWS THE "ELECTRODE" POLARITY "POSITIVE". TO CHANGE POLARITY, TURN THE UNIT OFF AND REVERSE LEAD CONNECTIONS AT CABLE CONDUCTOR STRAP AND WORK STUD.




LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

B
L15096PRINT

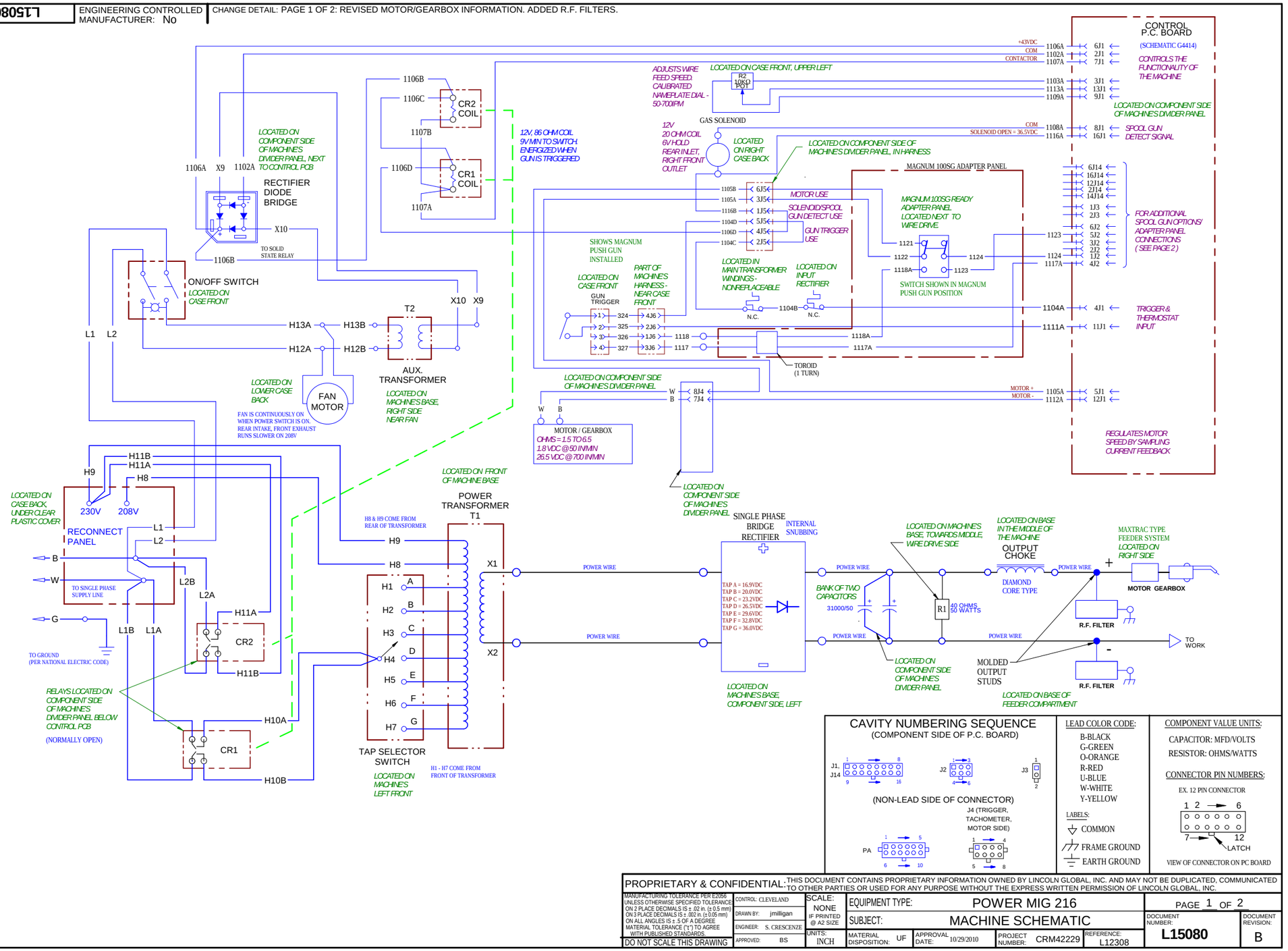
**NOTE:** This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.



Return to Section TOC
Return to Master TOC

## SCHEMATIC - COMPLETE MACHINE (L15080) PG 1

L15080 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: PAGE 1 OF 2: REVISED MOTOR/GEARBOX INFORMATION. ADDED R.F. FILTERS.




### CAVITY NUMBERING SEQUENCE
(COMPONENT SIDE OF P.C. BOARD)




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

LABELS:
COMMON
FRAME GROUND
EARTH GROUND

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

CONNECTOR PIN NUMBERS:
EX. 12 PIN CONNECTOR




VIEW OF CONNECTOR ON PC BOARD



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

| | |
|---|---|
| CONTROL: | CLEVELAND |
| DRAWN BY: | jmilligan |
| ENGINEER: | S. CRESCENZE |
| APPROVED: | BS |
| SCALE: | NONE IF PRINTED @ A2 SIZE |
| UNITS: | INCH |
| EQUIPMENT TYPE: | POWER MIG 216 |
| SUBJECT: | MACHINE SCHEMATIC |
| MATERIAL DISPOSITION: | UF |
| APPROVAL DATE: | 10/29/2010 |
| PROJECT NUMBER: | CRM42229 |
| REFERENCE: | L12308 |
| PAGE | 1 OF 2 |
| DOCUMENT NUMBER: | L15080 |
| DOCUMENT REVISION: | B |

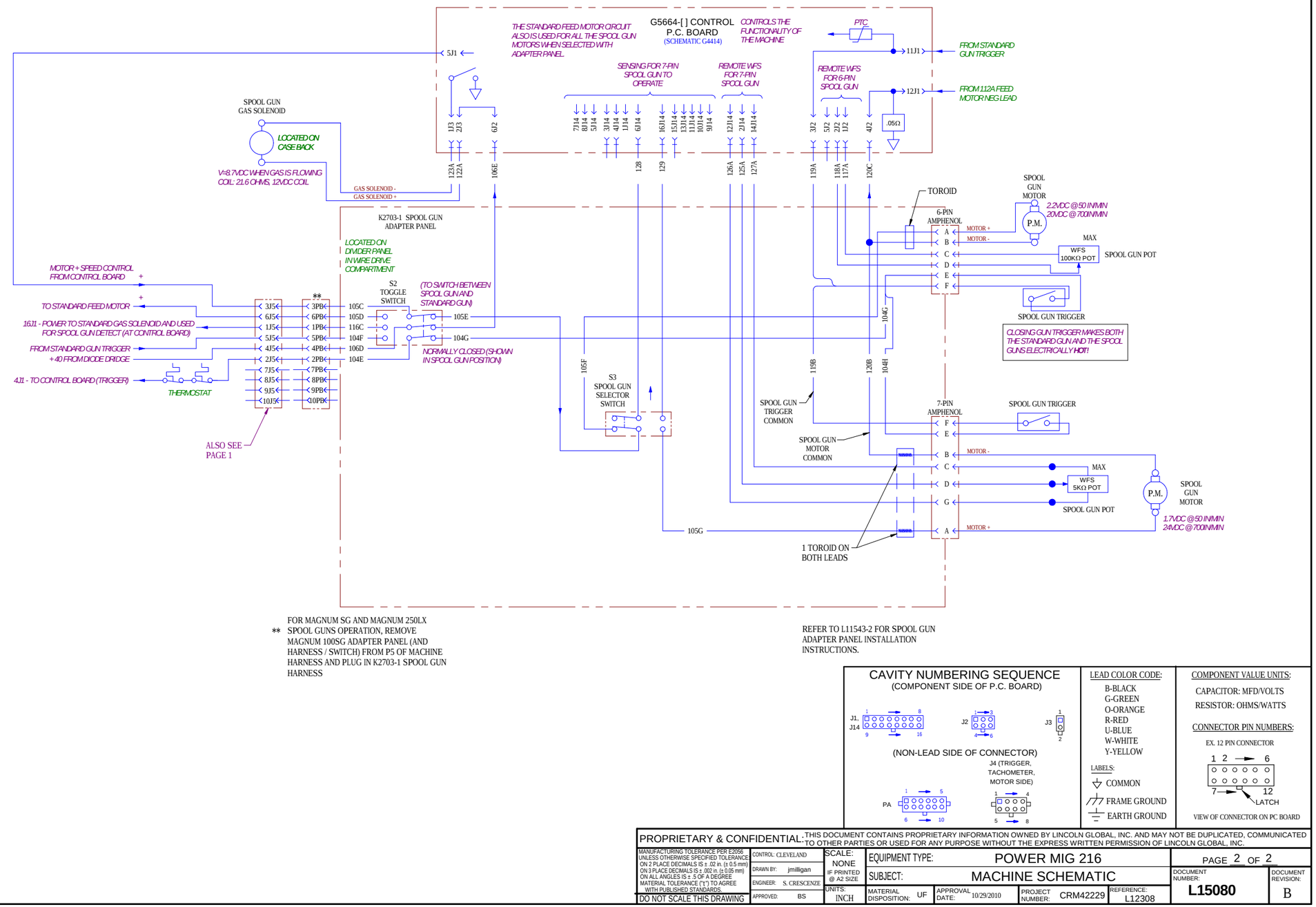
**NOTE:** This diagram is for reference only. It may not be accurate for all machines covered by this manual.



Return to Section TOC
Return to Master TOC

## SCHEMATIC - COMPLETE MACHINE (L15080) PG2

L15080 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: PAGE 1 OF 2: REVISED MOTOR/GEARBOX INFORMATION. ADDED R.F. FILTERS.




CAVITY NUMBERING SEQUENCE (COMPONENT SIDE OF P.C. BOARD)

J1, J14 | J2 | J3

(NON-LEAD SIDE OF CONNECTOR)

PA | J4 (TRIGGER, TACHOMETER, MOTOR SIDE)

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

LABELS:
COMMON
FRAME GROUND
EARTH GROUND

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

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



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

CONTROL: CLEVELAND
DRAWN BY: jmilligan
ENGINEER: S. CRESCENZE
APPROVED: BS

SCALE: NONE IF PRINTED @ A2 SIZE
UNITS: INCH

EQUIPMENT TYPE: POWER MIG 216
SUBJECT: MACHINE SCHEMATIC
MATERIAL DISPOSITION: UF
APPROVAL DATE: 10/29/2010
PROJECT NUMBER: CRM42229
REFERENCE: L12308

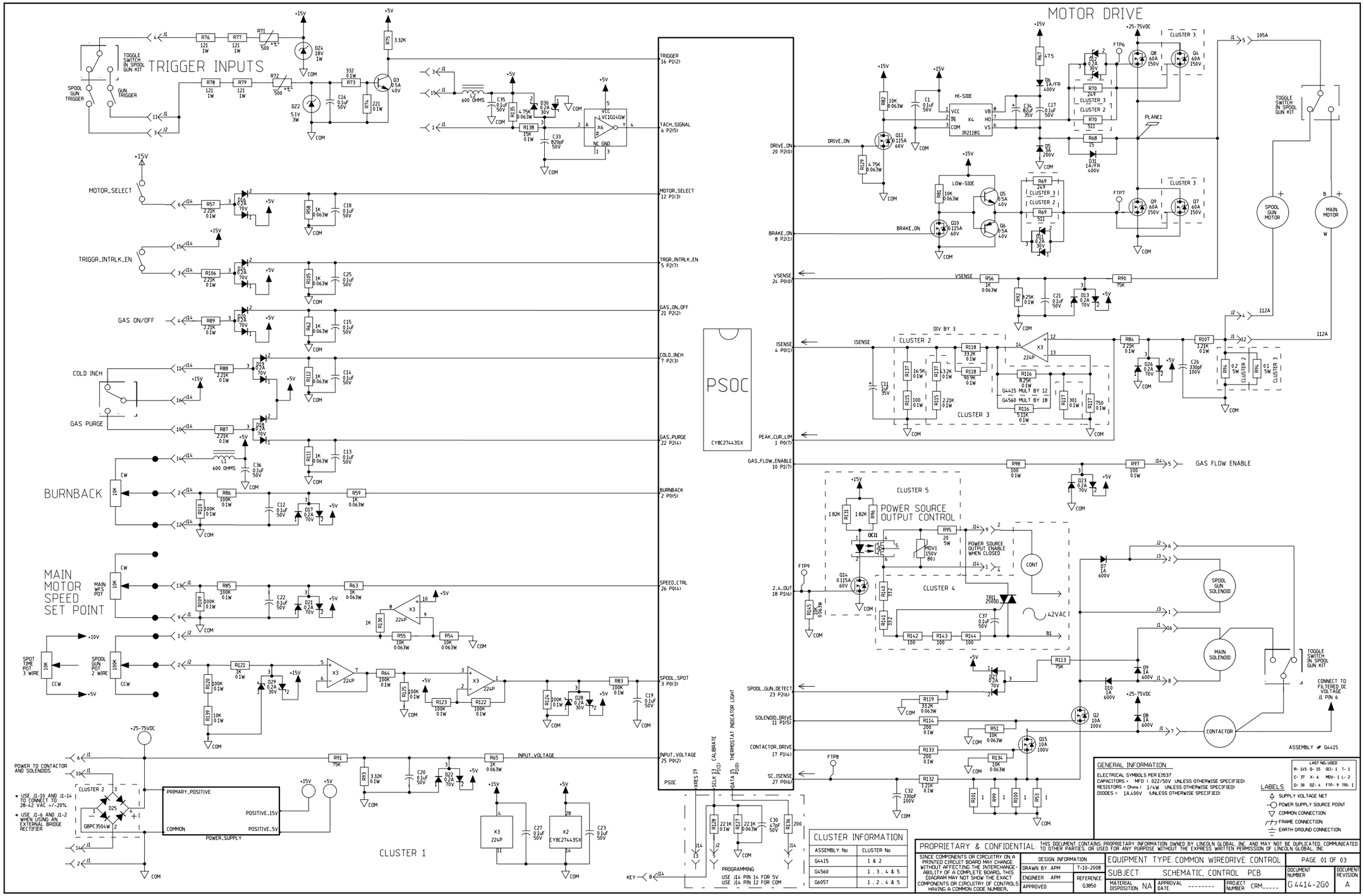
PAGE 2 OF 2
DOCUMENT NUMBER: L15080
DOCUMENT REVISION: B

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



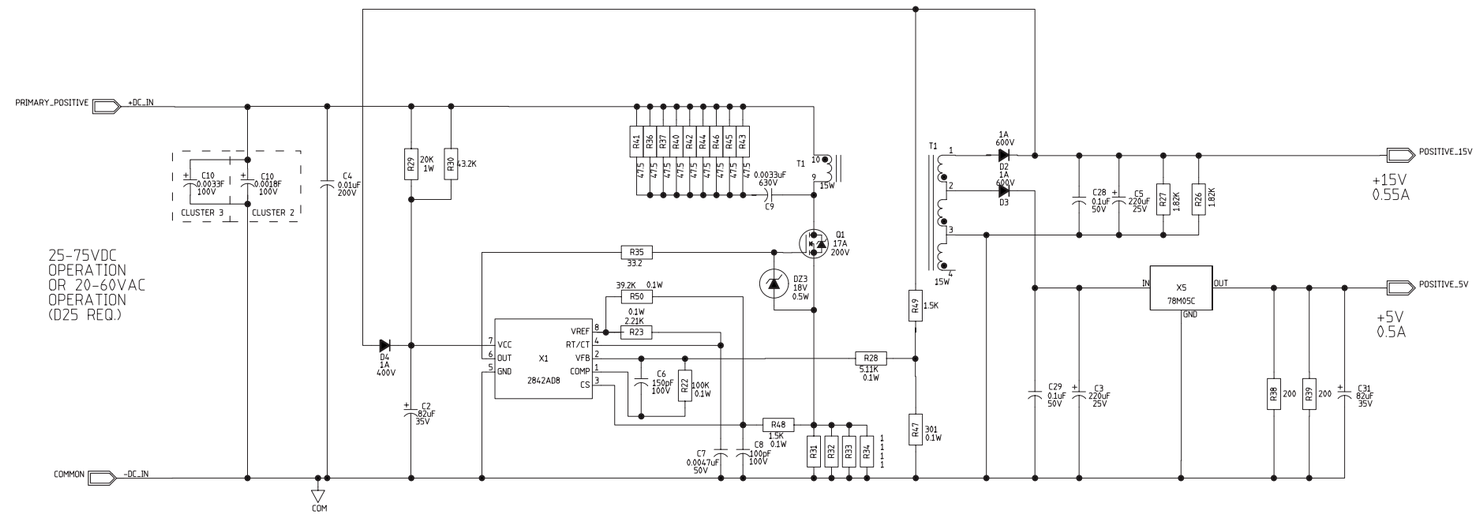
Return to Section TOC
Return to Master TOC

## SCHEMATIC - CONTROL PC BOARD (G4414-2) PG1




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

## SCHEMATIC - CONTROL PC BOARD (G4414-2) PG2




CLUSTER 1

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)

LAST NO. USED
A- -
C- - SEE PAGE 1
D- -

LABELS
- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION



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.

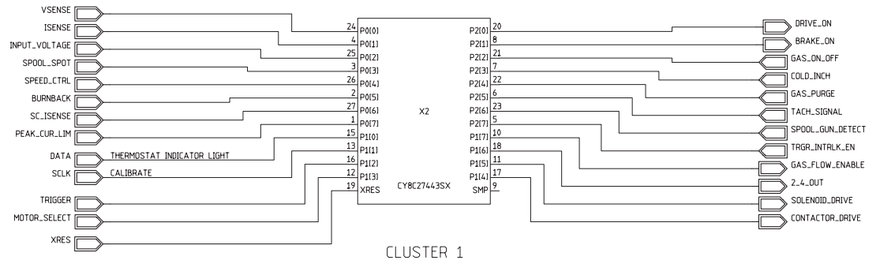
| DESIGN INFORMATION | | EQUIPMENT TYPE: COMMON WIREDRIVE CONTROL | PAGE 02 OF 03 |
|---|---|---|---|
| DRAWN BY: APM | 7-10-2008 | SUBJECT: SCHEMATIC, CONTROL PCB | DOCUMENT NUMBER: G 4414-2G0 / DOCUMENT REVISION: A |
| ENGINEER: APM | REFERENCE: | | |
| APPROVED: | -------- | MATERIAL DISPOSITION: NA / APPROVAL DATE: -------- / PROJECT NUMBER: CRM_____ | |

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



Return to Section TOC
Return to Master TOC

## SCHEMATIC - CONTROL PC BOARD (G4414-2) PG3




CLUSTER 1

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)

LAST NO. USED
R- -
C- - SEE PAGE 1
D- -

LABELS
- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION



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.

| DESIGN INFORMATION | | EQUIPMENT TYPE: COMMON WIREDRIVE CONTROL | PAGE 03 OF 03 |
|---|---|---|---|
| DRAWN BY: APM | 7-10-2008 | SUBJECT: SCHEMATIC, CONTROL PCB | DOCUMENT NUMBER: G4414-2G0 / DOCUMENT REVISION: A |
| ENGINEER: APM | REFERENCE: -------- | | |
| APPROVED: | | MATERIAL DISPOSITION: NA / APPROVAL DATE: -------- / PROJECT NUMBER: CRM_____ | |

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Return to Section TOC
Return to Master TOC