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.

IDEALARC SP-250

For use with machines having Code Numbers:

9402, 9546, 9723, 10001, 10002

SERVICE MANUAL

SVM111-A | Issue Date 96, Jan

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⚠ WARNING

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.

ELECTRIC SHOCK can kill.

1.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.

1.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.**

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

1.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.

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

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

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

1.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.

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

1.j. Also see Items 4.c. and 6.

ARC RAYS can burn.

2.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.

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

2.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.

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

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

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

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

3.e. Also see item 7b.

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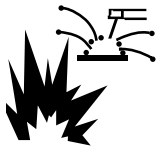


WELDING SPARKS can cause fire or explosion.

4.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.

4.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.

4.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.

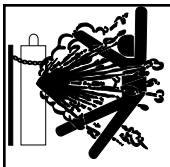
4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe 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).

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

4.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.

4.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.

4.h. Also see item 7c.



CYLINDER may explode if damaged.

5.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.

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

5.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.

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

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

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

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

FOR ELECTRICALLY powered equipment.

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

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

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

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FOR ENGINE powered equipment.

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

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

7.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.

7.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.

7.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.

7.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.

7.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.

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

ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.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

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

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

8d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

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

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

8.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.

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

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

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PRÉCAUTIONS DE SÛRETÉ

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

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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TECHNICAL SPECIFICATIONS - Idealarc SP-250

INPUT - SINGLE PHASE/ 60 HERTZ ONLY	
Standard Voltage	**Input Current at Rated Output**
208/230/1/60	**53/49 Amps**
230/460/575	**50/25/20 Amps**

RATED OUTPUT		
Duty Cycle	**Amps**	**Volts at Rated Amps**
100%	145 amps	26
60%	200 amps	28
35%	250 amps	26

OUTPUT		
Current Range	**Maximum Open Circuit Voltage**	**Wire Speed Range**
30A - 250A	10V - 40V	50 - 600 IPM (1.27-15.2 m./minute)

RECOMMENDED INPUT WIRE & FUSE SIZE				
Input Voltage/ Frequency	**Fuse (Superlag) or Breaker Size**	**Type 75°C wire in Copper conduit AWG (IEC Sizes) Runs to 100ft. (30m.)**	**Runs over 100ft.(30m.)**	**Type 75°C Copper Ground Wire in Conduit**
208/60	60	8 (10mm²)	6 (16mm²)	10 (6mm²)
230/60	60	10 (6mm²)	8 (10mm²)	10 (6mm²)
460/60	30	14 (2.5mm²)	12 (4mm²)	10 (6mm²)
575/60	25	14 (2.5mm²)	12 (4mm²)	10 (6mm²)

PHYSICAL DIMENSIONS			
HEIGHT	**Width**	**DEPTH**	**WEIGHT (W/GUN)**
28.2” (719mm)	18.8” (480mm)	40.1” (1019mm)	222 lbs. (101 Kg.)

OPERATING TEMPERATURE	
STORAGE	**OPERATING**
± 40°C	-20°C to 40°C

Read entire Installation Section before installing the IDEALARC SP-250

SAFETY PRECAUTIONS

ELECTRIC SHOCK CAN KILL.

⚠ WARNING

- Only qualified personnel should install this machine.
- Turn the input power OFF at the disconnect switch or fuse box before working on the equipment.
- Do not touch electrically hot parts.
- Always connect the IDEALARC SP-250 grounding terminal (located on the side of the Case Back Assembly) to a good electrical earth ground.
- Set the IDEALARC SP-250 Power switch to the OFF position when connecting power cord to input power.

SELECT PROPER LOCATION

Place the IDEALARC SP-250 where clean air can freely circulate in through the front intake and out through the rear louvers. Dirt, dust, or any foreign material that can be drawn into the machine should be kept at a minimum. Not following these precautions can result in the nuisance shutdown of the machine because of excessive operating temperatures.

STACKING

The IDEALARC SP-250 cannot be stacked.

INPUT CONNECTIONS

⚠ WARNING

All input power must be electrically disconnected before proceeding.

1. Before starting the installation, check with the local power company to determine if there is any question about whether your power supply is adequate for the voltage, amperes, phase, and frequency specified on the welder nameplate. 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 three-phase line.

2. Models that have multiple input voltages specified on the nameplate (e.g., 208/230) are shipped connected for the highest voltage. If the welder is to be operated at a lower voltage, it must be reconnected according to the instructions on the inside of the removable panel (Reconnect Access Door) near the top left side of the Case Back Assembly. Also see the Reconnect Section of this manual for details on reconnecting the machine to operate at different voltages.

3. Be sure the voltage, phase, and frequency of the input power is as specified on the machine rating plate. See Figure A.1 for the location of the machine's input cord entry, Reconnect Access Door, Reconnect Panel, and Rear Nameplate.

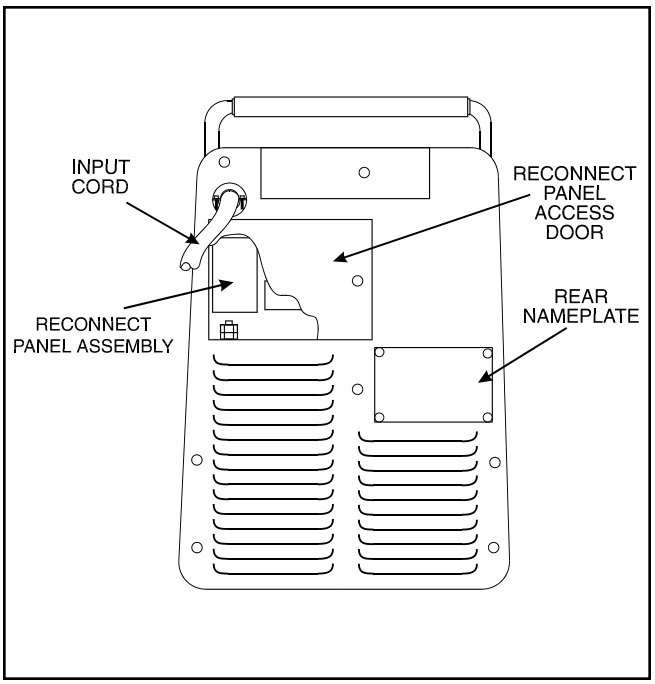

FIGURE A.1 - Case Back Assembly: Input Power Cable Entry Connections.

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FUSE AND WIRE SIZES

Protect the input circuit with the super lag fuses or delay type circuit breakers listed on the ***Specifications page*** of this manual for the machine being used. The tripping action of delay type circuit breakers decreases as the magnitude of the current increases. They are also called inverse time or thermal/magnetic circuit breakers.

DO NOT use fuses or circuit breakers with a lower amp rating than recommended. This can result in "nuisance" tripping caused by inrush current even when machine is not being used for welding at high output currents.

Use input and grounding wire sizes that meet local electrical codes or see the ***Specifications page*** in this manual.

INPUT POWER CONNECTIONS AND GROUND CONNECTIONS

Have a qualified electrician connect the receptacle or cable to the input power lines and the system ground according to the U.S. National Electrical Code and any applicable local codes.

1. Follow the Input Supply Connection Diagram on the inside of the Reconnect Panel Access Door.

2. Use a single-phase line or one phase of a three-phase line.

For the 208V/230V/ 60 HZ model SP 250 shipped with a 10 ft. input cord and plug connected to the welder, mount the matching receptacle supplied with the machine.

1. Mount the receptacle in a suitable location using the screws provided.

2. Locate the receptacle within reach of the 10 ft. input cord attached to the welder.

3. Mount the receptacle with the grounding terminal at the top. This allows the power cable to hang down without bending. See Figure A.2.

   a. The center terminal in the receptacle is for the grounding connection.

   b. Fuse the two hot lines of the receptacle with super lag type fuses as shown in Figure A.2. A green wire in the input cord connects this terminal to the frame of the welder. This ensures proper grounding of the welder frame when the welder plug is inserted into the receptacle.

4. Use proper wire sizes. See the ***Specification table*** for proper wire sizes. For cable lengths over 100 feet, larger copper wires should be used.

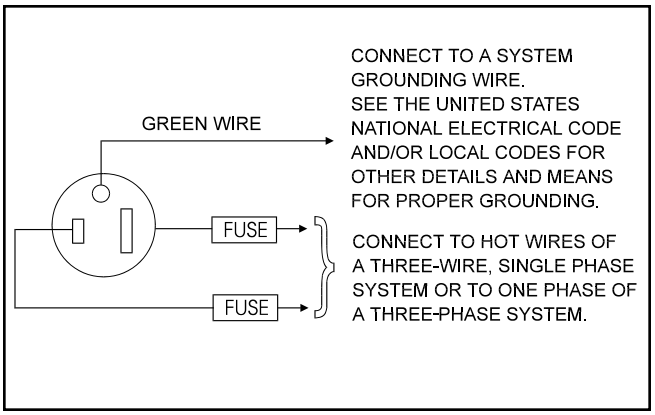


FIGURE A.2. - Ground Connections.

For the 230/460/575V/ 60 HZ model which is not equipped with a plug, an input cord, or a receptacle, the input power supply leads are connected directly to the Reconnect Panel as shown Figure A.3. Refer to the ***specifications table*** at the beginning of this chapter for proper wiring sizes.

1. Connect the input power leads to terminals L1 and L2 on the Reconnect Panel Assembly.

   a. For input power supply leads of 10 AWG or smaller, connect leads to Reconnect Panel using the ferrules (S19117-1) provided.

   b. Strip fi" (13mm) of insulation from the input power supply leads.

   c. Place ferrule over wire.

   e. Torque the terminal screws to 16 in.-lbs. (1.8nm).

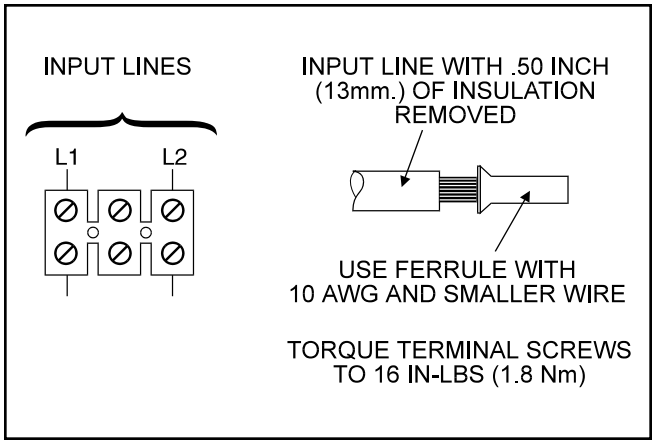
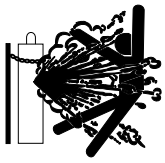


FIGURE A.3 - Ground Connection For 230/460/575 Volt Models

CONNECT SHIELDING GAS

Customer must provide cylinder of appropriate type of shielding gas for gas metal arc welding for the process being used. See ***Figure A.4*** for the location of the components used to connect the air supply cylinder.

⚠ WARNING



GAS UNDER PRESSURE IS EXPLOSIVE. ALWAYS KEEP GAS CYLINDERS IN AN UPRIGHT POSITION AND ALWAYS KEEP CHAINED TO UNDERCARRIAGE OR STATIONARY SUPPORT.

1. Set the gas cylinder on the rear platform of the SP 250.

2. Hook the chain in place to secure cylinder to rear of welder.

3. Remove the cylinder cap.

4. Inspect the cylinder valves for damaged threads, dirt, dust, oil or grease.

   a. Remove dust and dirt with a clean cloth.

NOTE: 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.

5. Stand to one side away from the outlet and open the cylinder valve for an instant to blow away any dust or dirt which may have accumulated in the valve outlet.

BE SURE TO KEEP YOUR FACE AWAY FROM THE VALVE OUTLET WHEN OPENING THE VALVE.

6. Inspect the regulator for damaged threads, dirt, dust, oil or grease.

   a. Remove dust and dirt with a clean cloth.

NOTE: DO NOT USE THE REGULATOR IF OIL, GREASE OR DAMAGE IS PRESENT! Have an authorized repair station clean the regulator or repair any damage.

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

   a. NOTE: If connecting the flow regulator to 100% CO2 cylinder, insert regulator adapter provided between regulator and cylinder valve. If adapter is equipped with a plastic washer, be sure it is seated properly to connect to the CO2 cylinder.

8. Connect one end of the inlet gas hose to the outlet fitting of the flow regulator.

9. Connect the other end of the inlet gas hose to the SP-250 rear fitting.

10. Tighten both the union nuts securely with a wrench.

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11. Before opening the cylinder valve, turn the regulator adjusting knob counter clockwise until the pressure is released from the adjusting spring.

12. Open the cylinder valve slowly a fraction of a turn.

    a. When the cylinder pressure gage pointer stops moving, open the valve fully.

NEVER STAND DIRECTLY IN FRONT OF OR BEHIND THE FLOW REGULATOR WHEN OPENING THE CYLINDER VALVE. ALWAYS STAND TO ONE SIDE.

13. Adjust the flow regulator for the flow rate recommended for the procedure and process being used before making the weld.

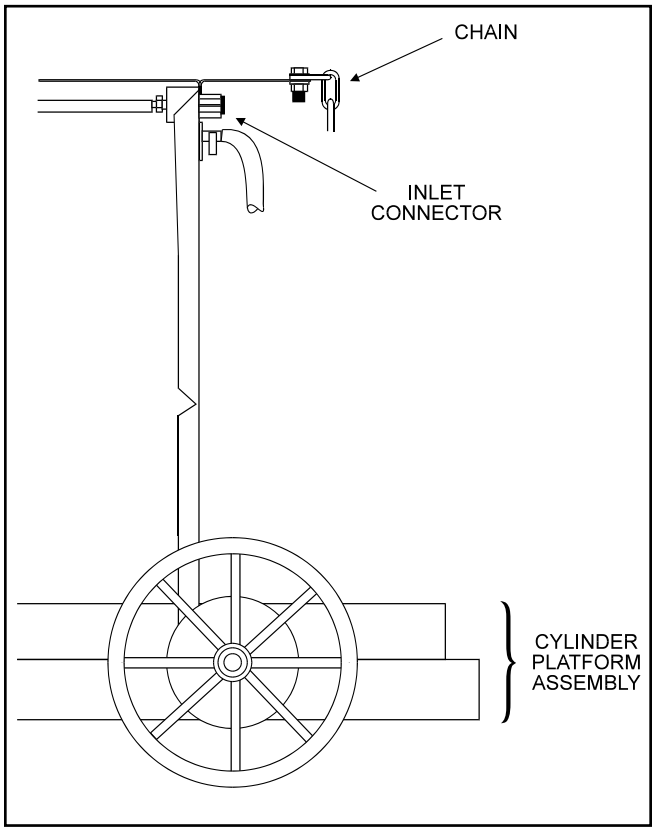

FIGURE A.4 - Shielding Gas Supply Connections

RECONNECT PROCEDURE

Multiple voltage machines are shipped connected to the highest input voltage listed on the machine's rating plate. Before installing the machine, check that the Reconnect Panel in the Input Box Assembly is connected for the proper voltage.

⚠ CAUTION

Failure to follow these instructions can cause immediate failure of components within the machine.

To reconnect a dual or triple voltage machine to a different voltage, change the position of the leads or links on the Reconnect Panel based on the type of machine. Follow The Input Supply Connection Diagram located on the inside of the Case Back Reconnect Panel Access Door.

For codes 9402, 9723, and 10001 208/230/1/60 machines, see ***Figure A.5.***

For codes 9546 and 10002 230/460/575/1/60 machines, see ***Figure A.6.***

ALL MACHINES ARE SHIPPED FROM THE FACTORY CONNECTED FOR THE HIGHER OF THE TWO INPUT VOLTAGES LISTED ON THE NAMEPLATE. TO CHANGE VOLTAGE CONNECTION PROCEED AS FOLLOWS:

1. REMOVE THE OUTER STEEL HEX NUT FROM THE TERMINAL WHERE THE TRANSFORMER INPUT LEAD IS CONNECTED.
2. SHIFT THE TRANSFORMER INPUT LEAD TO THE TERMINAL THAT THE UNIT IS TO OPERATE ON AND FASTEN SECURELY WITH THE HEX NUT REMOVED IN STEP1. (MAKE CERTAIN THAT BRASS NUTS ARE TIGHT.)

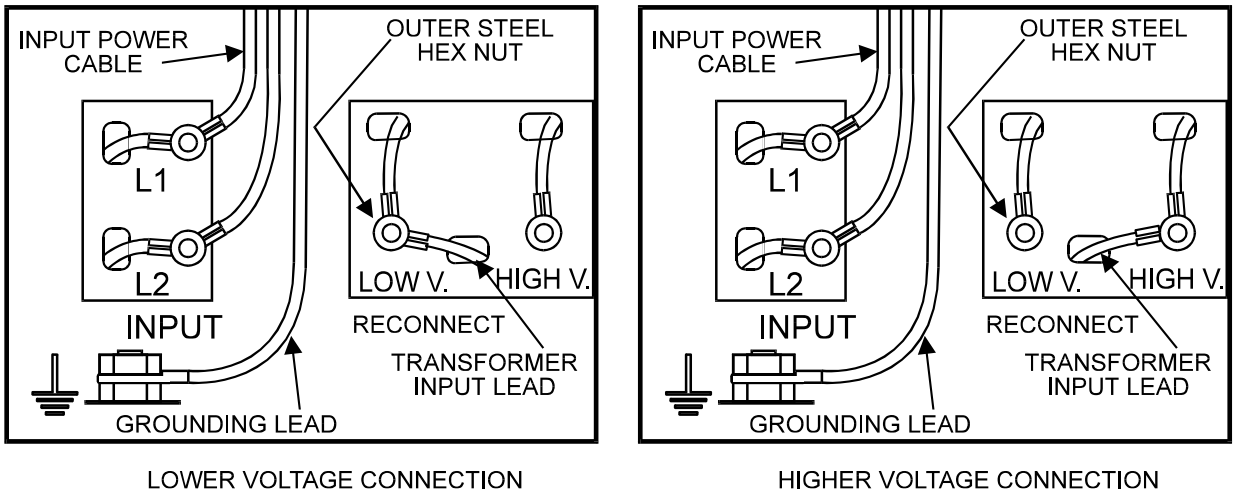

FIGURE A.5 - Reconnect Diagram For Codes 9402, 9723, and 10001 208/230/1/60 Machines.

1. ALL MACHINES ARE SHIPPED FROM THE FACTORY CONNECTED FOR THE HIGHEST NAME-PLATED SINGLE PHASE INPUT VOLTAGE. TO CHANGE CONNECTIONS FOR A DIFFERENT INPUT VOLTAGE, RECONNECT BOTH COPPER JUMPERS PER DIAGRAM BELOW. ALWAYS CONNECT JUMPERS BETWEEN OUTER STEEL NUT AND INNER BRASS NUT ON TERMINAL STUDS.
2. CONNECT THE INPUT POWER TO THE INPUT TERMINAL BLOCK, L1 AND L2 AT THE UPPER CORNER OF THE PANEL. FOR INPUT LEADS 10AWG AND SMALLER USE FERRULES PROVIDED. TORQUE TO 16 IN-LBS.
3. CONNECT A GROUNDING LEAD TO THE GROUND STUD (⏚) ON THE MACHINE NEAR THE TERMINAL BLOCK.

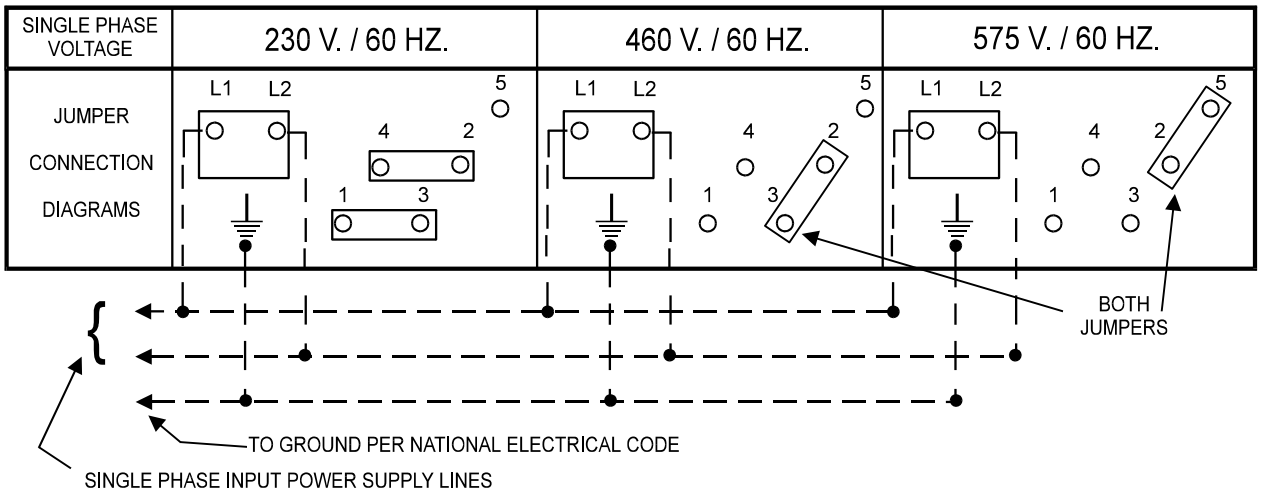

FIGURE A.6 - Reconnect Diagram For Codes 9546 & 10002 230/460/575/1/60 Machine.

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CONNECT OUTPUT COMPONENTS

INSTALL THE WORK CLAMP

Attach the work clamp to the cable which extends from the front of the machine using the following procedure:

1. Insert the lug on the end of the work cable through the strain relief hole in the work clamp handle. See Figure A.7.

2. Slide the work cable through the hole up to the bolt and nut.

3. Fasten work cable using the bolt and nut provided.

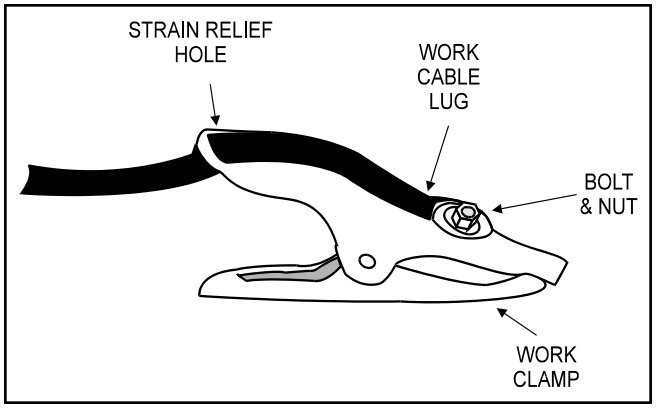

FIGURE A.7 - Installing The Work Clamp

OUTPUT POLARITY CONNECTION

⚠ WARNING

WARNING: TURN THE WELDER POWER SWITCH OFF BEFORE CHANGING OUTPUT CONNECTION.

The welder is shipped from the factory connected for electrode positive (+) polarity. This is the normal polarity for GMA welding.

If negative (-) polarity is required, interchange the connection of the two cables located in the wire drive compartment near the front panel. The negative lead is the lead closest to the front panel (where the leads come out of the floor of the compartment) and should be reconnected to the brass conductor tube of the gun connector. The positive lead is stamped (+) on its terminal and should be reconnected to the work lead terminal.

GUN LINER & CONTACT TIP INSTALLATION

The Magnum 250 SP gun and cable provided with the SP-250 is factory installed with a liner for a .035” or .045” (0.9 or 1.2mm) diameter electrode and an .035 (0.9mm) contact tip.

1. If a .045” diameter wire size is to be used, install the .045” contact tip (also provided).

2. For other wire sizes, use the following procedure for contact tip and gas nozzle installation. See Figure A.8.

   a. 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.

   b. Be sure the nozzle insulator is fully screwed onto the gun tube and does not block the gas holes in the diffuser.

   c. Slip the appropriate gas nozzle onto the nozzle insulator. Either a standard .50" (12.7mm) or optional .62” (15.9mm) I.D. slip on gas nozzle may be used and should be selected based on the welding application.

   d. Adjust the gas nozzle for the GMAW process to be used.

For the short-circuiting transfer process, the contact tip end should be flush to extended to .12" (3.2mm)

For the spray transfer process, the contact tip should be flush to recessed .12" (3.2mm).

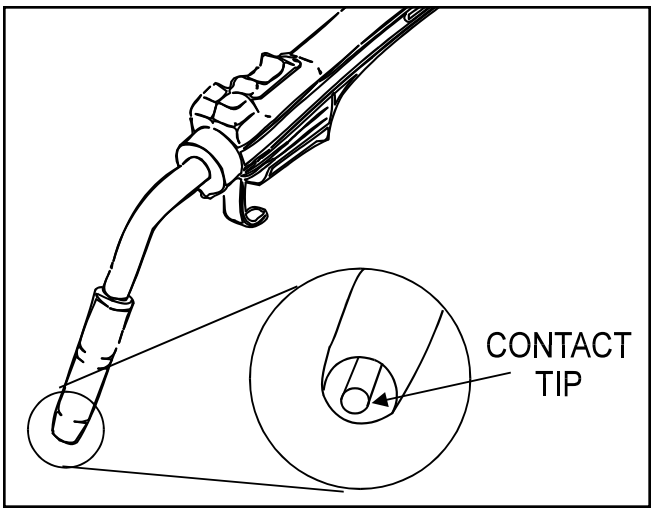

FIGURE A.8 - Contact Tip and Electrode Connections

GUN & CABLE INSTALLATION

⚠ WARNING

WARNING: TURN THE WELDER POWER SWITCH OFF BEFORE INSTALLING GUN AND CABLE.

1. Lay the cable out straight.

2. Make sure all pins on the gun cable connector are aligned with the proper mating sockets on the front panel gun connector and then join the connectors and tighten the hand nut on the gun cable connector.

NOTE: If a gun and cable other than the Magnum 250 SP is to be used, it must conform to standard European style connector (Magnum Fast Mate) specifications. See Figure A.9.

NOTE: The thumb switch functions available on the Magnum 250 SP gun will only be operable from the front panel keypad. The gun trigger switch must be capable of switching 5 milliamps at 15 volts DC resistive.

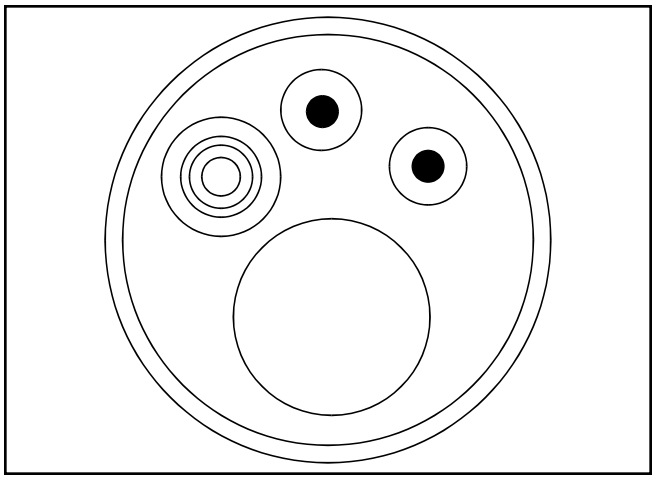

FIGURE A.9 - European Style Connector

⚠ CAUTION

The gun trigger switch connected to the gun trigger control cable must be a normally open momentary switch. The terminals of the switch must be insulated from the welding circuit. Improper operation of or damage to the SP-250 might result if this switch is common to an electrical circuit other than the SP-250 trigger circuit.

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Read and understand this entire section before operating your Idealarc SP-250.

SAFETY INSTRUCTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically live parts such as output terminals or internal wiring.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

Only qualified personnel should operate this equipment.

ADDITIONAL SAFETY PRECAUTIONS

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

GENERAL DESCRIPTION

Product Description

The IDEALARC SP-250 is a complete semiautomatic constant voltage DC arc welding machine built to meet NEMA specifications. This unit combines a constant voltage power source, a constant speed wire feeder, and a microcomputer-based controller to form an intelligent welding system.

A front panel touch key entry system with audible feedback, along with a two-line, 32 character alphanumeric display, provide user friendly control of the system. The system provides full range control from the keypad or from the thumb switch built into the SP-250 welding gun, which permits "on the fly" control while welding

Multi language display capability allows the SP-250 to communicate with the user in any of the following five languages: English, German, French, Spanish, or Japanese (Katakana).

Proper welding setup is simple. You only need to select the gauge size of the material to be welded and enter the welding process to used. With that data, the system

- automatically computes the proper wire feed speed and arc voltage relationship for the process.
- selects the right procedure for optimum starting, welding, and burnback.

The system allows you to store up to five separate welding setup procedures. You can recall them at any time at the touch of a single key. All active setup selections, as well as those stored in the memory locations, are automatically saved when power is turned off or disconnected. Whatever procedure was being used when power was removed, will be recalled when power is returned. The SP-250 does not require batteries to maintain memory data.

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The system includes the following features:

- 2-step or 4-step selectable trigger function (above code 9500 only).
- both timed spot and stitch welding selections.
- drop-in 2" (51mm) O.D. wire reel spindle with a 22-30 lb. (10 - 13.6 kg) Readi-Reel- adapter.
- integral gas cylinder mounting undercarriage.
- 12.5 ft. (3.8m) Magnum 250SP GMAW gun and cable.
- dual groove drive roll and a gun liner for .035 (0.9mm) and .045 (1.2mm) electrodes.
- one contact tip for each wire size.
- adjustable CO_2 or argon blend flow regulator with cylinder pressure gauge.
- 10 ft. (3.0m) plug cable with receptacle.
- 12 ft. (3.6m) work cable with clamp.

RECOMMENDED PROCESSES AND EQUIPMENT

The SP-250 is recommended for GMA welding processes using 10 to 30 lb. (4.5 to 13.6 kg) 2" (51mm) I.D. spools or Readi-Reel coils of

- .025" through .045" (0.61.2mm) solid steel using CO_2, $ArCO_2$, or ArO_2 shielding gas
- .035" (0.9mm) stainless steel using ArO_2 or $HeArCO_2$ shielding gas
- 3/64" (1.2mm) aluminum using Ar shielding gas
- .045" (1.2mm) Outershield- electrodes using CO_2 or $ArCO_2$ shielding gas
- .035" (0.9mm) and .045 (1.2mm) Innershield self-shielded electrodes.

The SP-250 is factory equipped to feed .035 (0.9mm) and .045 (1.2mm) electrodes and includes a 200A, 60% duty cycle rated, 12.5 ft. (3.8m) GMA gun and cable assembly equipped for these wire sizes. The SP-250 is factory equipped with an adjustable CO_2 or argon blend flow regulator. A supply of shielding gas is required for GMAW processes.

OPERATIONAL FEATURES AND CONTROLS

Keypad - Consists of 20 membrane keys that have large touch areas. The keys are spaced far enough apart to provide easy selection, even if wearing welding gloves. An audible feedback beep is provided whenever a key is pressed to ensure proper entry.

Display - Wide temperature range liquid crystal display combines large 0.32" (8.1mm) high characters in a 2-line by 16-character alphanumeric format. It has long life LED backlighting and a non-glare cover for easy viewing under bright or dark conditions. Multi language display capability permits the SP-250 to communicate in English, German, French, Spanish, or Japanese (Katakana).

Auto Mode - Simply set the thickness of the material being welded and the SP-250 automatically sets the proper wire feed speed and arc voltage for the process being used. This eliminates the need for look-up tables, procedure slide rules, or notebooks to find the proper settings. Auto Mode also provides one key control of the output by automatically adjusting both the wire feed speed and arc voltage for an increase or decrease in material thickness or wire feed speed. This allows the operator to easily increase or decrease his output without having to know how much to change each parameter.

Thumb Switch on Gun - Allows the operator to set or change the output of the machine, the wire feed speed, or the arc voltage from the gun, even during welding. This permits "on the fly" adjustment. In toggle operation mode, the thumb switch allows the operator to toggle between two procedures stored in memory.

Memory - There are five separate memory locations that the operator can use to save or recall a setup procedure. This eliminates dial marking and makes recalling a setup as simple as pushing one of the five memory keys for instant recall. Also, when power is removed, these five memories as well as any current setup in use is automatically saved. This feature does not require batteries. When power is restored, the procedure in use will automatically return the unit to whatever was set up was being used when power was removed.

Trigger Interlock (Above code 9500 only) - Selectable four-step trigger interlock allows operator to release gun trigger after weld current is established and continue welding. Breaking the arc or re-closing and then releasing the gun trigger, stops the welding process.

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DESIGN FEATURES AND ADVANTAGES

UNIT FEATURES:

Undercarriage for Hand Mobility - Heavy duty 10" (254mm) wheels and 4" (102mm) casters are factory installed along with the handle. Handle can be used for hanging the welding gun and work cable.

Gas Cylinder Platform - Factory installed on undercarriage. It permits platform mounting and support of a single gas cylinder. No full lifting of gas cylinder required during loading.

Adjustable Flow Regulator - Accommodates CO_2 or argon blend gas. Includes a cylinder pressure gauge and a dual seal flow gauge.

Easy Accessability - Wire feeder enclosure protects wire and wire drive from dirt, dust, and damage. Allows easy top-access for "drop-in" wire reel loading and to load or service the wire drive.

POWER SOURCE FEATURES:

10 Ft. (3.0m) Input Power Cable - Includes plug and mating receptacle for 208/230V unit. Convenient rear panel reconnect allows easy access for 208V re-connection.

Power Switch - Front panel toggle switch turns input power on and off.

Thermostatically Controlled Fans - Provides cooling of transformer and other components only when required. When used intermittently or at low current procedures, the fan motors stay off, reducing the amount of dust and dirt drawn into the machine. Also reduces power consumption.

Electronic Overload Protection - Protects machine from short circuit or high current overloading.

Power Source Line Voltage Regulation - Precise SCR phase control circuit holds the voltage setting constant to maintain weld quality even when the input voltage fluctuates $^{+}$/-10%.

Solid State Contactor - Output is turned on and off by SCR's instead of a mechanical contactor providing extra long life in highly repetitive welding applications.

Automatic Burnback - Provides proper burnback of the electrode to prevent it from sticking in the weld puddle at the end of a weld.

Output Terminals - Easily accessible in wire drive section for quick cable connection and polarity reversal.

Work Cable - 10 ft. (3.0m) long with work clamp.

WIRE FEEDER FEATURES:

Drop-in Wire Loading - Wire spindle snaps into Readi-Reel-Adapter, included with SP-250, or most any 2" (51mm) I.D. wire spool. The wire spindle drops into the top loading SP-250 case design. Accommodating standard 12” (305mm) and 8” (203mm) diameter coils, the unique spindle and support design automatically provides appropriate de-reeling drag to prevent wire reel overrun and loop-offs without manual brake adjustments.

Tachometer Controlled Wire Drive - Precision control of permanent magnet motor provides proper wire feed acceleration and speed accuracy, independent of fluctuations in line voltage and wire loading. This means reliable arc starting and weld consistency.

Low Speed Start - When the trigger is pulled, the wire feeder feeds wire at low speed regardless of the set wire feed speed until welding current is drawn or 2 seconds has expired. This feature enhances starting and makes setting stick out a snap. The 2 second limit permits high speed loading of the gun and cable. In later versions of the SP-250, a user selectable feature allows the wire feeder to feed wire directly at the set speed, thus bypassing the 2 second slow start.

Solid State Wire Feed Overload Protection - No circuit breaker to reset. Simply pull the trigger to resume welding once the overload condition has been cleared.

Unique Drive Roll and Guide Tube Design - Long life, precisely aligned guide tubes and drive rolls. Quickly reloads by simply starting wire into ingoing guide tube. Adjustable tension setting minimizes 'birdnesting', eliminates milling through the wire, and gives positive feeding. The double groove, reversible drive roll included with the SP-250 allows use of .030 (0.8mm) through .045 (1.2mm) diameter wire. Drive Roll kits for other sizes and types of wire are also available.

Fast-Mate Gun Connector - European style gun connector provides electrode, shielding gas and gun con-

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Gun and Cable (K524-1) - A 12.5 ft. (3.8) GMAW gun and cable assembly, rated 200 amps 60% duty, is provided with the SP-250 and includes a liner, diffuser, and contact tips for .035 (0.9mm) and .045 (1.2mm) electrodes. The gun is equipped with a Fast-Mate connector with additional control lead connections for the thumb activated 2 momentary position slide switch control designed into the gun handle for use with SP-250 remote control features.

MACHINE CAPABILITY

The IDEALARC SP-250 is rated at the following duty cycles based upon 10 minute time period (i.e., for 60% duty cycle, it is 6 minutes on and 4 minutes off).

DUTY CYCLE	AMPS	VOLTS
100%	145	26
60%	200	28
35%	250	26

LIMITATIONS

The SP-250 may not operate satisfactorily if powered with a portable or in-plant generating system.

CONTROLS AND SETTINGS

All operator controls are located on the Front Panel Keypad/Nameplate. See Figure B.1 for the location of each control.

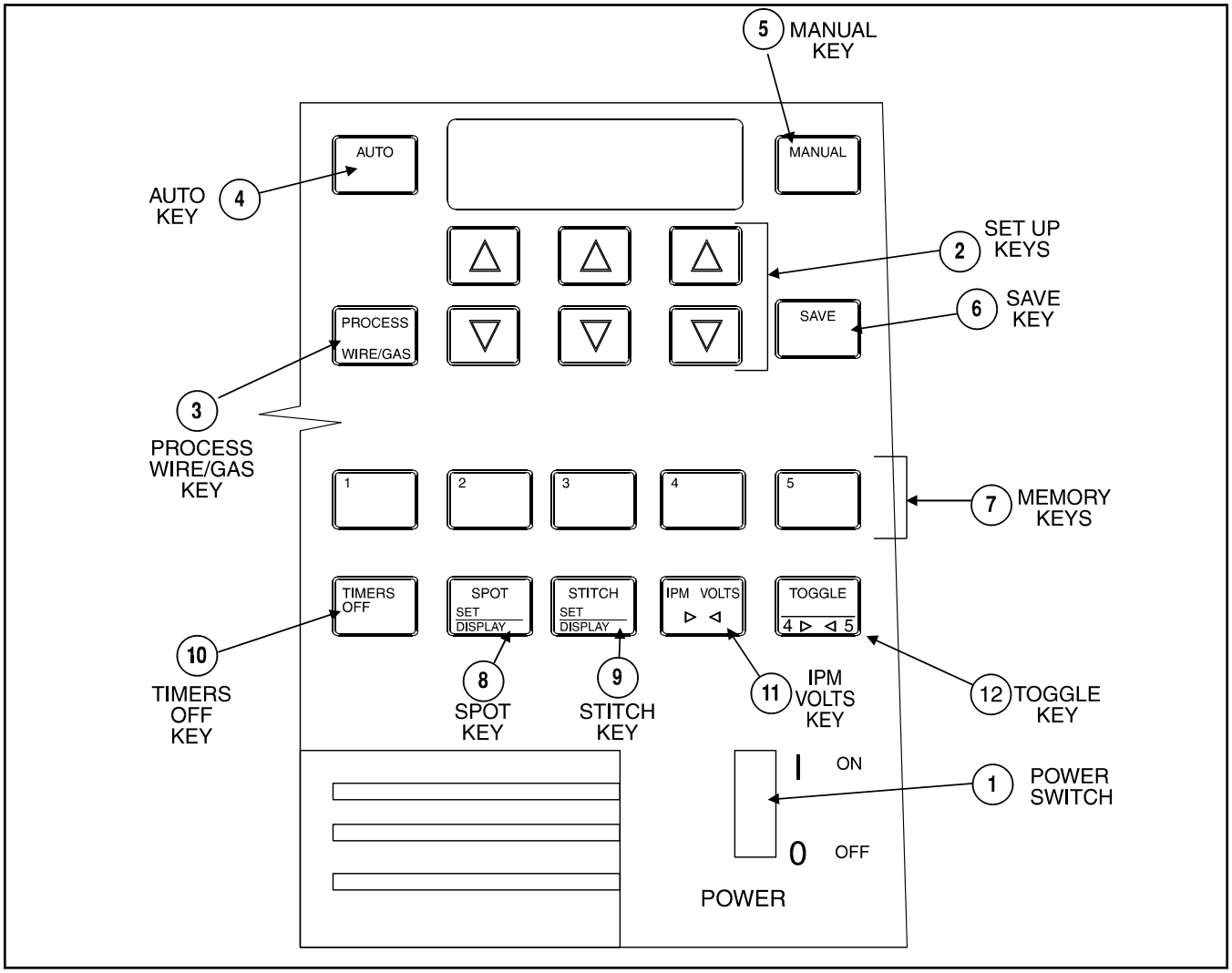

FIGURE B.1 - SP-250 Control Panel Keys

1. **POWER SWITCH:** Toggle switch to turn input power ON and OFF. When the switch is in the ON position the red LED backlighting of the LCD display lights and alphanumeric characters appear. The welding setup in operation when the power was shut off or disconnected is displayed when power is restored.

2. **SET UP ARROW KEYS:** Press keys to change the display selection directly above the keys. See Figure B.1. Function of arrow keys change depending on PROCESS KEY being used. For function of arrow keys, refer to each process or procedure. See ***Table B.1*** for summary of arrow key operation.

3. **PROCESS WIRE/GAS KEY:** Press key to display the Wire Type, Wire Diameter, and Welding Gas. Each combination of wire and gas dictates a unique relationship between the wire feed speed and the arc voltage. The SP-250 uses this unique relationship, along with the metal thickness, to set the proper values for wire feed speed and arc voltage. Therefore, it is very important that the wire type, wire diameter, and welding gas displayed match the actual wire type, wire diameter, and welding gas being used for the weld.

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TABLE B.1 - Arrow Key Functions.

KEY	PRESS TO SELECT LEFT	PRESS TO SELECT CENTER	PRESS TO SELECT RIGHT	DISPLAY
PROCESS WIRE/GAS	Wire Type	Wire Diameter	Welding Gas	Wire Type: SOLID STEEL GAS / WIRE .035 $ArCO_2$ — Wire Diameter; Welding Gas
AUTO	Metal Thickness	Wire Feed Speed	Arc Voltage	Automatic Mode: AUTO: IPM VOLTS / 14GA 229 17.8 — Metal Thickness; Wire Feed Speed; Arc Voltage
MANUAL	No Function	Wire Feed Speed	Arc Voltage	Manual Mode: MANUAL: IPM VOLTS / 240 17.8 — Wire Feed Speed; Arc Voltage
SAVE	No Function	No Function	No Function	
SPOT SET DISPLAY	No Function	Spot Weld On Time	No Function	Spot Welder Timer On: SPOT: ON / 2.50s — Selected On Time
STITCH SET DISPLAY	No Function	Stitch Weld On Time	Stitch Weld Off Time	Stitch Weld Timer On: STITCH: ON - - - OFF / 1.90s 1.25s — Selected On Time; Selected Off Time
TOGGLE 4 ▷ ◁ 5	Metal Thickness (Auto Mode Only)	Wire Feed Speed	Arc Voltage	Memory Currently Active: 4 AUTO: IPM VOLTS / 14GA 229 17.8; 5 MAN: IPM VOLTS / 356 24.3

ARROW KEY OPERATION WHEN USED WITH PROCESS WIRE/GAS KEY:

See Table B.1.

Left Arrow Keys: Press to set Wire Type. Pressing the UP and DOWN arrow keys changes the Wire Type displayed.

Center Arrow Keys: Press to set Wire Diameter. Press the UP (▵) arrow key to increase the wire diameter displayed. Press the DOWN (▿) arrow key to decrease the wire diameter displayed.

Right Arrow Keys: Press to select Welding Gas. Pressing the UP and DOWN arrow keys changes the Welding Gas displayed.

The following 16 processes are programmed into the SP-250:

Wire Type	Wire Diameter	Welding Gas
Solid Steel	.025 (0.6mm)	CO2
Solid Steel	.025 (0.6mm)	ArCO2
Solid Steel	.030 (0.8mm)	CO2
Solid Steel	.030 (0.8mm)	ArCO2
Solid Steel	.035 (0.9mm)	CO2
Solid Steel	035 (0.9mm)	ArCO2
Solid Steel	.035 (0.9mm)	ArOxy
Solid Steel	.045 (1.2mm)	CO2
Solid Steel	.045 (1.2mm)	ArCO2
Stainless	.035 (0.9mm)	ArOxy
Stainless	035 (0.9mm)	HeArCo2
Aluminum (5356)	3/64 (1.2mm)	Argon
Outershield	.045 (1.2mm)	CO2
Outershield	.045 (1.2mm)	ArCO2
Innershield	.035 (0.9mm)	None
Innershield	.045 (1.2mm)	None

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4. **AUTO KEY:** Press for automatic welding set up of recommended Wire Speed and Arc Voltage based on Metal Thickness selected.

ARROW KEY OPERATION WHEN USED WITH AUTO KEY:

See ***Table B.1.***

Left Arrow Keys: Press to change the metal thickness displayed. Press the UP (▵)arrow key to increase metal thickness. Press the DOWN (▿) arrow key to decrease the metal thickness. Increasing or decreasing metal thickness automatically increases or decreases both wire feed speed (IPM) and arc voltage (VOLTS) simultaneously. See gauge chart on the instruction label on the inside of SP-250 door for available sizes.

Center Arrow Keys: Press to change wire feed speed setting. Press the UP (▵) arrow key to increase the wire feed speed setting displayed. Press the DOWN (▿) arrow key to decrease the wire feed speed setting displayed. Increasing or decreasing the wire feed speed simultaneously causes an increase or decrease in the arc voltage and can change the metal thickness setting.

Right Arrow Keys: Press to change arc voltage setting. Press the UP (▵) arrow key to increase the arc voltage setting displayed. Press the DOWN (▿) arrow key to decrease arc voltage setting displayed. An up arrow indicator appears below the V in VOLTS if the arc voltage has been set higher than the recommended value. A down arrow indicator appears below the V in VOLTS if the arc voltage is below the recommended value. No arrow indicates that you are set to the recommended value.

Pressing the AUTO key again resets the wire feed speed and arc voltage settings to the recommended values for the metal thickness displayed. (NOTE: If the spot or stitch timers are on, metal thickness is not displayed and, therefore, the reset function does not work.)

5. **MANUAL KEY:** Press to set wire feed speed and arc voltage for manual procedure setup. The manual screen displays wire feed speed, arc voltage, and a cursor that indicates when the wire feed speed or arc voltage is being controlled by the thumb switch on the SP-250 gun.

ARROW KEY OPERATION WHEN USED WITH MANUAL KEY:

See ***Table B.1.***

Left arrow keys: Do not function in Manual mode.

Center arrow keys: Press the UP (▵) arrow key to increase wire feed speed. Press the DOWN (▿) arrow key to decrease wire feed speed.

Right arrow key: Press the UP (▵) arrow key to increase arc voltage. Press the DOWN (▿) arrow key to decrease arc voltage.

NOTE: If the spot or stitch timers are ON, it will be indicated in the bottom left corner of the display. See Figure B.2.

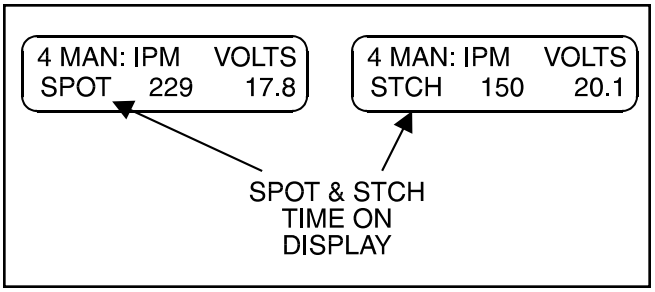

FIGURE B.2 - Display when Stitch or Spot Weld Timers are ON.

6. **SAVE KEY:** Press to save the current set up. The process, procedure, and timer functions (if used) are saved to one of five memory locations by pressing one of the five memory keys. When the Save key is pressed, a prompting message instructing the operator to "PRESS MEMORY 1-5 TO SAVE SETUP" is displayed. See Figure B. 3 for sample SAVE sequence. This message remains displayed until a memory number key is selected or one of the other keys, such as Auto, Manual, or Process, is pressed. If a memory number key is selected, a message will be displayed for 2.5 seconds that confirms that the setup was saved to that memory number.

The six arrow keys perform no function when saving a setup.

NOTE: When a setup is saved to a memory location, the previous contents of that memory is lost because it is replaced by the present setup. Removing input power does not effect the setup in memory.

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7. MEMORY KEYS: Press memory key location number in which you want to save a procedure or from which you want to recall a procedure from memory. See SAVE Key.

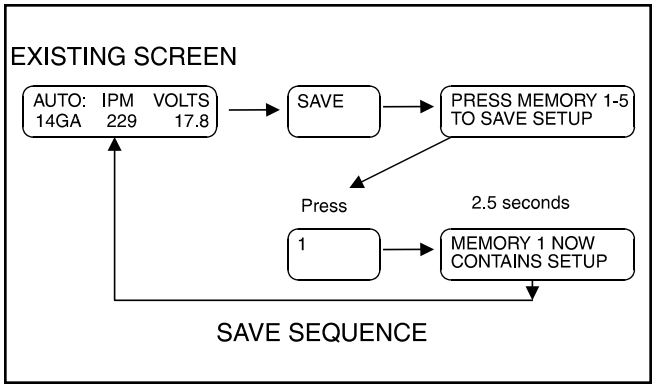

FIGURE B.3 - Sample SAVE Sequence.

8. SPOT KEY: Press to turn ON the Spot Weld Timer and display the spot weld ON time. Pressing the SPOT KEY a second time returns the screen to the previous display without turning off the spot timer. Anytime the Spot weld timer is on and the display is in the Auto or Manual mode, the word SPOT will appear in the bottom left corner of the display. See ***Figure B.2.***

ARROW KEY OPERATION WHEN USED WITH SPOT KEY:

See ***Table B.1.***

Left arrow keys: Do not function.

Center arrow keys: Press UP (▵) arrow key to increase Spot Weld ON time from 0.20 seconds to 2.5 seconds. Press DOWN (▿) arrow key to decrease Spot ON time from 2.5 seconds to 0.20 seconds.

Right arrow keys: - Do not function.

9. STITCH KEY: Press to turn Stitch Weld timers ON and display the Stitch Weld ON and OFF times. Pressing the STITCH key a second time returns the screen to the previous display without turning off the stitch timers. Anytime the Stitch weld timers are on and the display is in the Auto or Manual mode, the abbreviation STITCH will appear in the bottom left corner of the display. See ***Figure B.2.***

ARROW KEY OPERATION WHEN USED WITH STITCH KEY:

See ***Table B.1.***

Left arrow keys: Do not function.

Center arrow keys: Press UP (▵) arrow key to increase Stitch time ON from 0.20 seconds to 2.50 seconds. Press the DOWN (▿) arrow key to decrease Stitch ON time from 2.50 seconds to 0.20 seconds.

Right arrow keys: Press UP (▵) arrow key to increase Stitch OFF time from 0.20 seconds to 2.50 seconds. Press DOWN (▿) arrow key to decrease Stitch OFF time from 2.50 seconds to 0.20 seconds.

10. TIMERS OFF KEY: Press to turn OFF both Spot and Stitch timers. When the TIMERS OFF key is pressed the indicating letters from the bottom left corner of the Auto and Manual mode display disappears.

The six arrow keys do not function with this key.

11. GUN SWITCH CONTROL IPM VOLTS KEY: Press to engage the gun thumb switch to control IPM or VOLTS. Pushing the gun thumb switch forward (toward the tip) increases IPM or VOLTS . Pulling gun thumb switch back decreases IPM or VOLTS. The underlining cursor always indicates the selection being controlled by the gun thumb switch. See Figure B.4.

If the cursor is not present, the gun thumb switch does not function. This prevents any inadvertent actuations. Each time this IPM VOLTS key is pressed, the cursor moves in the following sequence: IPM to VOLTS to no cursor. The sequence continues each time the key is pressed.

NOTE: In Auto Mode, changing IPM changes arc voltage. This can result in a change in metal thickness setting as well.

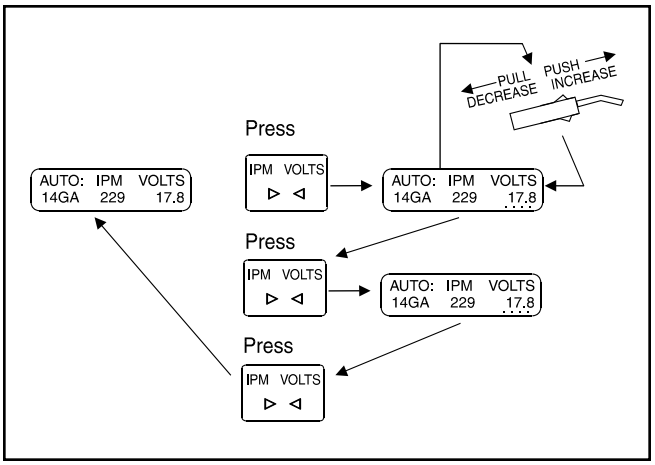

FIGURE B.4 - Using the IPM VOLTS key.

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12. TOGGLE KEY: When first pressed, this key turns ON the TOGGLE MODE and recalls the weld setup in memory 4. Pressing the key again switches to the weld setup in memory location 5. Each time the key is pressed, it alternates between the two memory locations. When the TOGGLE key is pressed, the LED screen displays the memory number the current setup was recalled from, indicates automatic (AUTO:) or manual (MAN:) mode, displays wire gauge (Auto Mode), wire feed speed, and arc voltage. The cursor underlines the memory number currently selected.

If in AUTO mode, an up or down arrow shows whether the arc voltage has been adjusted above or below the recommended level. Spot or Stitch timer status is displayed in the lower left-hand corner if either timer is active.

The gun thumb switch functions as a Toggle key in Toggle mode. Pushing the gun thumb switch forward (toward the tip) selects the setup in memory 5. Pulling gun thumb switch back selects the setup in memory 4. The gun thumb switch also functions with the trigger closed for "on the fly" changes during a weld. See Figure B.5.

To turn the toggle mode off, press the AUTO, MANUAL, or any MEMORY Number key.

NOTE: Any changes made to settings in toggle mode are not automatically saved when power is removed, or if toggle mode is turned off. To save these changes

Press the SAVE key
Press the MEMORY number key that is currently displayed on the screen (4 or 5)
Press the SAVE key
Press other MEMORY Number key that was displayed after the toggle (5 or 4).

When power is returned, the machine will not be in the toggle mode. However, the weld setting placed in memory when power was removed will return so you may continue to weld right where you left off. Press the TOGGLE key to return to toggle mode.

ARROW KEY OPERATION WHEN USED WITH THE TOGGLE KEY (See Table B.1.)

Left arrow keys: If metal thickness is displayed, Press the UP (▵) arrow key to increase metal thickness. Press the DOWN (▿) arrow key to decrease metal thickness. The Left arrow keys do not perform any function in any other mode.

Center arrow keys: Press the UP (▵) arrow key to increase wire feed speed. Press DOWN (▿) arrow key to decrease wire feed speed setting. If in Auto Mode, increasing or decreasing wire feed speed simultaneously causes an increase or decrease in the arc voltage and can change the metal thickness setting.

Right arrow keys: Press the UP (▵) arrow key to increases arc voltage setting. Press the DOWN (▿) arrow key to decrease the arc voltage setting. When in the Auto Mode, an up arrow indicator appears below the V in VOLTS if the arc voltage has been set higher than the recommended value. A down arrow indicator appears below the V in VOLTS if the arc voltage is below the recommended value. No arrow indicates that you are set to the recommended value.

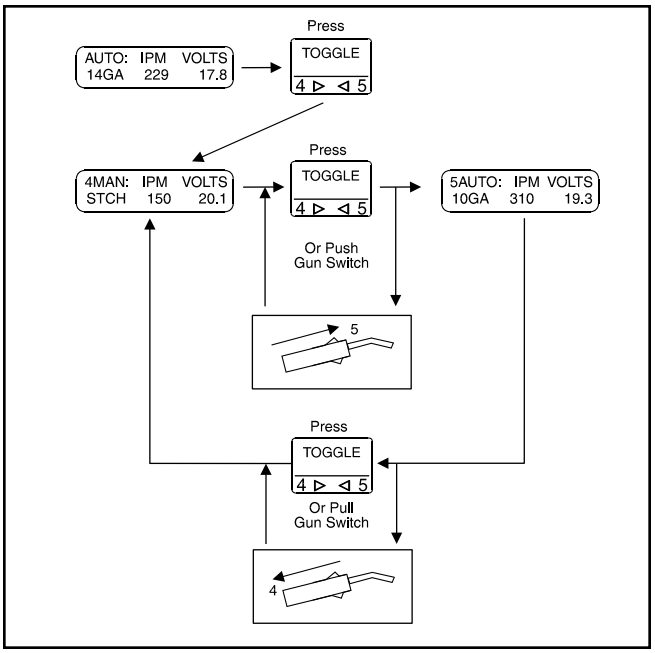

FIGURE B.5 - Using the TOGGLE Function.

4-STEP TRIGGER INTERLOCK KEYS

Pressing [PROCESS WIRE/GAS] and [TOGGLE 4 ▷ ◁ 5]

Controls whether 4-step trigger interlock is activated or deactivated. (See ***"Using 4-Step Trigger Interlock Function"*** section)

Note: 4-step Trigger is automatically deactivated if either the spot or stitch timer mode is being used.

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OPERATING STEPS

Before operating the machine, be sure you have all the materials needed to perform the work. Be sure you are familiar with and have taken all possible safety precautions before starting the work. It is important that you follow these operating steps each time you use the machine.

RUN-IN MODE

The IDEALARC SP-250 can operate in either a slow or fast run-in mode. It is factory set to operate in the slow run-in mode. In the slow run-in mode, the SP-250 initially feeds wire at the rate of 50 IPM until output current is reached or for 2 seconds, whichever condition is reached first. When either of these conditions are reached, the SP-250 accelerates to the preset wire feed speed.

When the SP-250 is in the fast run-in mode, the wire feed speed immediately accelerates to the preset wire feed speed - (available on later codes only.)

CHANGING RUN-IN MODE (CODES 10001 AND ABOVE)

NOTE: Arc starting characteristics may be affected when using the fast run-in mode because normal starting processes are overridden.

1. Turn the ON/OFF POWER SWITCH to ON.

2. Press and hold both the TIMERS OFF key and the PROCESS key.

NOTE: The order in which the TIMERS OFF key and the PROCESS key are pressed does not matter.

3. Read the SP-250 LED display. One of two messages appear:
   FAST INCH ENABLED = (Fast run-in mode)
   FAST INCH DISABLED = (Slow run-in mode)

NOTE: The run-in message appears on the display for 2 seconds. Pressing the PROCESS key causes the message to disappear immediately.

4. Select run-in mode required.
   a. If run-in mode displayed is the required mode, continue with weld process.
   b. If run-in mode displayed is not the required mode, repeat Step 1. By repeating Step 1, the run-in mode changes. Pressing the TIMERS OFF key and the PROCESS key allows you to switch back and forth between the two run-in modes.

You need only perform the above procedure when you want to change the run-in mode. It is not necessary to repeat the above procedure each time the unit is powered up. The unit will remember the run-in mode from the previous power down and return you to that same state on your next power up. When saving to Memory locations 1-5, the run-in mode is saved at the same time. All operators should be aware that when recalling a procedure from a memory location, the run-in mode in memory overrides any present run-in mode setting. The run-in mode remains in effect until either the run-in mode is changed using the double keystroke or until a memorized procedure containing the opposite run-in mode is recalled.

MAKING A WELD IN AUTO MODE

1. Check that the polarity is correct for the process being used.

2. Turn the ON/OFF POWER SWITCH to ON.

3. Press (PROCESS) key.

4. Press LEFT UP or DOWN ARROW Keys to select wire type being used.

5. Press CENTER UP or DOWN ARROW Keys to select wire diameter being used.

6. Press RIGHT UP or DOWN ARROW Keys to select welding gas type being used.

7. Press AUTO key. When the AUTO key is pressed, an alarm will beep three times. The following message is displayed for 2.5 seconds: PROCESS MUST MATCH WIRE & GAS.

8. Press UP or DOWN ARROW Keys to select metal thickness.

9. If SPOT or STITCH timing modes NOT required, go to Step 12.

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10. If SPOT timing mode required.
    a. Press SPOT key.
    b. Press CENTER UP or DOWN ARROW keys to select SPOT ON TIME required.
    c. Press SPOT key to return to previous display.
    d. Go to Step 12.

11. If STITCH timing mode required.
    a. Press STITCH key.
    b. Press CENTER UP and DOWN ARROW keys to select STITCH ON time required.
    c. Press RIGHT UP or DOWN ARROW keys to select STITCH OFF time required.
    d. Press STITCH key to return to previous display.
    e. Go to Step 12.

12. Inch the electrode through the gun and cable

13. Cut the electrode within approximately 3/8" of the end of the contact tip (3/4" for Outershield).

NOTE: When the trigger is pulled, the wire feeder feeds wire at low speed regardless of the set wire feed speed until the welding arc starts or 2 seconds has elapsed. This feature enhances starting and makes it easier to set the stick out. The two-second limit permits high speed loading of the gun and cable. To change Run-In Mode, see changing ***Run-In Mode section.***

14. If welding gas is to be used, turn on the gas supply and set the required flow rate (typically 25-35 CFH/12-16 l/min.).

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

15. Connect work clamp to metal to be welded. Work clamp must make good electrical contact to the

⚠ WARNING

work. The work must be grounded.
WARNING: WHEN USING AN OPEN ARC PROCESS, IT IS NECESSARY TO USE CORRECT EYE, HEAD, AND BODY PROTECTION.

16. Position electrode over joint. End of electrode may be lightly touching the work.

17. Lower welding helmet, close gun trigger, and begin welding. Hold the gun so the contact tip to work distance is about 3/8 inch (3/4" for Outershield).

18. To stop welding, release the gun trigger and then pull the gun away from the work after the arc goes out.

19. When no more welding is to be done, close valve on gas cylinder (if used). Momentarily operate gun trigger to release gas pressure.

20. Turn the ON/OFF POWER SWITCH to OFF.

USING THE 4-STEP INTERLOCK FUNCTION IN AUTO MODE

When the 4-Step Interlock function is not activated, the trigger functions in the normal mode so that welding happens only when the trigger is closed.

When the 4-Step Interlock function is activated, it functions as follows:

When the arc is struck, the gun trigger may be released. The welding continues until welding is stopped by either of these two methods:

1) The arc is extinguished by manually jerking the gun away from the work.

2) The gun trigger is closed and then released at the end of the weld. This action returns the trigger function to the normal mode so the weld stops when the trigger is released. Releasing the trigger reinstates the trigger interlock function for the next weld. This is the preferred Interlock mode because it provides better control at the end of the weld and allows automatic burnback to prevent excessive wire feed speed overrun.

The 4-step trigger feature does not function when using SPOT or STITCH timed welding modes.

MAKING A SPOT WELD IN AUTO MODE

Arc spot plug welds are used when continuous welds are not needed or to hold thin sheet metal together prior to stitch welding or continuous welding. Arc spot plug welds are made by using a punch to make a 3/16 inch diameter hole in the top sheet and arc welding through the hole into the back sheet.

To make an arc spot plug weld

1. Punch 3/16" hole in top sheet.

2. Set the procedure for the metal thickness to be welded.

4. Press the CENTER UP & DOWN ARROW keys to set the required Spot On time. Suggested initial setting is 1.2 seconds.

5. Press the SPOT key. Display returns to Auto screen. Spot timer status is shown in bottom left corner of screen.

6. Install spot weld nozzle (if available) on gun.

7. Press spot weld nozzle against the top sheet so the top and bottom sheets are tight together. If a spot weld nozzle is not used, smoother welds will result by moving the welding wire in a small circle while making the weld.

8. Close the trigger and hold it closed until the arc goes out.

MAKING A STITCH WELD IN AUTO MODE

A stitch weld is used to weld thin material because warpage and burnthrough are a problem. Properly adjusting the ON and OFF times and arc travel speed, permits welding thin sheet metal using small welds that result in minimum distortion and no burnthrough.

To make a stitch weld

1. Set the procedure for the metal thickness to be welded.

2. Press STITCH key. Stitch screen is displayed.

3. Press CENTER ARROW keys to set Stitch ON time. Start with a Stitch ON time setting of 0.5 seconds. Increase the Time ON setting to increase penetration and weld size. Decrease the Time ON setting to reduce burnthrough and distortion.

4. Press the RIGHT ARROW keys to set the Stitch OFF time. Start with a Time OFF setting of 0.5 seconds. Increase the Time OFF setting to reduce burnthrough. Decrease the Time OFF setting to produce a flatter and smoother weld.

5. Press STITCH key. Auto screen is displayed. Stitch timer status is display in lower left portion of screen.

6. Close the gun trigger and hold it closed for the length of seam. Hold gun in one place during ON time and move gun just beyond edge of molten metal during OFF time. For smoothest welds on thinner metal, point gun slightly towards the direction of travel.

USING THE GUN TRIGGER SWITCH

The Gun Trigger Switch turns on arc voltage, wire feeder, and gas solenoid (except with Innershield) when the Gun Trigger Switch is closed. When closed, the LED screen displays the Auto or Manual screens, depending on which mode is being used. When the Gun Trigger Switch is released, or opened, arc voltage, wire feeder, and gas solenoid are turned off.

NOTE: When the trigger is pulled, the wire feeder feeds wire at low speed regardless of the set wire feed speed until the welding arc starts or 2 seconds has elapsed. This feature enhances starting and makes it easier to set the stick out. The 2 second limit permits high speed loading of the gun and cable.

USING THE GUN THUMB SWITCH (MAGNUM SP-250 ONLY)

The Gun Thumb switch is used to control wire feed speed, arc voltage, or to switch, or toggle, between memory locations 4 and 5. See IPM VOLTS key and TOGGLE key for control details. The Thumb switch is used to increase or decrease IPM or VOLTS.

USING THE WIRE DRIVE ROLL

The drive roll provided with the SP-250 has two grooves, one for .030”-.035” (0.8-0.9mm) solid steel electrode, and the other for .045” (1.2mm) solid steel electrode. The welder is shipped with the drive roll installed in the .030”-.035” (0.8-0.9mm) position as indicated by the stenciling on the exposed side of the drive roll. If .045” (1.2mm) electrode is to be used or one of the optional drive rolls is required, then the drive roll must be reversed or changed per the instructions provided on the instruction decal inside the SP-250 Drive Roll Access door.

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LOADING THE WIRE REEL

To mount a 22-30 lb. (10-14 kg) Readi-Reel- package using the Readi-Reel adapter provided:

1. Pull the Readi-Reel adapter and spindle up out of the SP-250 spindle mounting clips (V-brackets).

2. Rotate the spindle and adapter so the retaining spring is at the 12 o'clock position.

3. Position the Readi-Reel so that it will rotate in a clockwise direction when wire is dereeled from the top of the coil. See Figure B. 6.

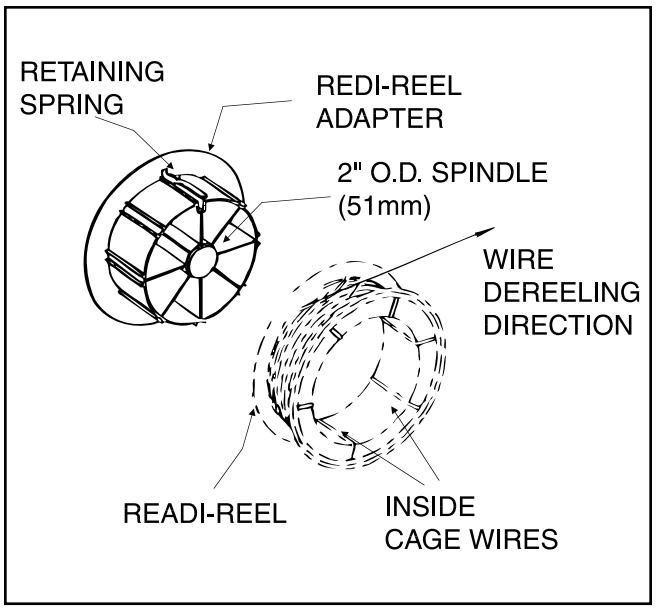

FIGURE B. 6 - Wire Reel Loading

4. Set one of the Readi-Reel inside cage wires on the slot in the retaining spring tab.

5. Lower the Readi-Reel to depress the retaining spring and align the other inside cage wires with the grooves in the molded adapter.

6. Slide the cage all the way onto the adapter until the retaining spring "pops up" fully.

⚠ WARNING

WARNING: Check to be sure the the retaining spring has fully returned to the locking position and has securely locked the readi-reel cage in place. Retaining spring must rest on the cage, not the welding electrode.

7. Check that the mating surfaces of the spindle hubs and spindle mounting clips (V-brackets) are clear of dirt and debris and that the adapter is fully engaged onto the spindle.

8. Lower the loaded spindle into the spindle mounting clips (V brackets) so wire dereels from top of coil toward wire drive.

NOTE: The retaining spring side of the adapter should be facing the center (inner) panel of the SP-250.

9. To remove the Readi-Reel from Adapter, depress retaining spring tab with thumb while pulling the Readi-Reel cage from the molded adapter with both hands. Do not remove adapter from spindle.

To mount 10 to 30 lb. spools: (8" and 12" diameter):

1. Remove the Readi-Reel adapter shipped on the 2 inch diameter spindle.

2. Be sure that the mating surfaces of the spindle hubs and spindle mounting clips (V-brackets) are clear of dirt and debris.

3. Place the spool on the spindle. Make certain the brake driving pin enters one of the holes in the back side of the spool.

4. Lower the loaded spindle into the spindle mounting clips (V brackets) so the wire dereels from the top of the reel toward the wire drive.

NOTE: The SP-250 Spindle was designed to mount 12"- (300mm) and 8"- (200mm) diameter spools meeting international spool size specifications. If the spool being used is too narrow to keep the brake driving pin* engaged with the spool pin hole, a 2" (51mm) I D shim washer could be used between the spool and the spindle retaining clip to take up the space.

* A later spindle design uses a longer "D"-shaped pin to assure engagement.

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FEEDING ELECTRODE

⚠ WARNING

When inching, the electrode and drive mechanism are always “hot” to work and ground. The electrode remains “hot” several seconds after the gun trigger is released.

NOTE: Check that the proper drive rolls and gun parts are used for the wire size and wire type being used.

1. Turn the Readi-Reel or spool until the free end of the electrode is accessible.

2. While tightly holding the electrode, cut off the bent end and straighten the first six inches. Cut off the first inch. (If the electrode is not properly straightened, it may not feed properly into the outgoing guide tube or welding gun causing a "birdnest".)

3. Push the wire through the ingoing guide tube, then press the gun trigger and push the electrode into the drive roll. If the electrode fails to thread itself into the outgoing guide tube of the wire drive, open the quick release idle roll arm, thread the electrode manually, and reclose the arm.

4. Inch the electrode through the gun.

NOTE: Due to the low speed starting feature of the SP-250, the wire will feed at low speed for 2 seconds while inching, then come up to the set speed.

5. Check that the welding process is set for the wire type, diameter, and gas per instructions on nameplate.

SETTING IDLE ROLL PRESSURE

The idle roll pressure wing screw is set at the factory backed out 2fi turns from full pressure. This is an approximate setting. The optimum idle roll pressure varies with type of wire, wire diameter, surface condition, lubrication, and hardness. As a general rule, hard wires may require greater pressure, and soft, or aluminum wire, may require less pressure than the factory setting. The optimum idle roll setting can be determined as follows:

1. Press end of gun against a solid object that is electrically isolated from the welder output and press the gun trigger for several seconds.

2. If the wire "birdnests", jams, or breaks at the drive roll, the idle roll pressure is too great. Back the wing screw out fi turn and run new wire through the gun. Repeat above step.

3. If the drive roll slips, loosen the gun cable Fast-Mate connection nut from the front of the SP-250. Pull the gun cable forward about 6". There should be a slight waviness in the exposed wire. If there is no waviness, the pressure is too low. Tighten the wing screw 1/4 turn and lock the gun cable in place. Repeat the above procedure.

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OPTIONS / ACCESSORIES

Replacement Magnum 250-SP Gun and Cable Assemblies

The following GMAW gun and cable assemblies are available for use with the SP-250. Each is rated at 200 amps at 60% duty cycle. Each is equipped with a Fast-Mate connector and additional control lead connections for the thumb activated 2 momentary position slide switch control designed into the gun handle to use with the SP-250 remote control features:

K524-1 Gun and Cable -A 12.5 ft. (3.8m) GMAW gun and cable assembly; includes a liner, diffuser, and contact tips for .035 (0.9mm) and .045 (1.2mm) electrodes.

K524-2 Gun and Cable -A 12.5 ft. (3.8m) GMAW gun and cable assembly; includes a liner, diffuser, and contact tips for .025 (0.6mm) and .030 (0.8mm) electrodes.

K524-3 Gun and Cable -A 15 ft. (4.6m) GMAW gun and cable assembly; includes a liner, diffuser and contact tips for .035 (0.9mm) and .045 (1.2mm) electrodes.

K524-4 Gun and Cable -A 15 ft. (4.6m) GMAW gun and cable assembly; includes a liner, diffuser, and contact tips for .025 (0.6mm) and .030 (0.8mm) electrodes.

K607-1 Spool Gun adapter Kit

The K607-1 Spool Gun Adapter Kit provides "up front" direct connection with the SP-250. It is used with the K487 Spool Gun (with remote speed control) or the K469 Spool Gun (requiring K518 Connection Adapter). It also provides single switch transfer between the machine's feeder gun or the spool gun for same polarity welding with different wire and gas processes. The kit includes a spool gun module board, a connection box assembly with connecting plug and lead harnesses, mounting hardware, and installation and operation instructions.

SPOOL GUN ADAPTER KIT INSTALLATION

(Option K607-1)

The spool gun module mounts inside the control section of the machine and provides control and inter-connection between the machine's control board and the spool gun kit connection box.

The connection box mounts to the front of the machine's base and provides for inlet connection of the spool gun gas supply hose. It provides up-front easy connection of the spool gun gas line, control plug, and electrode lead (using the Twist-Mate plug provided with the kit). Installation and Operation Accessory Manual (AM-105) is included with the kit.

SPOOL GUN MODULE BOARD INSTALLATION

NOTE: The K607-1 Spool Gun Adapter Kit is designed for use with SP-250, SP 250-I and Wire-matic 250 model codes above code 9900. Model Codes below 9900 may be used with the addition of holes to the case as described in the installation instructions below.

SP-250 model code 9402 must have S19636-2 read on display just after power switch is turned on.

⚠ WARNING

WARNING: HIGH VOLTAGE CAN KILL!

- Do not operate with covers removed.
- Disconnect input power before servicing
- Only qualified persons should install, use or service this equipment.

See Figures C-1 and C-2.

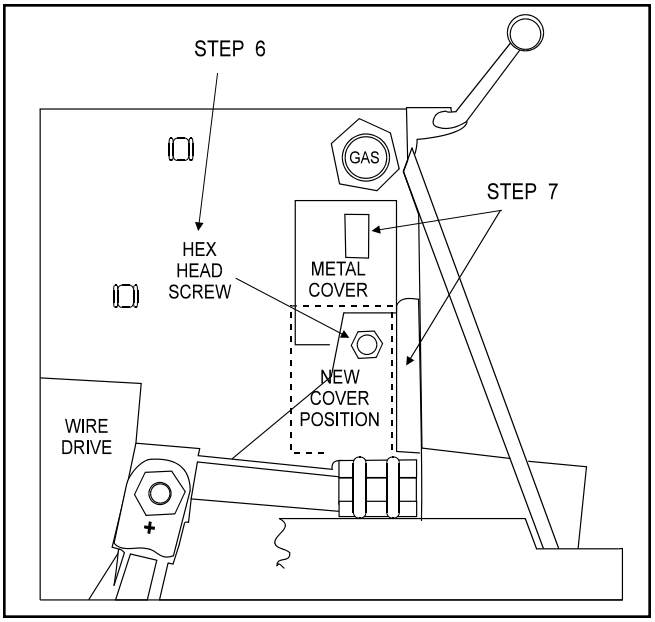

Figure C.1 - Spool Gun Installation.

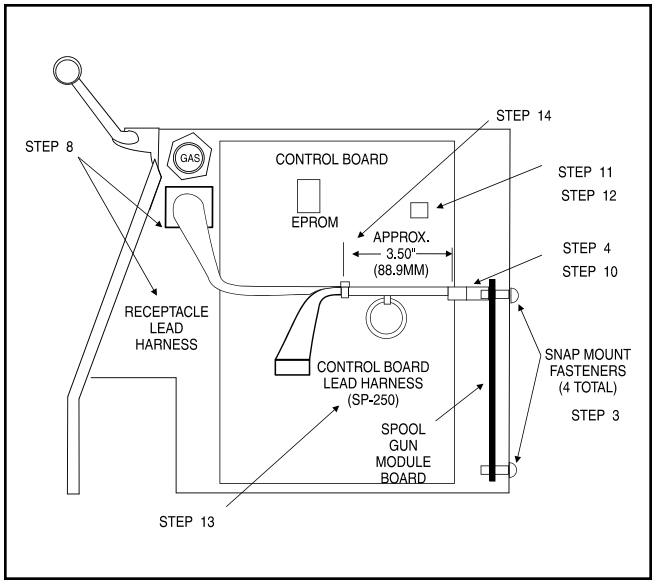

Figure C.2 - Spool Gun Module Board Installation.

1. Remove input power to the machine before starting.

2. Remove the six screws that hold the Case Side Panels.

3. Locate the four snap-mount fasteners mounted to the side panel of the control Board.

4. Position the spool gun module board over the snap-mount fasteners, making sure that the lead plug connectors are placed at the top.

5. Gently press the board onto the fasteners, making sure all of the fasteners snap into place.

6. On the wire drive side of the machine, remove the hex-head screw from beneath the gas connector releasing the metal cover. See ***Figure C-1.***

7. Slide the metal cover out from behind the motor bracket. Flip the cover over so that the screw hole is in the top right corner, then reinstall as a spacer plate with the hex head screw. See ***Figure C-1.***

8. Find the panel receptacle lead harness included in the kit. See Figure C-2. Insert the panel receptacle into the hole from the control board side of the panel, making sure that the panel receptacle mounting plate is positioned so that the grounding screw is in the lower left corner of the plate.

NOTE: For model codes below 9900, small notches may need to be filed at top and bottom of panel hole to clear the plastic mounting ears of the receptacle.

⚠ CAUTION

CAUTION: Collect metal filings with a rag to protect against possible metal contamination of the control board or other internal electrical components.

9. Fasten the panel receptacle to the case with the three #6-32 x 3/8" self tapping screws provided. Insert screws from wire drive side, through the sheet metal, and into the receptacle mounting plate holes.

10. Plug the 10-pin, 8-pin, and 6-pin connector plugs from the other end of the receptacle lead harness into the 10-, 8-and 6-pin connectors (J12, J11 and J13) at the top of the spool gun module board. Plug in the 8-pin connector at the opposite end of this harness into the unused 8-pin connector on the SP-250 control board (J4).

11. Disconnect the 4-pin gas solenoid plug from the receptacle (J8) on the upper right corner of the Control Board. See Figure C.2. Reconnect this plug into the 4-pin receptacle (J14) on the top of the Module Board.

12. Plug the 4-pin connector plug, included with the panel receptacle harness connected in step 10 above, into the Control Board receptacle (J8), disconnected in step 11 above.

13. Using the cable tie included in the kit, tie the two harnesses together approximately 3.50 inches (88.9mm) from the end of the lead plugs as shown in Figure C.2.

14. Replace the Case.

SPOOL GUN CONNECTION BOX INSTALLATION

NOTE: Model codes below 9900 require the addition of three holes to the front of the machine's base as shown in Fig C.3.

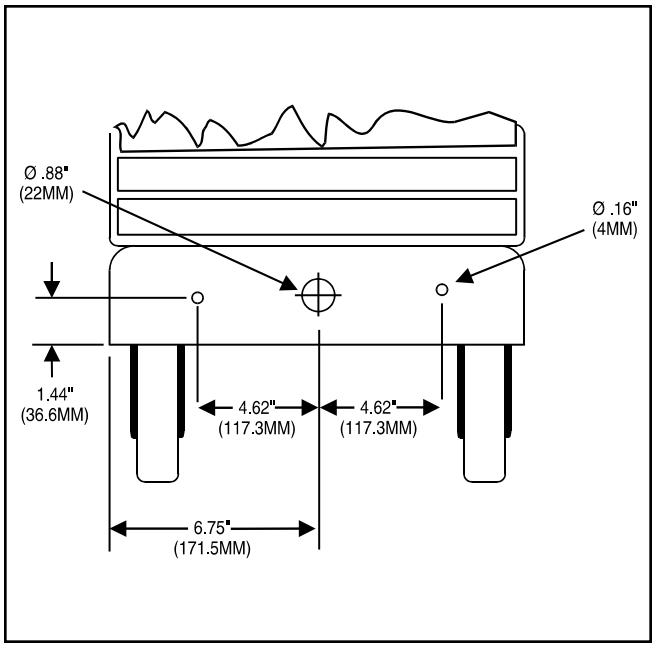

Figure C.3 - Spool Gun Connection Box Installation Mounting Holes

1. Remove the plug button, if present, from the center hole in the front of the machine's base and partially thread the two #10 thread forming screws, provided with kit, into the two small holes on both sides of the center hole.

2. Route a user-provided gas supply hose, from the flow regulator of the spool gun gas cylinder, over the rear axle of the machine, and out to the front through the center hole in the front of the base.

3. Connect the gas hose to the 5/8-18 female inert gas fitting on the back of the connection box.

4. Slip the connection box mounting keyholes over the screw heads (installed in Step 1 above) and pivot the box clockwise to engage and level the box, then tighten the screws.

5. Route the control cable of the connection box up through the opening in the front louver provided for the work lead, then up behind the wire drive, and connect the plug to the kit receptacle installed in the previous section A. See Figure C.4.

6. Route the electrode lead of the connection box up through the same opening in the front louver. With the machine connected for electrode positive, (refer to instruction manual), remove the positive electrode lead from its connection on the wire drive. Then reconnect with the connection box electrode lead on the bolt under the positive electrode lead so the connection box electrode lead is sandwiched between the positive electrode lead terminal and the wire drive contact surface. Tighten snugly, being careful not to strip the threads.

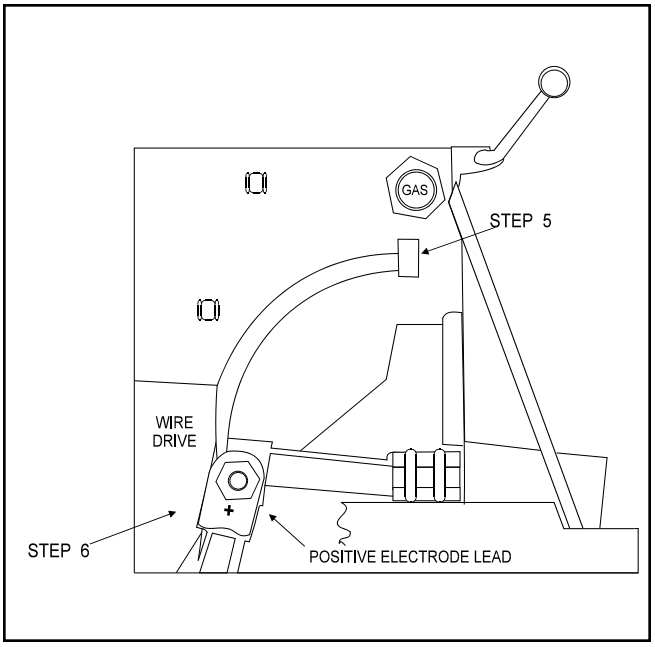

Figure C.4 - Spool Gun Connection Box Installation.

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SPOOL GUN CONNECTION

⚠ CAUTION

CAUTION: The spool gun module is intended for use with Lincoln Electric Magnum Spool Guns only. Use with other units may cause damage to the equipment. For Spool Gun operation, refer to the instruction manual provided with the Magnum Spool Gun.

1. Connect the spool gun control cable 6-pin plug to mating receptacle on the front of the spool gun adapter connection box.

NOTE: If using a K469 spool gun with 4-pin plug, use the K518 adapter.

2. Insert the Twist-Mate plug into the mating receptacle on the front of the connection box and twist to lock the connection.

3. Attach the spool gun gas line to the gas outlet fitting on the front of the connection box.

4. Refer to the Instruction Manual included with the K487 or K469 Spool Gun for more detail in Spool Gun set-up and operation.

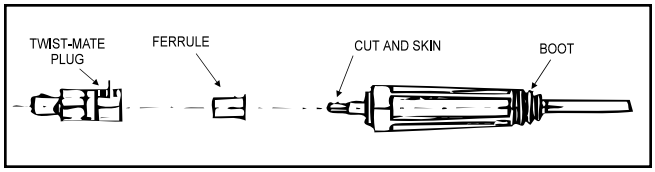

Figure C.5 - Spool Gun Connect.

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SPOOL GUN INSTALLATION TO OLD K531 KIT.

1. Slide the spool gun cable assembly through the opening in the louvers provided for the work lead. See Figure C.6.

2. Remove the SP-250 gas line from the gas line connector.

3. Screw the spool gun 6-pin plug into the new connector just below the gas line connector.

4. Attach the spool gun gas hose to the gas connector.

5. Tighten the gas hose tightly, being careful not to strip the brass threads.

NOTE: If using a K469 Spool Gun with a 4-pin plug, use the K518 adapter.

6. Thread the removed SP-250 gas line between the new gas hose and spool gun cable. See Figure C.6.

7. Pull the SP-250 gas hose up and through until it wedges between the cable connector and gas connector.

   a. Make sure the SP-250 gas hose connector does not touch the wire drive unit.

8. With the SP-250 connected electrode positive (+), remove the positive electrode lead from the terminal on the wire drive.

9. Position the spool gun electrode lead on the terminal.

10. Place the SP-250 electrode lead on the terminal. The spool gun electrode lead should be on the inboard side.

11. Tighten the hex nut, being careful not to strip the threads.

12. Confirm the spool gun has been connected properly.

    a. Toggle the POWER SWITCH to the “ON” position.

    b. If the spool gun cable has been installed properly, the following display appears
    SPOOL GUN HAS BEEN CONNECTED
    PRESS MANUAL TO ENTER SETTINGS.

    c. Press the MANUAL key for spool gun welding mode.

Refer to the Instruction Manual for the K487 or K469 spool gun for information on spool gun set up and operation.

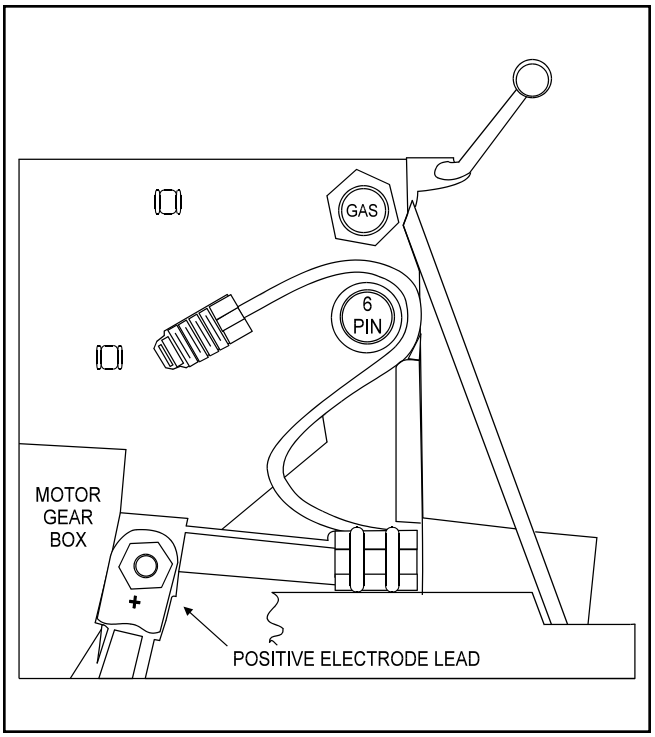

FIGURE C.6 - Spool Gun Connection.

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SAFETY PRECAUTIONS

⚠ WARNING

•Have a qualified technician do the maintenance and troubleshooting work.

•Disconnect input power at main input supply prior to working inside machine.

Read the Safety Precautions in the front of this manual before working on this machine.

ROUTINE AND PERIODIC MAINTENANCE

Disconnect input AC power supply lines to the machine before performing periodic maintenance, tightening, cleaning, or replacing parts. See ***Figure D.1.***

Perform the following daily:

1. Check that no combustible materials are in the welding or cutting area or around the machine.
2. Remove any debris, dust, dirt, or materials that could block the air flow to the machine for cooling.
3. Inspect the electrode cables for any slits, punctures in the cable jacket, or any condition that would affect the proper operation of the machine.

Perform Periodically:

Clean the inside of the machine with low pressure air stream. Clean the following parts. Refer to ***Figure D-1.***

Main transformer and choke.
Electrode and work cable connections.
SCR rectifier bridge and heat sink fins.
Control board.
Fan Assembly.

NOTE: The fan motor has sealed bearings which require no maintenance.

Drive Rolls and Guide Tubes

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 .

Drop-In Reel Spindle and Clips

Before loading a coil of wire into the SP-250 drop-in spindle, inspect the mating surfaces of the spindle hubs and the spindle mounting clips (V-brackets) and, if necessary, wipe or blow out any dirt and debris which may have deposited on these surfaces .

Cable Cleaning

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 start may cause 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.

Gun Tubes and Nozzles

a. Replace worn contact tips as required.

b. Remove spatter from inside of gas nozzle and from tip after each 10 minutes of arc time or as required.

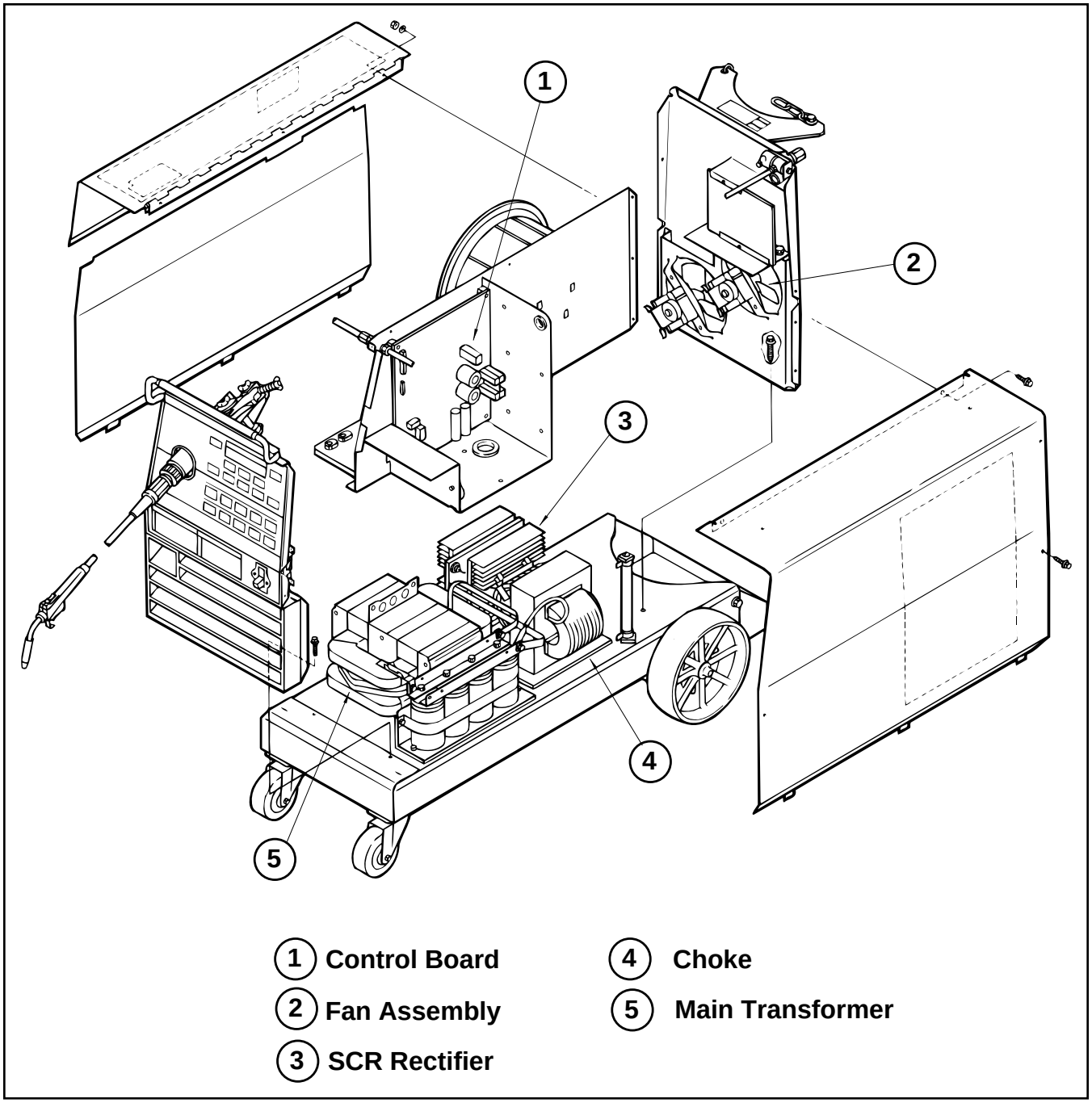

Figure D.1 - Component Locations

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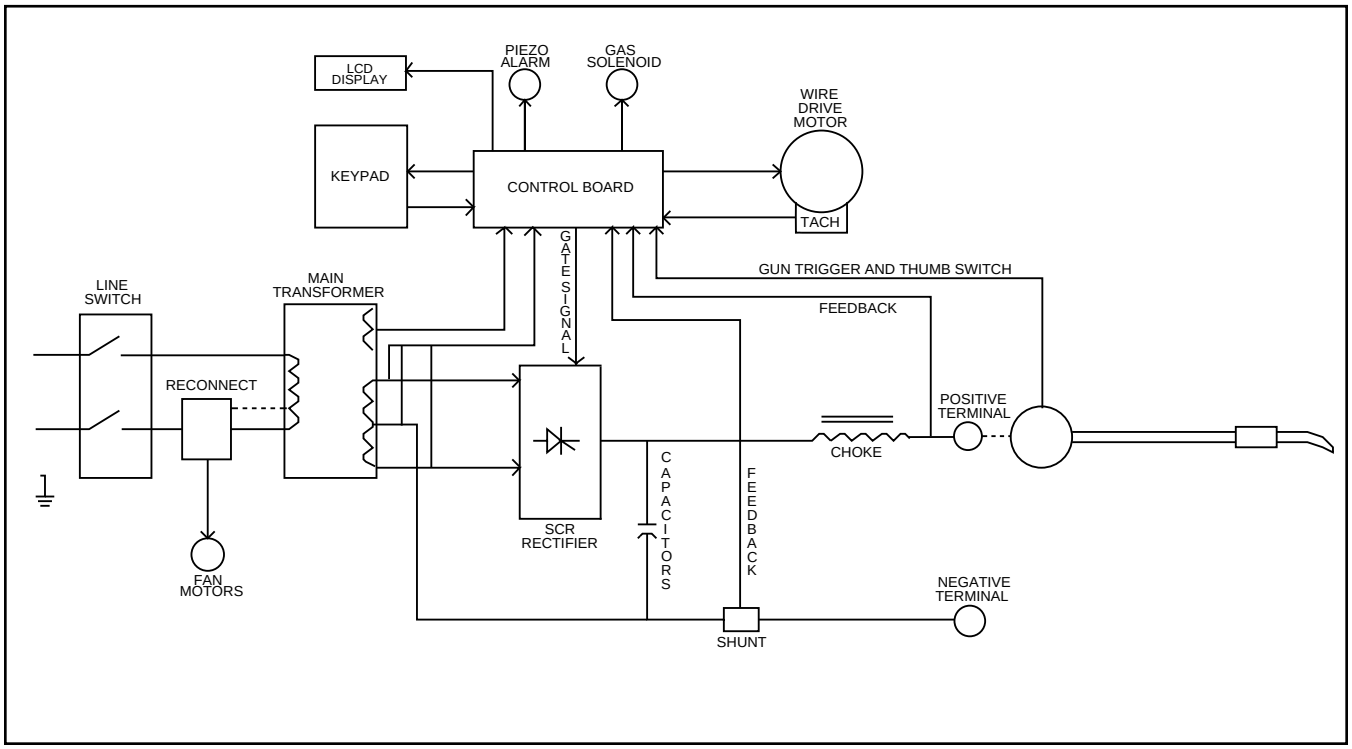

Figure E.1 -Block Logic Diagram

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

POWER SUPPLY OPERATION

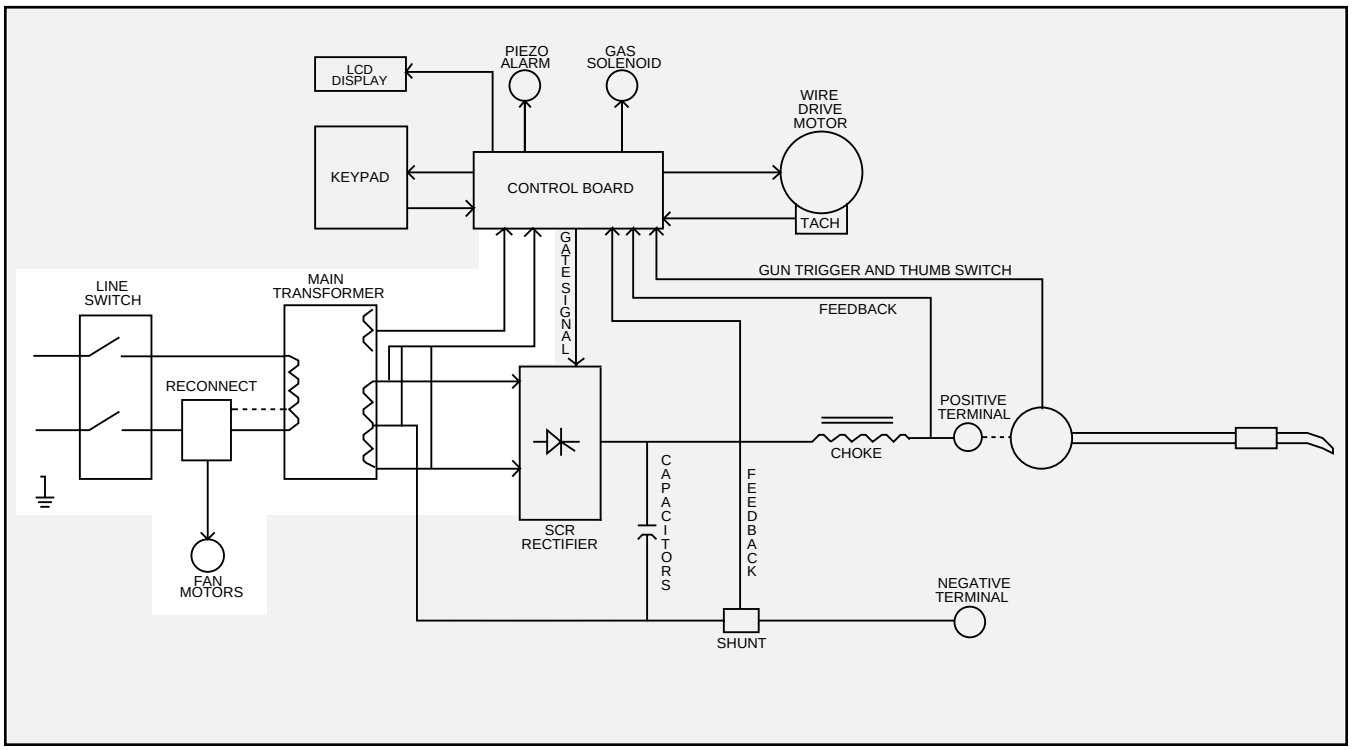

Figure E.2 - Input Line Voltage and Main Transformer

INPUT LINE VOLTAGE AND MAIN TRANSFORMER

The desired single phase input power is connected to the SP-250 through a line switch located on the front panel.

A reconnect panel allows the user to configure the machine for the desired input voltage. This AC input voltage is applied to the primary of the main transformer and to the thermostatically controlled fan motors. The transformer changes the high voltage, low current input power to a low voltage, high current output. In addition, the main transformer also has an isolated center tapped 30VAC auxiliary winding that supplies power to the Control Board for SCR gate drive and gas solenoid operation. The weld power windings connect to the Control Board as well as to the main SCR Rectifier.

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

POWER SUPPLY OPERATION (CONTINUED)

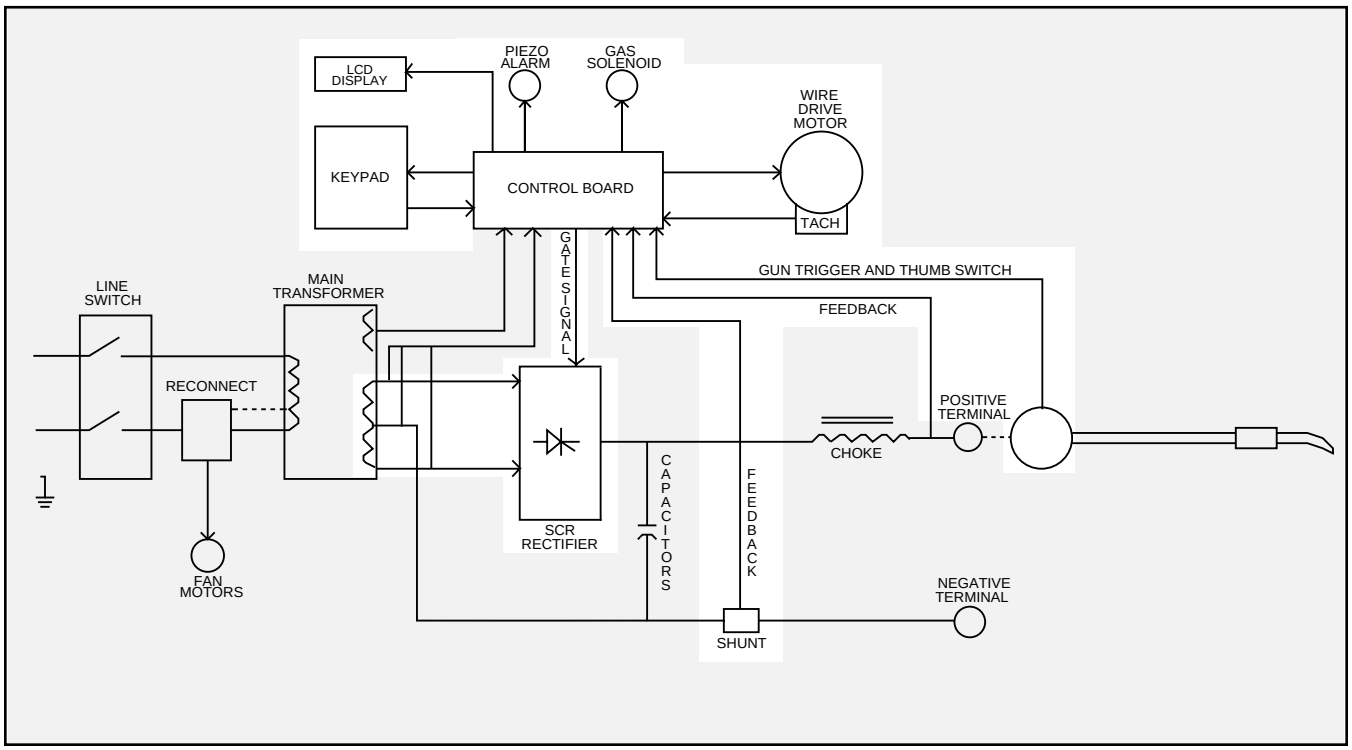

Figure E.3 - Output Rectification and Feedback Control

OUTPUT RECTIFICATION AND FEED-BACK CONTROL

The AC output from the main transformer secondary weld winding is rectified and controlled through the SCR rectifier assembly. Output voltage and current are sensed at the shunt and output terminals and fed back to the control board. The control board compares the commands of the keypad (or gun thumb switch) with the feedback signals. The appropriate gate firing pulses are generated by the control board and applied to the SCR rectifier assembly. The control board controls the firing of the SCRs, thus controlling the output of the machine. See ***SCR Operation.*** The control board also powers and commands the keypad, the LCD Display, the piezo alarm, the gas solenoid and the wire drive motor.

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

POWER SUPPLY OPERATION (CONTINUED)

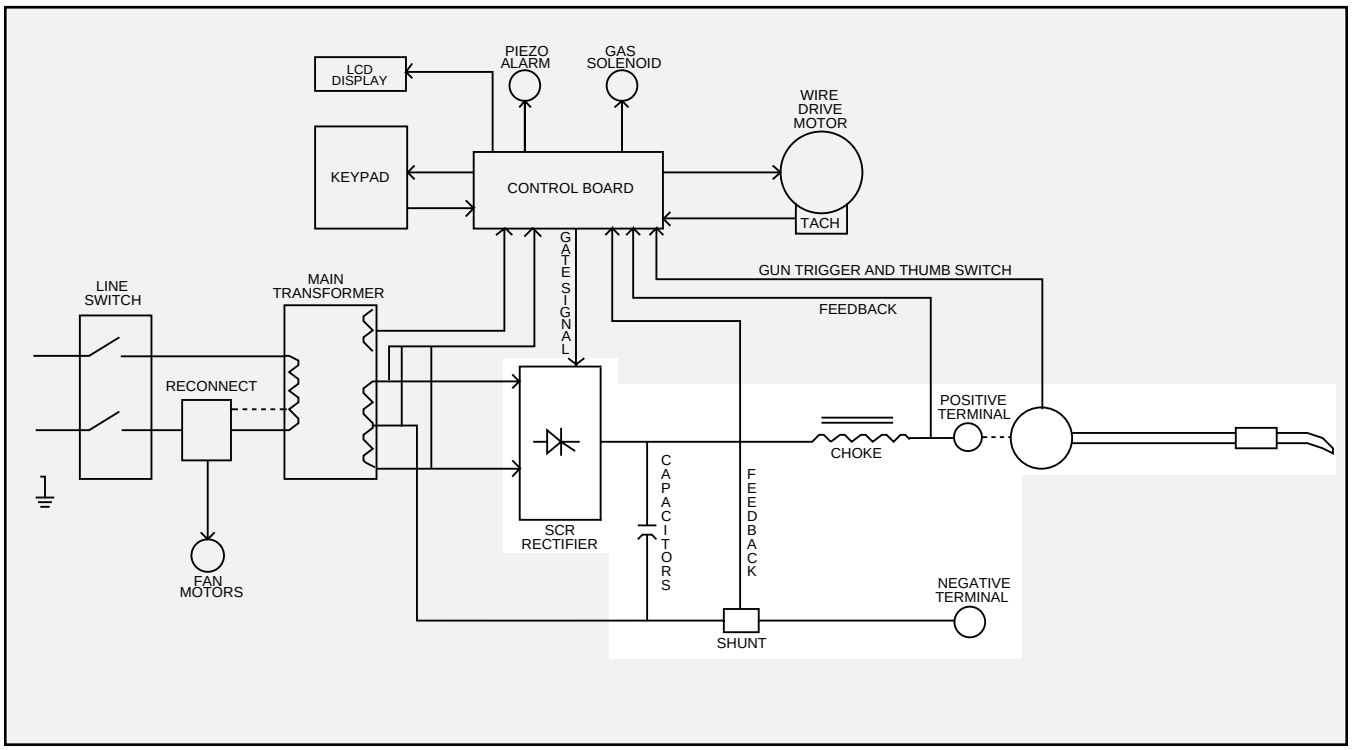

Figure E.4 - Constant Voltage Output

CONSTANT VOLTAGE OUTPUT

The controlled DC output from the SCR rectifier assembly is filtered by the capacitor bank and the output choke, which is in series with the gun and welding load, resulting in a constant voltage output at the output terminals of the machine.

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

POWER SUPPLY OPERATION (CONTINUED)

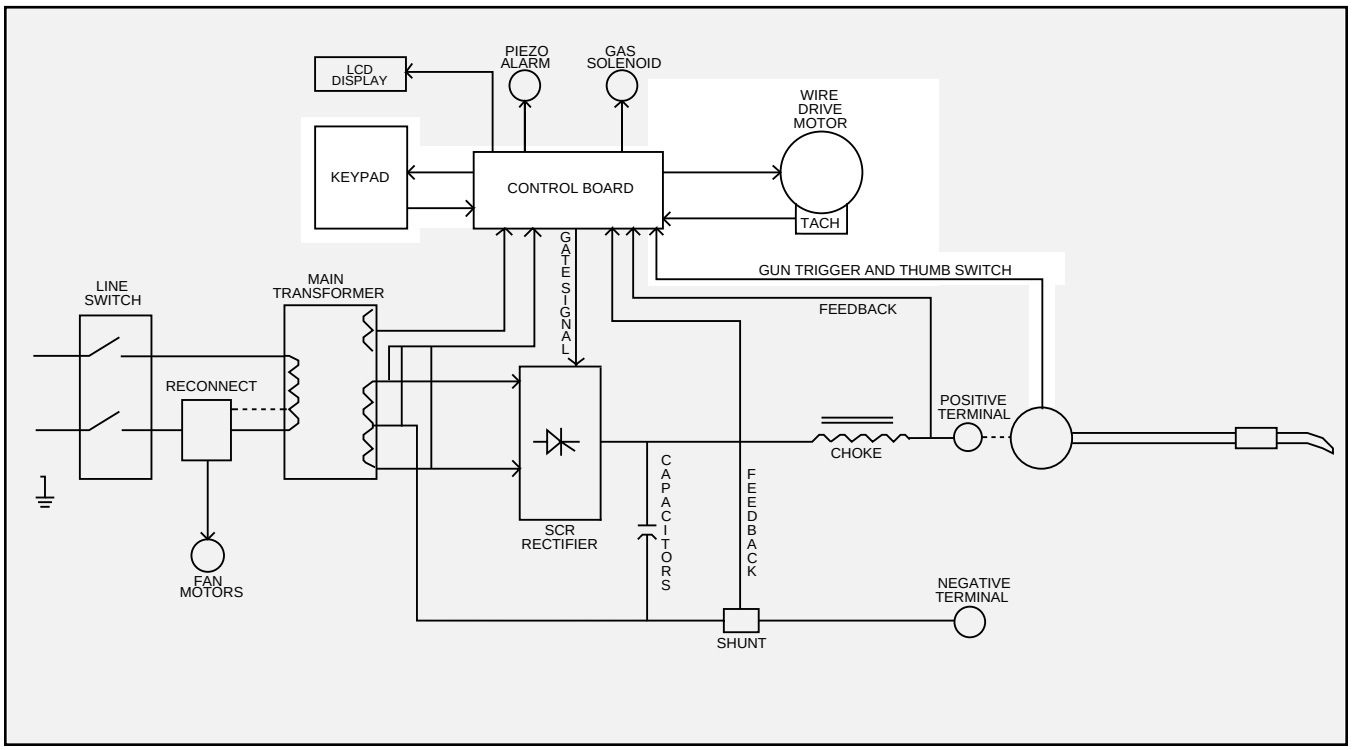

Figure E.5 - Wire Drive Motor and Feedback

WIRE DRIVE MOTOR AND FEEDBACK

The wire drive motor is controlled by the control board. A motor speed feedback signal is generated at the motor tach and sent to the control board. The control board compares this feedback signal with the commands set forth by the keypad (or the gun thumb switch) and sends the appropriate armature voltage to the wire drive motor. The drive motor speed is thus controlled which in turn regulates the electrode wire feed speed through the gun.

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

THERMAL PROTECTION

A thermostat protects the machine from excessive operating temperatures.. Excessive operating temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. There are three thermostats within the SP-250 machine. One of the thermostats, located on the output choke, energizes the cooling fan motors when required. The other choke thermostat "opens" the trigger circuit, preventing machine weld output and wire feed, if excessive operating temperatures are detected. The third thermostat insures that the fan motors are operating when required.

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

SCR OPERATION

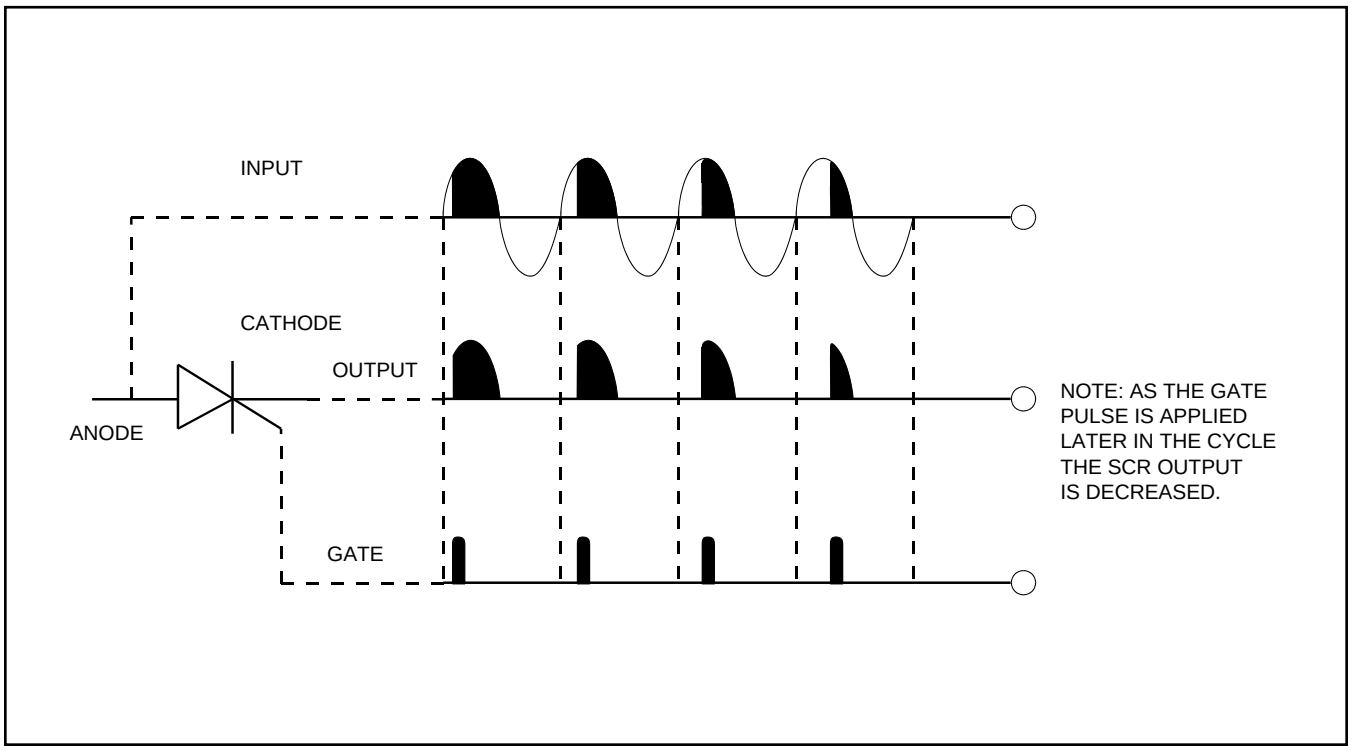

Figure E.6 - SCR Operation

A silicon controlled rectifier (SCR) is a three terminal device used to control rather large currents to a load. An SCR acts very much like a switch. When a gate signal is applied to the SCR it is turned ON and there is current flow from anode to cathode. In the ON state the SCR acts like a closed switch. When the SCR is turned OFF there is no current flow from anode to cathode thus the device acts like an open switch. As the name suggests, the SCR is a rectifier, so it passes current only during positive half cycles of the AC supply. The positive half cycle is the portion of the sine wave in which the anode of the SCR is more positive than the cathode.

When an AC supply voltage is applied to the SCR, the device spends a certain portion of the AC cycle time in the off state and the remainder of the time in the on state. The amount of time spent in the ON state is controlled by the gate.

An SCR is fired by a short burst of current into the gate. This gate pulse must be more positive than the cathode voltage. Since there is a standard PN junction between gate and cathode, the voltage between these terminals must be slightly greater than 0.6V. Once the SCR has fired it is not necessary to continue the flow of gate current. As long as current continues to flow from anode to cathode the SCR will remain on. When the anode to cathode current drops below a minimum value, called holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave. If the SCR is turned on early in the positive half cycle, the conduction time is longer resulting in greater SCR output. If the gate firing occurs later in the cycle the conduction time is less resulting in lower SCR output.

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).
Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: output problems, 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 216-383-2531 or 1-888-935-3877.

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PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

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

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

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.

2. Check for loose connections at the PC board to assure that the PC board is properly connected.

3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

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

Reusable Container
Do Not Destroy

P.C. Board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

- If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

- Tools which come in contact with the P.C. Board must be either conductive, anti-static or static-dissipative.

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

- If the P.C. Board uses protective shorting jumpers, don't remove them until installation is complete.

- If you return a P.C. 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.

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(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 The Lincoln Electric Service Dept. (216) 383-2531 or 1-888-935-3877
Machine is dead - No Open Circuit Voltage output and No Wire Feed when gun trigger is pulled. No Display.	1. Make certain that the input power switch is in the "ON" position. 2. Check the input voltage at the machine. Input voltage must match the rating plate and the reconnect panel. 3. Blown or missing fuses in the input line.	1. Check input power switch (S1). It may be faulty. 2. Check for loose or broken wires at the reconnect panel. 3. Perform ***Main Transformer Test.***
No Open Circuit Voltage output but wire feeds normally when gun trigger is pulled. - Display lights properly.	1. Check the input voltage at the machine. Input voltage must match the rating plate and the reconnect panel - High or Low Line message may be displayed. 2. The gun may be faulty. Check or replace.	1. Check for loose or broken connections at the output terminals, the choke, the capacitor bank and all heavy current carrying leads. 2. Make sure that the transformer secondary leads are securely connected to the SCR Rectifier Assembly. 3. Perform the ***SCR Rectifier Assembly Test.*** 4. The Control board may be faulty - 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 216-383-2531 or 1-888-935-3877

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
No Open Circuit Voltage output and no wire feed when gun trigger is pulled. Display is functioning properly.	1. The thermostats may be open due to machine overheating. If machine operates normally after a cooling off period then check for proper fan operation and ventilation. Make certain that the machine's duty cycle is not being exceeded. 2. Check the gun trigger circuit. Leads #324 to #325 should have continuity (zero ohms) when the gun trigger is pulled. If not then the gun may be faulty - replace.	1. Check thermostats and associated leads for loose or broken connections. See Wiring Diagram. 2. Perform ***The Main Transformer Test.*** 3. The control board may be faulty. Replace.
Wire feeds but welding output is low causing wire to "stub". Welds are "cold". Machine cannot obtain full rated output of 250 amps at 26 volts.	1. If an error message is displayed on the display then proceed to ***Explanation of Prompting and Error Messages Section.*** 2. Make sure that the proper wire and procedures are being used. 3. Check gun and work cable for loose or faulty connections.	1. Check for loose or faulty connections of the heavy current carrying leads. 2. The output capacitor bank may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary. WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body. 3. Perform the ***SCR Rectifier Assembly Test.*** 4. Perform the ***Main Transformer Test.*** 5. The control board may be faulty. 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 216-383-2531 or 1-888-935-3877

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The output voltage and wire feed is present continuously or pulsing when gun trigger is NOT activated.	1. Remove the gun. If the problem is resolved the gun trigger circuit is faulty. Repair or replace. 2. If the problem is not resolved then contact your Local Lincoln Electric Authorized Field Service Facility.	1. Check the machine's internal trigger leads for grounds or shorts. See Wiring Diagram. 2. The control board may be faulty. Replace.
Output settings (voltage and/or wire feed speed) are being changed even though gun thumb switch or keypad keys are not being activated.	1. Remove the gun. If the problem is resolved the gun thumb switch circuit may be faulty. Repair or replace. 2. If the problem persists after gun removal then the keypad may be faulty. Check for burned or damaged areas on the keypad.	1. Check leads #326 and #327 for grounds or shorts. See Wiring Diagram. 2. The Keypad may be faulty. Perform the ***Keypad Test.*** 3. The control board may be faulty. Replace.
No wire feed or open circuit voltage when gun trigger is pulled. The display lights up but the audio alarm and the display do not function properly.	1. Check the input voltage at the machine. Input voltage must match the rating plate and the reconnect panel - High or Low Line message may be displayed. 2. Remove the gun. If the problem is resolved the gun is faulty.- Replace.	1. Perform the ***Keypad Test.*** 2. Perform the ***Main Transformer Test.*** 3. The control board may be faulty.- Replace. 4. The LCD display may be faulty. - 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 216-383-2531 or 1-888-935-3877

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The audio alarm does NOT sound when a key is pressed, but display changes.	1. The background noise may be too loud for user to hear beeper.	1. Check the voltage across pins 1J7 (+) to 2J7 (-) on the control board. When the keys are pressed there should be a brief indication, or pulse, of a DC voltage. If the voltage "pulse" is present then the Piezo alarm may be defective.- Replace. If the DC voltage pulse is NOT present when the keys are pressed then the control board may be defective.-Replace.
The audio alarm does not sound when a key is pressed, and the display does NOT change.	1. Remove the gun. If the problem is resolved the gun is faulty.- Replace.	1. Perform the ***Keypad Test.*** 2. The control board may be faulty. - Replace. 3. The LCD Display may be faulty.- Replace.
There is no gas flow when gun trigger is pulled. Wire feeds and weld voltage is present. The display functions properly.	1. Make certain that a process is selected that requires gas flow. 2. Check gas source and hoses for leaks or kinks.	1. Check the gas solenoid by disconnecting it from the control board (Plug J8) and applying a 12VDC external supply to the gas solenoid. If the solenoid does NOT activate then it may be faulty. - Replace. 2. The control board may be faulty.- Replace.
No readable message on the display. Backlight is lit indicating there is power to the machine.	1. Check the input voltage at the machine. The input voltage must match the rating plate and the reconnect panel. 2. Turn the line switch (S1) off. Wait a minute and turn power on. If problem is not resolved contact your local Lincoln Electric Authorized Field Service Facility.	1. The display board may be faulty. Replace. 2. The control board may be faulty. 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 216-383-2531 or 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

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The display backlight does not function.	1. Check the input voltage at the machine. Input voltage must match the machine rating plate and the reconnect panel.	1. With the display board disconnected test for 12VDC from pins 1J1(+) to 2J1(-). If the 12VDC is present and the display board backlight does NOT function then replace the display board. See Wiring Diagram. 2. If the 12VDC is not present at pins 1J1 to 2J1 then perform the ***Main Transformer Test.*** 3. The control board may be faulty. Replace.
The machine stops feeding wire while welding and the MOTOR OVERLOAD message appears on the display.	1. Check for mechanical restrictions in the wire feeding path. The gun cable may be clogged.	1. Check the motor armature current. Normal armature current is 1.5 - 2.5 amps. If the motor armature current is normal the control board may be faulty.-Replace. 2. If the motor armature current is high (over 3 amps) and there are NO restrictions in the wire feeding path then the motor or gear box may be defective.-Replace.

⚠ CAUTION

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Return to Section TOC Return to Master TOC

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
WIRE FEEDING PROBLEMS		
No control of wire feed speed. Other machine functions are normal.	1. The thumb switch circuit in the gun may be faulty. Check or replace.	1. Perform the ***Wire Drive Motor and Tach Feedback test.*** 2. The control board may be faulty.- Replace.
There is no wire feed when gun trigger is pulled. Normal open circuit voltage is present.	1. If the drive rolls are turning then check for a mechanical restriction in the wire feed path. 2. The gun liner may be clogged. Check or replace. 3. If the drive rolls are NOT turning when the gun trigger is pulled then contact your local Lincoln Electric Authorized Field Service Facility.	1. Perform the ***Wire Drive Motor and Tach Feedback Test.*** 2. The control board may be faulty. - 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 216-383-2531 or 1-888-935-3877

Return to Section TOC Return to Master TOC

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The arc is unstable and or "hunting".	1. Check for worn or melted contact tip. 2. Check for loose or faulty connections on the work and electrode cables. 3. Make sure electrode polarity is correct or welding process being used. 4. Check for rusty or dirty wire. 5. Make sure machine settings and gas are correct for process being used.	1. Check for loose connections at the output terminals, the choke, the capacitor bank and all heavy current carrying leads. 2. Make sure that the transformer secondary leads are securely connected to the SCR Rectifier Assembly. 3. The output capacitor bank may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary. **WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.** 4. The control board may be faulty. Replace.
Weld bead is narrow or ropey. May have porosity with electrode stubbing into plate.	1. Make sure the weld procedure and electrode polarity is correct for the process being used. 2. Make sure shielding gas is correct and flow is proper. 3. Make sure the weld joint is not "contaminated".	1. The output capacitor bank may be faulty. Check for loose connections at the capacitors. Also check for leaky capacitors. Replace if necessary. **WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body.** 2. Perform the ***SCR Rectifier Assembly Test.*** 3. The control board may be faulty. 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 216-383-2531 or 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

TROUBLESHOOTING GUIDE - Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The contact tip seizes in the gas diffuser.	1. The tip is being over heated due to excessive high current and /or high duty cycle welding. 2. A light application of high temperature antisieze lubricant (such as Lincoln E2607 Graphite Grease) 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 216-383-2531 or 1-888-935-3877

Return to Section TOC
Return to Master TOC

EXPLANATION OF PROMPTING AND ERROR MESSAGES

ON SCREEN ERROR MESSAGE	MESSAGE EXPLANATION
PROCESS MUST MATCH WIRE & GAS	Reminder that in Auto mode the process entered with the Process key must match the process installed in the machine .
ONLY SET UP FOR .035 STAINLESS	Unit is only programmed for .035” (0.9mm) diameter in stainless steel wire. Other wire diameters can be accommodated by using the Manual mode.
ONLY ARGON USED WITH ALUMINUM	Unit is programmed to use only argon gas with aluminum electrodes. Other gases can be accommodated by using the manual mode.
ONLY SET UP FOR . 045 OUTERSHIELD	Unit is only programmed for .045” (1.1mm) diameter in Outershield® electrode wire. Other wire diameters within the SP-250 rating can be accommodated by using the Manual mode.
NO GAS REQUIRED WITH INNERSHIELD	Innershield® electrode wire does not require a shielding gas. In the Auto mode, the SP-250 automatically leaves the solenoid de-energized even when the trigger is closed.
MEMORY 1 NOW CONTAINS SETUP	Verifies that the setup was saved to memory number 1. The actual memory number is determined by the memory number key that was pressed following Save.
MEMORY 2 IS EMPTY	An attempt was made to recall a setup from a memory that does not contain one. The actual memory number is determined by the memory number key that was just pressed.
MEMORY 4 DOESN’T MATCH WIRE & GAS	An attempt was made to enter Toggle mode and the process of the Auto setup in memory 4 does not match the process in the machine. Press memory 4 to find out what process is required. The memory number indicates which memory, 4 or 5, does not match.
REQ'S: STAINLESS WIRE .035 Ar/O_2 ↓ PRESS PROCESS WHEN INSTALLED	An attempt was made to recall from memory an Auto setup whose process does not match the process in the machine. This message indicates the process required and alternates with the second message until the Process key is pressed.

EXPLANATION OF PROMPTING AND ERROR MESSAGES (CONT'D)

ON SCREEN ERROR MESSAGE	MESSAGE EXPLANATION
DATA ***ERROR*** CHECK SETTINGS ↓ PRESS PROCESS TO CHECK SETTINGS	An attempt was made to recall a setup from memory that has improper settings due to excessive electrical interference. The SP-250 will recall the setup and reset the improper data to within machine limits. However, all settings should be checked, properly set if needed, and then resaved to that memory. This message alternates with the second message until the Process key is pressed.
MOTOR OVERLOADED CHECK GUN, DRIVE	Unit shut down even though trigger was closed. There is an excessive current draw on the motor. 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.
XXXX ***ERROR*** CHECK SETTINGS ↓ PRESS PROCESS TO CHECK SETTINGS	Indicates that an error has occurred due to excessive electrical interference. All of these error types turn off the arc voltage, wire feed speed, and solenoid. Press the Process key, per second message, and check all settings before continuing to weld. **XXXX** IC3I RTI SWI IOT XIRQ PWOF DATA This table shows all of the actual lettering which appears in place of XXXX. There is no reason to note which of these occurred unless it occurs frequently.
GUN SWITCH BEING USED FOR TOGGLE	Reminds the operator that the gun switch is being used to toggle between memory 4 and memory 5 and, therefore, is not able to control IPM or arc VOLTS.
CONNECT FOR NEG. POLARITY	Reminds the operator to change the electrode polarity to negative when Innershield wire type is selected.
LOW LINE: CHECK RECONNECT PANEL PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that the input line voltage is too low to obtain the output set on the machine. The operator can continue to weld, but the voltage will be less than what is set on the machine. This message occurs when the line voltage is less than 75% of nominal line or if the voltage level set on the machine is not obtainable at that line voltage and load current. The operator should check if the reconnect panel is wired properly. Lowering the set VOLTS and/or IPM can eliminate the message. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed . Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 sec.) allowing the operator to view the increase or decrease in that setting.

EXPLANATION OF PROMPTING AND ERROR MESSAGES (CONT'D)

ON SCREEN ERROR MESSAGE	MESSAGE EXPLANATION
HIGH LINE: CHECK RECONNECT PANEL PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that the line voltage is too high, and the output voltage has been reduced to protect the capacitor bank voltage rating limits. The operator can continue to weld, but the voltage will be less than what is set on the machine. This message occurs when the line voltage is greater than 121% of nominal line. The operator should check if the reconnect panel is wired properly. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed. Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 sec.) allowing the operator to view the increase or decrease in that setting.
CURRENT OVERLOAD REDUCE OUTPUT PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that too much current is being drawn from the machine, and the output has been reduced to prevent the current from exceeding safe levels. This will typically occur in Manual mode using .045" (1.2mm) wire and WFS greater than 275 IPM (0.7m/min.). Lowering the WFS will reduce the output requirement and allow operation within the machine rating. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed. Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 seconds) allowing the operator to view the increase or decrease in that setting.
SXXXXX -X ROM ASSEMBLY	Only displayed at power-up. Displays the part number of the ROM ASSEMBLY currently on the PC board.
C SXXXXX -X ROM ASSEMBLY	Indicates a checksum error in the software. Turn power off and back on again. If this message persists, then replace the ROM assembly on the PC board. Earlier units did not display the SXXXXX-X ROM ASSEMBLY number.
R	Indicates a fault in system RAM. Turn power off and back on again. If this message persists, then replace the control PC board assembly.
SPOOL GUN HAS BEEN CONNECTED PRESS MANUAL TO ENTER SETTINGS	Reminder that the Spool gun has been connected and the Manual key must be pressed to enter any Spool gun welding procedures.
SPOOL GUN HAS BEEN REMOVED PRESS PROCESS TO TO ENTER SETTINGS	Reminder that the Spool gun has been removed and the Process key must be pressed to enter SP-250 weld settings. This message may also be displayed if there is an open lead in the spool gun 6-pin plug assembly.

MAIN TRANSFORMER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the correct voltages are being

a. applied to the primary windings of the Main Transformer.

b. induced on the weld winding and auxiliary windings.

MATERIALS NEEDED

5/16" Nut Driver
Volt-Ohm Meter

MAIN TRANSFORMER TEST

TEST PROCEDURE

⚠ WARNING

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

NOTE: Secondary voltages will vary proportionably 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 5/16" nut driver.

3. Locate Plug J3 and Plug J6 on the G2252 Control PC Board or Plug J3 on the G1992 (Code 9402 only) Control PC Board. See Figures F.1A and ***F.1B.***

NOTE: The location of Plugs may vary depending on the machine code.

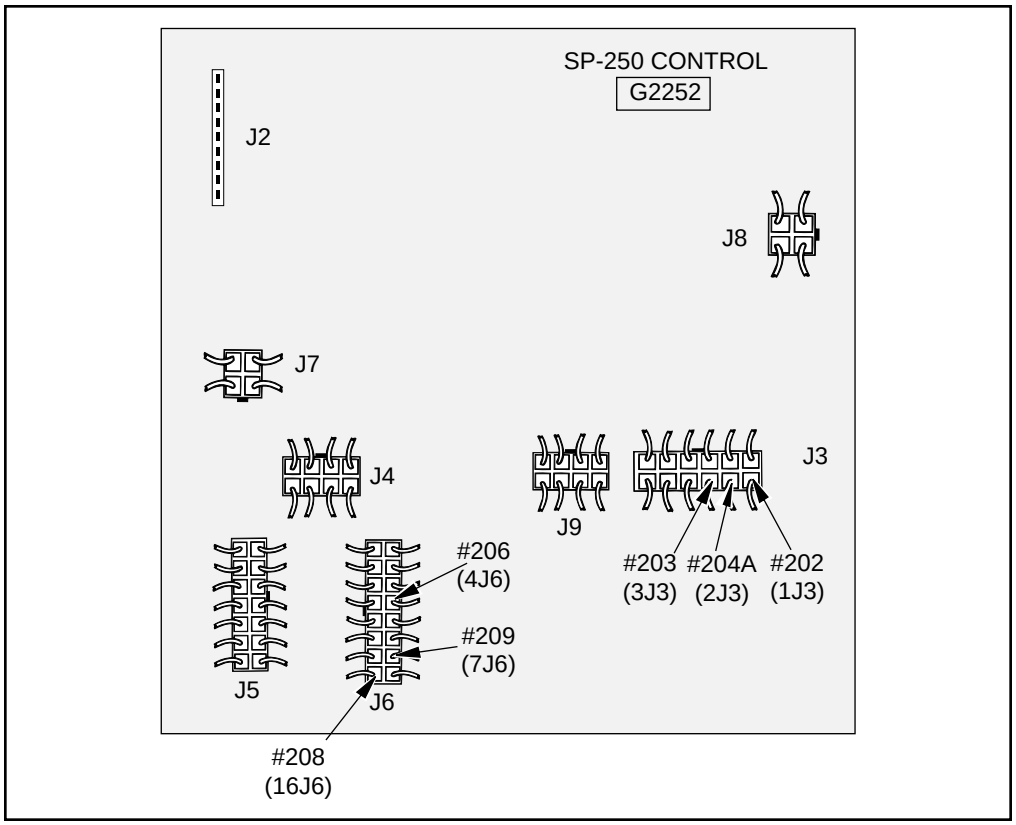

FIGURE F.1A - G2252 Control PC Board Main Transformer Test Points.

MAIN TRANSFORMER TEST

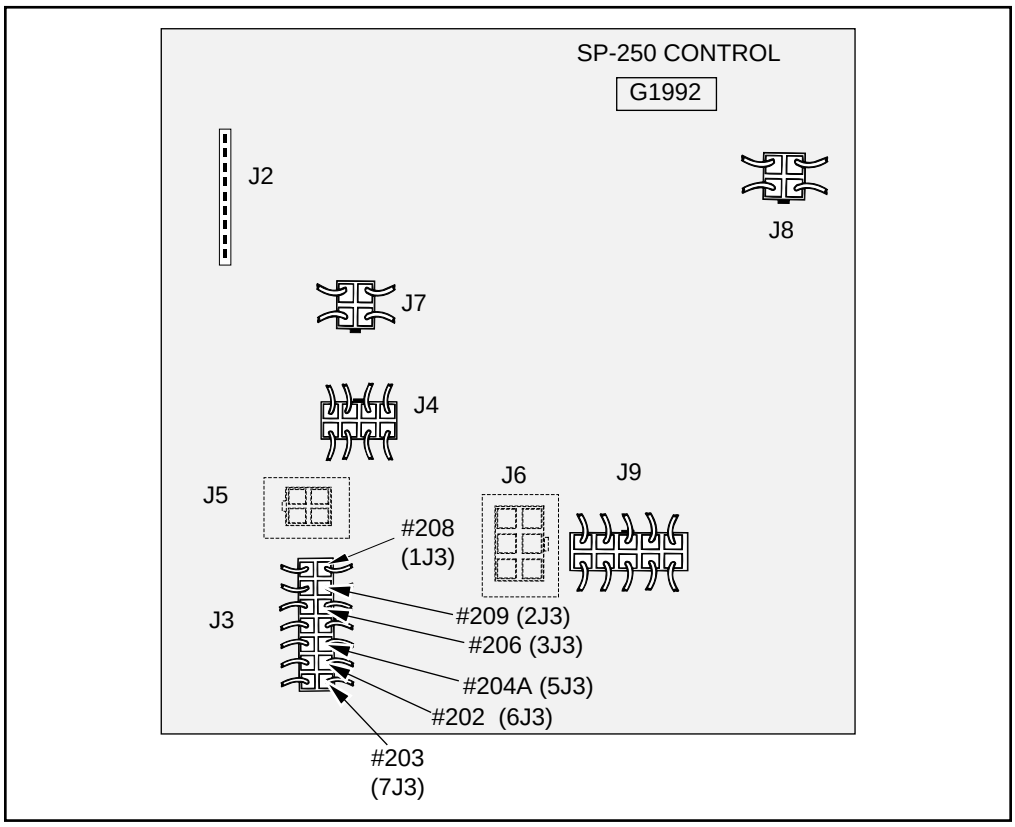

FIGURE F.1B - G1992 (Code 9402 Only) Control PC Board Main Transformer Test Points. Note: Plugs J5 and J6 are on inboard non-component side of Control Board.

4. Locate the following leads on Plug J3:

LEAD	PLUG LOCATION
#202	1J3
#203	3J3
#204 A	2J3

G2252:

LEAD	PLUG LOCATION
#202	6J3
#203	7J3
#204 A	5J3

G1992 (code 9402 only):

5. Connect main input power to the machine.

6. Turn the IDEALARC SP-250 ON/OFF POWER SWITCH to ON.

7. Make the following voltage tests at Plug J3.

FROM LEAD	TO LEAD	EXPECTED VOLTAGE
#202 (1J3)	#203 (3J3)	30 VAC
#202 (1J3)	#204 A (2J3)	15 VAC
#203 (3J3)	#204 A (2J3)	15 VAC

MAIN TRANSFORMER TEST

G1992 (Code 9402 only):

FROM LEAD	TO LEAD	EXPECTED VOLTAGE
#202 (6J3)	#203 (7J3)	30 VAC
#202 (6J3)	#204 A (5J3)	15 VAC
#203 (7J3)	#204 A (5J3)	15 VAC

8. Turn OFF the machine

9. Locate the following leads on Plug J6 on the G2252 Control PC Board or Plug J3 on the G1992 Control PC Board. See Figures ***F.1A*** & ***F1.B.***
G2252:

LEAD	PLUG LOCATION
#206 #208 #209	4J6 16J6 7J6

G1992 (Code 9402 only):

LEAD	PLUG LOCATION
#206 #208 #209	3J3 1J3 2J3

10. Turn ON the machine.

11. Make the following voltage tests at Plug J6 on the G2252 Control PC Board, or at Plug J3 on the G1992 Control PC Board (Code 9402 only.)

    a. Turn the machine OFF between each test.

    b. Carefully insert the meter probes into the back of each Molex Plug pin cavity to perform the test.

G2252:

FROM LEAD	TO LEAD	EXPECTED VOLTAGE
#208 (16J6)	#209 (7J6)	60 VAC
#208 (16J6)	#206 (4J6)	30 VAC
#209 (7J6)	#206 (4J6)	30 VAC

G1992 (Code 9402 only):

FROM LEAD	TO LEAD	EXPECTED VOLTAGE
#208 (1J3)	#209 (2J3)	60 VAC
#208 (1J3)	#206 (3J3)	30 VAC
#209 (2J3)	#206 (3J3)	30 VAC

    c. If any of the voltages tested are incorrect, check for loose or broken leads between the test points and the main transformer.

    d. If ALL the voltages tested are incorrect or missing, go to Step 12.

12. Test for correct nameplate input voltage between the H1 lead at the ON/OFF POWER SWITCH to H2 or H3 at the reconnect panel. Voltage tested will vary depending on Input Voltage Connection. See wiring diagram for test point locations.

    a. If the voltage test is incorrect,

    - check for loose or broken leads between the reconnect panel and the ON/OFF POWER SWITCH.

    - test the ON/OFF POWER SWITCH for proper operation.

MAIN TRANSFORMER TEST

b. If the correct nameplate voltage is being applied to the main transformer and one or more of the secondary voltages are missing or are incorrect, the main transformer may faulty. Replace.

STATIC SCR RECTIFIER ASSEMBLY TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

TEST DESCRIPTION

The Static SCR Test is used to quickly determine if an SCR is shorted or "leaky." See the Waveform Section in this manual for normal and abnormal SCR waveforms.

MATERIALS NEEDED

Analog Ohmmeter (Multimeter)
IDEALARC SP-250 wiring diagrams (See Electrical Diagrams Section of this Manual).
5/16" Nut Driver
fi" open end or socket wrench

STATIC SCR RECTIFIER ASSEMBLY TEST

TEST PROCEDURE

1. Disconnect main AC input power to the machine.

2. Disconnect Plugs J3 and J6 from the G2252 Control Board or remove Plug J3 from the G1992 Control Board (Code 9402 only.) This electrically isolates the SCR bridge assembly. See Figures F.2A and F.2B.

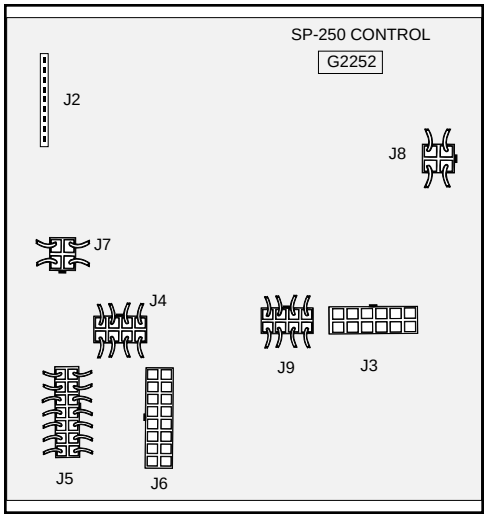

FIGURE F.2A - Remove Plugs J3 and J6 to Perform Static SCR Rectifier Assembly Test.

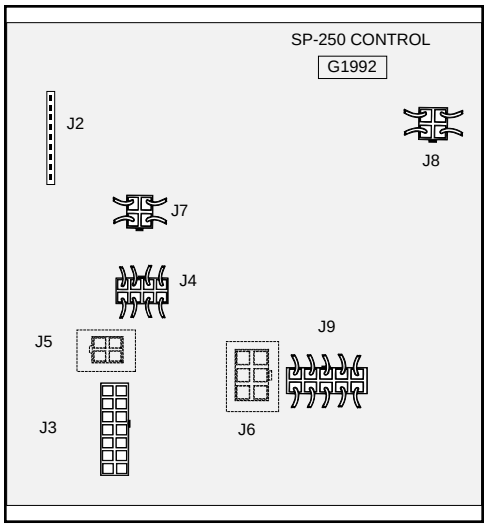

FIGURE F.2B - Remove Plug J3 to Perform Static SCR Rectifier Assembly Test.

3. Test with an Analog Volt-Ohm meter that capacitors have completely discharged.

4. Disconnect leads X2 and X3 from the negative capacitor bank using a fi" open end wrench. See Figure F.3.

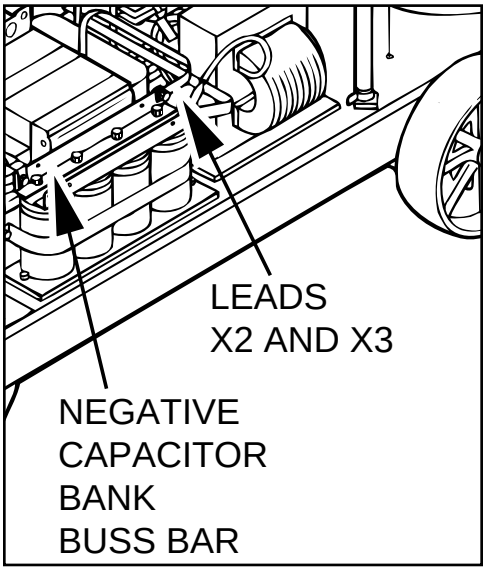

FIGURE F.3 - Location of Leads X2 and X3.

5. Separate leads X2 and X3 from the negative capacitor bank buss bar. Be sure there is no electrical contact. See Figure F.3.

STATIC SCR RECTIFIER ASSEMBLY TEST

NOTE: DO NOT DISASSEMBLE THE SCR RECTIFIER HEAT SINK ASSEMBLY.

6. Test for high or infinite resistance from the anode to the cathode of SCR 1. See Figure F.4. Use an analog ohmmeter (Multimeter).

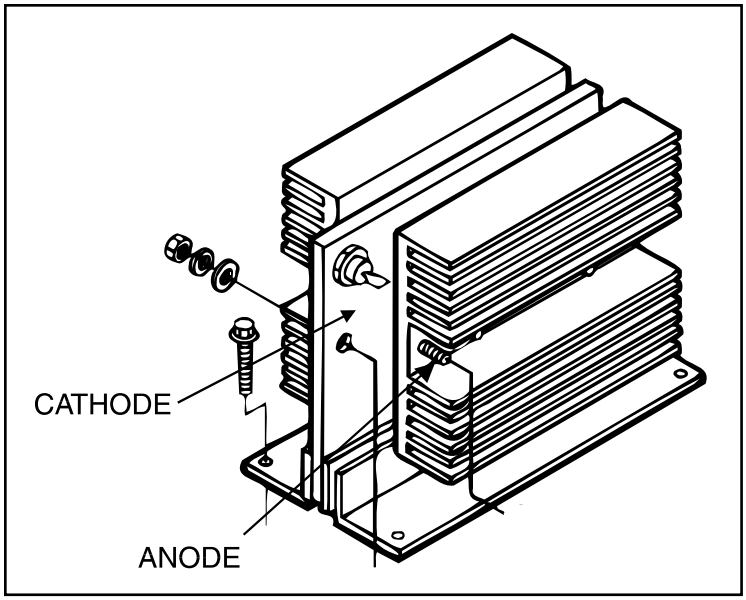

FIGURE F.4 - SCR 1 Test Points.

7. Test for high or infinite resistance from the cathode to the anode of SCR 1 by reversing the meter leads. See Figure F.4.

   a. If a high or infinite resistance is indicated for both tests 6 and 7, the SCR 1 is not “shorted”.

   b. If a low resistance is indicated in either tests 6 or 7, the SCR is faulty. Replace SCR Assembly.

8. Repeat Steps #7 to test SCR 2.

9. Reconnect leads X2 and X3.

10. Reconnect Plugs J3 and J6.

11. If this test did not identify the problem or to further test the SCR, go to the ***Active SCR Test.***

ACTIVE SCR RECTIFIER ASSEMBLY TEST

⚠ WARNING

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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 (216) 383-2531 or 1-888-935-3877.

TEST DESCRIPTION

The Active SCR Test will determine if the device is able to be gated ON and conduct current from anode to cathode.

MATERIALS NEEDED

An SCR Tester as specified in this procedure.
IDEALARC SP-250 wiring diagrams (See Electrical Diagrams Section of this Manual).
SCR Heat Sink Assembly Drawings

ACTIVE SCR RECTIFIER ASSEMBLY TEST

TEST PROCEDURE

1. Disconnect main AC input power to the machine.

2. Disconnect Molex Plugs J3 and J6 from the G2252 Control Board or remove Plug J3 from G1992 Control Board (Code 9402 only)
See Figures F.5A and F.5B.

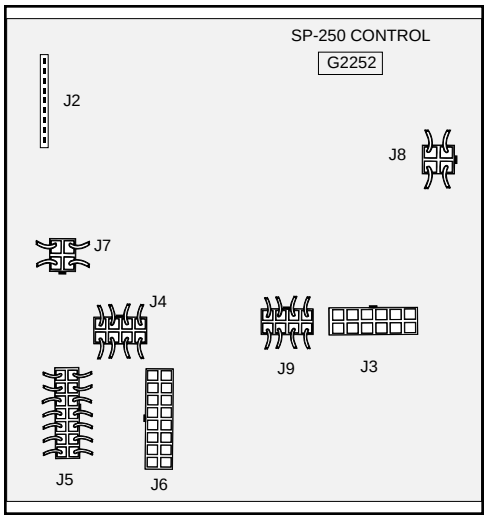


FIGURE F.5A - Control Board Molex Plug Locations for G2252 PC Control Board.

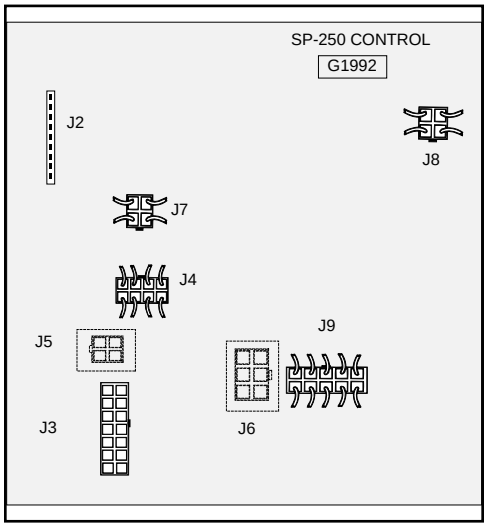


FIGURE F.5B - Control Board Molex Plug Locations for G1992 PC Control Board (Code 9402 only.)

3. Test with an Analog Volt-Ohm meter that capacitors have completely discharged.

4. Disconnect leads X2 and X3 from the negative capacitor bank using a fi" open end wrench.
See Figure F. 6.

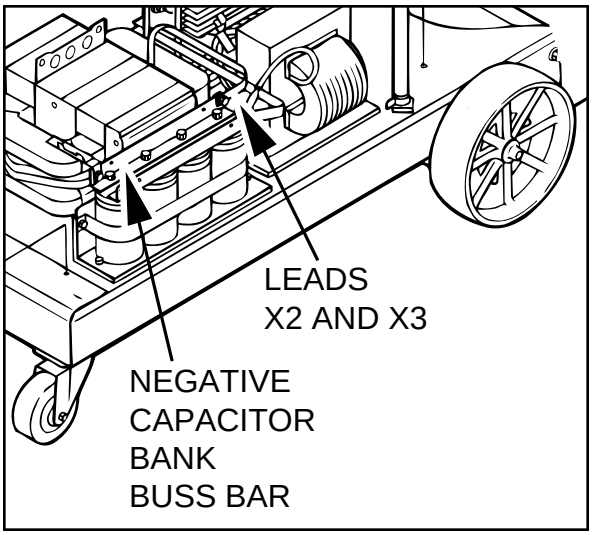


FIGURE F.6 - Location of Leads X2 and X3.

5. Separate leads X2 and X3 from the negative capacitor bank buss bar. Be sure there is no electrical contact. See Figure F6.

NOTE: DO NOT DISASSEMBLE THE SCR RECTIFIER HEAT SINK ASSEMBLY.

6. Construct the circuit shown in Figure F.8. One 6-volt lantern battery can be used. R1 and R2 resistor values are ±10%. Set voltmeter scale low, at approximately 0-5 volts or 5-10 volts.

   a. Test the voltage level of the battery. Short leads (A) and (C). Close switch SW-1. Battery voltage should be 4.5 volts or higher. If lower, replace the battery.

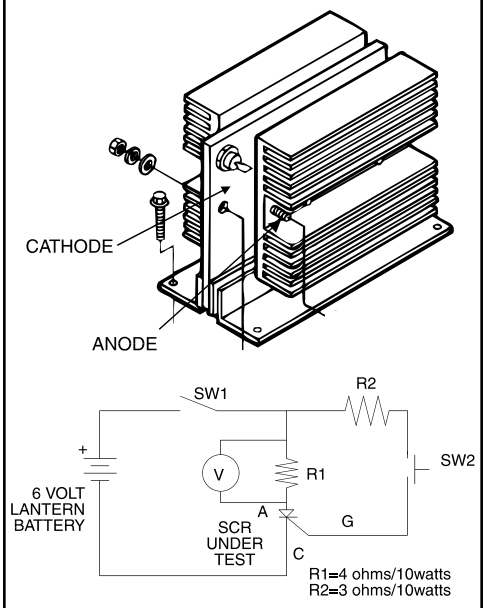
ACTIVE SCR RECTIFIER ASSEMBLY TEST

7. Connect the Tester to the SCR 1 as shown in Figure F.7.

   a. Connect Tester lead (A) to the anode.

   b. Connect Tester lead (C) to the cathode.

   c. Connect Tester lead (G) to the gate.



To test SCR's construct the circuit outlined above. Resistor values are plus or minus ten percent. The voltmeter scale should be low, approximately 0-5 or 0-10 volts DC.

FIGURE F.7 - SCR Tester Circuit and SCR connections.

8. Close switch SW-1.

NOTE: Switch SW-2 should be open.

9. Read meter for zero voltage.

   a. If the voltage reading is higher than zero, the SCR is shorted.

10. Close or keep closed switch SW-1

11. Close switch SW-2 for 2 seconds and release and read meter.

   a. If the voltage is 3 - 6 volts while the switch is closed and after the switch is open, the SCR is functioning.

   b. If the voltages is 3-6 volts only when the switch is closed or there is no voltage when the switch is closed, the SCR is defective.

NOTE: Be sure battery is functioning properly. A low battery can affect the results of the test. Repeat Battery Test Procedure in Step 6 if needed.

12. Open switch SW-1.

13. Reconnect the Tester leads. See Figure F.7.

   a. Connect Tester lead (A) to the cathode.

   b. Connect Tester lead (C) to the anode.

   c. Disconnect Test lead (G) from the gate.

14. Close switch SW-1.

15. Read meter for zero voltage.

   a. If the voltage is zero, the SCR is functioning.

   b. If the voltage is higher than zero, the SCR is shorted.

16. Perform the Active Test Procedure outlined in ***Steps 5-13*** for SCR 2.

17. Replace all SCR assemblies that do not pass the above tests.

18. Replace all Molex Plugs onto the Control Board and connect leads X2 and X3.

SP-250 KEYPAD RESISTANCE TEST

⚠ WARNING

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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 (216) 383-2531 or 1-888-935-3877.

TEST DESCRIPTION

This test will determine if any key is not functioning properly.

MATERIALS NEEDED

5/16" Nut Driver
Analog volt-ohmmeter

SP-250 KEYPAD RESISTANCE TEST

TEST PROCEDURE

1. Disconnect main input power to the machine.

2. Remove the Case Top and Side Panels using the 5/16" nut driver.

3. Locate and disconnect Plug J2 connected to the Control PC Board. See Figures F.8A and F8B.

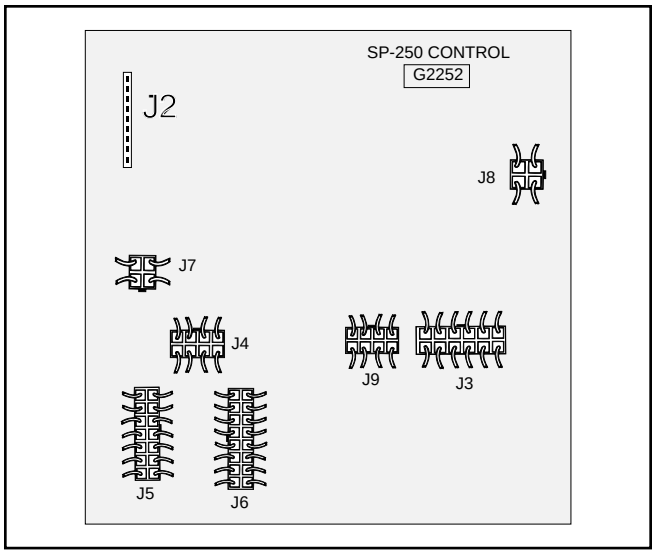

FIGURE F.8A - Plug J2 Location on G2252 PC Control Board.

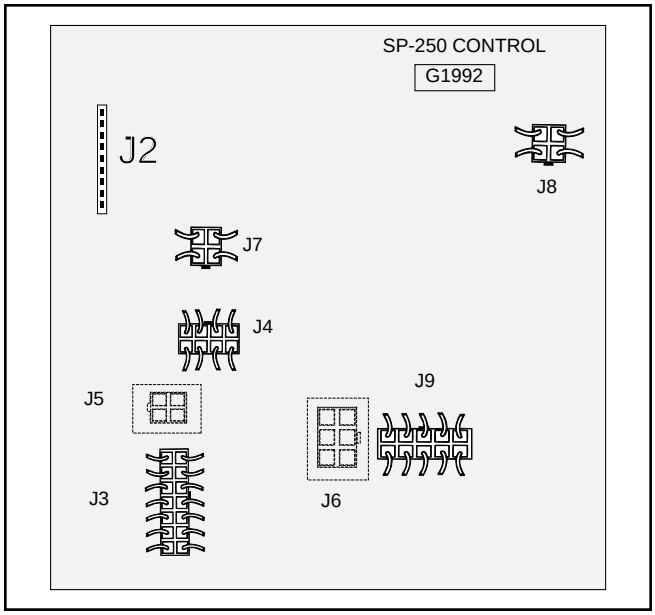

FIGURE F.8B - Plug J2 Location on G1992 PC Control Board (Code 9402 only).

4. Measure the resistance of each key at Plug J2 using an analog volt-ohm meter as described in ***Table F.1.***

   a. The resistance measurements are taken from the pin locations on Plug J2. See Figure F.9 for each pin location.

   b. If any of the resistance tests are not correct, the keypad may be faulty. Replace.

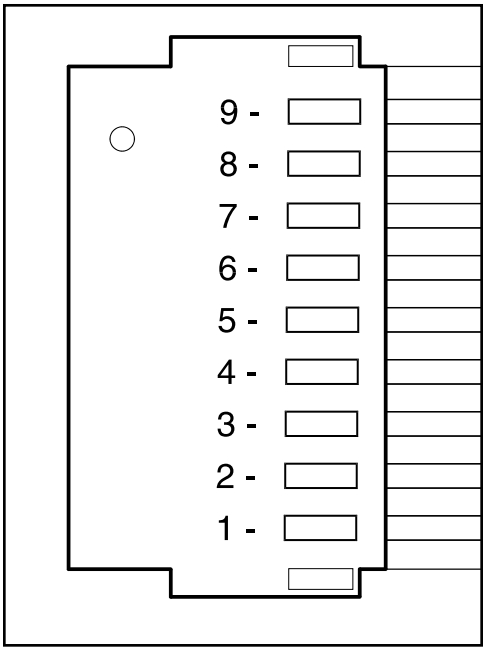

FIGURE F.9 - Plug J2 Test Points.

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SP-250 KEYPAD RESISTANCE TEST

TABLE F.1 - SP-250 KEYPAD RESISTANCE TESTS

NOTE: THERE SHOULD NOT BE CONTINUITY BETWEEN PINS UNTIL A KEY IS PRESSED ON THE KEYPAD.

TEST POINTS		KEY PRESSED	MAXIMUM ALLOWABLE RESISTANCE (TYPICAL RESISTANCE)
FROM PIN	TO PIN		
1J2	6J2	CENTER UP ARROW	100 OHMS (30 TYPICAL)
1J2	8J2	CENTER DOWN ARROW	100 OHMS (30 TYPICAL)
1J2	2J2	MEMORY 3	100 OHMS (30 TYPICAL)
1J2	4J2	SWITCH SET DISPLAY	100 OHMS (30 TYPICAL)
2J2	9J2	MEMORY 5	100 OHMS (30 TYPICAL)
2J2	7J2	MEMORY 4	100 OHMS (30 TYPICAL)
2J2	3J2	MEMORY 2	100 OHMS (30 TYPICAL)
2J2	5J2	MEMORY 1	100 OHMS (30 TYPICAL)
3J2	6J2	LEFT UP ARROW	100 OHMS (30 TYPICAL)
3J2	8J2	LEFT DOWN ARROW	100 OHMS (30 TYPICAL)
3J2	4J2	SPOT	100 OHMS (30 TYPICAL)
4J2	9J2	TOGGLE	100 OHMS (30 TYPICAL)
4J2	7J2	IMP VOLTS	100 OHMS (30 TYPICAL)
4J2	5J2	TIMERS OFF	100 OHMS (30 TYPICAL)
5J2	6J2	AUTO	100 OHMS (30 TYPICAL)
5J2	8J2	PROCESS WIRE/GAS	100 OHMS (30 TYPICAL)
6J2	9J2	MANUAL	100 OHMS (30 TYPICAL)
6J2	7J2	RIGHT UP ARROW	100 OHMS (30 TYPICAL)
7J2	8J2	RIGHT DOWN ARROW	100 OHMS (30 TYPICAL)
8J2	9J2	SAVE	100 OHMS (30 TYPICAL)

WIRE DRIVE MOTOR AND TACHOMETER FEEDBACK TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the wire drive motor and voltage feedback circuit are functioning properly.

MATERIALS NEEDED

5/16" Nut Driver
Volt-Ohmmeter

WIRE DRIVE MOTOR AND TACHOMETER FEEDBACK TEST

TEST 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. Remove the Case Top and Side Panels using a 5/16" nut driver.

3. Locate Plug J5 on the G2252 Control Board, or Plug J6 on the G1992 Control Board (Code 9402 only).. See Figures F.10A and ***F.10B.***

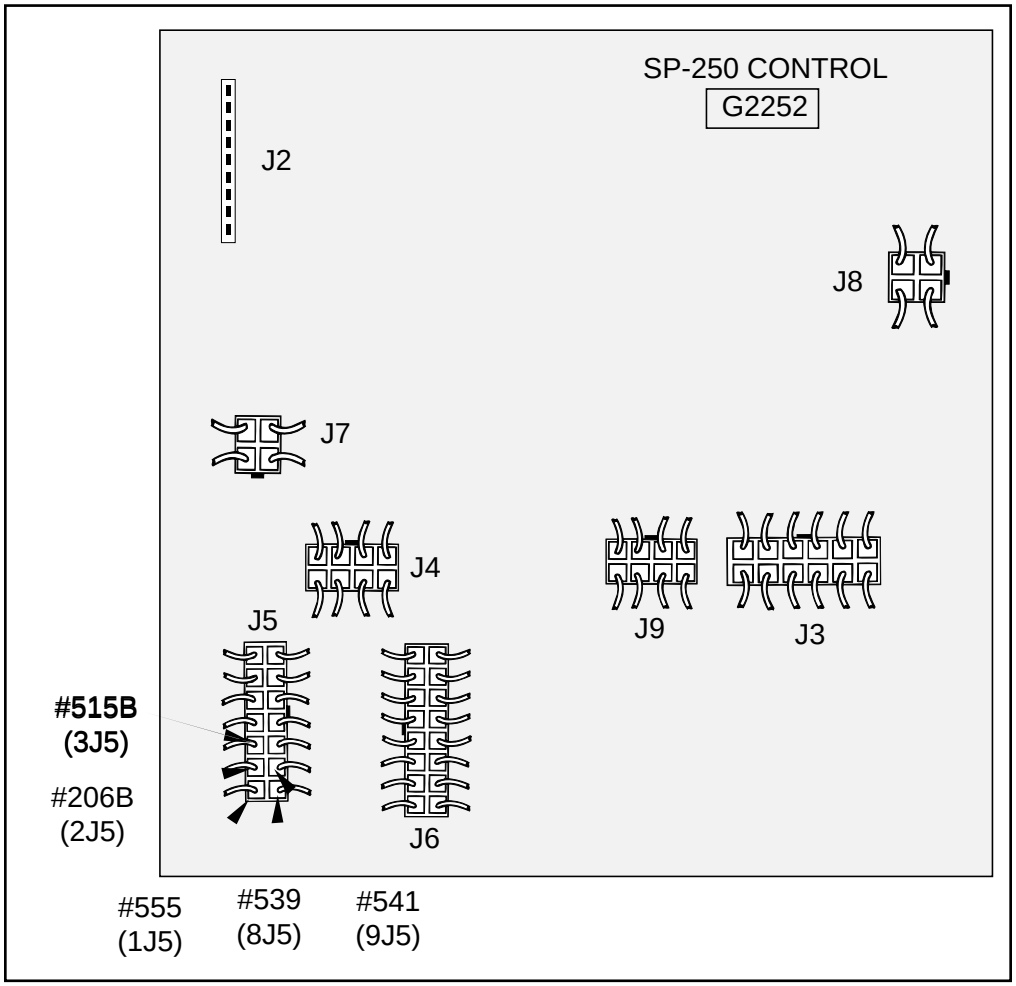

FIGURE F.10A - Plug J5 Location on G2252 PC Control Board.

WIRE DRIVE MOTOR AND TACHOMETER FEEDBACK TEST

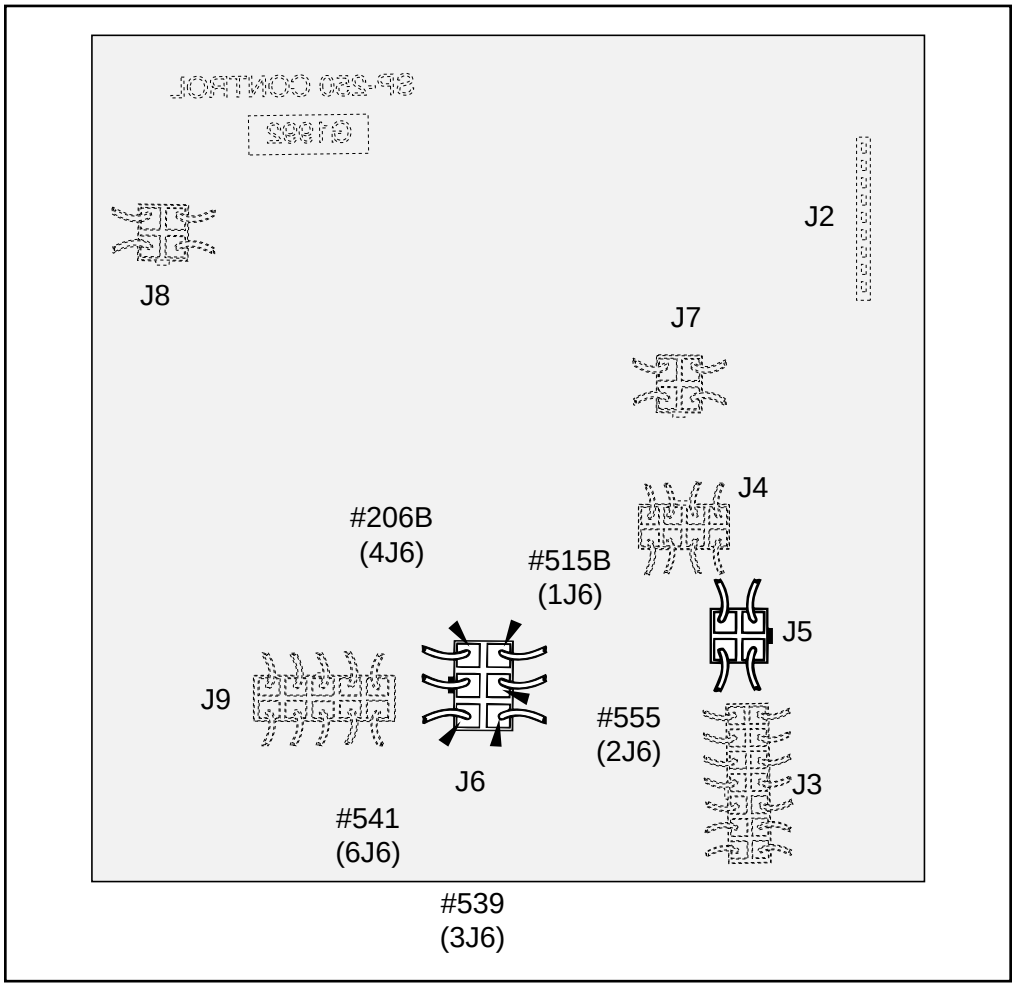

FIGURE F.10B - Plug J6 Location on G1992 PC Control Board (Code 9402 only.) NOTE: Plugs J5 and J6 are on the inboard non-component side of the Control Board.

4. Test for 2-25 VDC between lead #539 (positive) and lead #541 (negative) to determine if the correct armature voltage is being supplied. See ***Figure F.10A*** or F.10B.

   a. Insert probes in to the Molex pin cavities.

5. Pull the gun trigger.

6. Read meter. Normal DC volts is from 2 - 25 VDC. VDC varies depending on wire feed speed.

   a. If voltage to the wire drive motor armature is zero, check the wires between Plug J5 (J6 on Code 9402) and the wire drive motor.

   b. If the wires are okay and voltage to the drive motor armature is zero, the Control Board may be faulty. Replace.

   c. If the correct DC armature voltage is present at the wire drive motor, the motor or motor brushes may be faulty. Test and/or replace.

   d. If the motor is running at high speed and the armature voltage is high and uncontrollable, proceed with the tachometer test.

WIRE DRIVE MOTOR AND TACHOMETER FEEDBACK TEST

Test for Supply Voltage to Tachometer

1. Test for 15 VDC between lead #515B (positive) and lead #206B (negative). See ***Figure F. 10*** for pin locations.

    a. Insert probes into Molex pin cavities.

2. Pull gun trigger.

3. Read meter for 15 VDC.

    a. If the 15 VDC is present, check the leads to the tach circuit.

    b. If the leads are okay and 15 VDC is present, the correct voltage is being received from the Control Board. Go to Feedback Test.

    c. If the 15 VDC is not present and the leads are okay, the Control Board may be faulty. Replace.

Test for Feedback Voltage to the Control Board

1. Test for 1.5 - 3.5 VDC between lead #555 (positive) and lead #206B (negative). See ***Figure F.10*** for pin locations.

    a. Insert probes into Molex pin cavities.

2. Pull gun trigger.

3. Read meter for 1.5 - 3.5 VDC.

    a. If the 1.5 - 3.5 VDC is present, the tach circuit is sending the correct feedback signal to the Control Board.

NOTE: IF THE MOTOR IS NOT RUNNING, THE FEEDBACK VOLTAGE MAY BE FROM 0 TO 5 VDC.

    b. If the 1.5 - 3.5 VDC is not present or not correct, the Control Board is not receiving the proper feedback voltage from the tach circuit. Check the leads from the tach circuit to the Control Board for loose or broken connections.

    c. If the leads are okay, the Control Board may be faulty. Replace.

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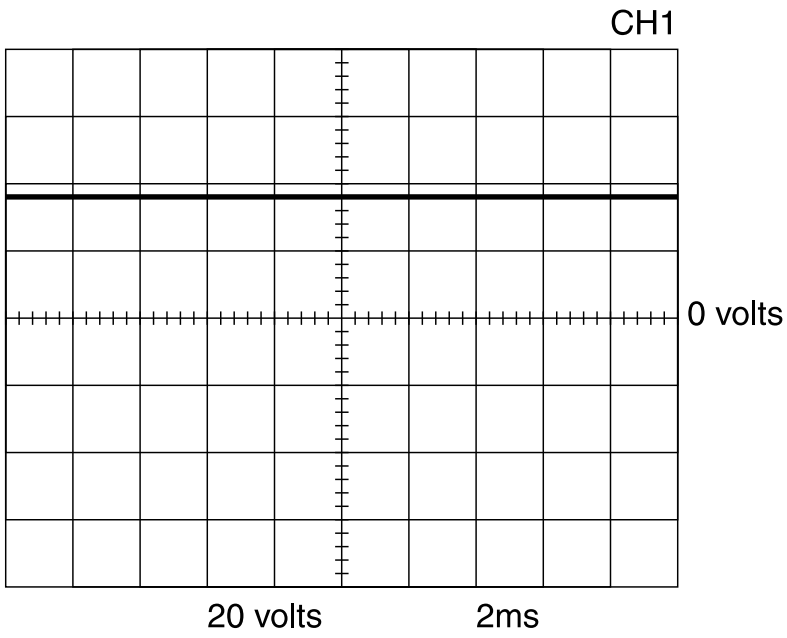
NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM



SCOPE SETTINGS

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 2 milliseconds in time. Note: Scope probes connected at machine output terminals: (+) probe to electrode, (-) probe to work.	Volts/Div . . . . . .20 V/Div. Horizontal Sweep . . . . . .2 ms/Div. Coupling . . . . . .DC. Trigger . . . . . .Internal.

Return to Section TOC
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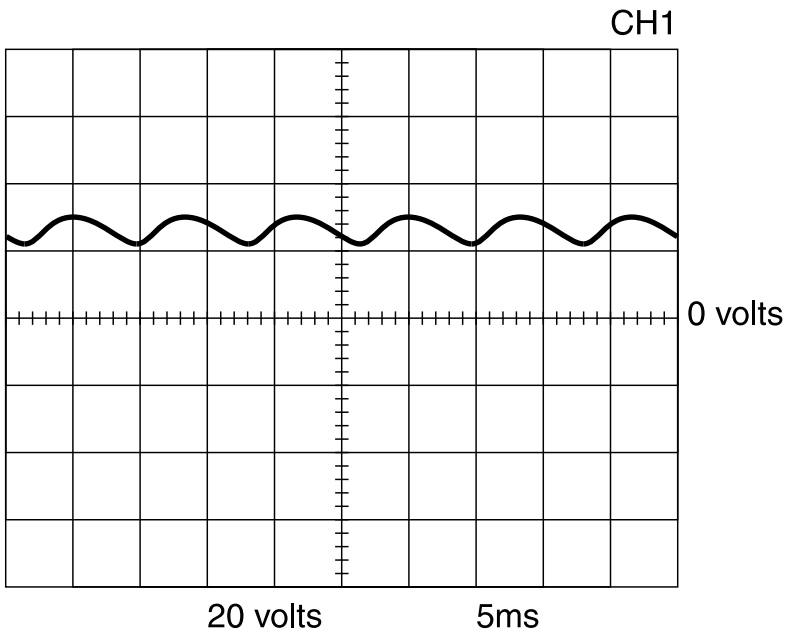
TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED



MACHINE LOADED TO 250 AMPS AT 26 VDC

SCOPE SETTINGS

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

Return to Section TOC
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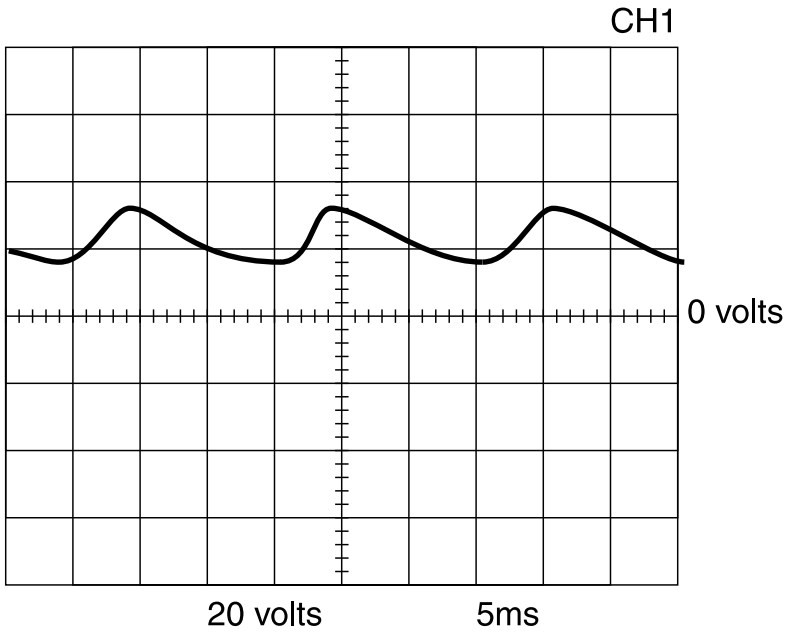
ABNORMAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED ONE OUTPUT SCR NOT FUNCTIONING



MACHINE LOADED TO 220 AMPS AT 22 VDC

SCOPE SETTINGS

This is NOT a typical DC output voltage waveform. One output SCR is not functioning. Note the increased ripple content. One SCR gate was disconnected to simulate an open or non-functioning output SCR. 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.	Volts/Div . . . . . .20 V/Div. Horizontal Sweep . . . . . .5 ms/Div. Coupling . . . . . .DC. Trigger . . . . . .Internal.

Return to Section TOC
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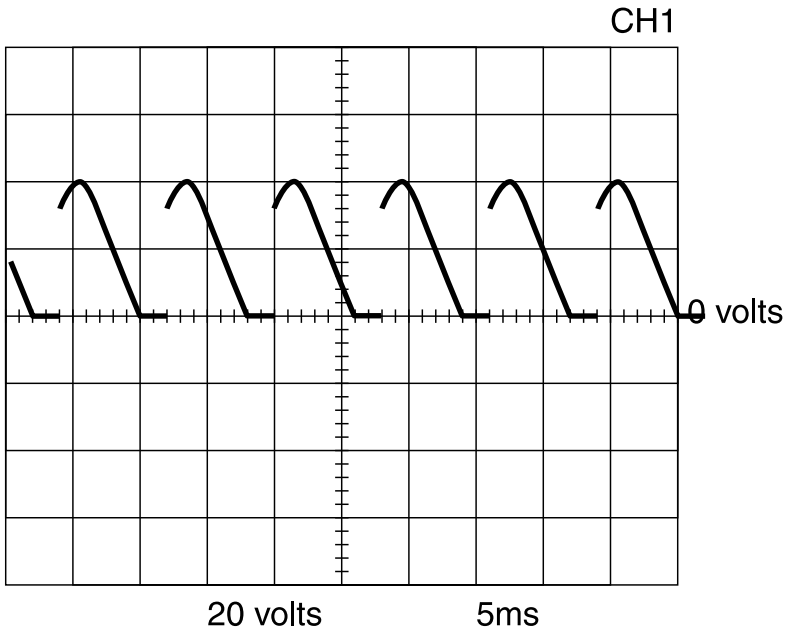
ABNORMAL OPEN CIRCUIT VOLTAGE OUTPUT CAPACITOR BANK NOT FUNCTIONING



SCOPE SETTINGS

This is NOT the 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.	Volts/Div . . . . . .20 V/Div. Horizontal Sweep . . . . . .5 ms/Div. Coupling . . . . . .DC. Trigger . . . . . .Internal.

Return to Section TOC
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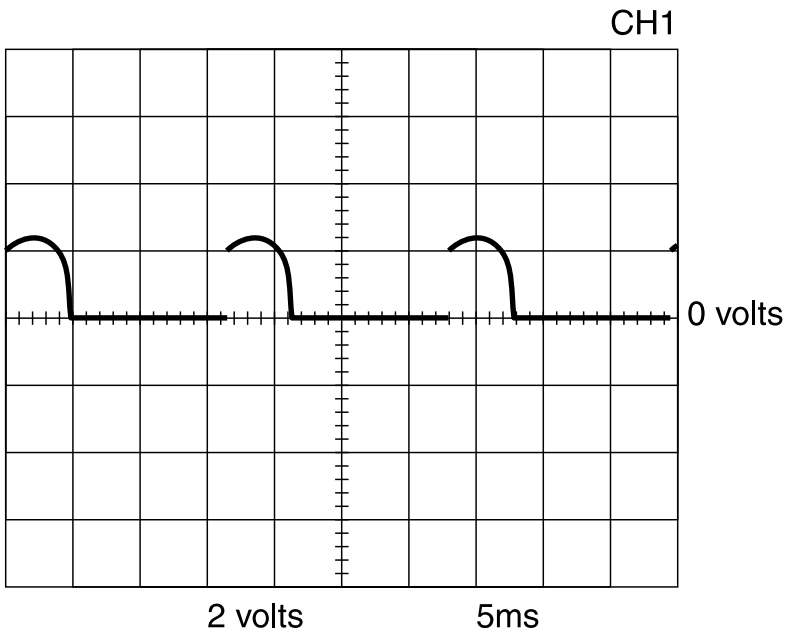
TYPICAL SCR GATE VOLTAGE WAVEFORM



SCOPE SETTINGS

This is a typical SCR gate pulse voltage waveform. The machine was in an open circuit condition (no load) and operating properly. Note that each vertical division represents 2 volts and each horizontal division represents 5 milliseconds in time. Note: Scope probes connected at Plug J3 on the control board. The (+) probe to lead G2, and the (-) probe to lead 204.	Volts/Div . . . . . .2 V/Div. Horizontal Sweep . . . . . .5 ms/Div. Coupling . . . . . .DC. Trigger . . . . . .Internal.

CONTROL PC BOARD REMOVAL AND REPLACEMENT

⚠ CAUTION

Printed Circuit Boards can be damaged by static electricity. Follow static handling guidelines detailed in "PC Board Troubleshooting Procedures" at the beginning of this chapter.

REMOVAL AND REPLACEMENT PROCEDURE

MATERIALS NEEDED

5/16" Nut Driver
Phillips Head Screwdriver
Static Electricity Grounding Strap

1. Disconnect main input power the machine.

2. Remove the Case Top and Side Panels using 5/16" nut driver.

3. Disconnect all wiring harness plugs and Molex Plugs connected to the Control Board. See Figure F.11.

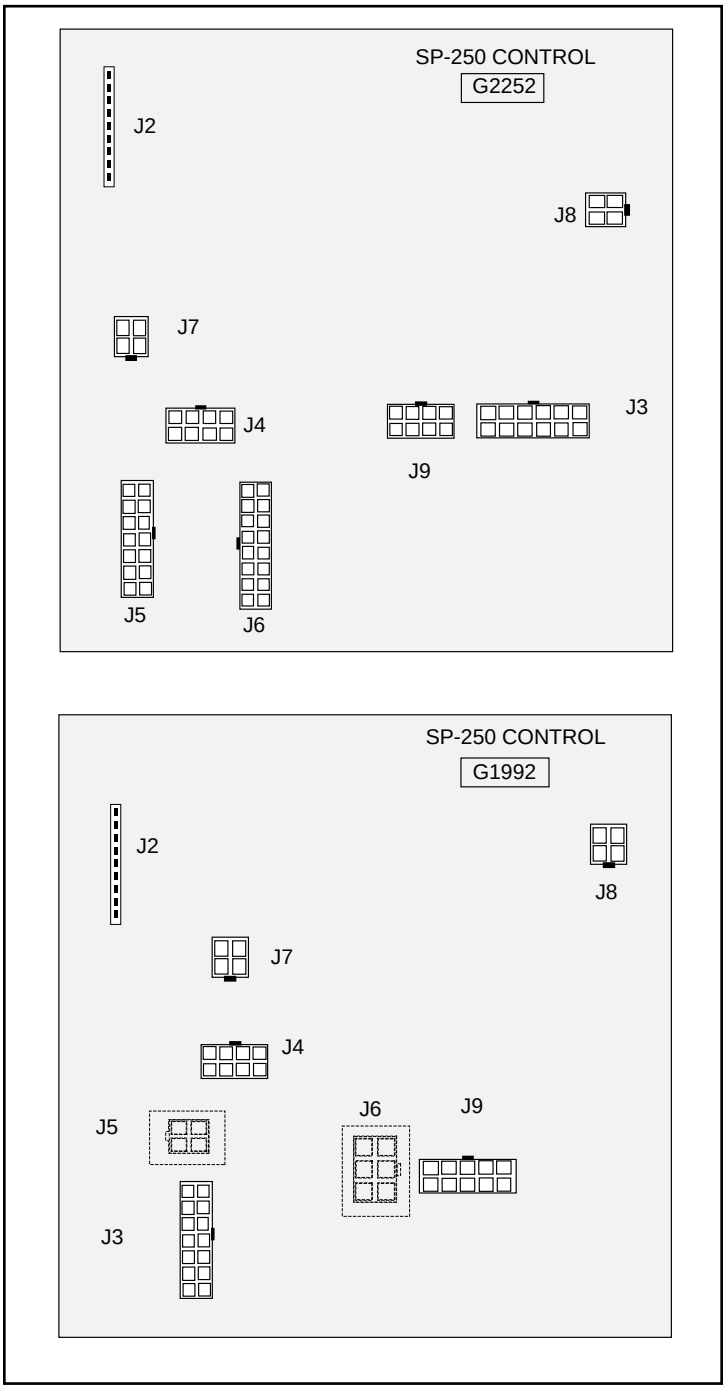


FIGURE F.11 - Wiring Harness and Molex Plug Locations.

CONTROL PC BOARD REMOVAL AND REPLACEMENT

4. Remove the eight Phillips Head mounting screws using a Phillips Head screwdriver. See Figure F.12.

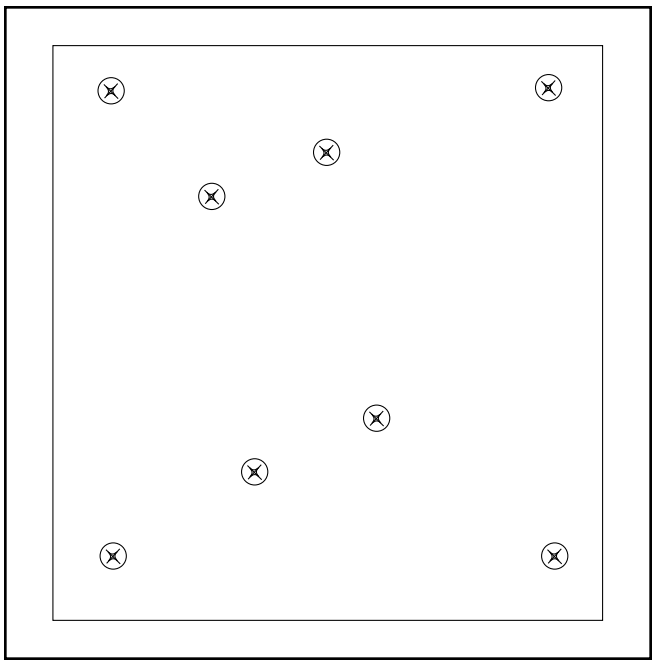


FIGURE F.12 - Control Board Mounting Screw Locations may vary with different Code Machines.

5. Lift the Control Board straight up and out from the machine.

6. Replace all mounting screws and wiring connections when installing the Control Board.

KEYPAD REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

MATERIALS NEEDED

5/16" Nut Driver
1/4" Nut Driver

KEYPAD REMOVAL AND REPLACEMENT

PROCEDURE

NOTE: BEFORE REMOVING THE KEYPAD, PERFORM THE KEYPAD RESISTANCE TEST TO BE SURE THE KEYPAD IS FAULTY.

1. Disconnect main input power to the machine.

2. Remove the Case Top and Side Panels with 5/16" nut driver.

3. Disconnect Keypad Plug J2 from the Control Panel.

4. Remove the two screws holding the POWER SWITCH and bezel using a 1/4" nut driver.

5. Grasp the upper right hand corner of the Keyboard and peel it off the front panel.

   a. The back of the Keypad is an adhesive material that bonds the Keypad to the Front Panel.

6. Install a new Keypad.

   a. Remove the paper backing from the new Keypad to uncover the adhesive backing.

   b. Install the new Keypad by carefully pressing the Keypad to the Front Panel. Be sure to smooth out any air bubbles that become trapped under the Keypad.

WIRE DRIVE ASSEMBLY REMOVAL AND REPLACEMENT

⚠ WARNING

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Call (216) 383-2531 or 1-888-935-3877.

MATERIALS NEEDED

Large slot head screwdriver
5/16" Nut Driver
Small slot head screwdriver

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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

1. Disconnect main input power to the machine.

2. Remove the Case Top and Side Panels.

3. Remove the large mounting screw with a large slot head screwdriver located in front of the drive roll. See Figure F.13.

   a. Note the placement of the insulators and washers for replacement.

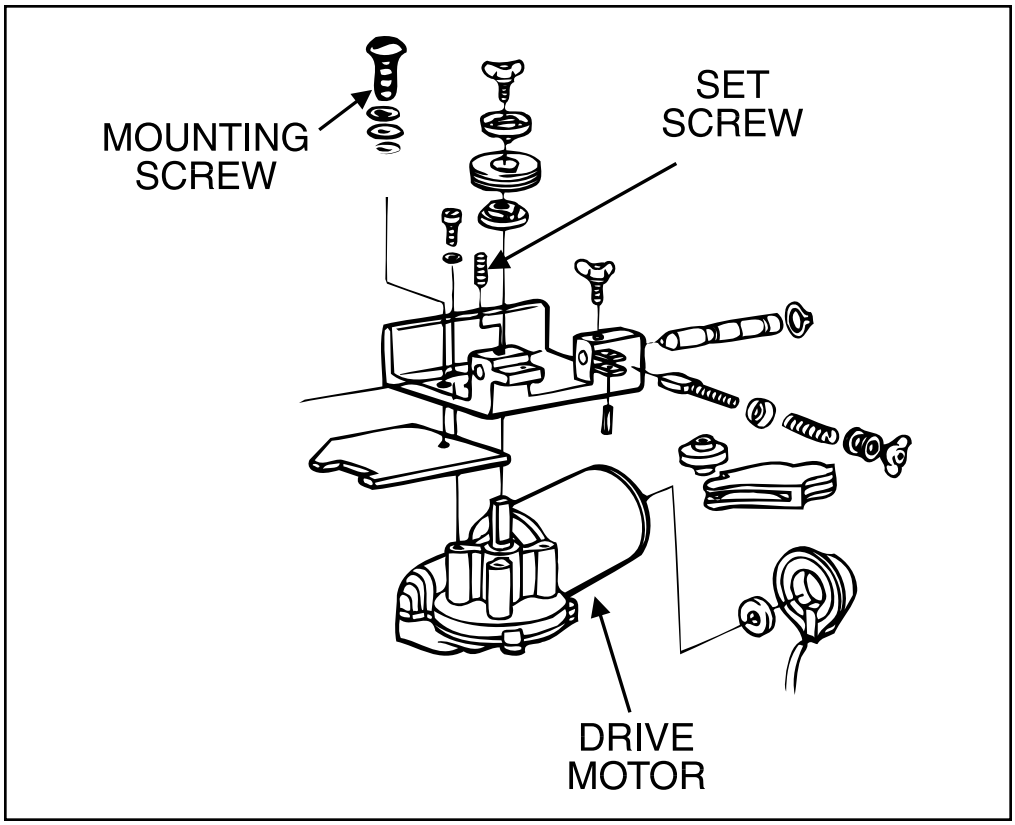

FIGURE F.13 - Wire Drive Assembly Removal

4. Using a small slot head screw driver, loosen the set screw holding the out going guide tube into the drive roll assembly. Carefully slide out the wire drive assembly.

5. Disconnect the six pin plug from the vertical baffle connector.

   a. The six pin plug contains the wire feed drive motor wires.

6. Remove carefully the drive motor and drive roll assembly.

SCR OUTPUT RECTIFIER REMOVAL

⚠ WARNING

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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 (216) 383-2531 or 1-888-935-3877.

MATERIALS NEEDED

5/16" Nut Driver
1/2" Open End Wrench
1/2" Socket wrench, universal tool, and extension
3/8" Open End Wrench
Slot head screwdriver
Wire cutters

SCR OUTPUT RECTIFIER REMOVAL

PROCEDURE

1. Disconnect lead #208 and Transformer Lead X1 from the heat sink on the left side of the machine (facing the front) using a 1/2" socket wrench. See Figure F.14.

   a. Thin lead is always on the outboard side of the connection.

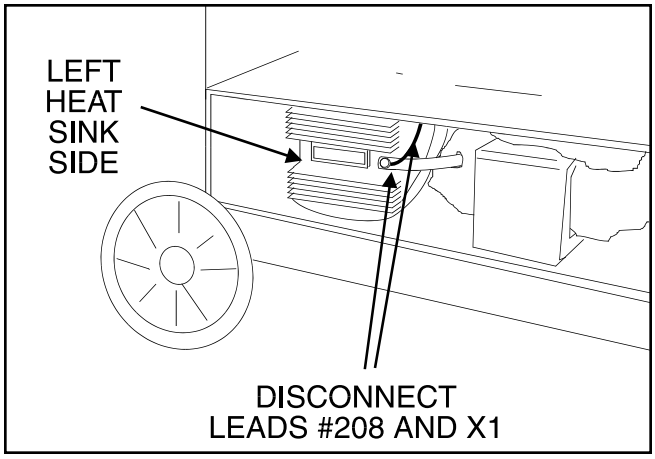

FIGURE F.14 - Heat Sink lead disconnection.

2. Disconnect lead #204 and heavy lead from the middle heat sink with a 1/2" socket wrench and 1/2" open end wrench. See Figure F. 15.

3. Remove the diode lead from the negative capacitor band buss bar on the right side of the machine using a slot head screwdriver and 3/8" open end wrench.

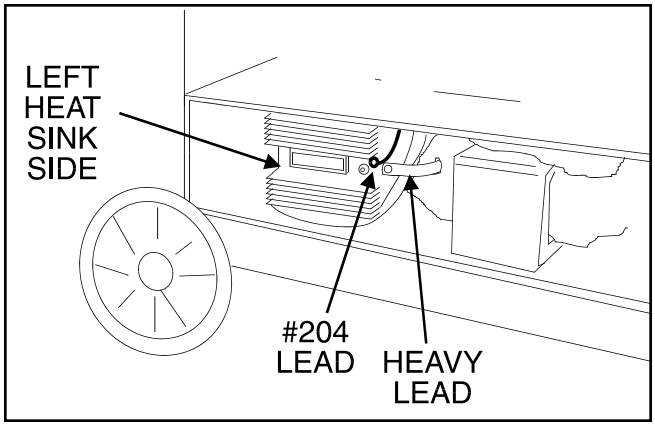

FIGURE F.15 - Heat Sink lead disconnection.

4. Cut the SCR gate leads G1 and G2 (see wire markers and wiring diagram) using wire cutters.

   a. The easiest access to these leads is from the right side of the machine.

   b. Cut any necessary cable ties.

5. Remove the four screws holding the SCR Assembly to the floor of the machine using a 5/16" nut driver.

6. Pivot the SCR Assembly counterclockwise to provide access to the right side heat sink. See Figure F.16.

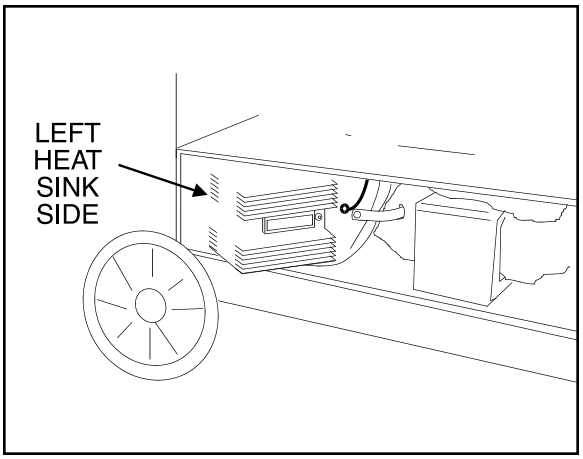

FIGURE F.16 - Heat Sink Lead Disconnection

7. Remove lead #209 and Transformer Lead X4 from the right side heat sink using a 1/2" socket wrench and 1/2" open end wrench.

8. Clear the leads and carefully remove the SCR Rectifier Assembly.

NOTE: When installing the SCR Rectifier Assembly, apply a thin coating of Dow Corning #340 Compound to the electrical connections.

CAPACITOR BANK REMOVAL AND REPLACEMENT

⚠ WARNING

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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 (216) 383-2531 or 1-888-935-3877.

⚠ WARNING

THE LIQUID ELECTROLYTE IN THE CAPACITORS IS TOXIC. DO NOT TOUCH THE CAPACITORS WITH ANY PART OF YOUR BODY.

MATERIALS NEEDED

5/16" Nut driver
5/16" socket wrench, extension, and universal tool
1/2" Open end wrench
3/8" open end wrench
Slot head screwdriver
Wiring diagram

CAPACITOR BANK REMOVAL AND REPLACEMENT

PROCEDURE

See Figure F.17 for location of Capacitor Bank Removal and Replacement components.

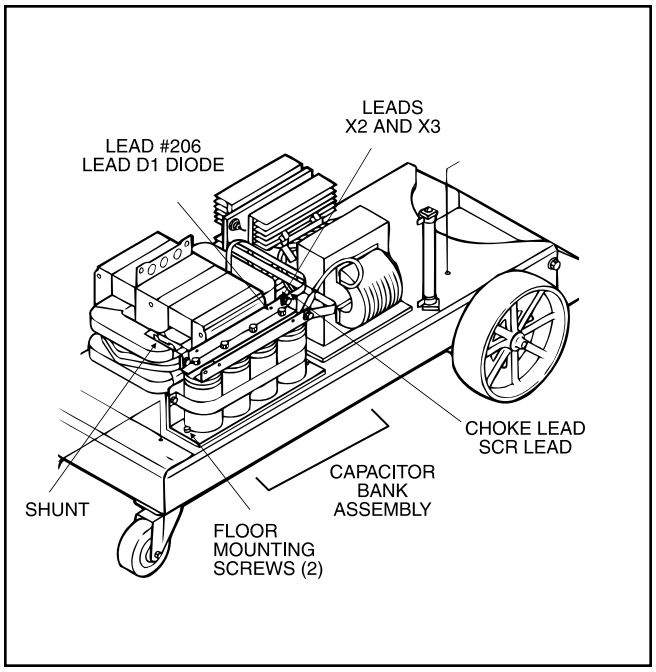

FIGURE F.17 - Location of Capacitor Bank Removal and Replacement Components

1. Disconnect main input power to the machine.

2. Test that the capacitors are discharged using a volt ohmmeter. Polarity must be observed.

3. Remove the two transformer secondary leads (X2 and X3) for the negative capacitor bank buss bar using two fi" open end wrenches.

4. Remove the output choke lead and the heavy lead extending from the SCR Rectifier Assembly to the positive capacitor bank buss bar using a fi" open end wrench.

5. Remove lead #206 and the D1 diode lead from the negative capacitor bank buss bar using a slot head screwdriver and 3/8" open end wrench.

6. Remove the #204 lead from the positive buss bar.

7. Remove the shunt from the negative capacitor bank buss bar using a 1/2" socket wrench with a universal tool adapter.

   a. Two people may be required to remove the shunt. One person may have to reach through from the left side of the machine to keep the bolt in position while the other person loosens the nut.

   b. There is no shunt on machine code 9402.

8. Remove the two screws holding the capacitor bank to the floor of the machine using a 5/16" nut driver.

9. Clear the leads and carefully remove the capacitor bank assembly from the machine.

MAIN TRANSFORMER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

MATERIALS NEEDED

5/16" Nut Driver
1/2" Open end wrench
3/8" Open end wrench
1/2" Socket wrench, extender, universal adapter
Wire cutters

MAIN TRANSFORMER REMOVAL AND REPLACEMENT

PROCEDURE

1. Disconnect main input power to the machine.
2. Remove the Case Top and Side Panels.
3. Perform the Capacitor Bank Removal Procedure.
4. Remove lead X1 from the left side SCR heat sink assembly using a 1/2" socket wrench, extender and universal adapter.
5. Remove lead X4 from the right side heat sink assembly using a 1/2" socket wrench, extender and universal adapter.
6. Disconnect all leads from the reconnect panel using a 3/8" open end wrench.
7. Disconnect all leads from the POWER SWITCH.
8. Remove the POWER SWITCH.
9. Label and cut leads #202, #203, #204A.
   a. Cut lead #204A at a point just in front of the transformer.
   b. These leads must be re-spliced during reassembly.
   c. An alternative to cutting these leads is to remove them from Molex Plug J3 and pull them free of any wire bundles.
10. Remove all cable ties, wire mounts, - and any harness tape that could get in the way during transformer removal using wire cutters and screwdriver.
11. Remove the four screws mounting the transformer to the floor of the machine using a 5/16" nut driver.
12. Disconnect the positive output lead at the wire drive motor.
13. Remove the strain relief grommet through which the positive output lead passes through the horizontal baffle of the machine.
14. Pull down on the positive output lead until it slides out the hole in the baffle.
15. Carefully remove the main transformer.
    a. Be sure all leads are clear.

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FAN MOTOR AND FAN REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment could result in danger to the technician or the 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 tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed.
Call (216) 383-2531 or 1-888-935-3877.

MATERIALS NEEDED

3/4" Open end wrench
1/2" Socket wrench with extension
Phillips head screwdriver

FAN MOTOR AND FAN REMOVAL AND REPLACEMENT

PROCEDURE

See Figure F.18 for fan motor and fan removal components.

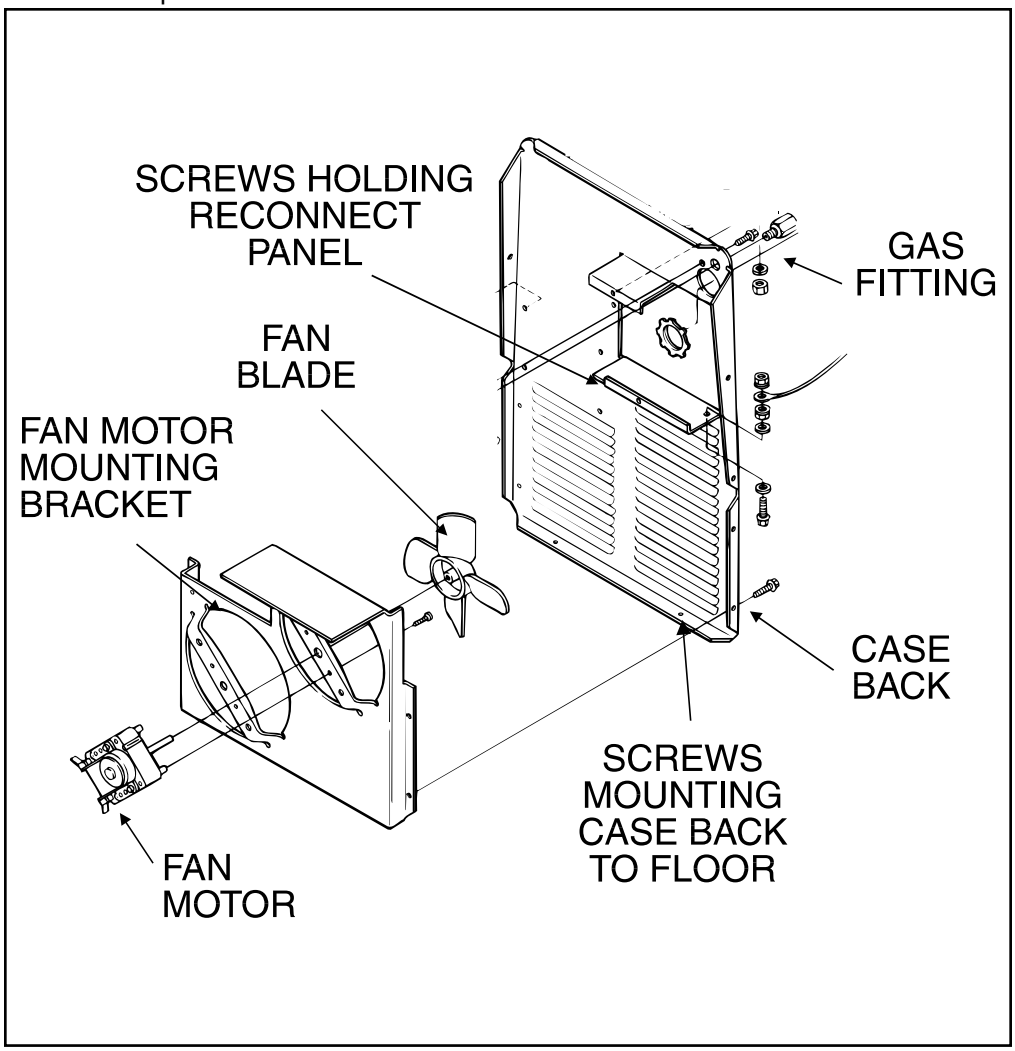

FIGURE F.18 - Fan Motor and Fan Removal Components

1. Remove the Case Back screws.

2. Remove the gas solenoid using a 3/4" open end wrench.

3. Using a 5/16” wrench, remove the 5 screws holding the fan motor mounting bracket to the case back.

4. Tilt the Case Back away from the machine and remove the screws holding the Case Back to the floor of the machine using a 1/2" socket wrench with extension.

5. Loosen the two screws holding the reconnect panel in place and a slide the reconnect panel from the frame.

6. Remove the fan blade. Note fan blade position on motor shaft for reference for replacing fan.

   a. Pry the fan blade off the motor.

   b. Slide the fan blade off the motor shaft.

FAN MOTOR AND FAN REMOVAL AND REPLACEMENT

7. Remove the fan motor.

   a. Loosen and remove the two screws from the motor mounting bracket using a slot head screw driver.

   b. When the motor is free from the mounting bracket, place it carefully on the bottom of the machine.

   c. Cut any necessary wire wraps bundling the motor leads.

   d. Remove the leads from the fan motor.

8. Install the replacement motor in the reverse order of removal.

9. Install the fan blade. When installing the fan blade, the blade is flush with the end of the motor shaft.

   a. Spin the fan to be sure it is free to rotate.

10. Reassemble the remaining components in reverse order of removal.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
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	6.4	375

OPEN CIRCUIT VOLTAGE

10 to 40 VDC	35-40 VDC Strike Voltage

WIRE SPEED RANGE

50 - 600 IPM (1.27 - 15.2 m/minute)

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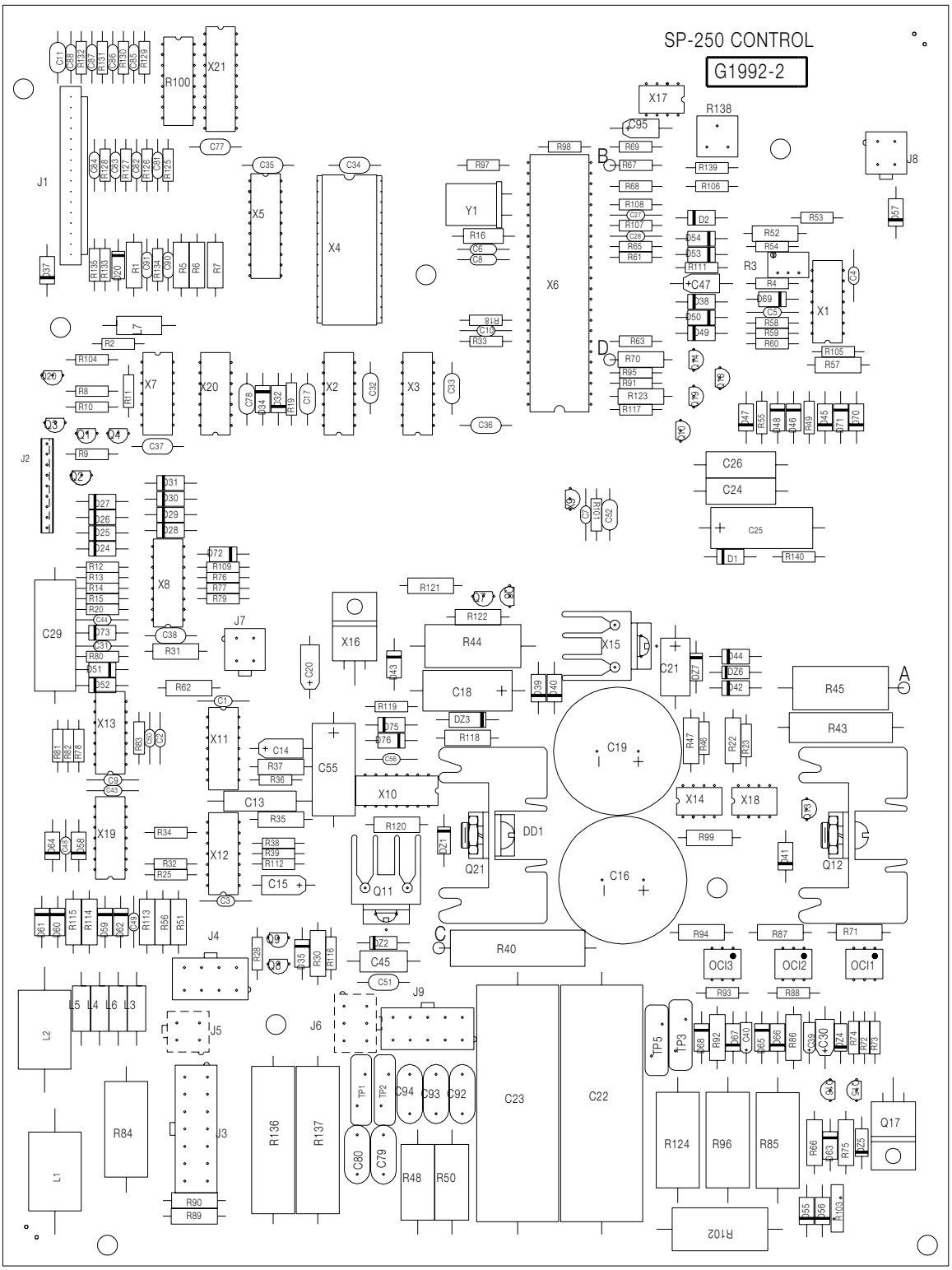
Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

G1992 CONTROL PC BOARD



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

G1992 CONTROL PC BOARD

Item	Identification
C45	CAPACITOR-PEMF,.047,100V,10%
C21	CAPACITOR-TAEL,39,20V,10%
C16	CAPACITOR-ALEL,2200,63V,+30/-10%
C30,C47,C95	CAPACITOR-TAEL,4.7,35V,10%
C15	CAPACITOR-TAEL,39,10V,10%
C14,C20	CAPACITOR-TAEL,18,15V,10%
C39,C40	CAPACITOR-TAEL,1.0,35V,10%
C25	CAPACITOR-ALEL,6,150V,+50/-10%
C55	CAPACITOR-ALEL,20,50V,+75/-10%
C13	CAPACITOR-PEF,.001,400V,10%
C18	CAPACITOR-ALEL,50,25V,+75/-10%
C24,C26	.27/50
C19	CAPACITOR-ALEL,3300,50V,+30/-10%
OCI2,OCI3	OPTOCOUPLER-PHOTO-SCR,400V,MCS2401
OCI1	OPTOCOUPLER-PHOTO-Q,30V,4N35
X10	IC-CMOS,INVERTER,SCHMITT,HEX,4584
X14,X17,X18	IC-VOLTREF,ADJ,PRECISION,431I
X16	IC-VOLTREG,FIXED,3-T,(-),1A,5V
R3	TRIMMER-MT,1/2W,10K,10%,LINEAR
R100	RESISTOR-NETWORK,100,8-RESISTOR
C6,C8	CAPACITOR-CEMO,22P,100V,5%
C11,C32,C33,C34, C35,C36,C37,C38,C51,C52,C77,C78	CAPACITOR-CEMO,0.1,50V,10%
C81,C82,C83,C846, C85,C8,C87,C88,C90,C91	CAPACITOR-CEMO,100P,100V,5%
C17	CAPACITOR-CEMO,2700P,50V,5%
C1,C2,C3,C4,C5,C7, C9,C10,C27,C28,C31,C43,C44,C48,C49,C50,C56	CAPACITOR-CEMO,.022,50V,20%
J2	CONNECTOR,PCB,WW,MALE,DIL,1X9
Q12	HEATSINK ASBLY
DD1	MULTIPLE DIODE & HEAT SINK ASBLY
J9	CONNECTOR,MOLEX,MINI,PCB,10-PIN
J3	CONNECTOR,MOLEX,MINI,PCB,14-PIN
J5,J7,J8	CONNECTOR,MOLEX,MINI,PCB,4-PIN
J6	CONNECTOR,MOLEX,MINI,PCB,6-PIN
J4	CONNECTOR,MOLEX,MINI,PCB,8-PIN
R103	THERMISTOR-PTC,.02-0.47 OHMS,0.90A
X15	POS VOLTAGE REG & HEAT SINK ASBLY
Q11	TRANSISTOR & HEAT SINK ASBLY
J1	CONNECTOR,PCB,WW,VERTICAL,16-PIN
R138	TRIMMER-ST,1/2W,1K,10%,LINEAR
C29	CAPACITOR-PEF,0.22,100V,10%
C22,C23	CAPACITOR-PPEF,0.68,400V,10%,RIGID
C79,C80,C92, C93,C94	CAPACITOR-CD,.0047/.005,1400V,20%
D1,D2,D24,D25,D26,D27, D28,D29,D30,D31,D32,D34,D35,D37,D38,D39,D40,D41, D42,D43,D44,D45,D46,D47,D48,D49,D50,D51,D52,D53, D54,D55,D56,D57,D63,D65,D66,D67,D68,D69,D70,D71, D72,D73,D75,D76	DIODE-AXLDS,1A,400V
D58,D59,D60,D61,D62,D64	DIODE-AXLDS,1A,1000V
L3,L4,L5,L6,L7	CHOKE-330UH,10%,110MA,MOLDED
L1,L2	CHOKE-390UH,5%,225MA,CONFORMAL
R40	RESISTOR-WW,7W,0.25,1%
DZ5	ZENER DIODE-1W,16V,5%,1N4745A
DZ4	ZENER DIODE-1W,15V,5%,1N4744A
DZ3	ZENER DIODE-5W,10V,5%,1N5347B
DZ7	ZENER DIODE-1W,6.2V,5%,1N4735A
DZ1,DZ2,DZ6	ZENER DIODE-1W,18V,5%,1N4746A
Q9,Q16	TRANSISTOR-P,T226,0.2A,30V,2N4125
Q17	TRANSISTOR-NMF,T220,15A,60V,15N06E
D20	DIODE-AXLDS,1A,30V,SCHOTTKY
R66	RESISTOR-MF,1/2W,1K,2%
R35	RESISTOR-MF,1/2W,2.7K,2%
R87,R94	RESISTOR-MF,1/2W,330,2%
R123	RESISTOR-MF,1/2W,6.8K,2%
R22,R70	RESISTOR-MF,1/2W,3.9K,2%
R47	RESISTOR-MF,1/2W,3K,2%
R121	RESISTOR-MF,1/2W,27K,2%
R5,R6,R7,R30,R75,R99, R113,R114,R115,R120	RESISTOR-MF,1/2W,100,2%
R37,R122	RESISTOR-MF,1/2W,750,2%
R52,R57	RESISTOR-MF,1/2W,1.8K,2%
R118	RESISTOR-MF,1/2W,68,2%
R89,R90	RESISTOR-MF,1/2W,270,2%
R31	RESISTOR-MF,1/2W,1.5K,2%
R62	RESISTOR-MF,1/2W,10K,2%
R1	RESISTOR-MF,1/2W,18K,2%
R86,R92	RESISTOR-MF,1/2W,15,2%
R51,R56	RESISTOR-MF,1/2W,56K,2%
R71	RESISTOR-MF,1/2W,470,2%
R48,R50	RESISTOR-CC,2W,10,10%
R43	RESISTOR-WW,5W,3.3K,5%
TP3,TP5	MOV-50VRMS,15J,14MM
TP1,TP2	MOV-75VRMS,22J,14MM
R106	RESISTOR-MF 102K 1/4W
R49,R55,R67,R69,R139	RESISTOR-MF 10K 1/4W

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G1992 CONTROL PC BOARD

2/95

Item	Identification
R16	RESISTOR-CC,1/2W,10M,5%
R32,R54,R119	RESISTOR-MF 22K 1/4W
R60,R81,R82,R83,R91,R95	RESISTOR-MF 2.2K 1/4W
R2,R116	RESISTOR-MF 330 1/4W
R61,R107,R108	RESISTOR-MF 100 1/4W
R112	RESISTOR-MF 270 1/4W
R34,R117,R125,R126,R127, R128,R129,R130,R131,R132,R133,R134,R135	RESISTOR-MF 3.3K 1/4W
R18,R19,R20,R33,R109	RESISTOR-MF 4.7K 1/4W
R25,R28,R74	RESISTOR-MF 5.6K 1/4W
R23,R38,R53,R58,R59,R68, R105	RESISTOR-MF 6.8K 1/4W
R8,R9,R10,R11,R63,R65, R76,R77,R78,R79,R88,R93,R97,R98,R104,R111,R140	RESISTOR-MF 10K 1/4W
R80	RESISTOR-MF 33K 1/4W
R73	RESISTOR-MF 100K 1/4W
R4	RESISTOR-MF 2.7K 1/4W
R39	RESISTOR-MF 47K 1/4W
R36,R46	RESISTOR-MF 15K 1/4W
R12,R13,R14,R15,R72,R101	RESISTOR-MF 1K 1/4W
R44,R84	RESISTOR-WW,5W,1K,5%,SQ
R45,R85,R96	RESISTOR-WW,5W,50,5%,SQ
R102,R124	RESISTOR-WW,5W,20,5%,SQ
R136,R137	RESISTOR-WW,7W,0.25,5%
X6	IC-CMOS,MCU,NO-ROM,DIP,68HC11A1P
X9	IC-CMOS,UNDERVOLT-SENSING,RESET,MCU
X12	IC-CMOS,SWITCH,ANALOG,QUAD,4066
X1	IC-OP-AMP,QUAD,GEN-PURPOSE,224N
Y1	CRYSTAL-QUARTZ,4.000MHZ
X3	IC-CMOS,GATE,NAND,2-INPUT,QUAD,HC00
X5	IC-CMOS,LATCH,3-STATE,OCTAL,HC373A
X2,X20	IC-CMOS,INVERTER,SCHMITT,HEX,HC14A
X7	IC-CMOS,REGISTER,SHFT,SI/PO,8-BIT
X11,X13,X19	IC-COMPARATOR,QUAD,2901N
X8	IC-CMOS REGISTER,SHFT,S-PI/SO,8-BIT
X21	IC-CMOS,TRNSCVR,BUS,3-STATE,OCTAL
Q1,Q2,Q3,Q4,Q6, Q8,Q10,Q14,Q15,Q18,Q19,Q20	TRANSISTOR-N,T226,0.2A,30V,2N4123
Q7,Q13	TRANSISTOR-N,T226,0.5A,300V,MPS-A42

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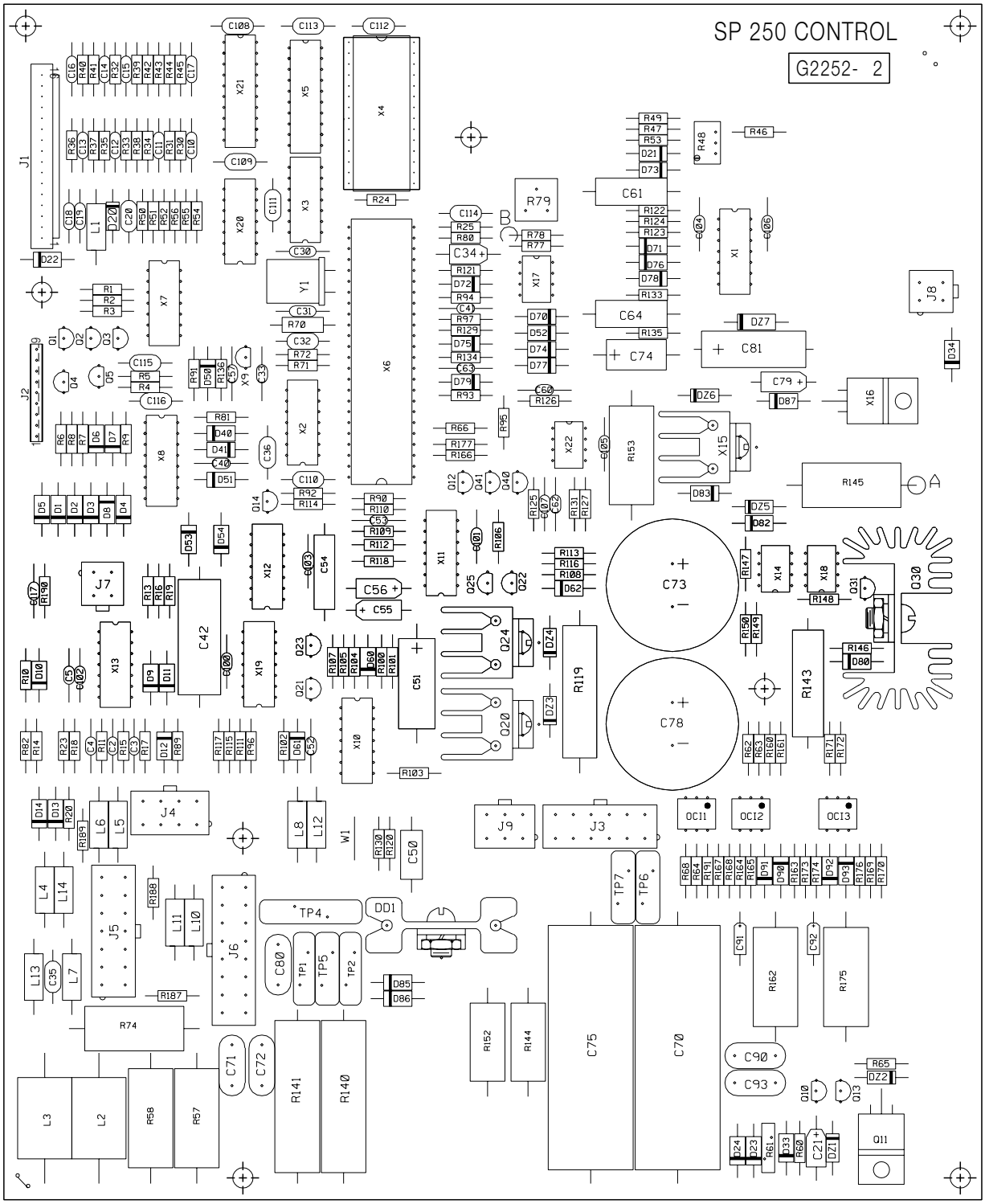
NOTES

G2252 CONTROL PC BOARD



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G2252 CONTROL PC BOARD

Item	Identification
W1	.20 AWG UNINSULATED JUMPER
C81	CAPACITOR-ALEL,50,25V,+75/-10%
X10	IC-CMOS,INVERTER,SCHMITT,HEX,4584
X16	.VOLTAGE REGULATOR
R48	TRIMMER-MT,1/2W,10K,10%,LINEAR
C30,C31	CAPACITOR-CEMO,22P,100V,5%
C10,C11,C12, C13,C14,C15,C16,C17,C18,C19	CAPACITOR-CEMO,100P,100V,5%
C36	CAPACITOR-CEMO,2700P,50V,5%
C2,C3,C4,C5,C33, C40,C41,C52,C53,C57,C60,C62,C63,C100,C101,C102, C103,C104,C105,C106,C107,C117	CAPACITOR-CEMO,.022,50V,20%
J2	CONNECTOR,PCB,WW,MALE,DIL,1X9
Q30	HEAT SINK ASBLY
DD1	DIODE & HEAT SINK ASBLY
J7,J8	CONNECTOR,MOLEX,MINI,PCB,4-PIN
J9	CONNECTOR,MOLEX,MINI,PCB,6-PIN
J4	CONNECTOR,MOLEX,MINI,PCB,8-PIN
R61	THERMISTOR-PTC,.02-0.47 OHMS,0.90A
X15	POS VOLTAGE REG & HEAT SINK ASBLY
Q24	TRANSISTOR & HEAT SINK ASBLY
Q20	TRANSISTOR & HEATSINK ASBLY
D1,D2,D3,D4,D5,D6,D7,D8, D21,D22,D23,D24,D33,D34,D40,D41,D50,D51,D52,D53, D54,D60,D61,D62,D70,D71,D72,D73,D74,D75,D76,D77, D78,D79,D80,D82,D83,D85,D86,D87,D90,D91,D92,D93	DIODE-AXLDS,1A,400V
D9,D10,D11,D12,D13,D14	DIODE-AXLDS,1A,1000V
L1,L4,L5,L6,L7,L8, L10,L11,L12,L13,L14	CHOKE-330UH,10%,110MA,MOLDED
L2,L3	CHOKE-390UH,5%,225MA,CONFORMAL
R143	RESISTOR-WW,5W,3.3K,5%
TP1,TP2	MOV-75VRMS,22J,14MM
R70	RESISTOR-CC,1/2W,10M,5%
R140,R141	RESISTOR-WW,7W,0.25,5%,SQ
C21,C34	CAPACITOR-TAEL,4.7,35V,10%
C56	CAPACITOR-TAEL,39,10V,10%
C55,C79	CAPACITOR-TAEL,18,15V,10%
C91,C92	CAPACITOR-TAEL,1.0,35V,10%
C51	CAPACITOR-ALEL,20,50V,+75/-10%
C54	CAPACITOR-PEF,.001,400V,10%
C61,C64	CAPACITOR-PCF,0.27,50V,20%
C73	CAPACITOR-ALEL,3300,50V,+30/-10%
X14,X17,X18	IC-VOLT REF,ADJ,PRECISION,431I
X22	IC-OP-AMP,SINGLE,PRECISION,OP-27GZ
C20,C35,C108, C109,C110,C111,C112,C113,C114,C115,C116	.CAPACITOR-CEMO, 0.1, 50V, 10%
J3	CONNECTOR,MOLEX,MINI,PCB,12-PIN
J5	CONNECTOR,MOLEX,MINI,PCB,14-PIN
J6	CONNECTOR,MOLEX,MINI,PCB,16-PIN
J1	CONNECTOR,PCB,WW,VERTICAL,16-PIN
R79	TRIMMER-ST,1/2W,1K,10%,LINEAR
C42	CAPACITOR-PEF,0.22,100V,10%
C70,C75	CAPACITOR-PPEF,0.68,400V,10%,RIGID
C71,C72,C80, C90,C93	CAPACITOR-CD,.0047/.005,1400V,20%
R119	RESISTOR-WW,7W,0.25,1%
DZ2	ZENER DIODE-1W,16V,5%,1N4745A
DZ1	ZENER DIODE-1W,15V,5%,1N4744A
DZ7	ZENER DIODE-5W,10V,5%,1N5347B
DZ6	ZENER DIODE-1W,6.2V,5%,1N4735A
DZ3,DZ4,DZ5	ZENER DIODE-1W,18V,5%,1N4746A
Q11	TRANSISTOR-NMF,T220,15A,60V,15N06E
D20	DIODE-AXLDS,1A,30V,SCHOTTKY
R144,R152	RESISTOR-CC,2W,10,10%
TP5	MOV-130VRMS,38J,14MM
TP6,TP7	MOV-50VRMS,15J,14MM
TP4	MOV-150VRMS,80J,20MM
R74,R153	RESISTOR-WW,5W,1K,5%,SQ
R145,R162,R175	RESISTOR-WW,5W,50,5%,SQ
R57,R58	RESISTOR-WW,5W,20,5%,SQ
C50	CAPACITOR-PEMF,.047,100V,10%
C74	CAPACITOR-TAEL,39,20V,10%
C78	CAPACITOR-ALEL,2200,63V,+30/-10%
R14,R17,R20,R30,R31,R32, R41,R42,R43,R44,R45,R54,R55,R56,R65,R94, R103,R108,R121,R129,R148,R192,R193	RESISTOR-MF,1/4W,100,1%
R6,R7,R8,R9,R60,R62, R63,R64,R72,R163,R176	RESISTOR-MF,1/4W,1.00K,1%
R1,R2,R3,R4,R5,R13, R16,R19,R24,R25,R78,R80,R93,R96,R124,R134	RESISTOR-MF,1/4W,10.0K,1%

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G2252 CONTROL PC BOARD

Item	Identification
R97,R110,R160,R161, R171,R172,R188,R189	RESISTOR-MF,1/4W,1.50K,1%
R23,R115,R147,R187	RESISTOR-MF,1/4W,15.0K,1%
R95	RESISTOR-MF,1/4W,16.5K,1%
R11,R15,R18,R166,R177	RESISTOR-MF,1/4W,2.21K,1%
R46,R47,R102,R111	RESISTOR-MF,1/4W,22.1K,1%
R118	RESISTOR-MF,1/4W,267,1%
R114	RESISTOR-MF,1/4W,2.67K,1%
R105	RESISTOR-MF,1/4W,26.7K,1%
R165,R170	RESISTOR-MF,1/4W,26.7,1%
R120,R123,R130,R135	RESISTOR-MF,1/4W,28.0K,1%
R150	RESISTOR-MF,1/4W,3.01K,1%
R49,R82	RESISTOR-MF,1/4W,332,1%
R33,R34,R35,R36,R37, R38,R39,R40,R50,R51,R52,R53,R92,R112	RESISTOR-MF,1/4W,3.32K,1%
R100,R101,R164,R169	RESISTOR-MF,1/4W,33.2,1%
R66,R146	RESISTOR-MF,1/4W,3.92K,1%
R89	RESISTOR-MF,1/4W,475,1%
R71,R81,R90,R91, R136,R190	RESISTOR-MF,1/4W,4.75K,1%
R116	RESISTOR-MF,1/4W,47.5K,1%
R125,R127	RESISTOR-MF,1/4W,511,1%
R126,R131	RESISTOR-MF,1/4W,51.1K,1%
R167,R168,R173,R174	RESISTOR-MF,1/4W,562,1%
R10,R68,R104,R106	RESISTOR-MF,1/4W,5.62K,1%
R77,R109,R113,R122, R133,R149	RESISTOR-MF,1/4W,6.81K,1%
R107,R117	RESISTOR-MF,1/4W,750,1%
X6	IC-CMOS,MCU,NO-ROM,DIP,68HC11A1P
X9	IC-CMOS,UNDERVOLT-SENSING,RESET,MCU
X12	IC-CMOS,SWITCH,ANALOG,QUAD,4066
X1	IC-OP-AMP,QUAD,GEN-PURPOSE,224N
X3	IC-CMOS,GATE,NAND,2-INPUT,QUAD,HC00
X5	IC-CMOS,LATCH,3-STATE,OCTAL,HC373A
X2,X20	IC-CMOS,INVERTER,SCHMITT,HEX,HC14A
X7	IC-CMOS,REGISTER,SHFT,SI/PO,8-BIT
OCI1	OPTOCOUPLER-PHOTO-Q,70V,CNY17-3
X11,X13,X19	IC-COMPARATOR,QUAD,2901N
X8	IC-CMOS REGISTER,SHFT,S-PI/SO,8-BIT
X21	IC-CMOS,TRNSCVR,BUS,3-STATE,OCTAL
Q21,Q31	TRANSISTOR-N,T226,0.5A,300V,MPS-A42
Q1,Q2,Q3,Q4,Q5, Q10,Q12,Q14,Q22,Q23,Q40,Q41	TRANSISTOR-N,T226,0.5A,40V,2N4401
Q13,Q25	TRANSISTOR-P,T226,0.5A,40V,2N4403
R191	RESISTOR-MF,1/4W,475K,1%
Y1	CRYSTAL-QUARTZ,4.000MHZ
OCI2,OCI3	OPTOCOUPLER TRIAC DRIVER
SCR1,SCR2	4 A. 400 VOLT. SCR

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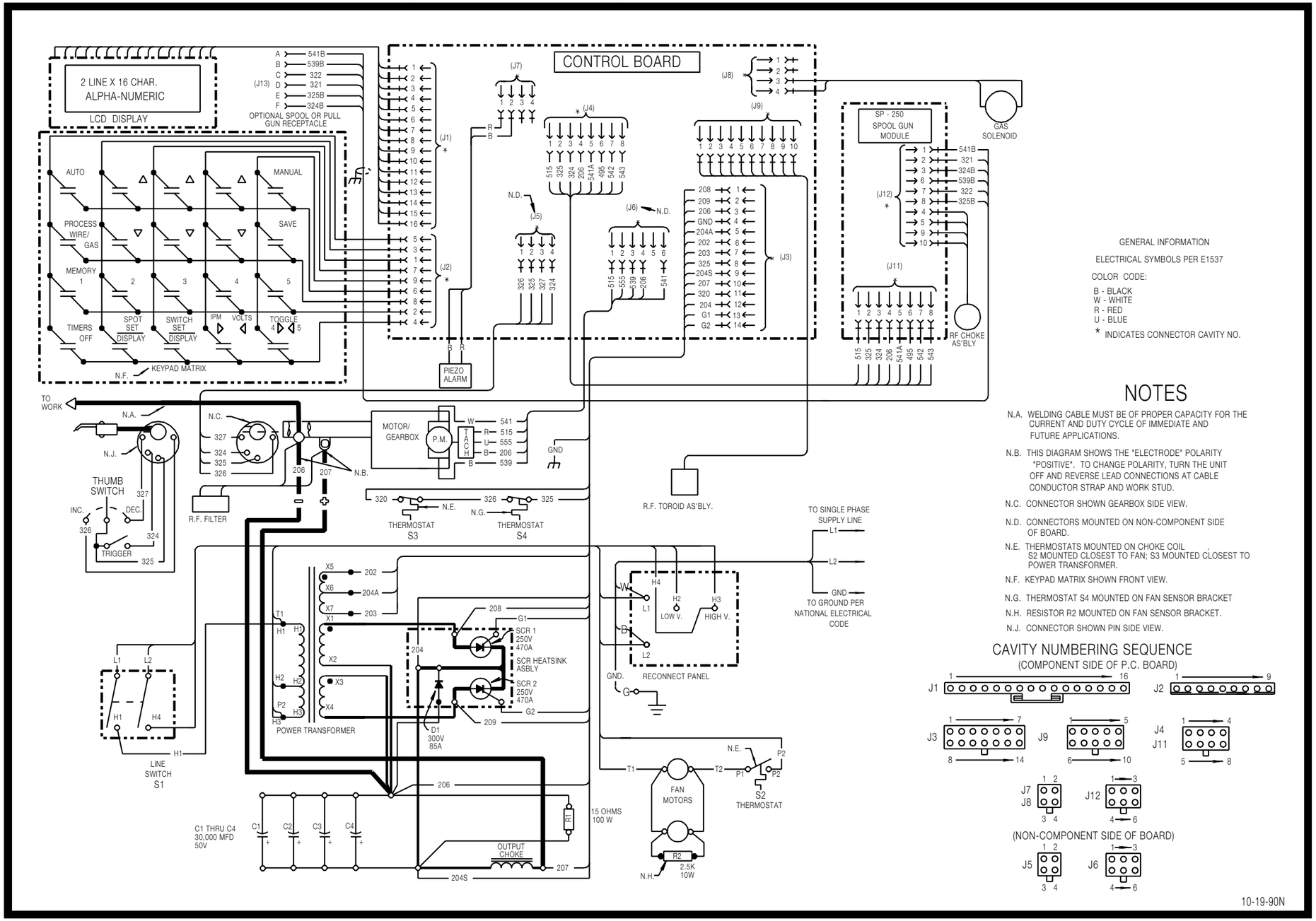
NOTES

WIRING DIAGRAM FOR CODE 9402

SP-250 (DUAL VOLTAGE) - WIRING DIAGRAM



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537

COLOR CODE:

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

* INDICATES CONNECTOR CAVITY NO.

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.

N.C. CONNECTOR SHOWN GEARBOX SIDE VIEW.

N.D. CONNECTORS MOUNTED ON NON-COMPONENT SIDE OF BOARD.

N.E. THERMOSTATS MOUNTED ON CHOKE COIL . S2 MOUNTED CLOSEST TO FAN; S3 MOUNTED CLOSEST TO POWER TRANSFORMER.

N.F. KEYPAD MATRIX SHOWN FRONT VIEW.

N.G. THERMOSTAT S4 MOUNTED ON FAN SENSOR BRACKET

N.H. RESISTOR R2 MOUNTED ON FAN SENSOR BRACKET.

N.J. CONNECTOR SHOWN PIN SIDE VIEW.

CAVITY NUMBERING SEQUENCE

(COMPONENT SIDE OF P.C. BOARD)

(NON-COMPONENT SIDE OF BOARD)

10-19-90N

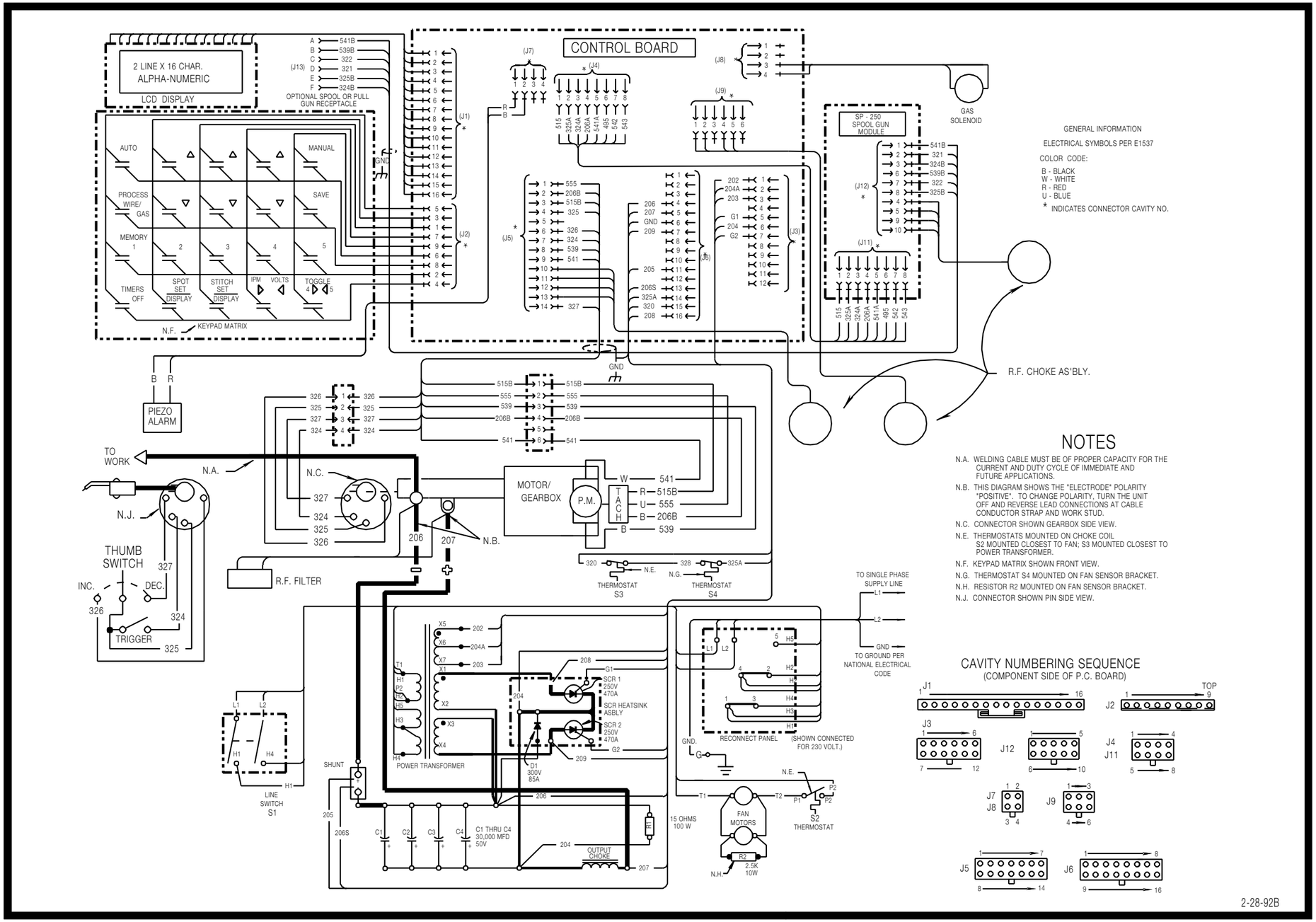
L7976

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

Return to Section TOC
Return to Master TOC

WIRING DIAGRAM FOR CODE 9546 & 10002

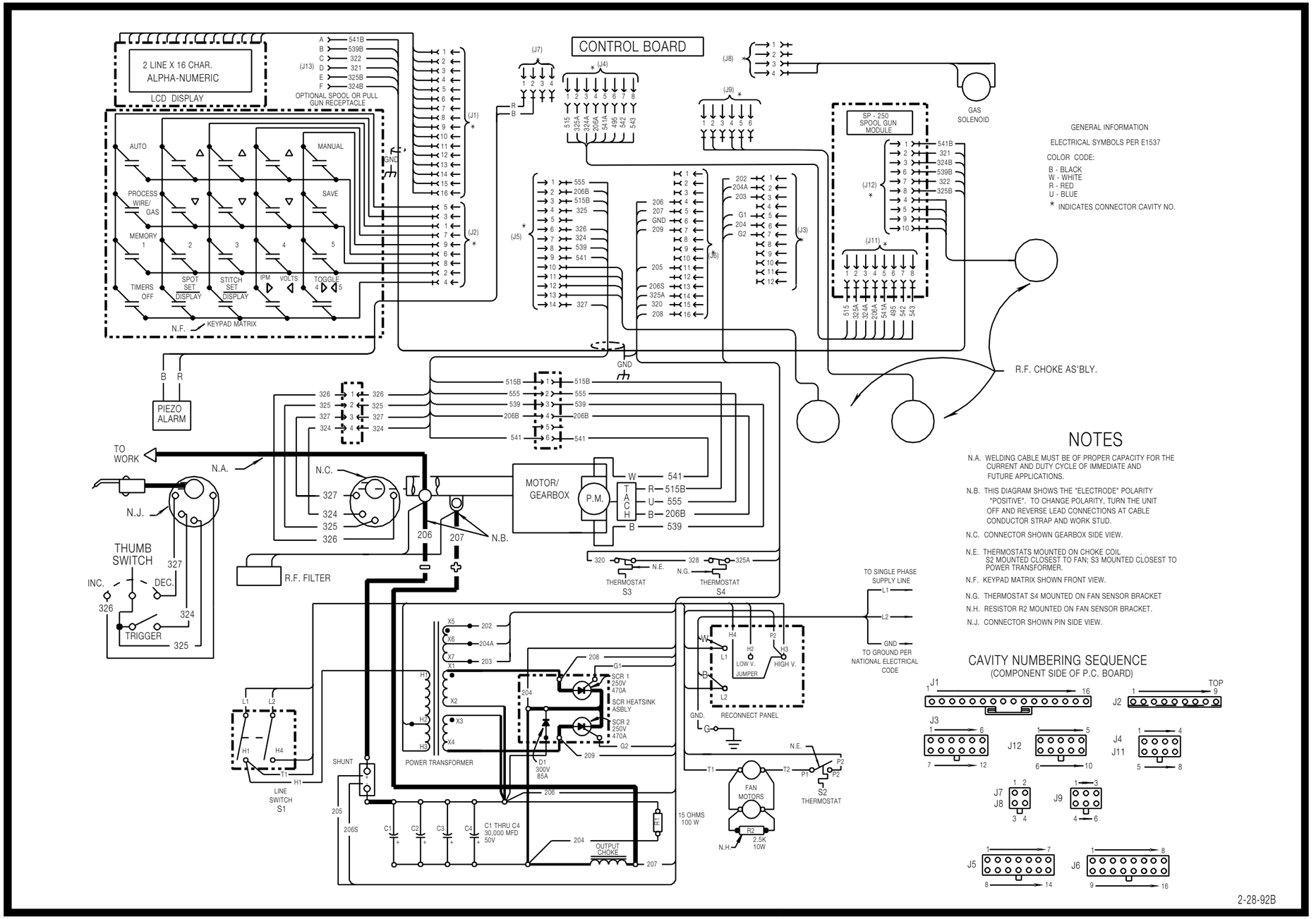
SP-250 (230/460/575V) - WIRING DIAGRAM



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

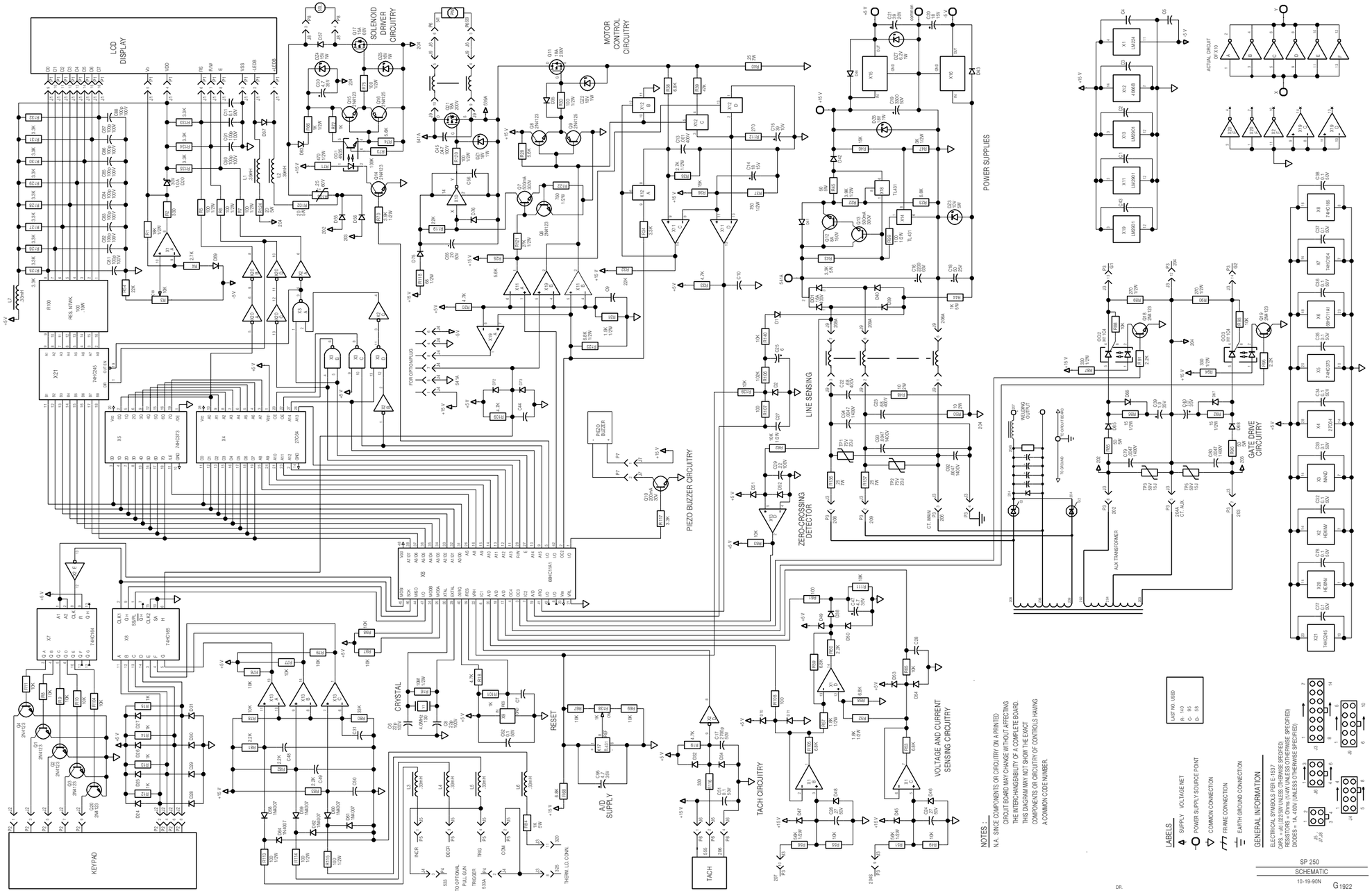
WIRING DIAGRAM FOR CODE 9723 & 10001

SP-250 (DUAL VOLTAGE) - WIRING DIAGRAM



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

G1992 CONTROL PC BOARD SCHEMATIC



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

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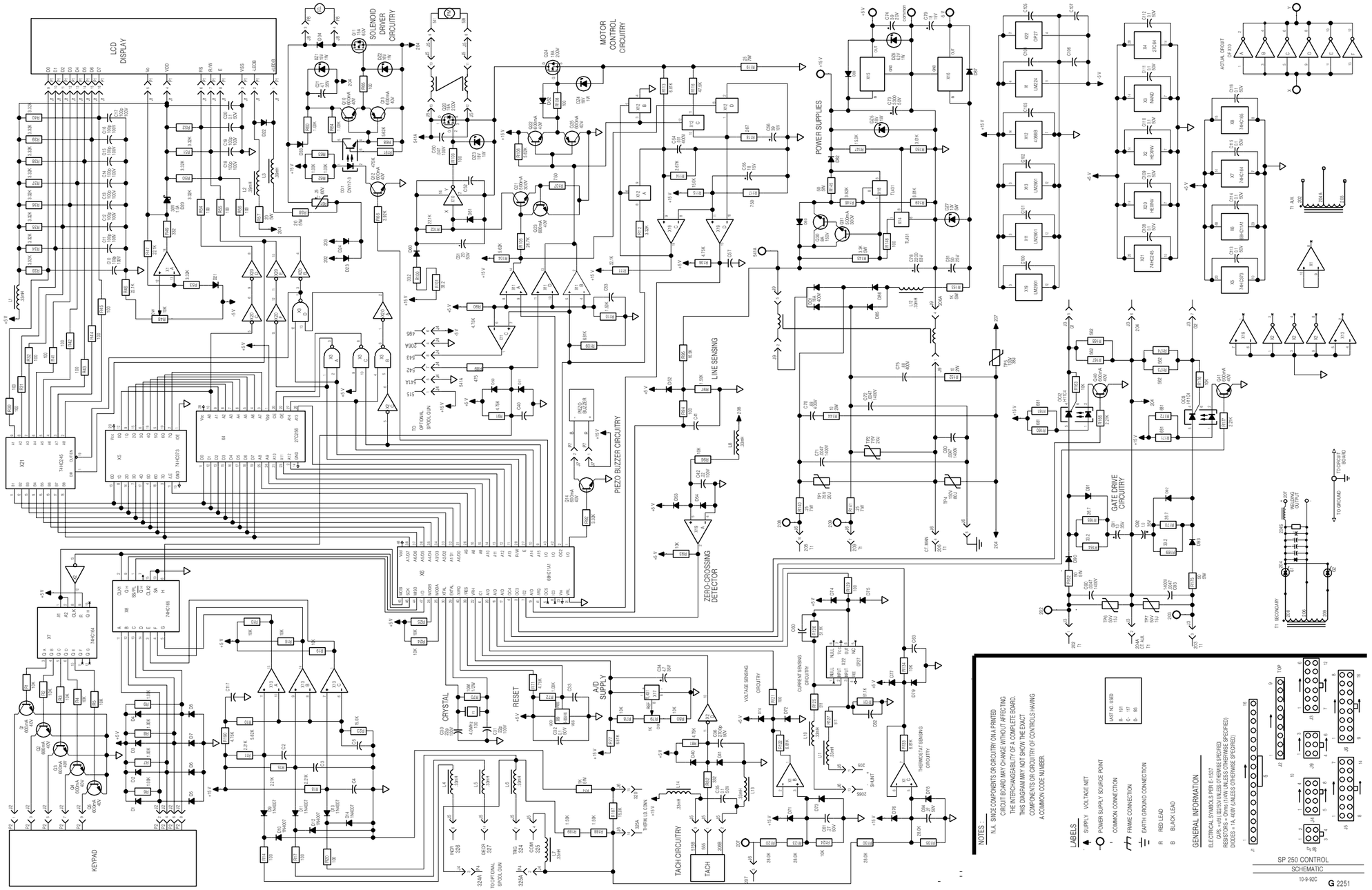
Return to Master TOC
Return to Section TOC
Return to Master TOC

G2252 CONTROL PC BOARD SCHEMATIC



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