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SVM100-A

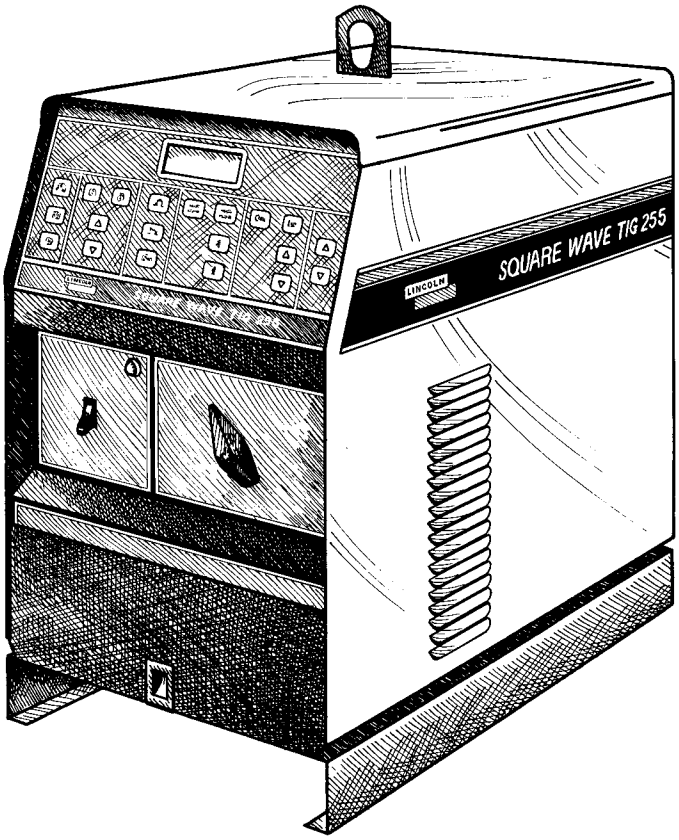
December 1995

SQUARE WAVE TIG 255

For use with machine Code Numbers **10022**
10023
10024
10025
10026
10134

Safety Depends on You

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



SERVICE MANUAL

World's Leader in Welding and Cutting Products

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SAFETY

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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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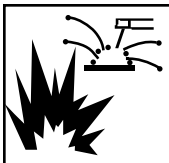


WELDING SPARKS can cause fire or explosion.

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.

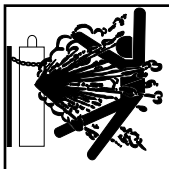
4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe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

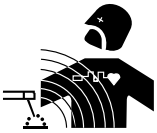
7.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

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 – SQUARE WAVE TIG 255

INPUT - SINGLE PHASE ONLY

Standard Voltage	Input Current at Rated Output (1)	Code Number
208/230/460/1/60	81/74/37	10022
230/460/575/1/60	74/37/30	10023
200/240/400/1/50/60	85/77/44	10024
220/380/440/1/50/60	77/45/39	10025
380/415/500/1/50/60	45/41/33	10026
220/380/415/1/50/60	77/45/41	10134

RATED OUTPUT

Duty Cycle	Amps	Volts at Rated Amperes
40% Duty Cycle NEMA Class II (40)	255	30
60% Duty Cycle	200	28
100% Duty Cycle	150	26

OUTPUT

Welding Current Range (Continuous)	Constant Open Circuit Voltage	Auxiliary Power
5-315 Amps AC and DC	Stick OCV: 76 TIG OCV: 53	115 Volts AC, 10 Amps 220Volts AC, 2 Amps (50/60 Hz. machines only)

RECOMMENDED INPUT WIRE AND FUSE SIZES

		For all Stick, DC TIG, and Balanced AC TIG Welding at 255A/30V/40% Duty Cycle Based on the 1993 US. National Electrical Code			For Unbalanced AC TIG Welding Above 180 Amps, 255A/16V/40% Duty Cycle, Auto Balance Based on the 1993 U.S. National Electrical Code		
Input Voltage / Frequency	Fuse (Super Lag) or Breaker Size	Input Ampere Rating on Nameplate	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes	Input Amperes	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
208/60	125	81	6 (16mm^2)	6 (16mm^2)	102	4 (25mm^2)	6 (16mm^2)
230/60	100	74	6 (16mm^2)	8 (10mm^2)	92	4 (25mm^2)	6 (16mm^2)
460/60	50	37	10 (6mm^2)	10 (6mm^2)	46	8 (10mm^2)	10 (6mm^2)
575/60	50	30	10 (6mm^2)	10 (6mm^2)	37	10 (6mm^2)	10 (6mm^2)
200/50/60	125	85	6 (16mm^2)	6 (16mm^2)	105	4 (25mm^2)	6 (16mm^2)
220/50/60	100	77	6 (16mm^2)	8 (10mm^2)	96	4 (25mm^2)	8 (10mm^2)
380/50/60	70	46	8 (10mm^2)	8 (10mm^2)	55	8 (10mm^2)	8 (10mm^2)
400/50/60	60	43	10 (6mm^2)	10 (6mm^2)	53	8 (10mm^2)	10 (6mm^2)
415/50/60	60	41	10 (6mm^2)	10 (6mm^2)	51	8 (10mm^2)	10 (6mm^2)
440/50/60	60	39	10 (6mm^2)	10 (6mm^2)	48	8 (10mm^2)	10 (6mm^2)
500/50/60	50	34	10 (6mm^2)	10 (6mm^2)	42	10 (6mm^2)	10 (6mm^2)

PHYSICAL DIMENSIONS

Height	Width	Depth	Weight
30.5 in.	19.0 in. (Lift bail, add 3.5 in)	30.0 in.	300 lbs (137 kg)
775 mm	485 mm (Lift bail, add 90 mm)	760 mm	

(1) Unbalanced TIG welding above 180 amps will draw higher input currents; see Supply Connections section.

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Read entire installation section before starting installation.

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**
- **Always connect the Square Wave TIG 255 grounding terminal (located on the bottom of the input connection box) to a good electrical earth ground.**

SELECT SUITABLE LOCATION

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the side louvers. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shut-downs. Square Wave TIG 255 power sources carry an IP23 enclosure rating. They are rated for use in damp, dirty environments subject to occasional falling water such as rain.

STACKING

Square Wave TIG 255's cannot be stacked.

TILTING

Each machine must be placed on a secure, level surface, either directly or on a recommended undercarriage. The machine may topple over if this procedure is not followed.

HIGH FREQUENCY INTERFERENCE PROTECTION

The spark gap oscillator in the high frequency generator, being similar to a radio transmitter, can be blamed for many radio, TV and electronic equipment interference problems. These problems may be the result of radiated interference. Proper grounding methods can reduce or eliminate radiated interference.

Radiated interference can develop in the following four ways:

1. Direct interference radiated from the welder.
2. Direct interference radiated from the welding leads.
3. Direct interference radiated from feedback into the power lines.
4. Interference from re-radiation of "pickup" by ungrounded metallic objects.

Keeping these contributing factors in mind, installing equipment per the following instructions should minimize problems.

1. Keep the welder power supply lines as short as possible and completely enclose them in rigid metallic conduit or equivalent shielding for a minimum distance of 50 feet (15.2m). There should be good electrical contact between this conduit and the welder. Both ends of the conduit should be connected to a driven ground and the entire length should be continuous.
2. Keep the work and electrode leads as short as possible and as close together as possible. Lengths should not exceed 25 ft (7.6m). Tape the leads together when practical.
3. Be sure the torch and work cable rubber coverings are free of cuts and cracks that allow high frequency leakage. Cables with high natural rubber content, such as Lincoln Stable-Arc® better resist high frequency leakage than neoprene and other synthetic rubber insulated cables.

4. Keep the torch in good repair and all connections tight to reduce high frequency leakage.

5. The work terminal must be connected to a ground within ten feet of the welder, using one of the following methods:

   a) A metal underground water pipe in direct contact with the earth for ten feet or more.

   b) A 3/4" (19mm) galvanized pipe or a 5/8" (16mm) solid galvanized iron, steel or copper rod driven at least eight feet into the ground.

   The ground should be securely made and the grounding cable should be as short as possible using cable of the same size as the work cable, or larger. Grounding to the building frame electrical conduit or a long pipe system can result in re-radiation, effectively making these members radiating antennas.

6. Keep all access panels and covers securely in place.

7. All electrical conductors within 50 ft (15.2m) of the welder should be enclosed in grounded rigid metallic conduit or equivalent shielding. Flexible metallic conduit is generally not suitable.

8. When the welder is enclosed in a metal building, several good earth driven electrical grounds (as in 5 (b) above) around the periphery of the building are recommended.

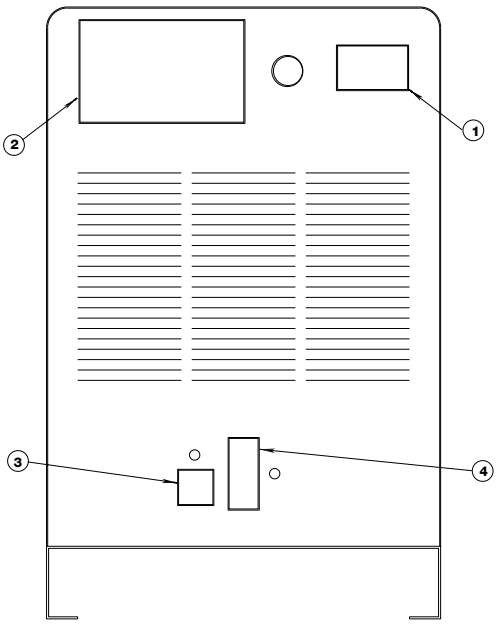
   Failure to observe these recommended installation procedures can cause radio or TV interference problems and result in unsatisfactory welding performance resulting from lost high frequency power.

INPUT CONNECTIONS

Be sure the voltage, phase, and frequency of the input power is as specified on the rating plate, located on the rear of the machine. Refer to Figure A.1.

Welder supply line entry provision is in the case rear panel with a removable cover over the input connection panel area. Entry is through a 1.7 in (43mm) diameter hole in the case back. See Figure A.1.

FIGURE A.1 — REAR PANEL



1. RATING PLATE
2. INPUT ENTRY HOLE
3. RECONNECT PANEL
4. 220V RECEPTACLE & BREAKER (50/60 HZ MACHINE ONLY)
5. 115V RECEPTACLE & BREAKER

GROUND CONNECTION

The frame of the welder must be grounded. A ground terminal marked with the symbol ⏚ is located at the bottom of the input box for this purpose. See your local and national electrical codes for proper grounding methods.

INPUT SUPPLY CONNECTIONS

Have a qualified electrician connect single phase input power leads to L1 and L2 of the input panel in accordance with all local codes and national electrical codes. Refer to the connection diagram located on the inside of the cover of the Reconnect Panel.

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RECONNECT PROCEDURE

On multiple input voltage welders, be sure the reconnect panel is connected per the following instructions for the voltage being supplied to the welder.

⚠ CAUTION

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

Welders are shipped connected for the highest input voltage as listed on the rating Plate. To change this connection for a different input voltage, reconnect the power strap (P) to the terminal corresponding to the input voltage used. Designations on reconnect panel, LOW, MID and HIGH correspond to the nameplate input voltages of a triple voltage welder. Dual voltage welders use only LOW and HIGH. Single voltage welders use only HIGH.

EXAMPLE: On a 208/230/460 volt welder, LOW is 208V, MID is 230V, and HIGH is 460V.

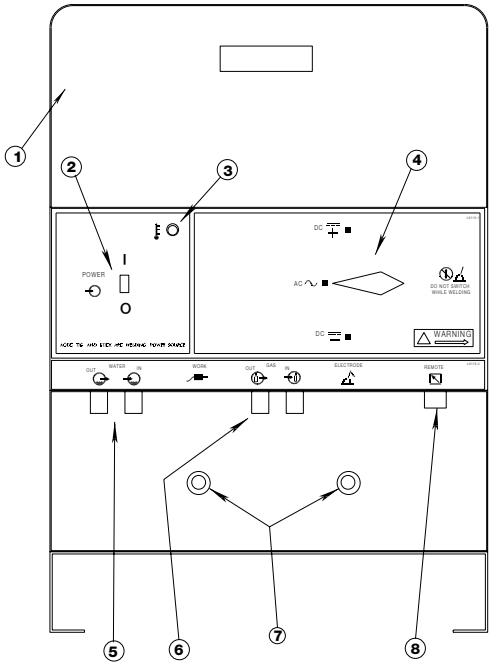
Fuse the input circuit with the recommended super lag fuses or delay type[1] circuit breakers. Choose an input and grounding wire size according to local or national codes, refer to Specification page at the beginning of this chapter. Using fuses or circuit breakers smaller than recommended may result in “nuisance” shut-offs from welder inrush currents even if not welding at high currents.

Unbalanced AC TIG welding draws higher input currents than those for stick, DC TIG, or Balanced AC TIG welding. The welder is designed for these higher input currents. However, where unbalanced AC TIG welding above 180 amps is planned, the higher input currents require larger input wire sizes and fuses. Refer to Specification page at the beginning of this chapter.

The Square Wave TIG 255 should be permanently wired into the power system. Plugs or connectors are not recommended.

[1]Also called “inverse time” or “thermal/magnetic” circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of the current increases.

FIGURE A.2. - FRONT PANEL



1. CONTROL AND DISPLAY AREA
2. POWER SWITCH
3. THERMOSTATIC PROTECTION LIGHT
4. POLARITY SWITCH
5. OPTIONAL WATER SOLENOID
6. GAS SOLENOID
7. WORK (LEFT) AND ELECTRODE TERMINALS
8. REMOTE RECEPTACLE

OUTPUT CONNECTIONS

⚠ WARNING

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

See Figure A.2 for the location of the work and electrode terminals, the gas and optional water solenoids, and the Remote Receptacle.

TIG TORCH CONNECTION

TIG welding torches come with 12.5 ft (3.8m) and 25 ft (7.6m) cables. Use the shorter length whenever possible to minimize possible radio interference problems. With power source off, connect the torch cable to the “Electrode” terminal on the welder. Connect a separate work cable to the “Work” terminal of the welder. See Table A.1 for recommended work cable sizes. Both work and electrode cables should be routed through the cable strain relief holes provided in the base directly below the welding output terminals.

TABLE A.1
Cable Sizes for Combined Lengths of Copper Electrode and Work Cable

Machine Size	Lengths up to 100 ft	100 to 200 ft	200 to 250 ft
255 Amp 40% Duty Cycle	#2 (35mm^2)	#1 (45mm^2)	1/0 (55mm^2)

Connect the TIG torch gas and water fittings to the welder fittings. Any torch with fittings that conform to Compressed Gas Association (CGA) standards can be used.

The welder fittings have the following threads: Gas Inlet and Outlet: 5/8"-18 right-hand female; Water inlet and Outlet: 5/8"-18 left-hand female. The cylinder of inert shielding gas must be equipped with a pressure regulator and flow meter. Install a hose between the flow meter and gas inlet on the welder.

⚠ WARNING

Observe the safety precautions necessary for handling and using compressed gas containers. Contact your supplier for specific information.

DO NOT operate a water-cooled torch unless water is flowing. Water doesn't flow until solenoid is actuated.

If using a water-cooled torch with a Magnum water cooler, connect the cooler water outlet to the 'Water Valve In" fitting. Connect the TIG torch inlet to the "Water Valve Out" fitting.

If using a water-cooled torch with a free-running water supply, install a water line between the welder "Water Inlet" and the supply. Include a strainer in the water supply line to prevent dirt particles from obstructing water flow in the valve and cooling chamber of the TIG torch. Failure to do so could result in water valve malfunction and overheating of the water-cooled torch. Connect the torch water line to the welder "Water Out" fitting. Use a nonmetallic drain line from the electrode connection to the drain or water recirculating pump.

For other water coolers or torches, consult the manufacturer's instructions for the water cooler or TIG torch being used.

STICK ELECTRODE CABLE CONNECTION

Turn the Power switch Off. Run the electrode and work cables through the strain relief holes below the welding output terminals, and connect the cables to the proper terminals. This strain relief prevents damage to the welding output terminals if the cables are pulled excessively. Select cable size according to Table A.1.

⚠ WARNING

Do not connect a TIG torch and stick electrode cable at the same time. They will both be electrically **HOT** whenever the output contactor is energized.

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OPERATING INSTRUCTIONS

Read and understand entire section before operating machine.

GENERAL WARNINGS

SAFETY PRECAUTIONS

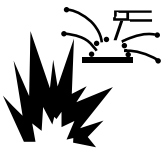
⚠ WARNING

ELECTRIC SHOCK can kill.

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

FUMES AND GASES can be dangerous.

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



WELDING SPARKS can cause fire or explosion

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

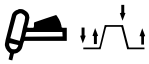
ARC RAYS can burn.

- Wear eye, ear and body protection.

Observe additional Safety Guidelines detailed in the beginning of this manual.

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

TIG 2-STEP



TIG 4-STEP

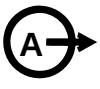
STICK

CURRENT CONTROL OUTPUT

LOCAL CURRENT CONTROL

REMOTE CURRENT CONTROL

INCREASE



OUTPUT

DECREASE

HF

HIGH FREQUENCY

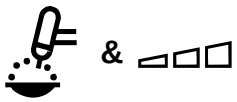
AFTERFLOW / AFTERFLOW TIME

CONTINUOUS HIGH FREQUENCY

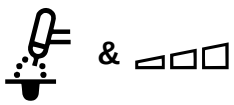
START ONLY HIGH FREQUENCY

OFF

ON



CLEAN (INCREASE POSITIVE POLARITY)



PENETRATE (INCREASE NEGATIVE POLARITY)

TIG PULSER

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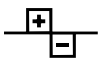
GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL (CONT.)

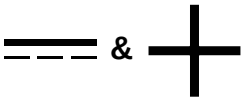


AC WAVE BALANCE

PULSED PER SECOND

OVER TEMPERATURE

INPUT POWER



DC+ POLARITY

DC- POLARITY

DO NOT SWITCH WHILE WELDING

WARNING

WATER (COOLANT) OUTPUT

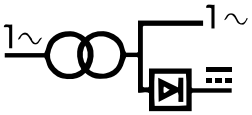
WATER (COOLANT) INPUT

GAS OUTPUT

GAS INPUT

ELECTRODE CONNECTION

PROTECTIVE GROUND



SINGLE PHASE TRANSFORMER AC & DC RECTIFIER POWER SOURCE

TIG (GTAW)

SINGLE PHASE

WORK CONNECTION

AC POLARITY

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GENERAL DESCRIPTION

The Square Wave TIG 255 is a constant current, single range square wave AC/DC TIG (GTAW) arc welding power source with built-in high frequency stabilization. It also has stick (SMAW) capability. It is available from the factory in one model only; there are no factory installed options, only variations in input voltage and frequency.

The Square Wave TIG 255 includes advanced features such as Auto-Balance™, 2-Step/4-Step Arc Start Switch operation and a TIG pulser. In addition, fixed preflow and variable afterflow timers are included for shielding gas and cooling water control.

RECOMMENDED PROCESSES AND EQUIPMENT

The Square Wave TIG 255 is recommended for the TIG (GTAW) and stick (SMAW) welding processes within its output capacity of 5 to 315 amps, on both AC and DC polarity. It is compatible with all Magnum TIG accessories (see Accessory section in this manual), as well as many industry standard items, such as TIG torches, hoses, and water coolers.

OPERATIONAL FEATURES AND CONTROLS

The Square Wave TIG 255 has the following controls as standard: TIG 2-Step/TIG 4-Step/Stick mode selection, Local/Remote current control selection, Continuous/Start Only/Off high frequency selection, Auto/Manual AC wave balance selection with the manual wave balance adjustment, TIG pulser On/Off selection with frequency adjustment, afterflow adjustment, and DC+/DC-/AC polarity selection.

DESIGN FEATURES AND ADVANTAGES

- Designed to NEMA EW-1 & International IEC-974 Standards.
- Single output range of 5-315 amps covers the majority of all TIG welding applications.
- Solid State Output Contactor: no noise, no parts to wear.
- Digital Ammeter and Voltmeter for precise readings from 5 to 315 amps welding.
- Welding current limit can be preset from 5 to 315 amps and is displayed on the Ammeter when not welding.
- Auto Balance circuitry automatically provides the proper amount of cleaning and penetration when AC TIG welding. Manual AC wave balance adjustment is also possible.
- 2-Step/4-Step Arc Start Switch Capability.
- TIG Pulser with On/Off Selection, and Pulses Per Second adjustment. Background current and duty cycle are automatically adjusted according to the peak welding current.
- Fixed preflow time of 0.5 seconds. Preflow time is eliminated if welding restarts during gas afterflow of previous weld. This avoids unnecessary delays when making repeated welds.
- Adjustable afterflow time control.
- Local/Remote current selection.
- Stick/TIG selection.
- Continuous/Start/Off High Frequency selection.
- DC+/AC/DC- Polarity Switch.
- Power Factor Correction for lower input currents and smaller input wire sizes.
- Remote Receptacle for Amptrol or Arc Start Switch.
- Low Voltage Arc Start Switch Circuit (24 V AC) for maximum operator safety.
- Gas and optional Water Valves: Inlet & outlet fittings conform to Compressed Gas Association (CGA) standards.
- Built-in High Frequency Generator.
- 115 Volt Receptacle with 10 amp Circuit Breaker.
- 220 Volt European (Schuko) type receptacle with 2 amp circuit breaker for water coolers (50/60Hz machines only).
- Excellent arc starting and stability up through 315 amps.
- High resistance to AC arc rectification.
- No tungsten spitting within current range of electrode.
- Compact size, requires only a 19 in x 30 in (485 mm x 760 mm) footprint.

- Strain relief holes in base for welding cables, gas and water hoses and control cables.
- Easy access for input connections. Connections are simple strip and clamp of input wires (no lugs required).
- Low fan noise at idle.
- Modular construction for easy servicing.
- Simple keypad layout allows even novice users to operate with minimal instruction.
- Unused controls are automatically locked out to simplify setup. Examples: the AC wave balance control has no effect in DC; the High Frequency and gas and water valves do not operate in Stick mode; TIG Pulser is locked out in the Stick mode.
- Recessed panels protect controls, output terminals gas and water fittings.
- Large safety margins and protective circuits protect rectifiers from transient voltages and high currents.
- Line Voltage Compensated.
- Thermostatically Protected.
- Electronic Over Current Protection.

WELDING CAPABILITY

The Square Wave TIG 255 is rated at 255 amps, 30 volts, at 40% duty cycle on a ten minute basis. It is capable of higher duty cycles at lower output currents. If the duty cycle(s) are exceeded, a thermal protector will shut off the output until the machine cools to a reasonable operating temperature.

LIMITATIONS

The Square Wave TIG 255 is not recommended for arc gouging due to its limited output capacity.

The Square Wave TIG 255 is not recommended for AC TIG welding when high concentrations of helium are used for shielding; starting problems and arc rectification may occur.

The Square Wave TIG 255 is not recommended for pipe thawing.

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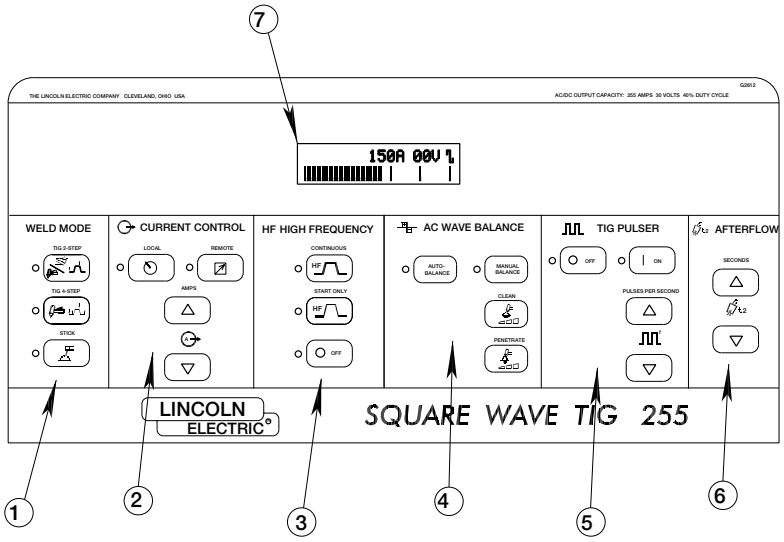
CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the Square Wave TIG 255. Refer to Figures B.1, B.2.a and B.2.b and corresponding explanations.

FIGURE B.1 - CONTROL PANEL KEYS



1. WELD MODE KEYS
2. CURRENT CONTROL KEYS
3. HIGH FREQUENCY KEYS
4. AC WAVE BALANCE KEYS
5. TIG PULSER KEYS
6. AFTERFLOW KEYS
7. DISPLAY

CONTROL PANEL KEYS

The keys are grouped into six areas, described below and in Figure B.1. Some areas are active in both TIG and Stick, while others are active in TIG only. The red LED indicator lights are used to tell which functions are active, and the display (Item 1) is used to check the settings of the up/down keys.

1. WELD MODE KEYS: These keys select the Weld Mode desired: TIG 2-Step, TIG 4-Step, or Stick. Read the complete Operating Instructions section for more information on TIG 2-Step and TIG 4-Step.

2. CURRENT CONTROL: These keys select Local or Remote and adjust the Amps Up or Amps Down. These keys are used to set thewelding current from 5 to 315 amps, as well as to select Local or Remote control. Local control allows the current to be adjusted only with the Amps Up/Amps Down keys. Remote control allows the use of a hand or foot operated remote control. Read the complete Operating Instructions section for more information on Local and Remote.

3. HIGH FREQUENCY: These keys are active in the TIG mode only. Select from Continuous, Start Only, or Off. Read the TIG Welding Section for information on High Frequency.

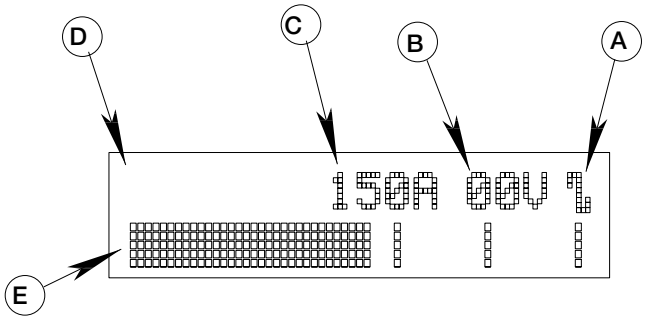
4. AC WAVE BALANCE: These keys are active in the AC TIG mode only. They are used to set the amount of cleaning and/or penetration produced during an AC TIG weld. Auto Balance™ automatically sets the AC Wave Balance according to the welding current. If manual adjustment is desired, the Manual Balance key can be pressed, and the balance adjusted from +5 (cleaning) to -10 (penetration) with the Cleaning and Penetration keys. Read the Advanced Features section for a complete explanation of the AC Wave Balance.

5. TIG PULSER: These keys are active in the TIG mode only. The On/Off keys turn the TIG Pulser on and off. The Pulses Per Second keys adjust the pulsing frequency up and down, from 0.5 to 10 pulses per second. Read the Advanced Features section for more information on the TIG Pulser.

6. AFTERFLOW: These keys are active in the TIG mode only. They must adjust the afterflow time from 5 to 50 seconds for shielding gas and cooling water flow through solenoids located on the case front. As the Afterflow time is adjusted, the Afterflow time, in seconds, is shown in the Momentary Display.

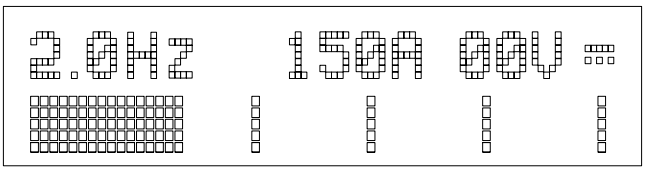
7. CONTROL PANEL: The display is divided into five sections. See Figures B.2.a and B.2.b.

FIGURE B.2.a - DISPLAY



A. AC/DC INDICATOR
B. VOLTMETER
C. AMMETER
D. MOMENTARY DISPLAY
E. BAR GRAPH

FIGURE B.2.b - DISPLAY



A. AC/DC INDICATOR: This symbol represents the output polarity of the 255 . . . either AC or DC. AC is shown in Figure B.2.a; DC is shown in Figure B.2.b.

B. VOLTMETER: This meter displays open circuit voltage as well as welding voltage, as measured on the output studs of the Square Wave TIG 255.

C. AMMETER: The ammeter can display preset current (for setting the welding current before welding) and actual welding current (the value of the welding current during a weld).

D. MOMENTARY DISPLAY: This area is blank under most conditions; see Figure B.2.a. Different values may be displayed here as certain keypad keys are pressed. See Figure B.2.b; the TIG Pulser is being adjusted, so the Pulse Frequency, 2.0 Hz, is being displayed. Information in the Momentary Display lasts for five seconds after a key is pressed. Read the complete Operating Instructions section for more information on the values that appear in the Momentary Display.

E. BAR GRAPH DISPLAY: This area provides a graphical display of values shown on the Ammeter and on the Momentary Display. When the Momentary Display is blank (as in Figure B.2.a), the Bar Graph Display represents values shown on the ammeter. When a low value is shown on the ammeter, only a few “bars” will appear on the left hand side of the Bar Graph Display. As the ammeter value increases, more and more “bars” will appear. Whenever a value increases, more and more “bars” will appear. Whenever a value appears in the Momentary Display, the Bar Graph Display will represent the Momentary Display value, not the ammeter value.

CASE FRONT CONTROLS

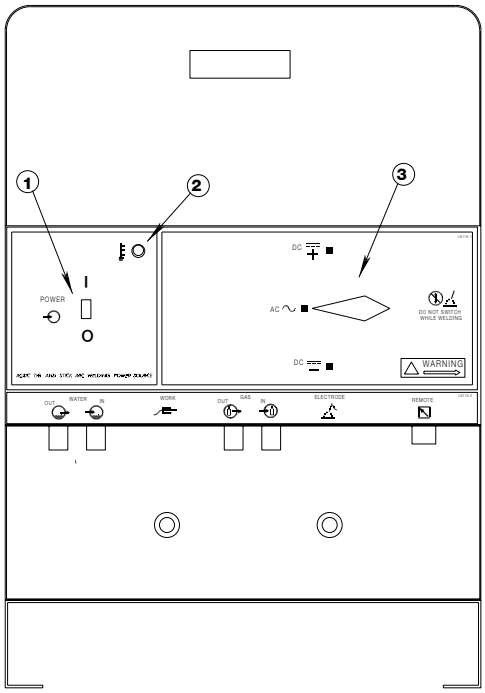
Refer to Figure B.3 for the location of the following controls:

1. POWER SWITCH: Controls the input power to the Square Wave TIG 255.

2. OVER TEMPERATURE LIGHT: A yellow light which only lights when an over temperature situation occurs. See the Maintenance Section for more information on the thermostatic protection.

3. POLARITY SWITCH: Selects DC+, AC or DC- welding polarity. **DO NOT SWITCH UNDER LOAD.**

FIGURE B.3 - CASE FRONT CONTROLS



1. POWER SWITCH
2. THERMOSTATIC PROTECTION LIGHT
3. POLARITY SWITCH

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HAND AND FOOT AMPTROL ACCESSORY OPERATION

Both the Hand and Foot Amptrol work in a similar manner. They are meant to be used for remote current control when Remote Current Control is selected. The TIG 2-Step mode must be selected when using an Amptrol for remote current control. As explained below, Amptrols can also be used as arc start switches if Local Current Control is selected.

For simplicity, the following explanation will refer only to “Amptrols”, meaning both Foot and Hand models. The term “minimum” refers to a Foot pedal in the “up” position, as it would be with no foot pressure, or a Hand Amptrol in the relaxed position, with no thumb pressure. “Maximum” refers to a fully depressed Foot Amptrol, or a fully extended Hand Amptrol.

The Amptrol is capable of controlling the output current from 5 amps to the preset current displayed on the ammeter. For example, if the ammeter is preset for 200 amps and the Current Control switch is in the REMOTE position, the Amptrol, when depressed just past its minimum position, will cause the Square Wave TIG 255 to weld at 5 amps. At the Amptrols maximum position, the output would be near 200 amps.

It is important to note that, for many applications, the tungsten will not start an arc at only 5 amps. To start an arc reliably, it is important to depress the Amptrol far enough so that the machine output current is near the tungsten operating range. In the example above, a 3/32” tungsten may be used on DC- to weld near 200 amps. To start the weld, the operator may have to depress the Amptrol approximately 1/4 of the way down, or to nearly 50 amps, in order to start the arc. Merely depressing the Amptrol to its 5 amp minimum position will not start the arc.

If the Current Control switch is set to the LOCAL position, an Amptrol can be used as an arc start switch. Depressing the Amptrol just past minimum will cause the Amptrols built-in arc start switch to close, and backing off completely causes the built-in start switch to open. The Amptrol will have no effect on the welding current when used as an arc start switch.

WELDING OPERATION

TIG WELDING

Familiarize yourself with the Controls and Display Section before attempting operation of the Square Wave TIG 255.

TIG WELDING GUIDELINES

TIG welding can be done in either the TIG 2-Step or the TIG 4-Step Weld Mode. TIG 2-Step is typically used with Hand or Foot Amptrols, with Remote Current control. TIG 4-Step is typically used with Arc Start switches and Local Current Control, because it provides a very brief current upslope, and a 5-second current downslope. TIG 4-Step also functions like a trigger interlock, making it unnecessary to hold down the Arc Start switch during a weld. Read the TIG Welding Sequence of Operation sections for more details on 2-Step and 4-Step Operation.

Refer to Table B.2 for guidelines on electrode sizes, torch nozzles and shielding gas flow rates.

TABLE B.1
RECOMMENDED POLARITY SETTINGS FOR TIG WELDING

Type of Welding	Electrode Polarity	High Frequency Setting
Stainless Steel	DC-	START
Aluminum & Magnesium	AC	CONTINUOUS
Other Metals	DC-	START

TABLE B.2
TYPICAL CURRENT RANGES [1] FOR TUNGSTEN ELECTRODES [2]

Tungsten Electrode Diameter in. (mm)	DCEN (-)	DCEP (+)	AC				Approximate Argon Gas Flow Rate C.F.H. (1/min.)		TIG Torch Nozzle Size [4], [5]
			Unbalanced Wave		Balanced Wave				
	1%, 2% Thoriated Tungsten	1%, 2% Thoriated Tungsten	Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated	Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated	Aluminum	Stainless Steel	
.010 (.25)	2-15	[3]	2-15	2-15	2-15	---	3-8 (2-4)	3-8 (2-4)	#4, #5, #6
0.020 (.50)	5-20	[3]	5-15	5-20	10-20	5-20	5-10 (3-5)	5-10 (3-5)	
0.040 (1.0)	15-80	[3]	10-60	15-80	20-30	20-60	5-10 (3-5)	5-10 (3-5)	
1/16 (1.6)	70-150	10-20	50-100	70-150	30-80	60-120	5-10 (3-5)	9-13 (4-6)	#5, #6
3/32 (2.4)	150-250	15-30	100-160	140-235	60-130	100-180	13-17 (6-8)	11-15 (5-7)	#6, #7, #8
1/8 (3.2)	250-400	25-40	150-210	225-325	100-180	160-250	15-23 (7-11)	11-15 (5-7)	
5/32 (4.0)	400-500	40-55	200-275	300-400	100-240	200-320	21-25 (10-12)	13-17 (6-8)	#8, #10
3/16 (4.8)	500-750	55-80	250-350	400-500	190-300	290-390	23-27 (11-13)	18-22 (8-10)	
1/4 (6.4)	750-1000	80-125	325-450	500-630	250-400	340-525	28-32 (13-15)	23-27(11-13)	

(1) When used with argon gas. The current ranges shown must be reduced when using argon/helium or pure helium shielding gasses.

(2) Tungsten electrodes are classified as follows by the American Welding Society (AWS):
Pure . . . . . EWP
1% Thoriated EWTh-1
2% Thoriated EWTh-2
Though not yet recognized by the AWS, Ceriated Tungsten is now widely accepted as a substitute for 2% Thoriated Tungsten in AC and DC applications.

(3) DCEP is not commonly used in these sizes.

(4) TIG torch nozzle "sizes" are in multiples of 1/16ths of an inch:
#4 = 1/4 in. (6 mm)
#5 = 5/16 in. (8 mm)
#6 = 3/8 in. (10 mm)
#7 = 7/16 in. (11 mm)
#8 = 1/2 in. (12.5 mm)
#10 = 5/8 in. (16 mm)

(5) TIG torch nozzles are typically made from alumina ceramic. Special applications may require lava nozzles, which are less prone to breakage, but cannot withstand high temperatures and high duty cycles.

TIG WELDING SEQUENCE OF OPERATION (2-STEP MODE)

In TIG 2-Step Mode the welding arc is established by depressing the Arc Start Switch or Amptrol (Step 1). Output continues as long as the switch or Amptrol is depressed. Releasing the switch or Amptrol (Step 2) turns off the arc. Hence the name 2-Step Mode.

1. Connect an Arc Start Switch or an Amptrol to the Remote Receptacle.

2. Turn on the welder, gas supply and water supply (if so equipped). The Control Panel Display and red LEDS will illuminate when the power is on.

3. Select the TIG 2-Step Weld Mode.

4. Select Local (if using an Arc Start Switch) or Remote (if using an Amptrol) current control. Set the output current using the Amps Up/Down keys. The output current setting will be displayed on the Ammeter.

5. Select Continuous High Frequency if welding with AC polarity, or Start Only High Frequency if welding with DC- polarity. High Frequency Off can be used for scratch start welding.

6. Select AC or DC- electrode polarity. See Table B.1.

7. If welding with AC polarity, select Auto Balance™. This gives the optimum ratio between cleaning and penetration, automatically adjusted for the output current. If manual adjustment of the AC Wave Balance is desired, select Manual Balance, and adjust the wave balance with the Cleaning and Penetration keys. See the Advanced Features section for more information on setting and using the AC Wave Balance.

8. Select TIG Pulser On or Off. If the TIG Pulser is on, adjust the pulse frequency with the Pulses Per Second Up/Down keys. See the Advanced Features section for more information on setting and using the TIG Pulser.

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9. Set the Afterflow time with the Seconds Up/Down keys. Afterflow time provides shielding gas flow (and cooling water, if used) after the weld. Use short Afterflow times with low currents and small tungstens, use long afterflow times at high output currents with large tungstens.

10. Press and release the Arc Start Switch, and set the gas flow meter. The welder is now ready for welding.

11. Position the tungsten electrode at the start of the weld at a 65° to 75° angle with the horizontal so that the electrode is approximately 1/8" (4mm) above the work piece. Press the Arc Start Switch. This opens the gas and water valves to automatically purge air from the hose and torch. After a 0.5 second preflow time, the high frequency becomes available to strike the arc.

12. Hold the Arc Start Switch or Amptrol down until an arc is established. If using an Amptrol, read the section on Hand and Foot Amptrol Operation. Release the Arc Start Switch or Amptrol to stop the arc and start the Afterflow timer. After the Afterflow time has expired, the gas and water valves will close. To make another weld, repeat steps 11 and 12.

TIG WELDING SEQUENCE OF OPERATION (4-STEP MODE)

TIG 4-Step Mode funcitons like a trigger interlock, making it unnecessary to hold down the Arc Start Switch during welding. By depressing the Arc Start Switch a first time, the arc will start at a low current (step 1). By releasing the Arc Start Switch (step 2) the output ramps up to welding current. Depressing the Arc Start Siwtch a second time (step 3) initiates a welding current downslope. Releasing the Arc Start Switch (step 4) stops the arc. Hence the name "4-Step Mode"

1. Connect an Arc Start Switch to the Remote Receptacle.

2. Turn the welder, gas supply and water supply (if so equipped), on. The Control Panel Display and red lights will illuminate when the power is on.

3. Select the TIG 4-Step Weld Mode.

4. Select the Local current control. Set the output current using the Amps Up/Down keys. The output current setting will be displayed on the Ammeter.

5. Select Continuous High Frequency if welding with AC polarity, or Start Only High Frequency if welding with DC- polarity. High Frequency Off can be used for scratch start welding.

6. Select AC or DC- electrode polarity. See Table B.1.

7. If welding with AC polarity, select Auto Balance™. This gives the optimum ratio between cleaning and penetration, automatically adjusted for the output current. If manual adjustment of the AC Wave Balance is desired, select Manual Balance, and adjust the wave balance with the Cleaning and Penetration keys. See the Advanced Features section for more information on setting and using the AC Wave Balance.

8. Select TIG Pulser On or Off. If the TIG Pulser is on, adjust the pulse frequency with the Pulses Per Second Up/Down keys. See the Advanced Features section for more information on setting and using the TIG Pulser.

9. Set the Afterflow time with the Seconds Up/Down keys. Afterflow time provides shielding gas flow (and cooling water, if used) after the weld. Use short Afterflow times with low currents and small tungstens, long afterflow times at high output currents with large tungstens.

10. Press and release the Arc Start Switch, and set the gas flow meter. The welder is now ready for welding.

11. Position the tungsten electrode at the start of the weld at a 65° to 75° angle with the horizontal so that the electrode is approximately 1/8" (4mm) above the work piece. Press the Arc Start Switch. This opens the gas and water valves to automatically purge air from the hose and torch. After a 0.5 second preflow time, the high frequency becomes available to strike the arc.

12. Hold the Arc Start Switch down until an arc is established. The arc will start at a low current value. Release the Arc Start Switch. At this point, the Square Wave TIG 255 will quickly ramp up to the welding current, and the weld will continue indefinitely. Press the Arc Start Switch a second time to initiate a 5-second downslope. The current will go down to a crater fill current that is equal to 25% of the welding current. Release the Arc Start Switch to stop the arc and start the Afterflow timer. After the Afterflow time has expired, the gas and water valves will close. To make another weld, repeat steps 11 and 12.

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ADVANCED TIG WELDING FEATURES

AC WAVE BALANCE AND AUTO BALANCE™

AC Wave Balance is a feature unique to square wave TIG power sources. It is active only in AC TIG mode. It controls the amount of positive and negative current in the AC output.

The Square Wave TIG 255 allows the operator to select Auto Balance™. This selection provides automatic adjustment of the AC Wave Balance; it is suitable for most welding conditions. Auto Balance gives the ideal amount of cleaning and penetration, based on the welding current output.

Manual adjustment of the AC Wave Balance is also possible. Select the Manual Balance key, and the Balance setting will appear in the Momentary Display. Manual Balance settings vary from +5 (maximum cleaning) to -10 (maximum penetration). A setting of 0 yields a balanced output (equal amounts of cleaning and penetration). Use the following as a guide when setting the Balance manually:

BALANCED (0): The amounts of positive and negative are the same.

CLEANING (+1 to +5): Provides more positive current than negative. Since the positive current produces the “cleaning” or oxide removal on aluminum, this setting is used for welding on heavily oxidized aluminum.

PENETRATION (-1 to -10): Provides more negative current than positive. The arc plasma will be more concentrated and more easily directed to where the heat is needed. Higher penetration settings allow a given size of tungsten to carry more current.

CAUTION: Use only the amount of cleaning required because the greater amount of positive current will heat the tungsten more and possibly cause it to melt or “spit”. Also, the arc is usually more flared and less stable with more cleaning current.

In general, use just enough “cleaning” to remove oxides and to give good wetting to the puddle.

TIG PULSER

The Square Wave TIG 255 contains a unique TIG Pulser circuit. The TIG Pulser has On/Off selections, as well as adjustments for Pulses Per Second Up/Down. Adjustment of the pulses per second (pulse frequency), allows for control of the heat input into the work piece. This adjustment can reduce distortion and burnthrough on thin guage base metal. When the Pulser is turned On, or when the Pulses Per Second are adjusted, the pulse frequency is shown in the Momentary Display. It can be varied from 0.5 Hz to 10 Hz in 0.5 Hz increments. (One Hertz {Hz} is equivalent to one pulse per second.) The background current (the welding current at the low point of the pulse cycle) is automatically adjusted from 40% to 60% of the peak current by the Square Wave TIG 255. The duty cycle (the ratio between that time spent at the peak current vs, the time spent at the background current) is fixed at 50%.

AUXILIARY POWER

ALL MACHINES

The Square Wave TIG 255 provides 10 amps of 115 volt AC power at a standard NEMA 5-15R receptacle, located on the lower case back of the machine. This circuit is protected from shorts and overloading by a 10 amp circuit breaker, located next to the receptacle. The auxiliary circuit is intended for running water coolers and small power tools, whose current draw is within the 10 amp rating.

⚠ CAUTION

Note that some types of equipment, especially pumps and large motors, have starting currents which are significantly higher than their running current. These higher starting currents may cause the circuit breaker to open. If this situation occurs, the user should refrain from using the Square Wave TIG 255 auxiliary for that equipment.

50/60Hz MACHINES

Square Wave TIG 255 machines rated for 50/60Hz operation provide 2 amps of 220 volt AC power at a continental European (Schuko) type receptacle, located on the lower case back of the machine. This circuit is protected from shorts and overloading by a 2 amp circuit breaker, located above the receptacle. The auxiliary circuit is intended for running water coolers whose current draw is within the 2 amp rating of the receptacle.

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⚠ CAUTION

Note that some types of equipment, especially pumps and motors, have starting currents which are significantly higher than their running currents. These higher starting currents may cause the circuit breaker to open. If this situation occurs, the user should refrain from using the Square Wave TIG 255 auxiliary for that equipment.

OVERLOAD PROTECTION

This welder has thermostatic protection from excessive duty cycles, overloads, loss of cooling, and high ambient temperatures. When the welder is subjected to an overload or loss of cooling, a thermostat will open. This condition will be indicated by the illumination of the yellow Thermostatic Protection Light on the case front (see Figure A.2). Also, the Display will be blank, and all of the red Control Panel lights will be out. The fan will continue to run to cool the power source. No welding is possible until the machine is allowed to cool and the Thermostatic Protection Light goes out.

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ACCESSORIES

OPTIONS / ACCESSORIES

- Hand Amptrol (K812)
- Foot Amptrol (K870)
- Arc Start Switch (K814)
- Magnum Cooler Horizontal TIG Mounting Bracket (K559-2)
- Undercarriage (K932-1)

UNDERCARRIAGE FUNCTION

The Square Wave TIG 255 is designed to be used with a Lincoln K932-1 Undercarriage. Complete installation instructions are included with the K932-1 undercarriage. When the undercarriage is properly installed, the Square Wave TIG 255 lift bail is non-functional. Do not attempt to lift the power source with the undercarriage attached. The undercarriage is designed for hand moving only; mechanized towing can lead to injury and/or damage to the Square Wave TIG 255.

INSTALLATION OF FIELD INSTALLED OPTIONS

Instructions for connecting the K932-1 Undercarriage and the K559-2 Magnum Cooler Horizontal TIG Mounting Bracket are included with those accessories.

Installation of the K812 Hand Amptrol, the K814 Arc Start Switch and K870 Foot Amptrol are as follows:

Lift the Output Cover Door (if so equipped) on the Square Wave TIG 255. Feed the cable up through the strain relief holes in the base, and connect the 6-pin MS-type (Amphenol) connector to the Remote Receptacle (See Figure A.2). Secure with the threaded collar.

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MAINTENANCE

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this maintenance.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

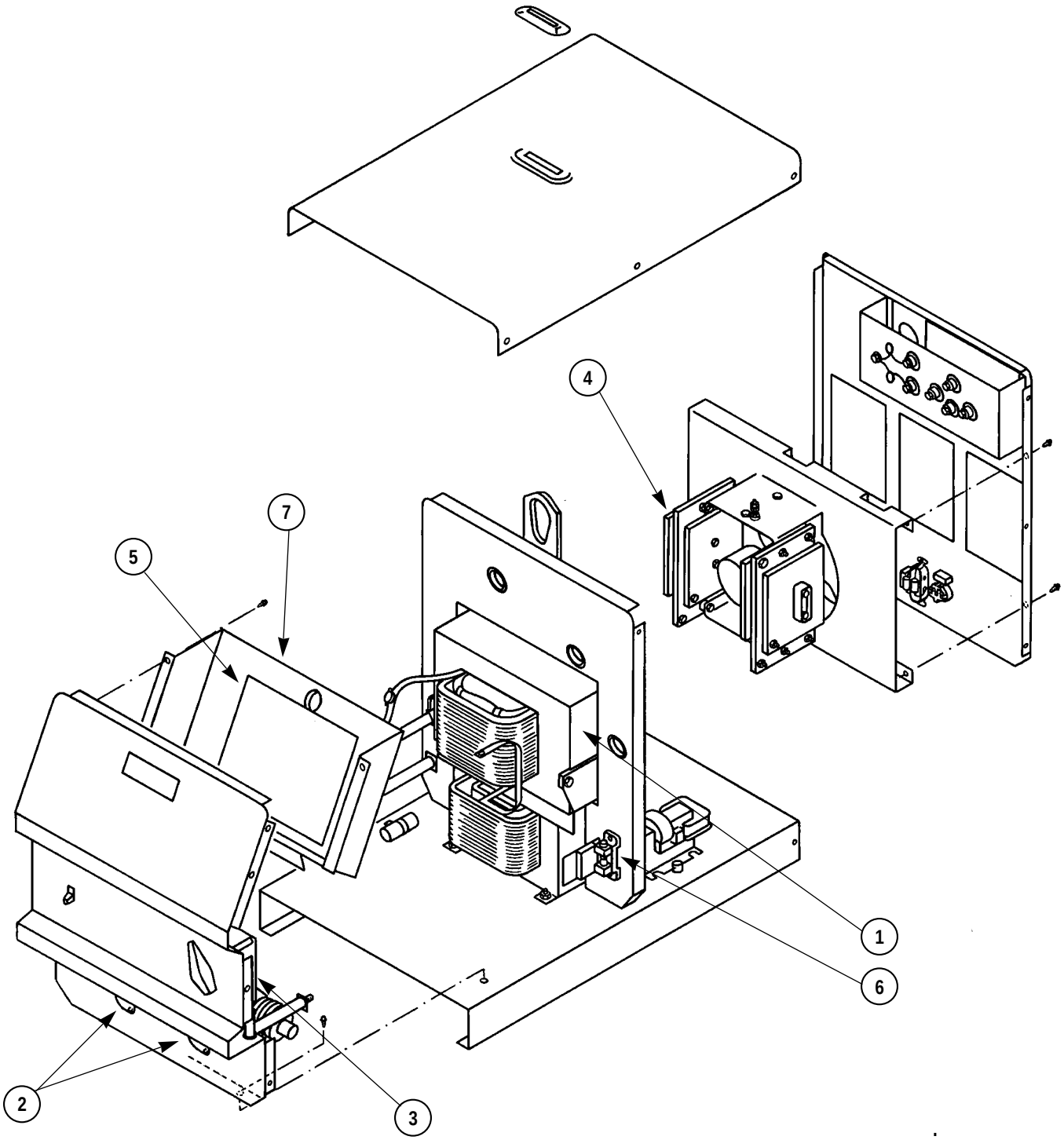
ROUTINE AND PERIODIC MAINTENANCE

⚠ WARNING

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

1. Disconnect power supply lines to machine before performing periodic maintenance.
2. Periodically clean the inside of the machine with a low pressure air system. Be sure to clean the following components thoroughly. See Figure D.1 for location of those components.
   - Main Transformer
   - Output Terminals
   - Polarity Switch
   - Rectifier Assembly
   - Control Box Assembly
   - Spark Gap Assembly
   - Protection PC Board - (Mounted to rear of control box assembly)
3. Inspect welder output and control cables for fraying, cuts, and bare spots.
4. Keep TIG torch and cables in good condition.
5. The fan motor has sealed ball bearings which require no maintenance.
6. Inspect spark gap spacing at regular intervals to maintain a 0.015 in (0.4mm) gap. (Smallest possible air gap consistent with good welding is desirable to minimize R.F.I. problems.) Dressing or any refinishing of the spark gap contacts is not recommended. If the contact surfaces become irregular or completely eroded, replacement of both electrodes is recommended.

FIGURE D.1 - GENERAL ASSEMBLY EXPLODED VIEW



1, MAIN TRANSFORMER
2. OUTPUT TERMINALS
3. POLARITY SWITCH
4. RECTIFIER ASSEMBLY
5. CONTROL BOX ASSEMBLY
6. SPARK GAP ASSEMBLY
7. PROTECTION PC BOARD - (Mounted to rear of control box assembly)

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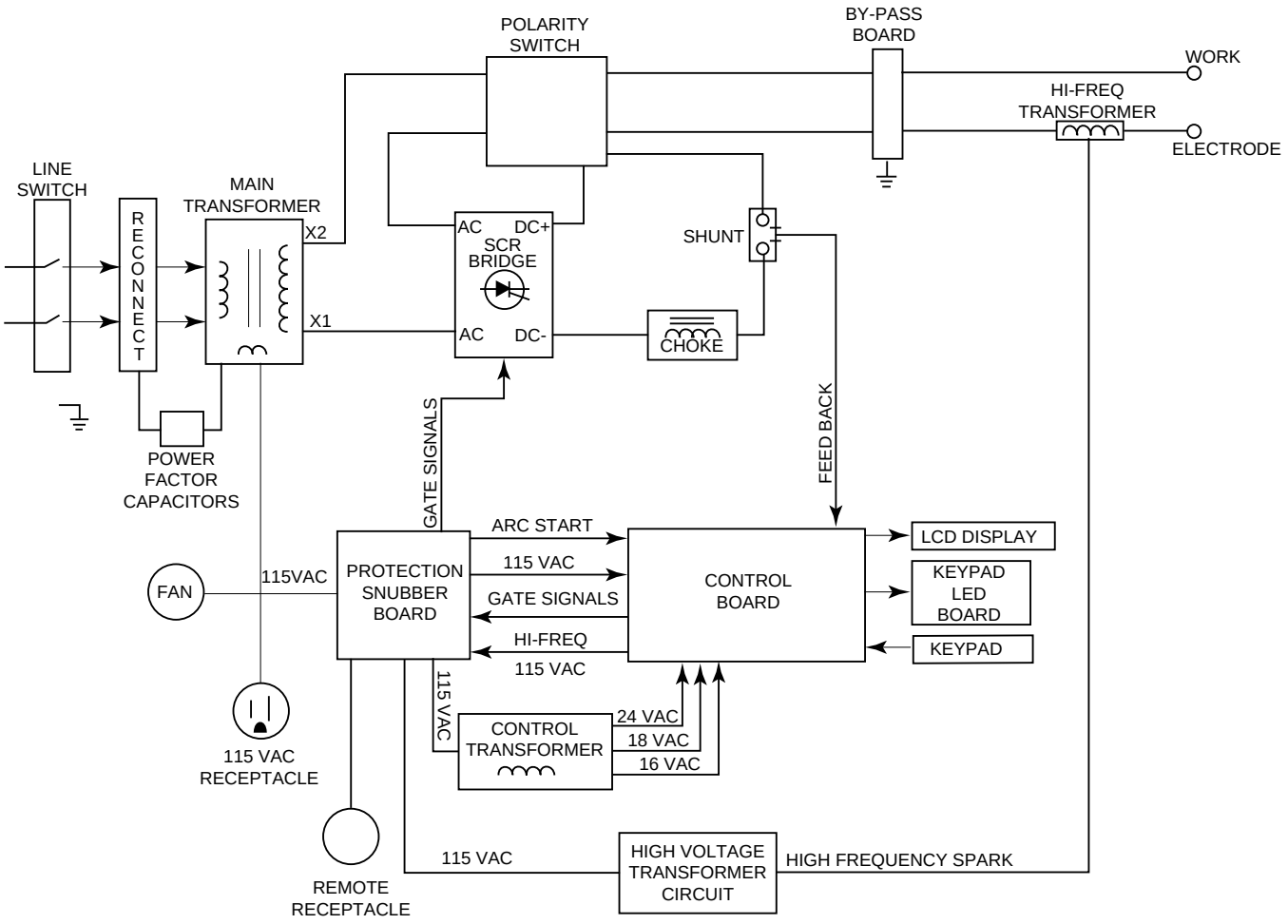
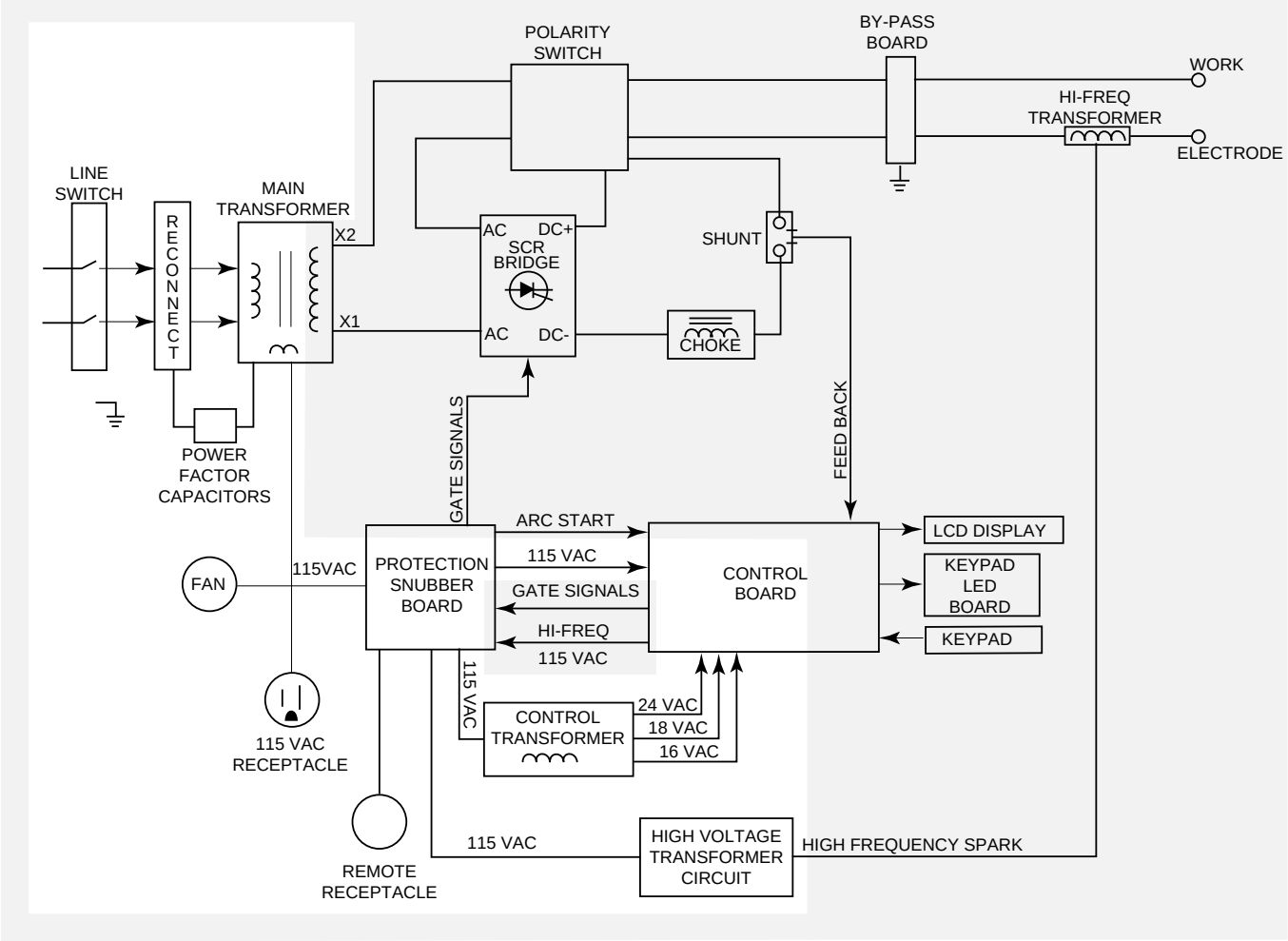
POWER SUPPLY BLOCK LOGIC DIAGRAM



NOTE: On subsequent pages areas of this diagram that are the topic of discusstion are shown in white, other portions of the circuit are shaded.

THEORY OF OPERATION

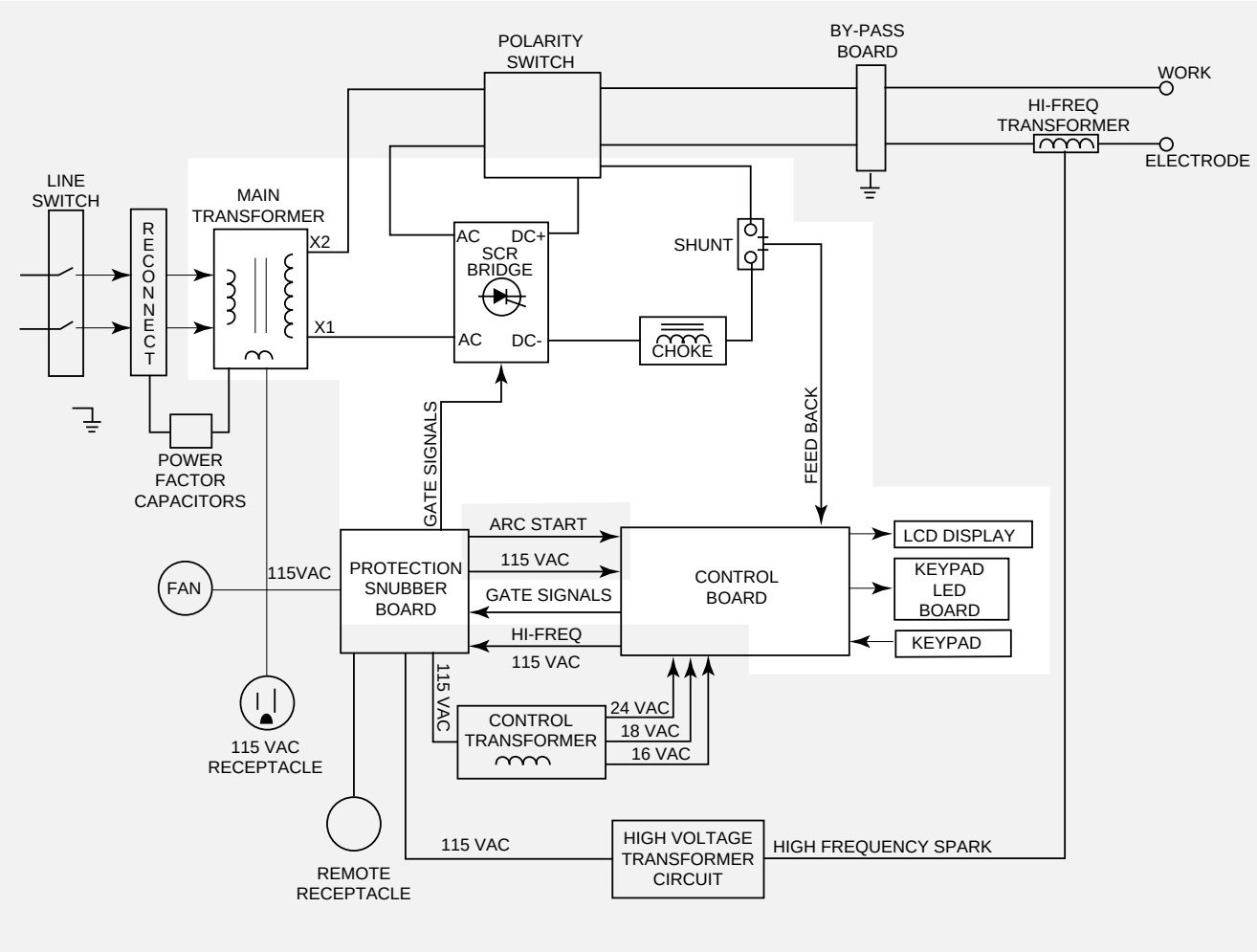
INPUT LINE VOLTAGE AND MAIN TRANSFORMER



The desired single-phase input power is connected to the TIG 255 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. Power factor correction capacitors are incorporated in the primary circuit of the main transformer to help balance the inductive nature of the TIG 255. 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 115vac auxiliary winding, that supplies 115vac to operate the cooling fan and offers 10 Amps of auxiliary power at the 115vac receptacle. This 115vac is also applied to the control board and the control transformer via the protection/snubber board. The 115vac also powers the high voltage circuit. The secondary voltages that are developed in the control transformer power the control board. On 50/60 Hz machines the main transformer also has a 220vac auxiliary winding that provides power to the 220vac receptacle. This 220vac winding is not isolated from the 115vac winding.

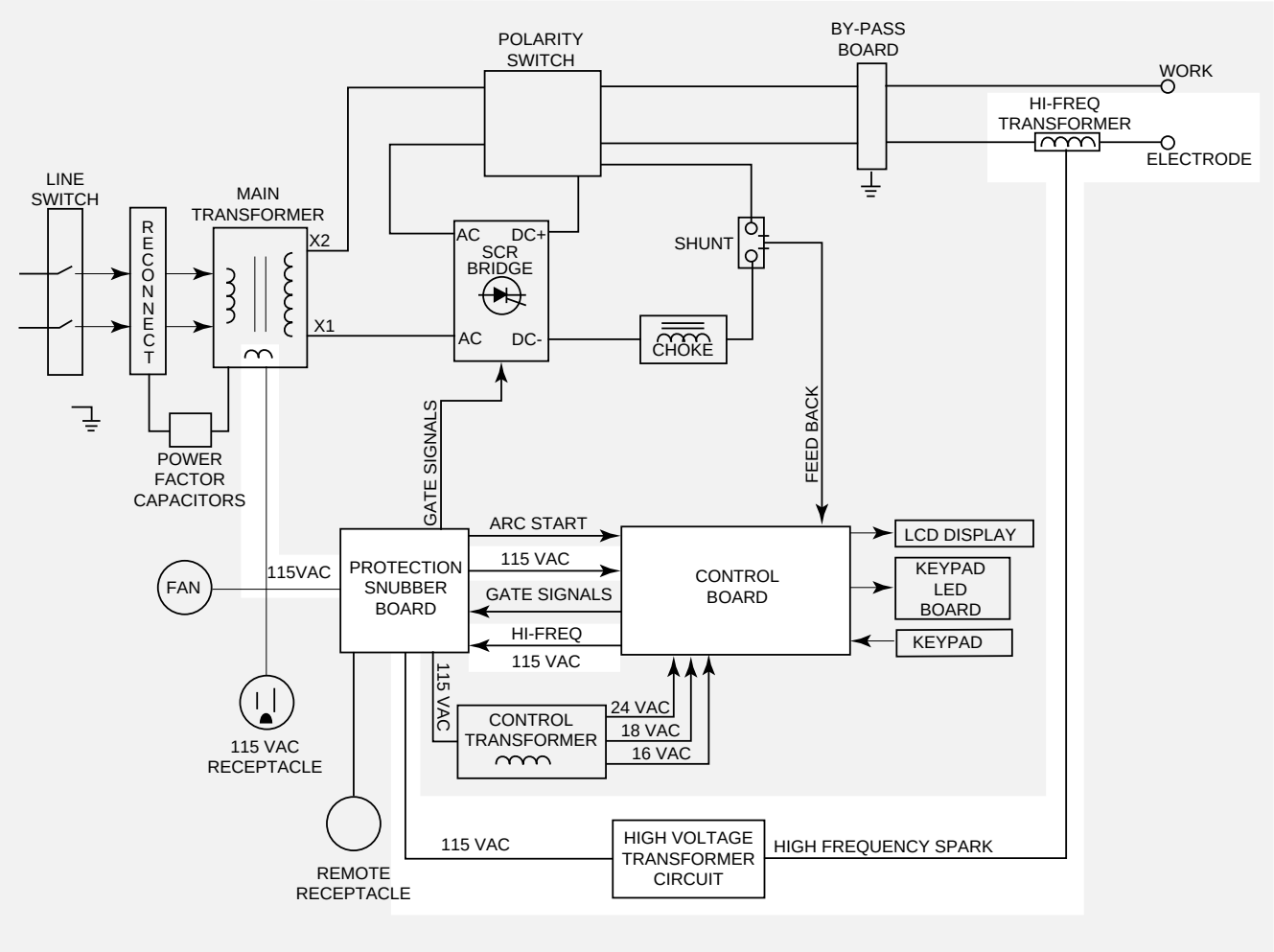
OUTPUT RECTIFICATION AND FEEDBACK CONTROL



The AC output from the main transformer secondary is rectified and controlled through the SCR bridge. Output current is sensed at the shunt, as a low voltage signal, and fed back to the control board. The control board compares the commands of the keypad (or remote control) with the shunt feedback signal. The appropriate gate firing pulses are generated by the control board and applied to the SCR bridge through the protection / snubber board. 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 LED board and the display board.

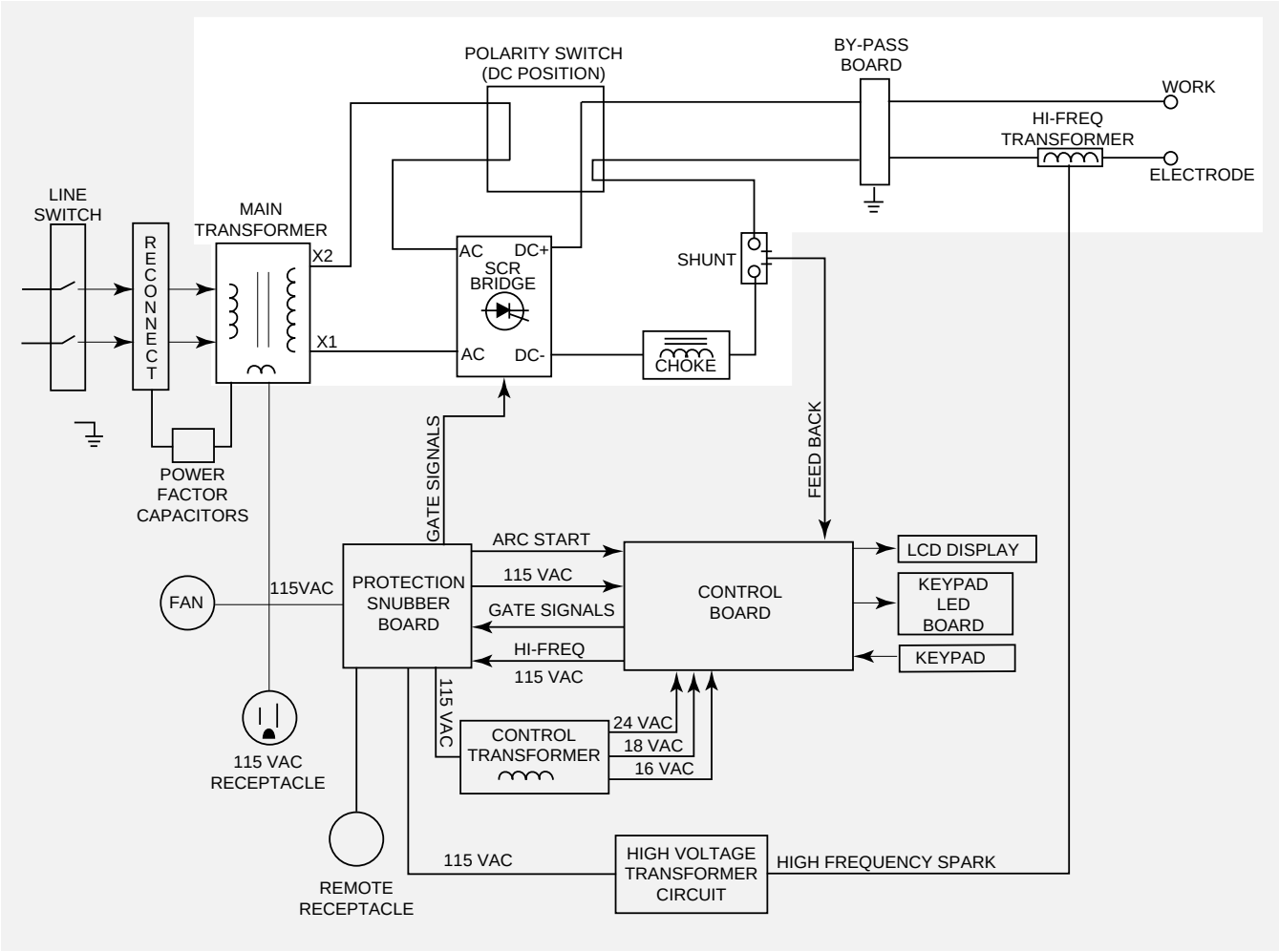
THEORY OF OPERATION

HIGH VOLTAGE / HIGH FREQUENCY CIRCUIT

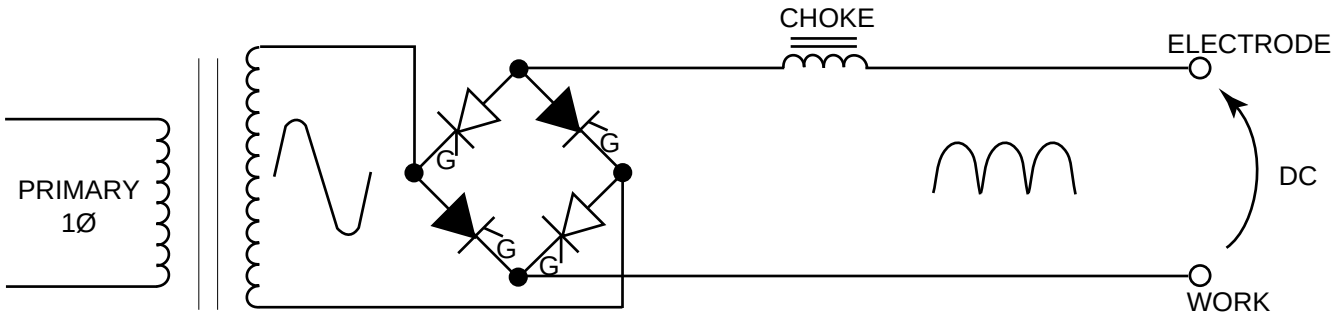


The control board passes the 115vac through the protection / snubber board to the primary of the high voltage transformer. The secondary of the high voltage transformer is coupled to a spark gap generator and also to the high frequency transformer. The high frequency transformer transfers the high frequency “spark” to the electrode stud.

DC WELDING OUTPUT



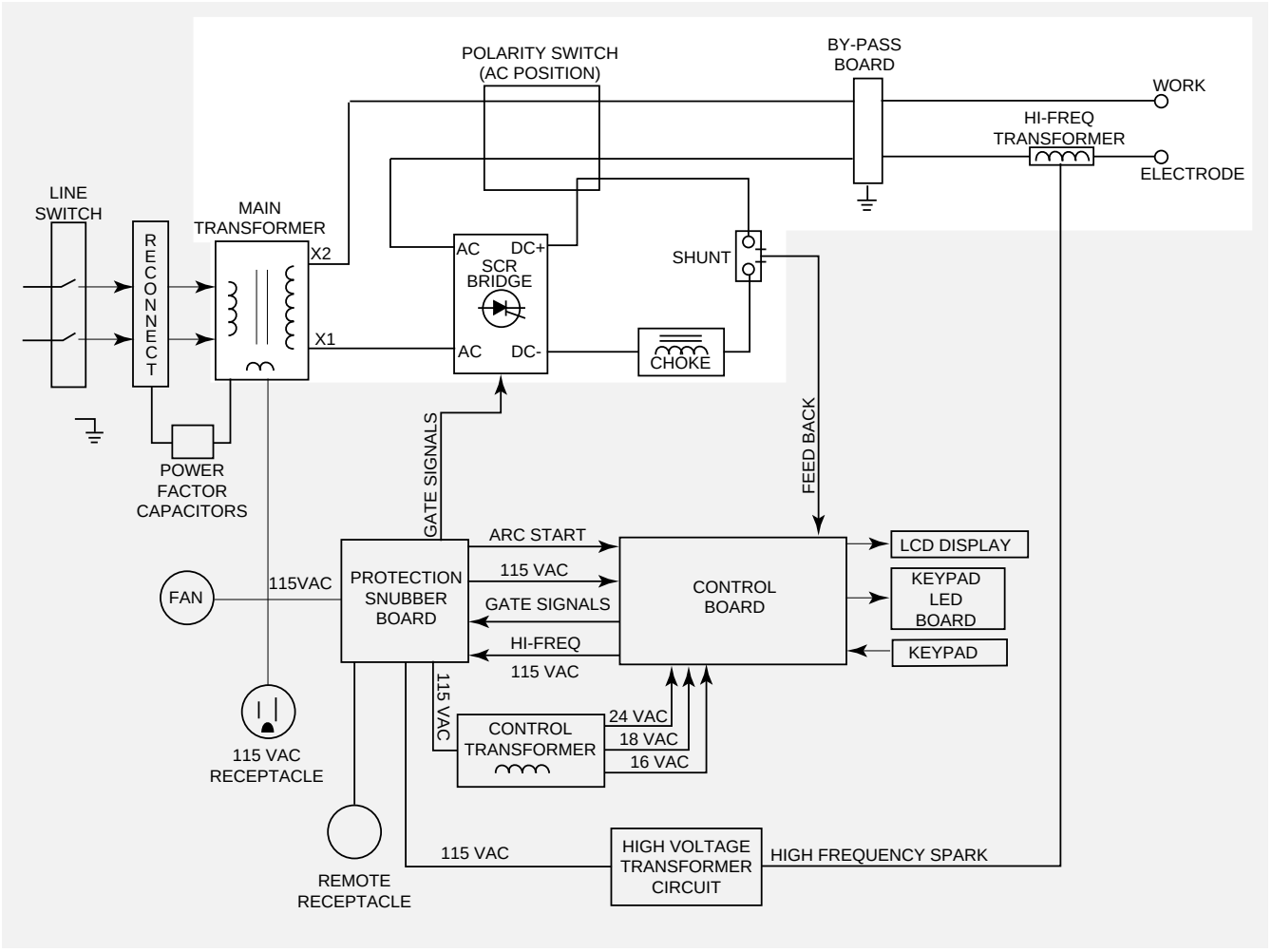
When the polarity switch is placed in either DC position, the AC voltage from the main transformer secondary is applied to the SCR bridge. The SCR bridge and choke circuits are connected in a conventional full wave bridge and filter configuration, resulting in a controlled DC output. Since the choke is in series with the negative leg of the bridge and also in series with the welding load, a filtered DC is applied to the machine's output studs.



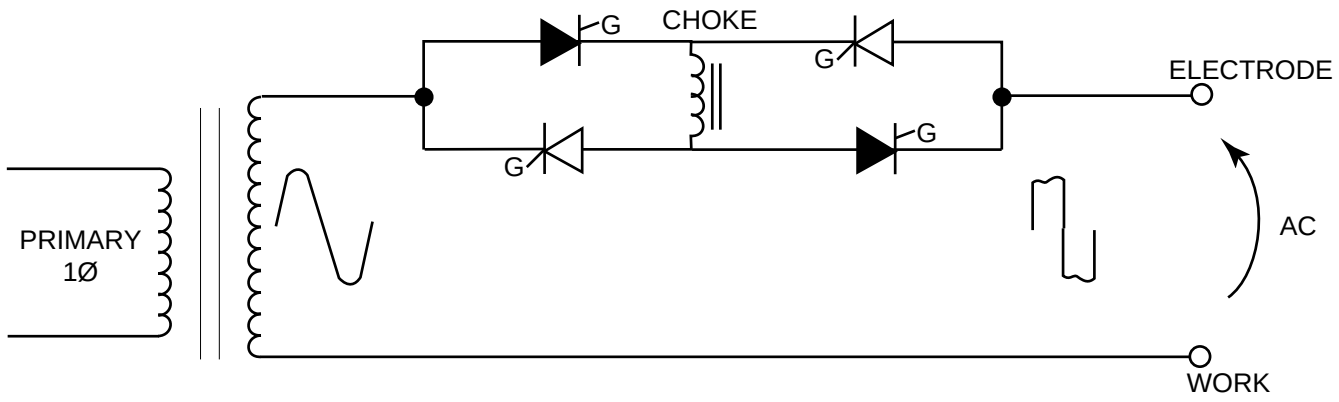
DC WELDING CIRCUIT

THEORY OF OPERATION

AC WELDING OUTPUT



By rotating the polarity switch to the AC position the welding power circuit is changed. One lead (X2) of the main transformer secondary is connected to the machine's output work stud. The other secondary lead (X1) is connected to one of the AC connections on the SCR bridge. The electrode stud is connected to the other AC side of the bridge. The choke is now electrically across the negative and positive SCR bridge connections. Due to the ability of the choke to store energy and the SCR's ability to turn on at the appropriate times, an AC Square Wave is developed and applied to the output studs.



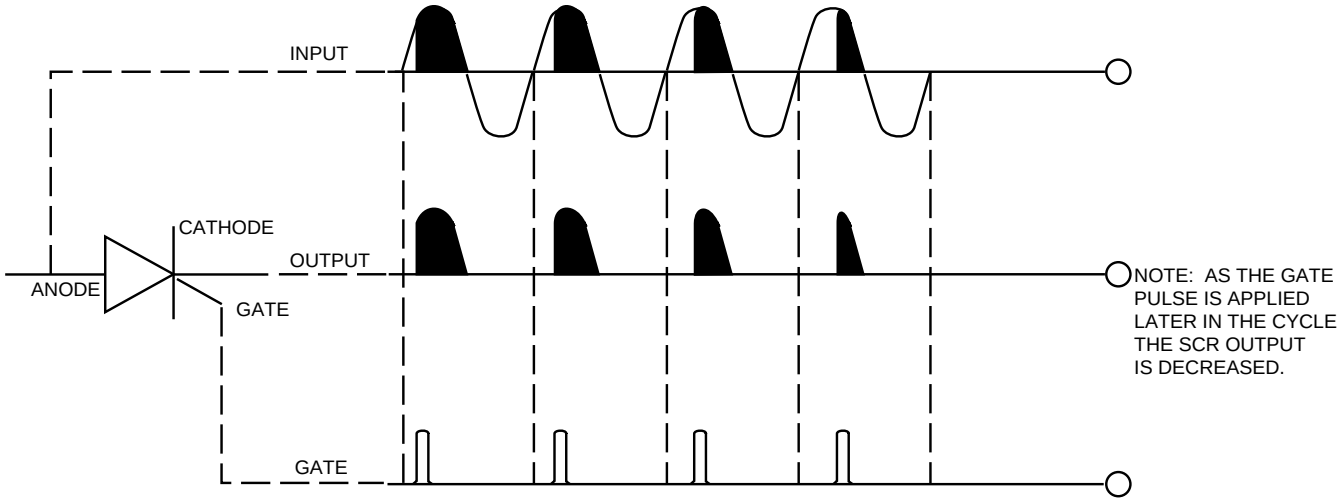
AC WELDING CIRCUIT

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 on state and the remainder of the time in the off 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.



SCR OPERATION

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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. If excessive operating temperature should occur, the thermostat will prevent output voltage or current and the yellow indicator light will glow. Additionally, the display and keypad lights will turn off. The fan will remain on during this period. The thermostat is self-resetting once the machine cools sufficiently. If the thermostat shutdown is caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louvers are obstructed, then the input power must be removed and the fan problem or air obstruction be corrected.

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

All of the referenced test procedures refered 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 1-800-833-9353.

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255. This is best accomplished with a wooden block. Refer to Figure F.3 as an example.

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.

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.)

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

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

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

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.

   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.

   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.

6. Always indicate that this procedure was followed when warranty reports are to be submitted.

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

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TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major Physical or Electrical Damage is Evident.	1. Contact The Lincoln Electric Service Dept. (216) 383-2531 or 1-800-833-9353 (WELD).	
Machine is Dead - No Output - No Fan No Displays.	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 reconnect the panel. 3. Blown or missing fuses in input line.	1. Check input power switch (S1). It may be faulty. 2. Check for open or broken primary leads to main transformer (T1). 3. Check auxiliary (115vac) power winding in the main transformer (T1).
Fan runs - Display and control panel dark. No output from machine in either Stick or TIG modes.	1. Check for proper input voltages. As per nameplate and reconnect panel.	1. Secondary thermostat may be open. Check for glowing yellow light on front panel 2. Control transformer (T2) may be faulty. See Control Transformer Voltage Test. 3. Protection/Snubber board may be faulty. See Protection/Snubber Board Continuity Test. 4. 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 1-800-833-9353.

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The voltmeter reads “00” in Stick Mode, and there is no output from the machine when in the TIG 2-Step Mode.	1. Inspect to assure that the arc start switch is in the on (closed) position when welding in the TIG Mode.	1. Check for loose connectors at the SCR bridge and at the Protection/Snubber board. (J10) and (J11). See Figure F.2 at end of this Guide for location. 2. Check the wiring to the Control Transformer (T2). Observe directions on decal. 3. The Protection/Snubber board may be faulty. See Protection/Snubber Board Continuity Test. 4. Check the Control Transformer (T2). See Control Transformer Voltage Test. 5. Check the polarity switch (S2) for loose or broken connections. 6. Check the SCR bridge. See Static and Active SCR Tests. 7. If all previous tests are OK - then replace the Control board.
Machine does not respond (no gas flow, no high frequency and no open circuit voltage) when arc switch or amptrol is activated - displays and fan working. Note: Machine may have OCV in the Stick Mode.	1. Machine MUST be in one of the TIG Modes. 2. The arc start switch or amptrol may be defective. Check for continuity between pins “D” and “E” on cable connector when arc switch or amptrol is activated.	1. Check trigger circuit. See Arc Start Trigger Circuit Test 2. Check the Control transformer (T2). See Control Transformer Voltage Test. 3. Protection/Snubber board may be faulty. See Protection/Snubber Board Continuity Test. 4. If all previous tests are OK - then replace the Control board.

⚠ 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 1-800-833-9353.

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
115VAC Receptacle not working properly (voltage is below 108VAC). Machine has welding output - fan is running.	1. Check for 115VAC at receptacle - if low (below 108VAC), then check input voltage to machine.	1. If voltage at the receptacle is zero, then check for open circuit breaker (CB1) 2. Check leads #230, #231, and #232 for loose or broken connections. Refer to wiring diagram.
Machine regularly overheats - thermostat opens, PL1 (yellow light on front panel) glows. The fan runs but machine has no output and no display.	1. Welding application may exceed recommended duty cycle. 2. Dirt and dust may have clogged the cooling channels inside the machine. Blow out unit with clean, dry compressed air. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance around machine.	1. Check for proper fan operation. 2. The thermostat may be faulty - Should be normally closed
Machine makes a very loud buzzing noise in DC Stick Mode, or in DC TIG Mode when the arc start or amptrol is pressed. There is no current draw from machine's output studs. (The machine is not externally loaded).	1. Inspect output stud insulators for cracks or signs of overheating.	1. Diode (D1) may be shorted. Check and replace if necessary. 2. The SCR bridge may be faulty. See Static and Active SCR Tests. 3. Check the polarity switch (S2) for correct connections.

⚠ 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 1-800-833-9353.

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The ammeter displays a very high value (greater than 316 amps) when the machine is not loaded. Machine may have low or no output.	None.	1. The shunt leads (#221 and #222) may be loose or open. Check the red and white twisted pair from the shunt to the control board. Refer to wiring diagram. 2. The Control board may be faulty. If the shunt leads have continuity (zero ohms) to the control board, pins 1J7 and 2J7, then replace the control board. See pin locations in Figure F.1 at end of this Guide.

⚠ 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 1-800-833-9353.

TROUBLESHOOTING GUIDE

Observe Safety Guidelines
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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The yellow light (PL1) on the front panel is not lit.	1. Normal condition - this light will glow only if machine is in an overheated condition. (Thermal overload).	
One or more keypad lights (LEDS) are dark and cannot be lit when their respective keys are pressed - machine is operable.	1. Be sure that the proper weld mode is selected. For example, the high frequency keys and keypad lights (LEDS) are not active in the stick mode.	1. Check the Keypad LED board to the Control board harness. The plugs may be loose or defective. 2. If only one red LED won't light, the LED PC Board may be defective. Replace. 3. If three or more red LEDS do not light, the Control board may be faulty. Replace.
The Beeper (Piezoelectric Buzzer) cannot be heard - machine operating normally.	1. Background noise may be too loud for user to hear beeper.	1. Watch the Control Panel Display to see if the keys are responding properly to key presses. If so then the Buzzer may be defective. Replace the Piezo Electric Buzzer. **HINT- The Piezo Electric Buzzer may be checked by applying a 9vdc signal to the buzzer leads. Red lead to +. Black lead to –.** 2. The Control board may be faulty. Check for the presence of 15vdc at pins 6J6 to 13J6 at the Control board. See figure at end of this Guide. The 15vdc will be present for a very short period of time when a key is pressed. If the voltage is not present then replace the Control board.

⚠ 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 1-800-833-9353.

Observe Safety Guidelines
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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The control panel displays cannot be read. The characters run, display only half characters, or random dots may appear on display.	None	1. Check for loose connections at plug J3 on the control board. 2. The display may be faulty. Replace. 3. The control board may be faulty. Replace.
The voltmeter always reads “00” . The machine output is normal.	None	1. Check the continuity of leads #305 and #313C and their connections to the machine output studs. Refer to wiring diagram. 2. The Control board may be faulty. Check for machine “open citcuit voltage” at 5J6 and 12J6 on the Control board. If open circuit voltage is present then replace the Control board. 3. If open circuit voltage is not present at 5J6 and 12J6 (see Figure F.1) then check the Protection/Snubber board. See Protection/Snubber Board Continuity Test.
The control panel display background is dark instead of red. The machine operates normally.	None	1. Check for loose connector (P3) at the Control board. 2. The Control board may be faulty. Disconnect P3 from the Control board. Check voltage from 1J3 to 2J3 on the board. See Figure F.1. The voltage should be 15 to 20vdc. If the voltage is not correct then replace the Control board. 3. If the Control board is good then the Display may be faulty. Replace Display.

⚠ 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 1-800-833-9353.

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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
AC/DC Indicator on control panel display show AC when polarity switch is in the DC position, or vice versa — machine has output but balance control is not operable in the AC TIG mode.	None	1. Check leads #304 and #312 for proper connections. Refer to wiring diagram 2. Check microswitch (S2A), located on polarity switch (S2), for proper operation. 3. The protection/snubber board may be faulty. See protection/ snubber board continuity test. 4. Check control transformer (T2). See control transformer voltage test. 5. If above checks are OK, then replace the control board.
All red keypad LEDS are dark but the control panel display is operable. The machine has output.	None	1. The wiring harness between the Control board and the LED board may be faulty. Check for defective plugs or loose wires. 2. The Control board may be faulty. Replace.

⚠ CAUTION

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Observe Safety Guidelines
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TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TIG MODE PROBLEMS		
Machine output is intermittently lost. Gas flow and high frequency are also interrupted.	1. Problem may be caused by high frequency interference. Make sure that the machine is grounded properly according to the installation instructions. If there are other high frequency sources in the area, make certain that they are grounded properly. 2. Check arc start switch or amptrol for proper operation and loose connections.	1. Internal ground connections may be loose. Check mounting screws on the Protection/ Snubber board and also on the Bypass board. All case screws should be in place and tight. 2. Protection/Snubber board may be faulty. See Protection/ Snubber Board Continuity Test. 3. Check trigger circuit. See Arc Start Trigger Circuit Test.
Arc “Flutters” when TIG welding.	1. Tungsten electrode may be too large in diameter. 2. Tungsten not “Sharp” when welding in DC negative mode. 3. If helium is used as a shielding gas, then reduce the percentage of helium. 4. Adjust flow rate of shielding gas. 5. Check hoses and connections for leaks.	1. Check for loose shunt connections.- leads #221 and #222. Refer to wiring diagram. 2. Check polarity switch for loose or faulty connections. 3. SCR bridge may be faulty. See Static and Active SCR Tests. 4. Protection/Snubber board may be faulty. See Protection/ Snubber Board Continuity Test. 5. Check R3, R4 and C2 in the high voltage transformer primary circuit. Refer to wiring diagram. 6. 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 1-800-833-9353.

Return to Section TOC
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PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TIG MODE PROBLEMS		
Lack of penetration in AC TIG welding.	1. Manual balance control set improperly - set to negative 10 (-10) for maximum penetration.	1. SCR bridge may be faulty. See Static and Active SCR Tests. 2. Protection/Snubber board may be faulty. See Protection/ Snubber Board Continuity Test. 3. Control board may be faulty.- Replace.
Black areas along weld bead.	1. Tungsten electrode may be contaminated. Replace or sharpen. 2. Shielding gas flow may be insufficient. 3. Contaminated gas or faulty gas line or torch.	This may be a welding procedure problem. Contact The Lincoln Electric Service Department (216) 383-2531 or 1-800-833-9353 (WELD).
Black areas along weld bead at or near end of weld.	1. Increase post flow time.	This may be a welding procedure problem. Contact The Lincoln Electric Service Department (216) 383-2531 or 1-800-833-9353 (WELD).

⚠ 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 1-800-833-9353.

Observe Safety Guidelines
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TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TIG MODE PROBLEMS		
Machine has low output when in TIG 4-Step Mode.	1. Machine must be in "Local" Control Mode when 4-Step is used.	Machine controls may be set incorrectly. Contact The Lincoln Electric Service Department (216) 383-2531 or 1-800-833-9353 (WELD).
Weak high frequency - machine has normal welding output.	1. Spark gap may be misadjusted. Check and reset per maintenance instructions. 2. Improper shielding gas flow. Adjust for a flow of 10 to 30 CFH (4.7 to 14.1 l/min.) for most applications. 3. Work and electrode cables in poor condition allowing high frequency to "Leak Off". Use good quality cables with a high natural rubber content, such as Lincoln Stable Arc Cable. Cables should be as short as possible.	1. Check for an open or arcing high frequency component. Replace as required. (Examples. R3, R4, C2.) Refer to wiring diagram. 2. If spark is weak at the spark gap check or replace high frequency circuit. (Examples. T3, C3, L3, L4.)
The display shows zero amps, but indicates open circuit voltage (approximately 53V). The arc start switch or amptrol is not actuated.	1. The arc start switch or amptrol may be defective. There should not be any continuity between pins "D" and "E" on the arc start cable connector, unless the unit is actuated. 2. If an amptrol is not being used, the machine must be in the Local Control Mode.	1. Check Trigger circuit. See Arc Start Trigger Circuit Test. 2. 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 1-800-833-9353.

Return to Section TOC
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TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TIG WELDING PROBLEMS		
High frequency "Spark" is present at tungsten electrode, but operator is unable to establish a welding arc. Machine has normal open circuit voltage (approximately 53V).	1. Torch may be faulty. 2. If an amptrol is not being used, then the machine must be in the Local Control Mode. 3. Tungsten electrode may be too large for the process. 4. If helium shielding gas is being used, then reduce percentage of helium. 5. If TIG welding in the DC negative mode, then a properly sharpened thoriated tungsten should be used. 6. Check the welding cables and output stud connections.	This may be a welding procedure problem. Contact The Lincoln Electric Service Department (216) 383-2531 or 1-800-833-9353 (WELD).
No high frequency. Machine is in the TIG Mode and has normal output.	1. In order for the high frequency to operate, the machine must be either in the start only Mode or the continuous high frequency mode. 2. The high frequency spark gap may be too large or shorted. Check gap as per maintenance instructions.	1. Check the high voltage transformer (T3). The normal resistance of the secondary winding of the high voltage transformer is 12.5k ohms. 115vac is applied to the primary of T3. A very high voltage is developed on the secondary winding. For assistance call The Lincoln Electric Service Department. (216) 383-2531 or 1-800-833-9353 (WELD). 2. Check the values of R3, R4 and C2. Replace if faulty. 3. The Protection/Snubber board may be faulty. See Protection/Snubber Board Continuity 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 1-800-833-9353.

Observe Safety Guidelines
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TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
TIG WELDING PROBLEMS		
No gas or water flow when arc start switch or amptrol is activated in the TIG Mode. Machine has output - fan runs. When toggling between the Stick and TIG Modes a "Click" can be heard indicating that the solenoids are operating.	1. Gas supply is empty or not turned on. 2. Gas or water hose may be pinched. 3. Gas or water solenoid may be blocked with dirt. Use filters to prevent reoccurrence. Consult your Local welder/gas distributor.	Possible gas or water supply problem. Contact The Lincoln Electric Service Department (216) 383-2531 or 1-800-833-9353(WELD).
Arc rectification when AC TIG welding.	1. Tungsten electrode may be too small for process. 2. Manual balance control may be misadjusted. Readjust to the negative direction. 3. If helium gas is being used, reduce percentage of helium.	1. Check components R3, R4, and C2 in the high voltage transformer primary circuit. Replace if faulty. 2. Check the SCR bridge. See Static and Active SCR Tests.
There is no gas or water flow when the arc start switch or amptrol is activated in the TIG mode. The machine has output and the fan runs. When toggling between the Stick and TIG modes a "click" CANNOT be heard indicating that the solenoids are NOT operating.	None	1. The gas or water solenoid may be defective. Check for 115vac at the solenoid leads. The machine must be in the TIG mode and the arc start switch activated. 2. If 115vac is not present at the solenoids then check the Protection/Snubber board. See Protection/Snubber Board Continuity Test. 3. If the above tests are OK - Then 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 1-800-833-9353.

Return to Section TOC
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TROUBLESHOOTING GUIDE

Observe Safety Guidelines
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
STICK WELDING PROBLEMS		
Stick electrode “Blasts Off” when arc is struck.	1. Weld current is set too high for recommended electrode size. Reduce preset current adjustment.	1. Possible faulty SCR bridge. See Static and Active SCR Tests. 2. Control board may be faulty. Replace.
Cannot adjust AC Wave Balance when welding in the Stick Mode.	1. This is a normal condition. Wave balance keys are automatically disabled in the Stick Mode.	None
Machine welds at a very low output regardless of the preset current setting - arc is stable.	1. If welding in the Remote Control Mode, the remote amptrol may be defective or not installed properly. 2. If the output is low when the machine is in the Local Control Mode, the problem could be internal to the machine.	1. Check the SCR bridge. See Static and Active SCR Tests. 2. Check polarity switch (S2) connections and operation. 3. Check the control transformer (T2). See Control Transformer Voltage Test. 4. The Control board may be faulty. Replace.
Variable or sluggish welding arc when welding in the Stick Mode.	1. Check work and electrode cables for loose or poor connections. 2. The weld cables may be too small or too long to permit the desired current to flow. 3. The preset current adjustment may be set too low.	1. Check polarity switch (S2) for wear or loose connentions. 2. Check interior connections of the heavy current carrying leads.

⚠ 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 1-800-833-9353.

PC BOARD CONNECTOR LOCATIONS

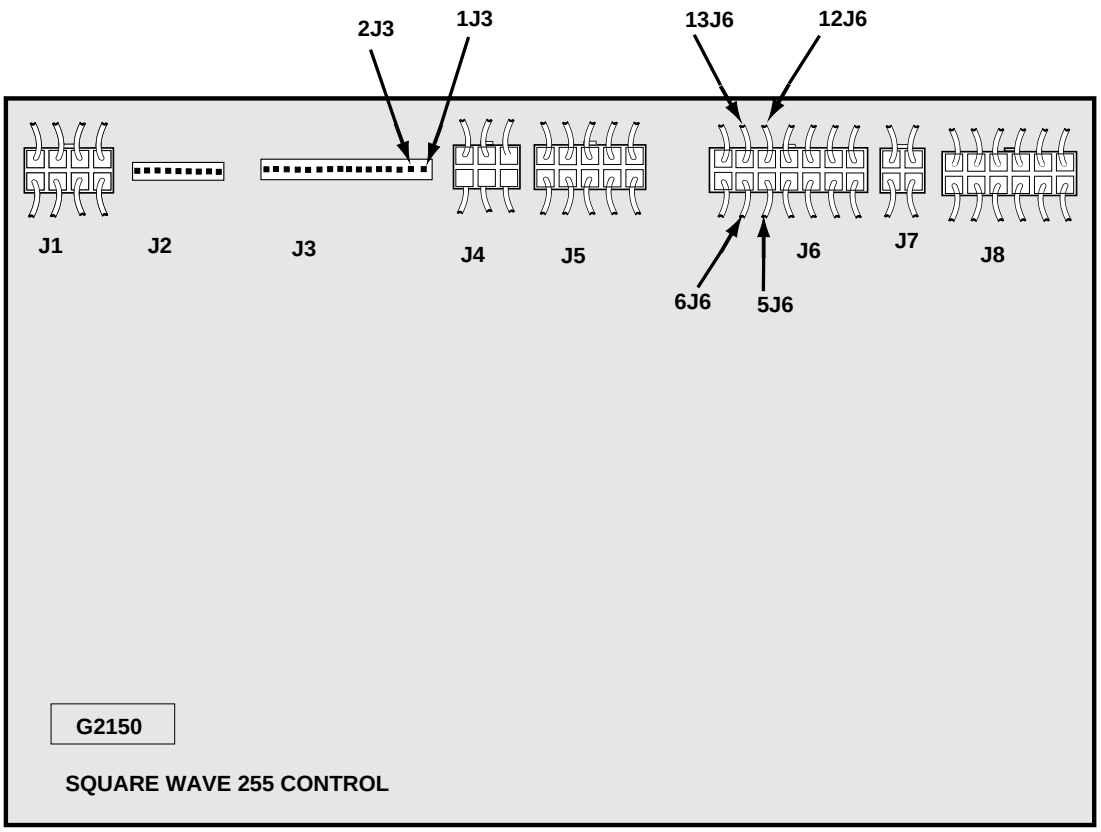


FIGURE F.1 - CONTROL BOARD CONNECTORS

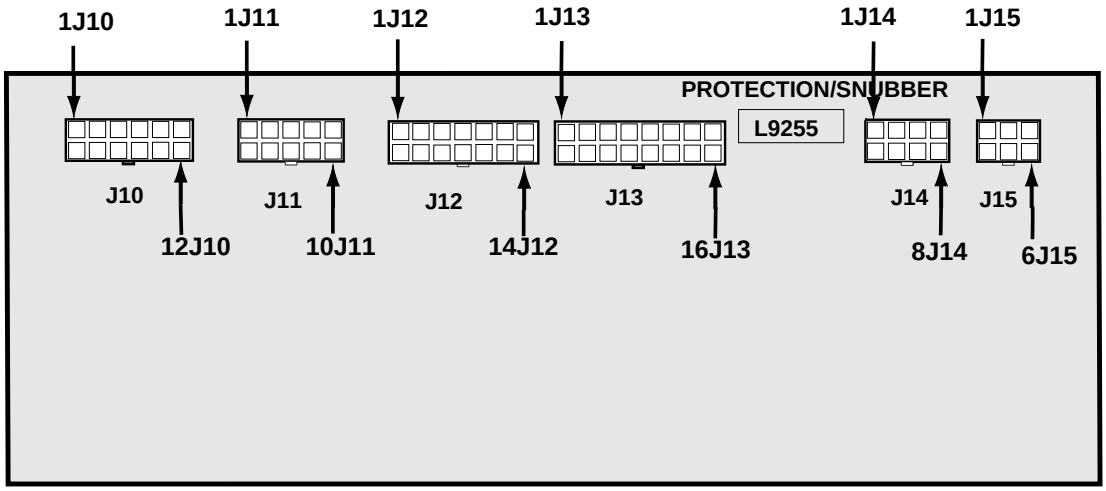


FIGURE F.2 - PROTECTION/SNUBBER BOARD CONNECTORS

CONTROL TRANSFORMER (T2) VOLTAGE TEST

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of the control transformer and also if the correct voltages are being induced on the secondary windings of the transformer.

MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)
TIG 255 Wiring Diagrams (See Electrical Diagram Section of manual.)
Table of Voltage Tests and Drawing of Transformer and Molex Plug (J8)
Figure F.4.

CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

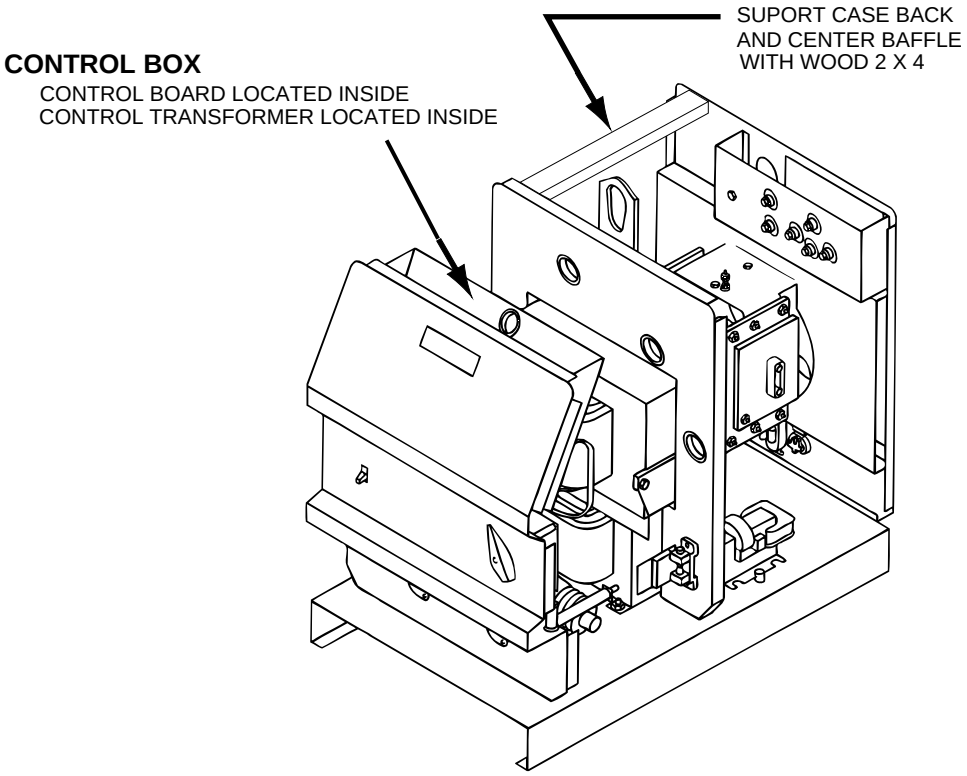


FIGURE F.3 - LOCATION OF CONTROL BOARD AND CONTROL TRANSFORMER.

TEST PROCEDURE

1. Remove main supply power to machine

2. Locate and remove Plug J8 from control board, located in the control box. **Hint: For ease of testing, secure Plug J8 to case front with tape.**

3. Locate leads #432 and #433 connected to the control transformer (T2) which is located in the top of the control box.

4. Turn main power ON

5. Check for 120VAC at leads #432 to #433

   A.. If 120VAC is present at leads #432 to #433, go to Step 8.

   Note: If main supply voltage varies, control transformer voltages will vary accordingly.

   B. If a very low or zero voltage is shown at leads #432 to #433 then go to Step 6.

6. Remove main supply power to machine.

CONTROL TRANSFORMER (T2) VOLTAGE TEST *(continued)*

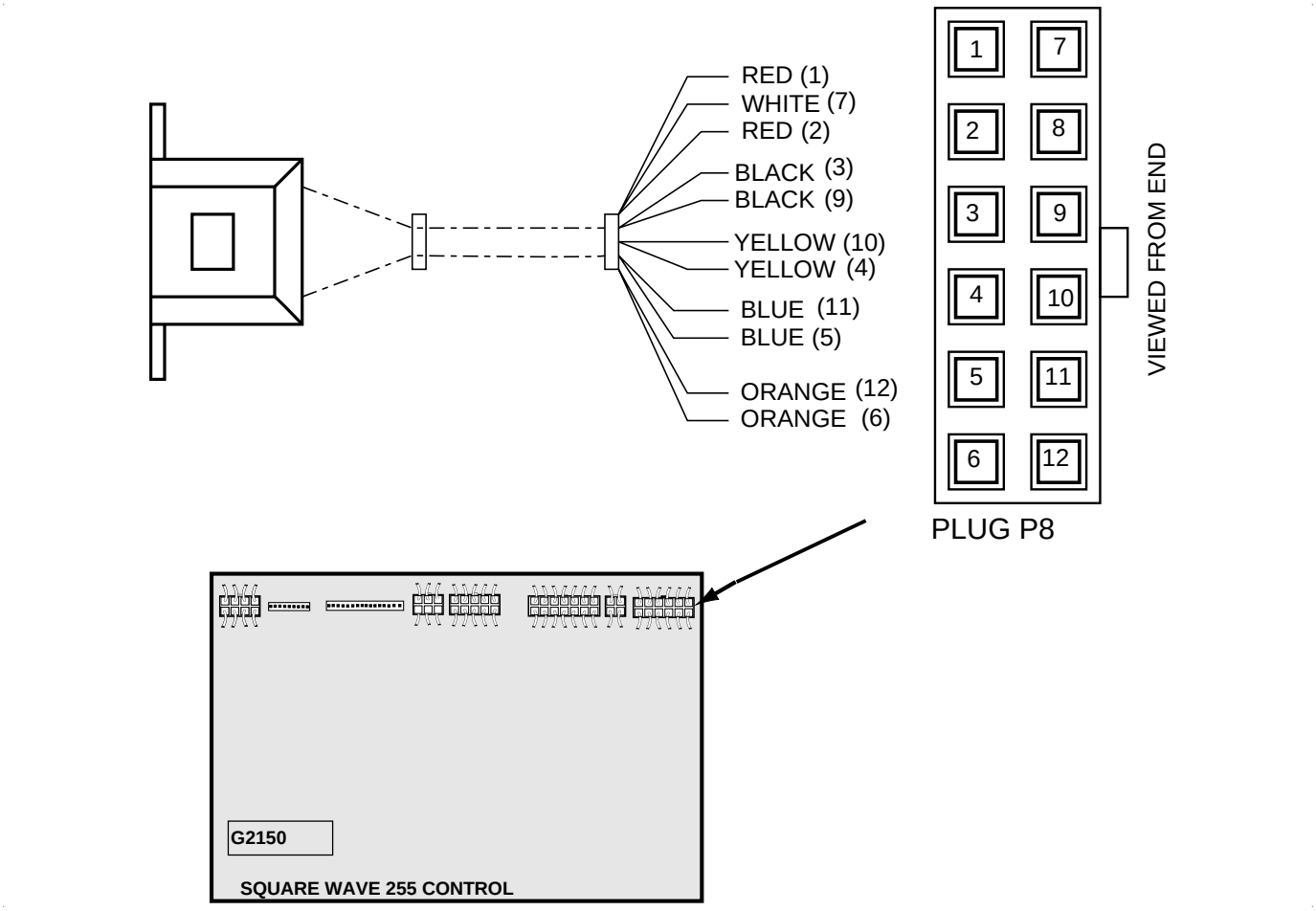


FIGURE F.4 - CONTROL BOARD AND TRANSFORMER.

7. Test the resistance from 8J14, on the protection/ snubber board, to the #432 lead at the control transformer. Also check resistance from 4J14, on the protection/snubber board, to the #433 lead at the control transformer.

   A. If zero ohms resistance is shown test is OK. Proceed to protection/ snubber board continuity test.

   B. If resistance of any value is shown, check wires and connections.

8. Test for the correct AC voltages at Plug 8. See Figure F-4.

   A. If one or more voltages are missing or incorrect, control transformer is faulty. Replace.

IMPORTANT: If the Control Transformer is replaced refer to label on the new transformer for correct primary lead connections. If connected wrong, the machine will have no OCV output. If no OCV occurs reverse the control transformer's primary connections and recheck machine's OCV.

Note: If main supply voltage varies, control transformer voltages will vary accordingly.

Secondary Lead Colors	Plug P8	Approximate Voltages
Red to Red	1 to 2	36 VAC
Red to White	1 to 7	18 VAC
Yellow to Yellow	4 to 10	16 VAC
Black to Black	3 to 9	24 VAC
Orange to Orange	6 to 12	16 VAC
Blue to Blue	5 to 11	16 VAC

PROTECTION/SNUBBER BOARD CONTINUITY TEST

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

TEST DESCRIPTION

Many circuits pass through the protection/snubber board. The purpose of this test is to determine if the board's circuitry and components are intact and capable of passing signal currents.

MATERIALS NEEDED

Ohmmeter (Multimeter)
TIG 255 Wiring Diagrams (see Electrical Diagram section of manual)
Protection/snubber board Continuity Table, Figure F.6.

PROTECTION/SNUBBER BOARD CONTINUITY TEST *(continued)*

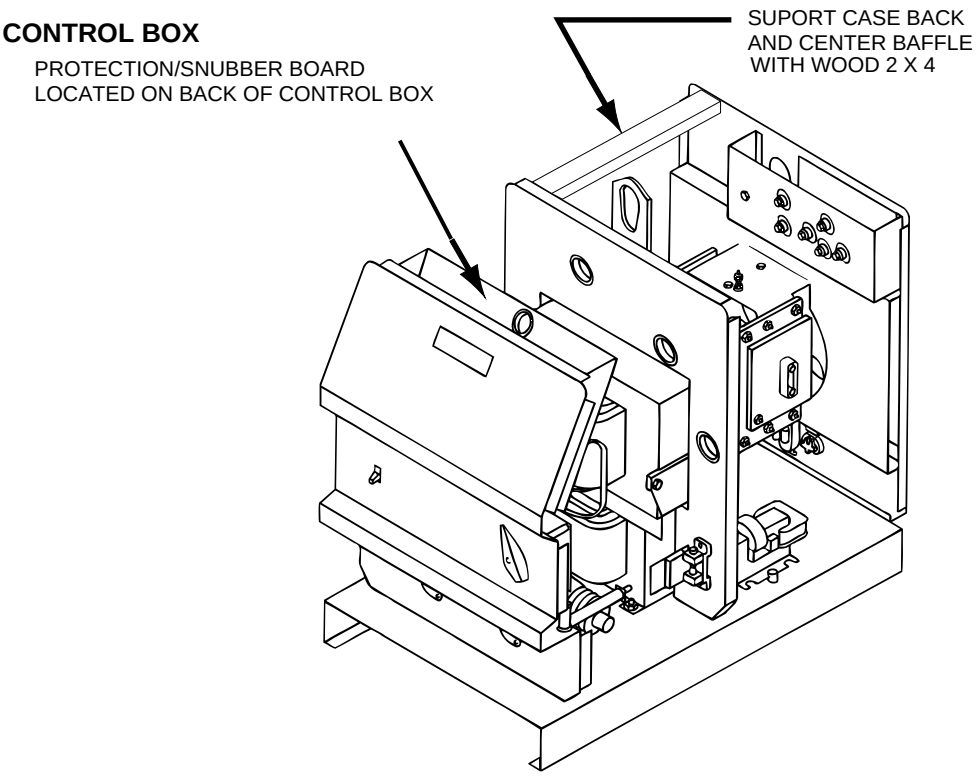


FIGURE F.5 - PROTECTION/SNUBBER BOARD LOCATION

TEST PROCEDURE

1. Remove main supply power to machine.

2. Locate and remove all harness plugs from the protection/snubber board located on the back of the control box. Refer to Figure F.5.

3. The protection/snubber board may be removed to simplify test.

   A. Remove three 8 - 32 x 1/4" Phillips head screws from bottom of board

   B. Release board from nylon supports with needle nose pliers or small screw driver

4. Inspect board for "leaky" or burned components. If questionable components are observed then replace projection/snubber board. (See note.)

5. Check resistances per Continuity Table F.6.

   A. If any resistances do not meet the Continuity Table specifications, projection/snubber board is faulty - Replace. (See note.)

Note: When installing projection/ snubber board be sure that the three 8 - 32 x 1/4" Phillips head mounting screws are tightened securely. These conduction points are necessary for high frequency by-pass grounding.

PROTECTION/SNUBBER BOARD CONTINUITY TEST *(continued)*

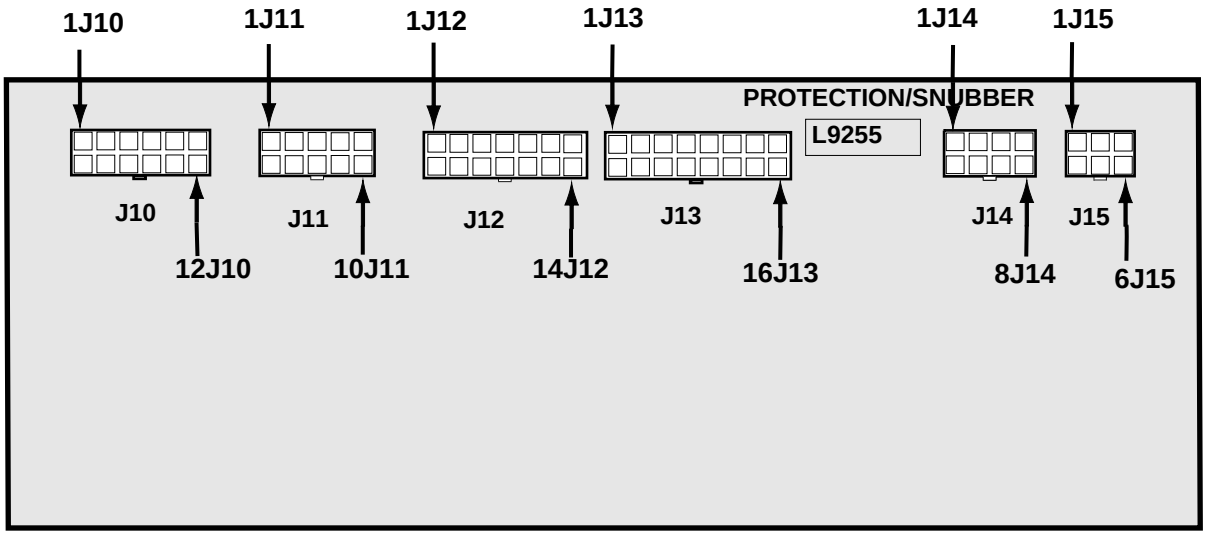


FIGURE F.6 - PROTECTION/SNUBBER BOARD TEST POINTS.

Check Points	Component(s) Being Checked	Maximum Allowable Resistance
5J13 to 5J12	L1 and Board Trace	4.2 OHMS (3.3 Typical)
13J13 to 12J12	L2 and Board Trace	4.2 OHMS (3.3 Typical)
4J13 to 4J12	L3 and Board Trace	4.2 OHMS (3.3 Typical)
12J13 to 11J12	L4 and Board Trace	4.2 OHMS (3.3 Typical)
2J13 to 2J12	L5 and Board Trace	4.2 OHMS (3.3 Typical)
9J13 to 8J12	L6 and Board Trace	4.2 OHMS (3.3 Typical)
1J13 to 1J12	L7 and Board Trace	4.2 OHMS (3.3 Typical)
11J13 to 10J12	L8 and Board Trace	4.2 OHMS (3.3 Typical)
3J13 to 3J12	L9 and Board Trace	4.2 OHMS (3.3 Typical)
5J15 to 4J14	L10 and Board Trace	4.2 OHMS (3.3 Typical)
4J15 to 8J14	L11 and Board Trace	4.2 OHMS (3.3 Typical)
4J15 to 5J14	L12 and Board Trace	.35 OHMS (.32 Typical)
4J15 to 3J14	L13 and Board Trace	.35 OHMS (.32 Typical)
6J15 to 4J14	L10 and Board Trace	4.2 OHMS (3.3 Typical)
2J15 to 2J14	L14 and Board Trace	.35 OHMS (.32 Typical)
3J15 to 6J14	L15 and Board Trace	.35 OHMS (.32 Typical)
1J15 to 1J14	L16 and Board Trace	.35 OHMS (.32 Typical)
1J10 to 1J11	Board Trace	.0 OHMS
2J10 to 2J11	Board Trace	.0 OHMS
7J10 to 6J11	Board Trace	.0 OHMS
10J10 to 9J11	Board Trace	.0 OHMS
9J10 to 8J11	Board Trace	.0 OHMS
3J10 to 3J11	Board Trace	.0 OHMS
4J10 to 4J11	Board Trace	.0 OHMS

TABLE F.6

ARC START TRIGGER CIRCUIT TEST

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

TEST DESCRIPTION

The Arc Start Trigger Test determines if the wiring and connections are good from the six pin amphenol receptacle to the protection/snubber board and also from the protection/snubber board to the control board.

MATERIALS NEEDED

Ohmmeter (Multimeter)
TIG 255 Wiring Diagrams (see Electrical Diagrams section of this manual)
Arc Start Trigger Circuit, (Figure F.10)

ARC START TRIGGER CIRCUIT TEST *(continued)*

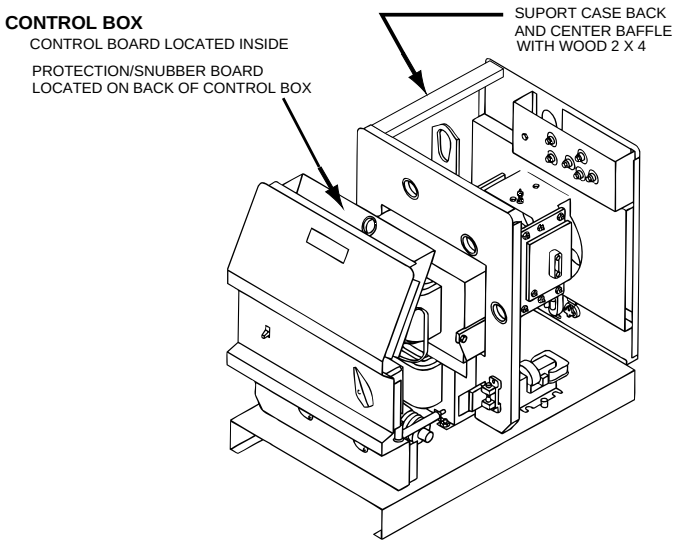


FIGURE F.7 - LOCATION OF PROTECTION/SNUBBER BOARD.

TEST PROCEDURE

1. Remove main supply power to machine

2. Remove plug J6 from the control board

3. Close the arc start switch or jumper pins “D” and “E” at the six pin amphenol receptacle.

4. Check for continuity between pins 10J6 and 3J6 at plug J6 on the wiring harness. Refer to Figure F.8. If 8.4 ohms to 6.0 ohms resistance is indicated then arc start trigger circuit is okay. If a high resistance or open is read then proceed to Step 5.

   Note: If arc start switch is opened or jumper removed from pins “D” and “E” the measured resistance in Step 4 should be infinite.

5 Test the resistance between 10J6 plug and 10J12 on the projection/snubber board. Also check resistance from 3J6 plug to 3J12 on the projection/ snubber board.

   A. If zero ohms resistance is indicated, test is okay. Go to Step 6.

   B. If a resistance of any value is shown, check wires and connections.

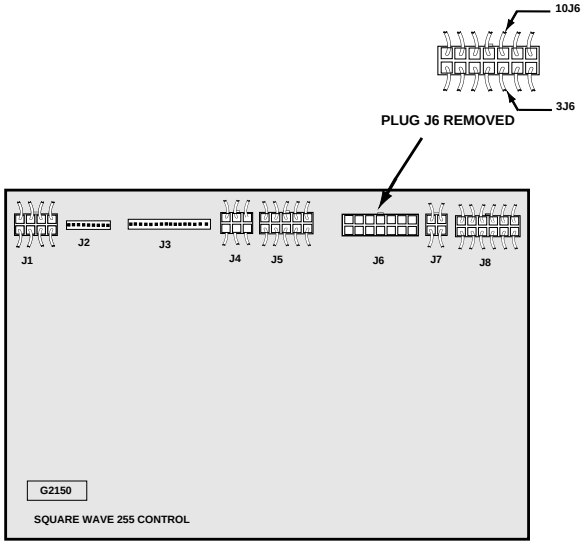


FIGURE F.8 - CONTROL BOARD TEST POINTS.

ARC START TRIGGER CIRCUIT TEST *(continued)*

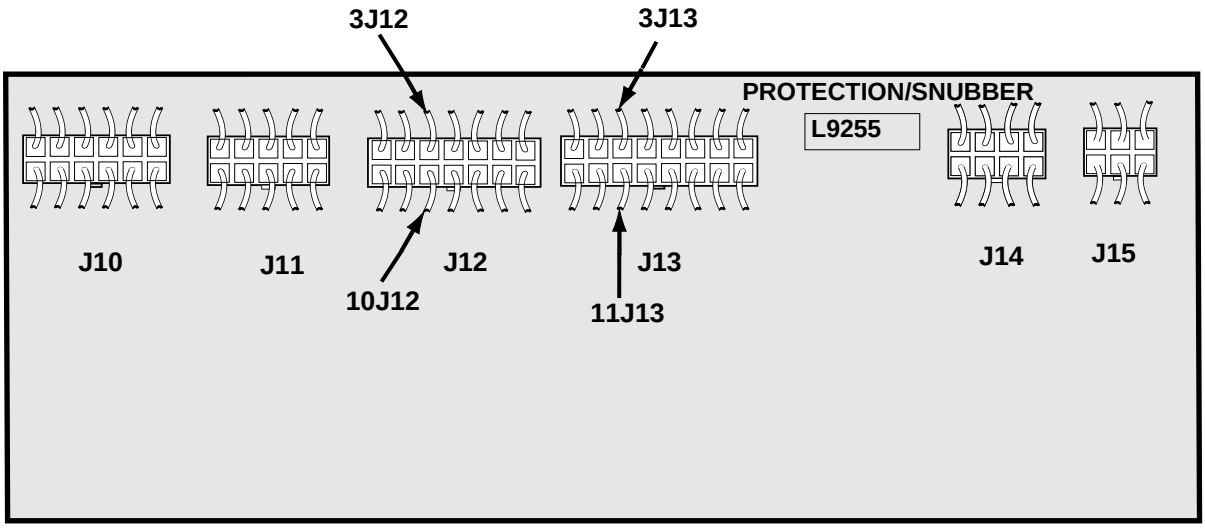


FIGURE F.9 - PROTECTION/SNUBBER BOARD TEST POINTS.

6. Test the resistance from 11J13 on the projection/ snubber board to pin “D” on the six pin amphenol receptacle. (Lead #311). Also check resistance from 3J13 on the projection/snubber board to pin “E” on the six pin amphenol receptacle. (Lead #303).

A. If zero ohms resistance is shown test is okay. Proceed to projection/ snubber board test.

B. If resistance of any value is shown, check wires and connections.

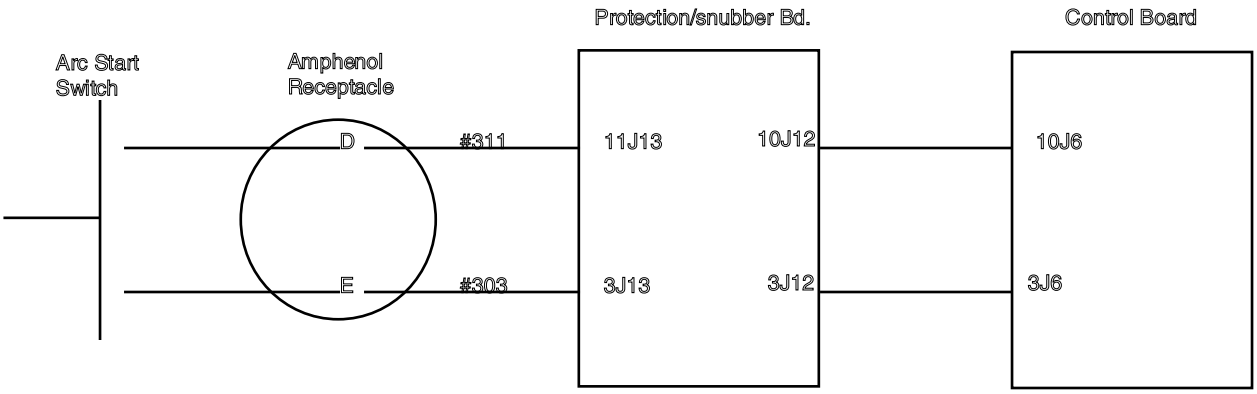


FIGURE F.10 - ARC START TRIGGER CIRCUIT.

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

STATIC SCR TEST

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

TEST DESCRIPTION

The Static SCR Test is a quick check to determine if an SCR is shorted or “leaky”. See machine waveform section or normal and abnormal SCR waveforms.

MATERIALS NEEDED

Analog ohmmeter (Multimeter)
TIG 255 Wiring Diagrams (see Electrical Diagrams section of this manual)
SCR Heat Sink Assembly Drawing, Figure F.12

STATIC SCR TEST *(continued)*

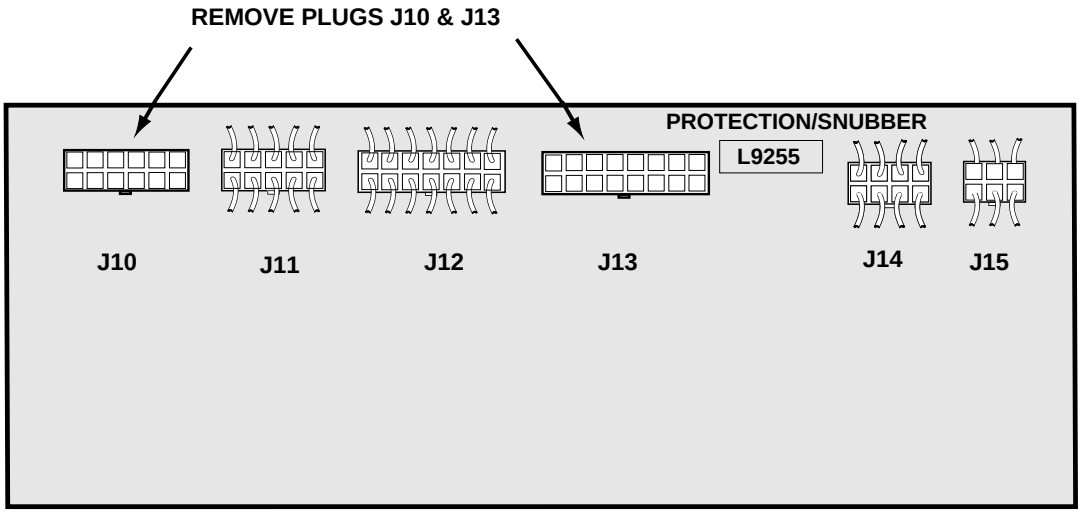


FIGURE F.11 - PROTECTION BOARD PLUG LOCATIONS

TEST PROCEDURE

1. Remove main supply power to machine

2. Remove plug J10 and J13 from the protection/snubber board. Refer to Figure F.11.

3. Remove red insulating paint from heat sink test points. See Figure F.12. DO NOT DISASSEMBLE THE HEAT SINKS.

4. Using an analog ohmmeter test the resistance from anode to cathode of SCR1. Reverse the meter leads and check from cathode to anode of SCR1.

   A. If a low resistance is indicated in either direction SCR1 is faulty. Replace SCR assembly.

5. Repeat Step 4 testing SCR2, SCR3 and SCR4.

   To further check the SCR's functions use an SCR tester and proceed to active SCR test.

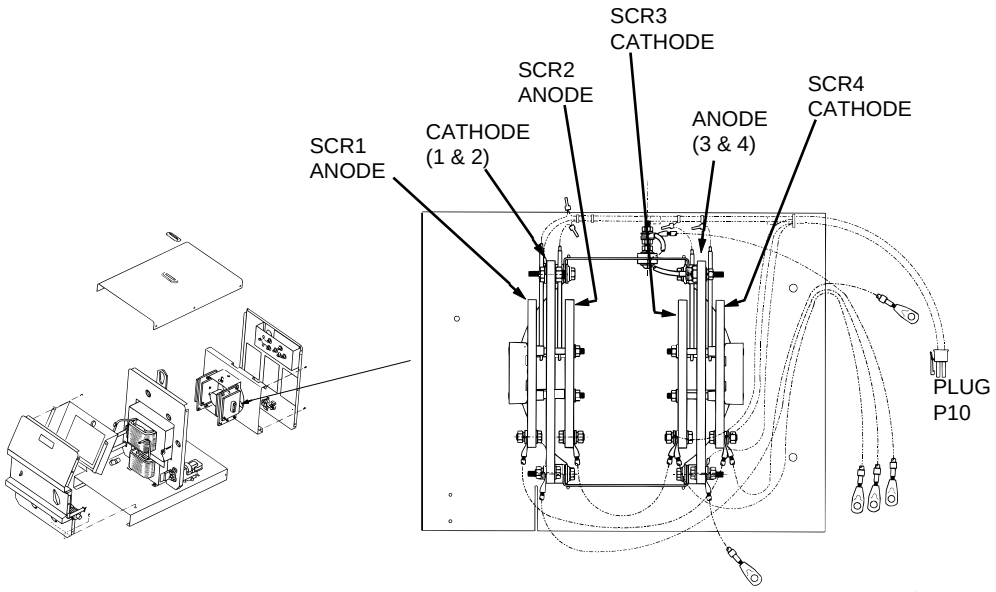


FIGURE F.12 - SCR TEST POINTS.

ACTIVE SCR TEST

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

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 outlined in this procedure
TIG 255 Wiring Diagrams (see Electrical Diagrams section of this manual)
SCR Heat Sink Assembly Drawing, Figure F.14

ACTIVE SCR TEST *(continued)*

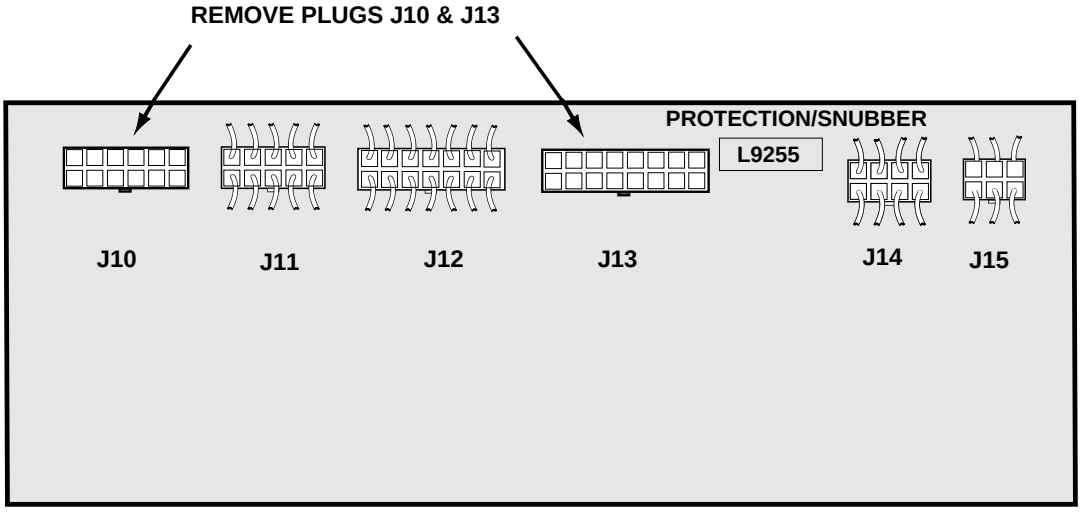


FIGURE F.13 - PROTECTION/SNUBBER BOARD PLUG LOCATIONS.

TEST PROCEDURE

1. Remove main supply power to machine
2. Remove plugs J10 and J13 from protection/snubber board. See Figure F.13.
3. Remove red insulating paint from heat sink test points. See Figure F.14. DO NOT DISASSEMBLE THE HEAT SINKS.
4. Perform test procedure as outlined in Figure F.15. Repeat test for all four SCR's
5. Replace any SCR assembly that does not pass test in Step 4

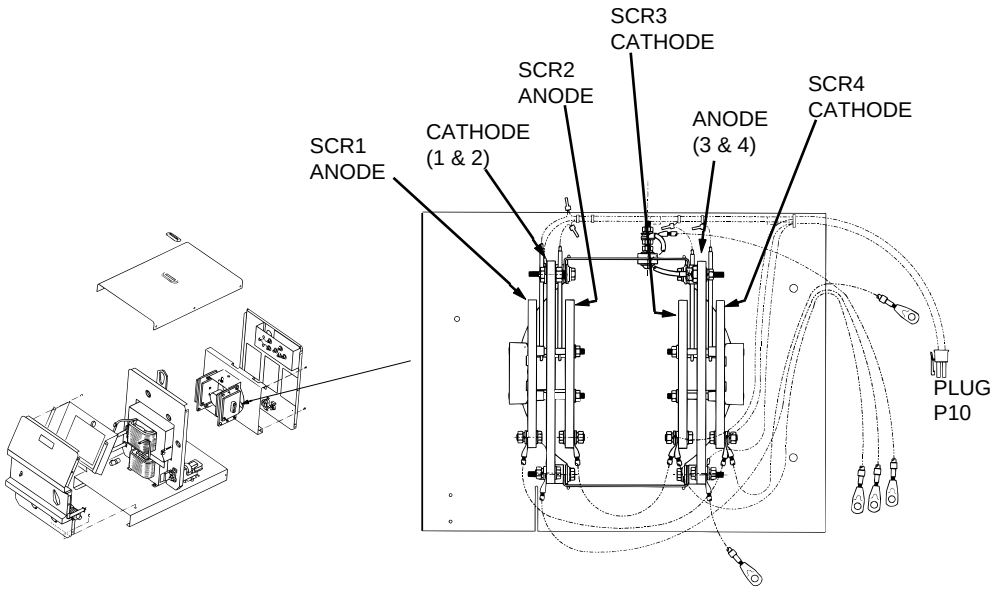
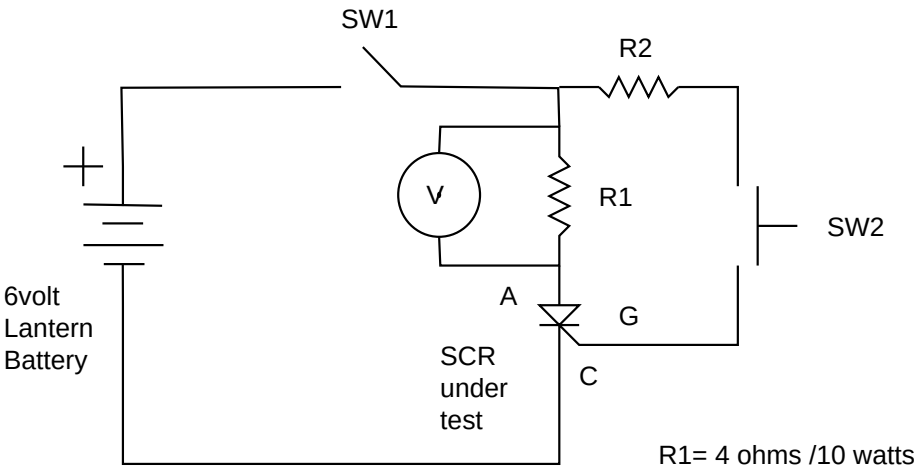


FIGURE F.14 - SCR TEST POINTS.

ACTIVE SCR TEST *(continued)*



To test SCRs 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.15 - SILICON CONTROLLED RECTIFIER TEST SETUP.

SILICON CONTROLLED RECTIFIER TEST

(Heat Sink Mounted Units)

To test SCR's construct the circuit outlined in Figure F.15. One 6V lantern battery can be used. Resistor values are Ò10%. The voltmeter scale should be low, approximately 0-5 or 0-10 volts.

BATTERY TEST

Check the battery by shorting leads (A) and (C) and then close switch SW-1. Re-place battery if voltage is less than 4.5 volts.

1. Connect SCR into the test circuit as shown (A) lead to anode (C) lead to cathode and (G) lead to the gate.

2. Close switch SW-1 (switch SW-2 should open), voltmeter should read zero. If the voltmeter reads higher than zero the SCR is shorted.

3. With switch SW-1 closed, close switch SW-2 for two seconds and release. The voltmeter should read 3 to 6 volts before and after switch SW-2 is released. If the voltmeter does not read, or reads only while SW-2 is depressed, the SCR or battery is defective (repeat Battery Test Procedure).

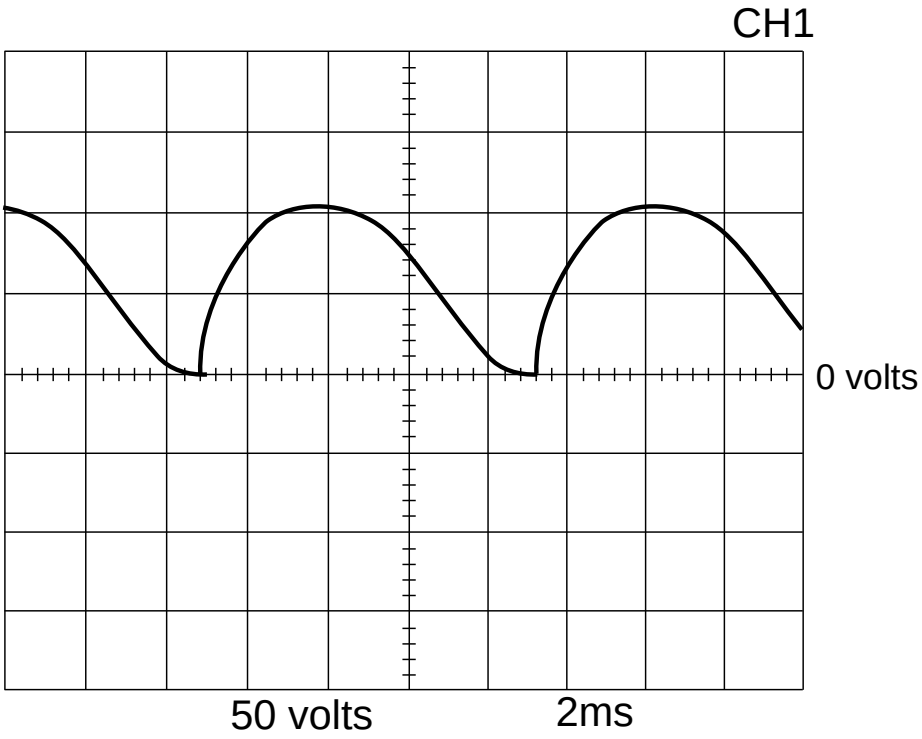
4. Open switch SW-1, disconnect the gate lead (G) and reverse the (A) and (C) leads on the SCR. Close switch SW-1. The voltmeter should read zero. If the voltage is higher than zero, the SCR is shorted.

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
DC STICK MODE

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is the typical DC (+) output voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

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

SCOPE SETTINGS

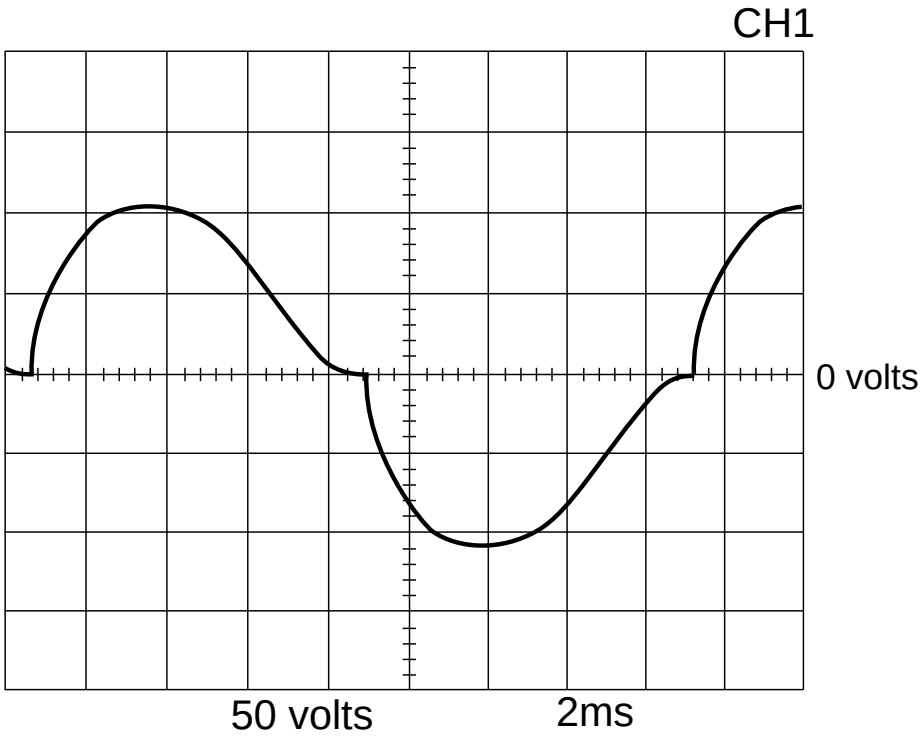
Volts/Div.	50 V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
AC STICK MODE

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is the typical AC output voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

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

SCOPE SETTINGS

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

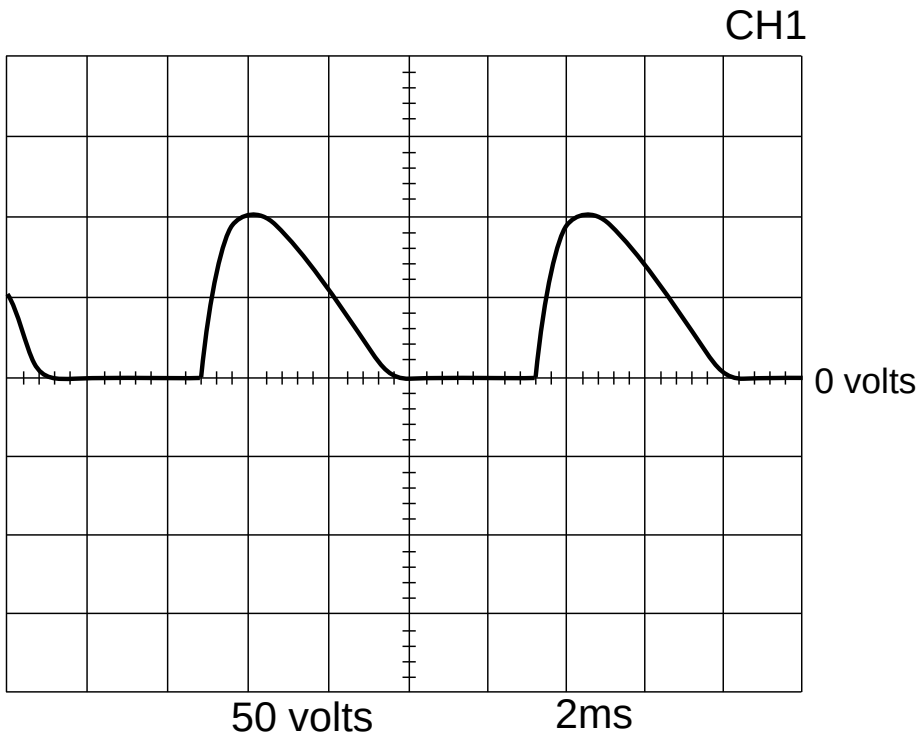
Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
DC TIG MODE

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is the typical DC (+) output voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

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

SCOPE SETTINGS

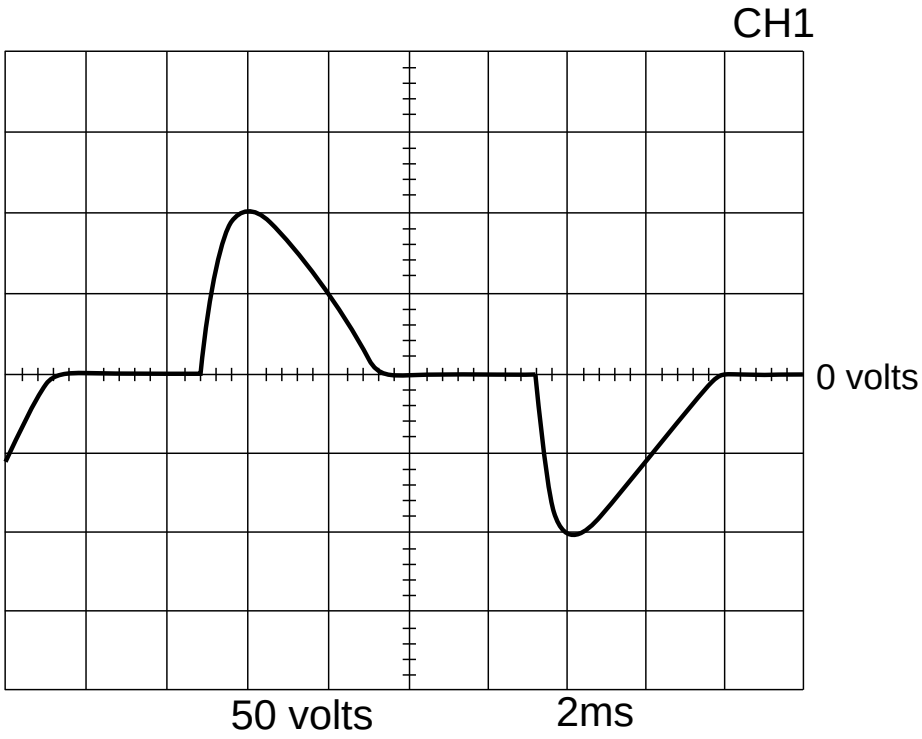
Volts/Div.	50 V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM
AC TIG MODE

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is the typical AC output voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

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

SCOPE SETTINGS

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

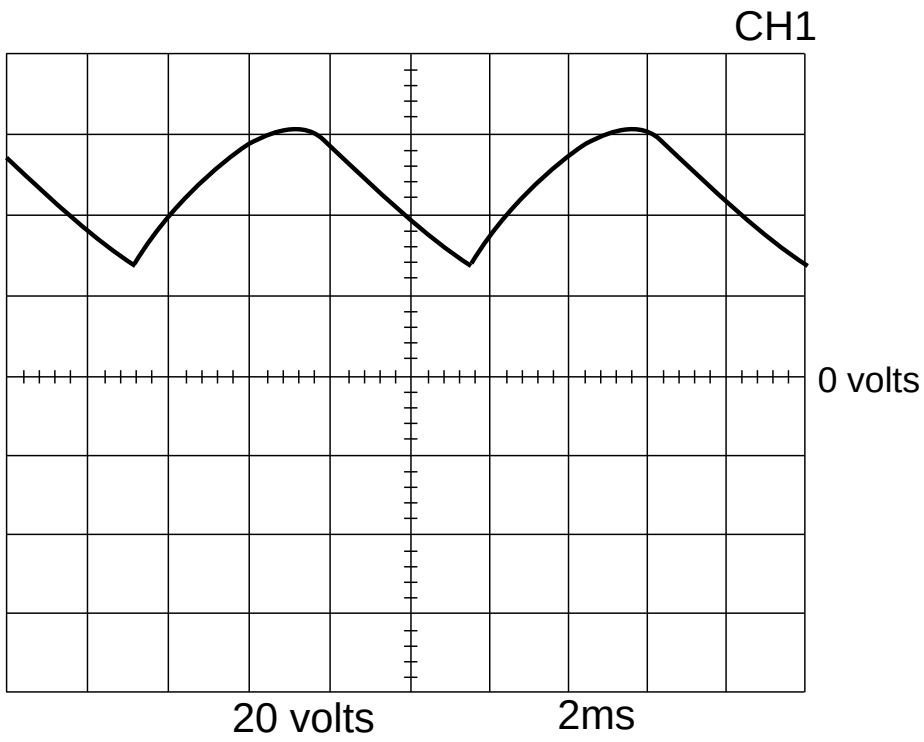
Return to Section TOC
Return to Master TOC

TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED DC TIG MODE

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



MACHINE LOADED TO 200 AMPS AT 50 VDC

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. The machine was loaded with a resistance grid bank. The TIG 255 display read 200 amps at 50VDC.

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

SCOPE SETTINGS

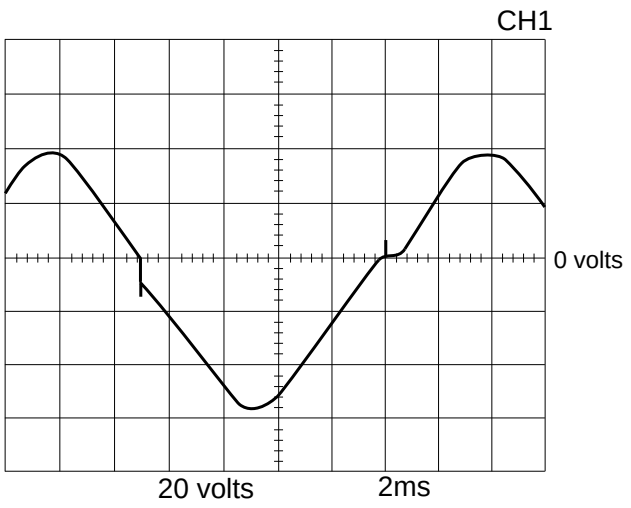
Volts/Div.	20 V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

AC TIG MODE (AUTO - BALANCE ON)

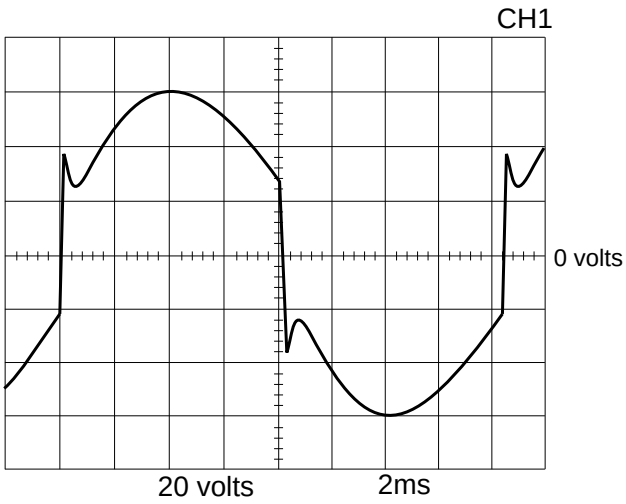
⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



MACHINE LOADED TO 50 AMPS AT 26VAC



MACHINE LOADED TO 200 AMPS AT 46 VAC

These are typical AC output voltage waveforms generated from a properly operating machine. Note each vertical division represents 20 volts and each horizontal division represents 2 milliseconds in time. The machine was loaded with a resistance grid bank. As the load is increased the output waveform becomes more "square".

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

SCOPE SETTINGS

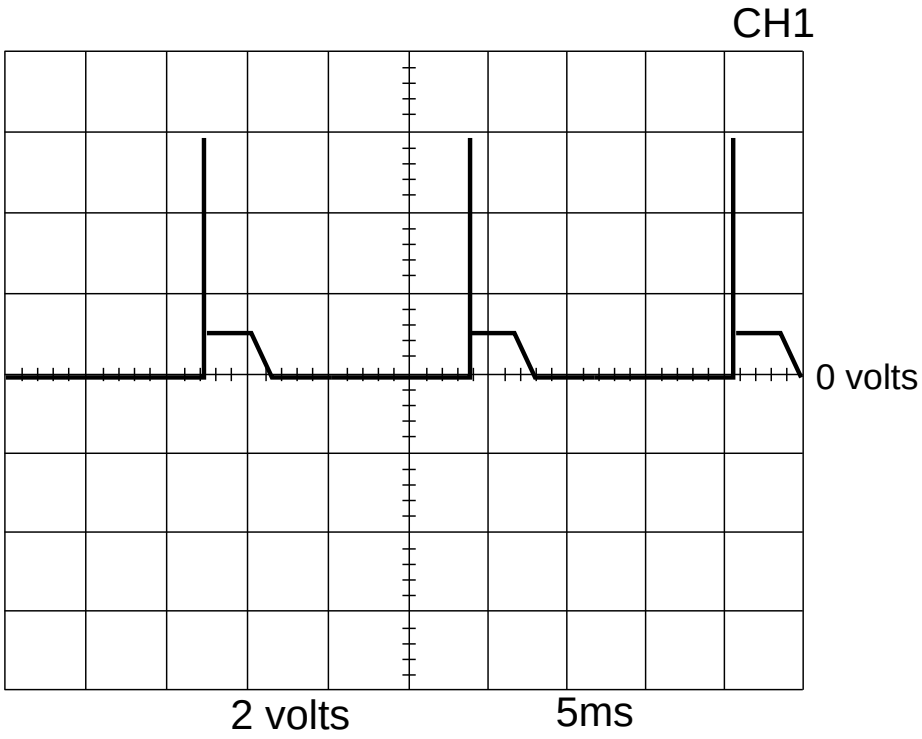
Volts/Div.	20 V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

TYPICAL SCR GATE VOLTAGE WAVEFORM

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is the 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 that each horizontal division represents 5 milliseconds in time.

Note: Scope probes connected at SCR gate and cathode: (+) probe to gate, (–) probe to cathode.

SCOPE SETTINGS

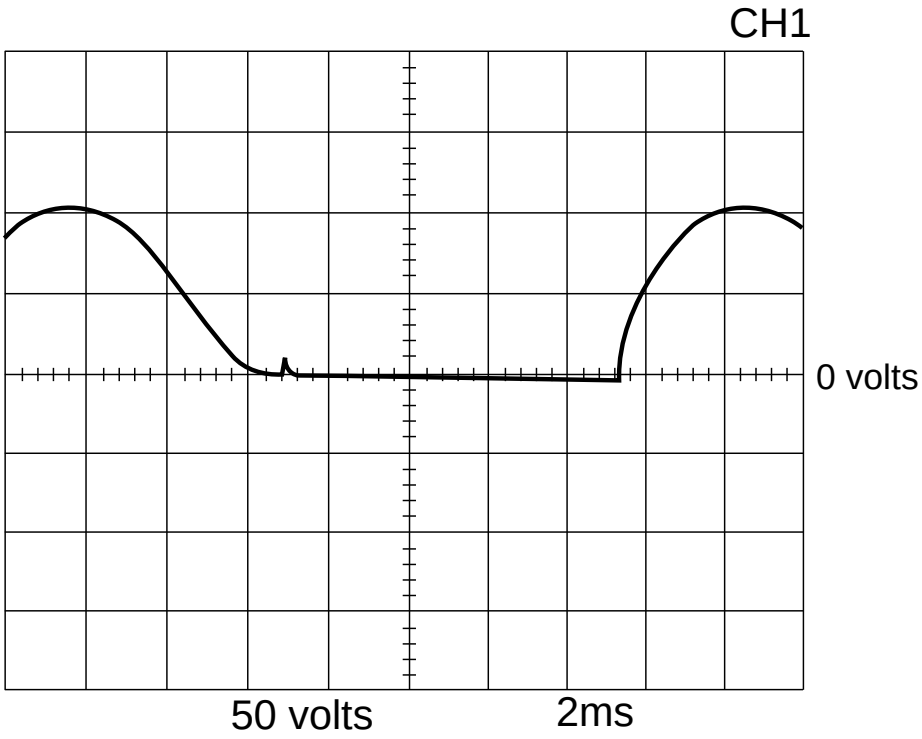
Volts/Div.	2 V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

ABNORMAL OPEN CIRCUIT VOLTAGE - DC STICK MODE ONE OUTPUT SCR NOT FUNCTIONING

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is NOT the typical DC (+) output voltage waveform. One output SCR is not functioning. Note the "gap" in the waveform. One SCR gate was disconnected to simulate an open or non-functioning output SCR. Each vertical division represents 50 volts and each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output studs: (+) prove to electrode, (–) probe to work.

SCOPE SETTINGS

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

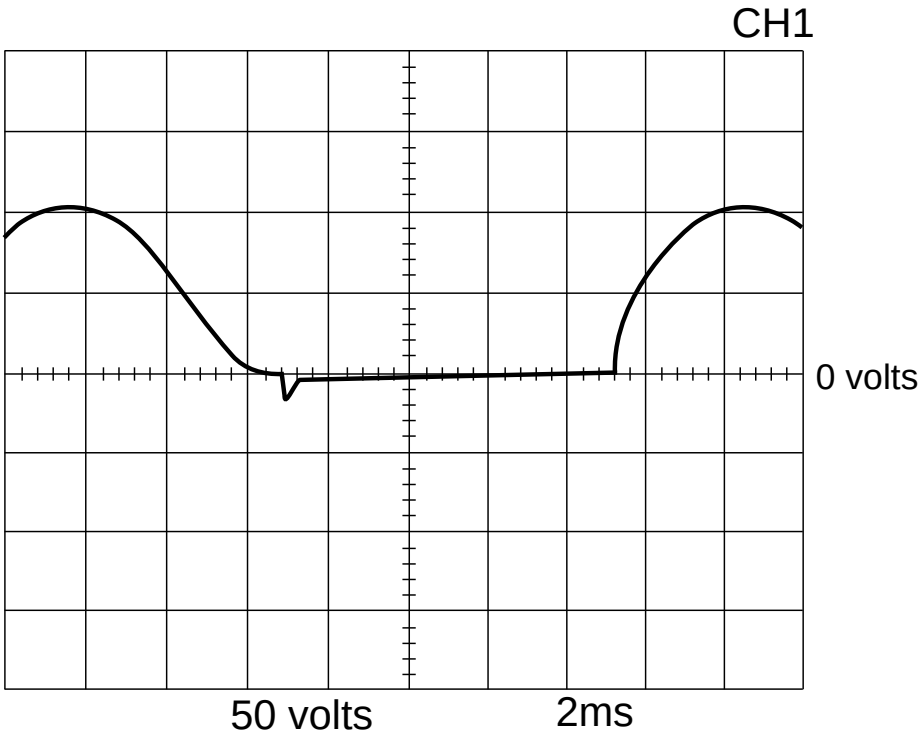
Return to Section TOC
Return to Master TOC

ABNORMAL OPEN CIRCUIT VOLTAGE - AC STICK MODE ONE OUTPUT SCR NOT FUNCTIONING

⚠ CAUTION

HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.

• Perform all voltage and waveform checks with high frequency circuit OFF.



This is NOT the typical AC output voltage waveform. One output SCR is not functioning. Note the "gap" in the waveform. One SCR gate was disconnected to simulate an open or non-functioning output SCR. Each vertical division represents 50 volts and each horizontal division represents 2 milliseconds in time.

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

SCOPE SETTINGS

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

FAN MOTOR AND BLADE REMOVAL

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

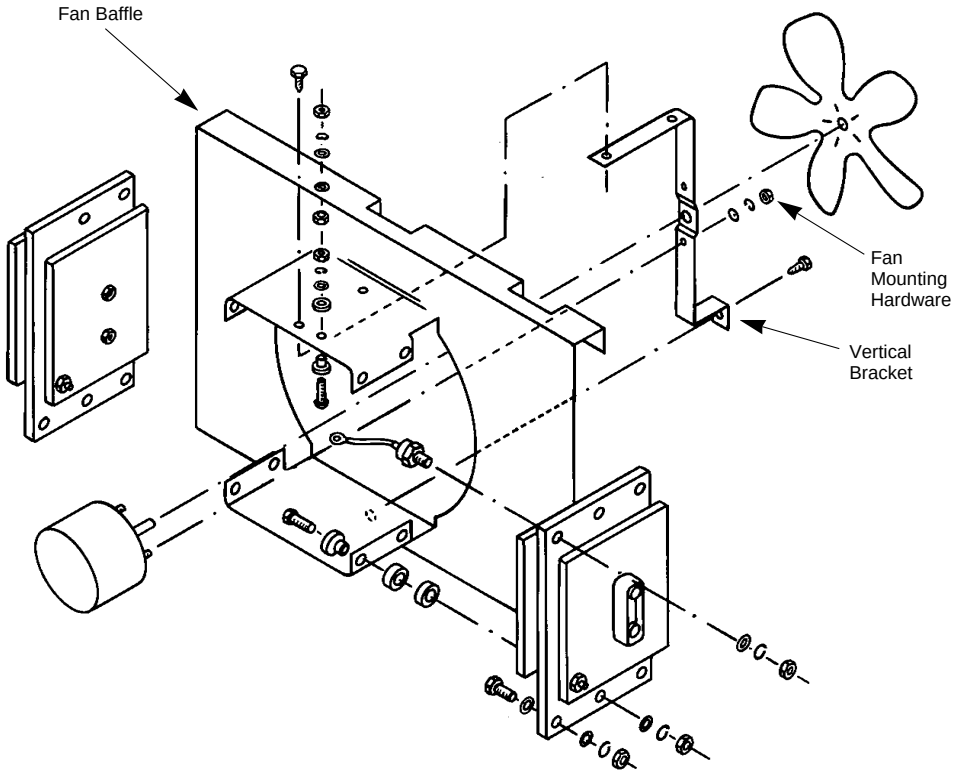
TEST DESCRIPTION

The following procedure will aid the technician in gaining access to the fan blade and fan motor, for maintainence or replacement

TOOLS REQUIRED

3/8” socket wrench or nutdriver
10” long screwdriver (slot head)
5/16” open end or box wrench

FAN MOTOR AND BLADE REMOVAL *(continued)*



TEST PROCEDURE

1. Remove main supply power to machine.

2. Remove case sides and top.

3. Locate and SUPPORT rectifier and fan baffle assembly.

4. Remove the two self-tapping screws from the input access door.

5. Remove the five thread-forming screws holding the fan baffle and rectifier assembly to the case back. AT THIS POINT THE RECTIFIER AND FAN BAFFLE ASSEMBLY WILL DROP UNLESS SUPPORTED.

   Once the baffle assembly and case back are separated there is sufficient working space for fan blade and fan motor removal and replacement.

6. The fan blade can be removed by loosening the clamp on the fan blade and carefully sliding the fan blade off of the motor shaft. Note: When reinstalling the fan blade make certain the blade is on the motor shaft in the correct location. Approximately .25” past end of shaft.

7. If the fan motor is to be removed the leads to the motor must be disconnected. The fan motor may be removed by removing the two #8-32 hex nuts and associated plain and lock washers that mount the motor to the vertical bracket.

SCR HEAT SINK ASSEMBLY REMOVAL

⚠ 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 or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact the Lincoln Electric service department for technical troubleshooting assistance before you proceed call 216-383-2531 or 1-800-833-9353 (WELD).

⚠ CAUTION

If machine case sides and top are removed the case back and front must be supported. Failure to do this could result in mechanical or electrical damage to the TIG 255.

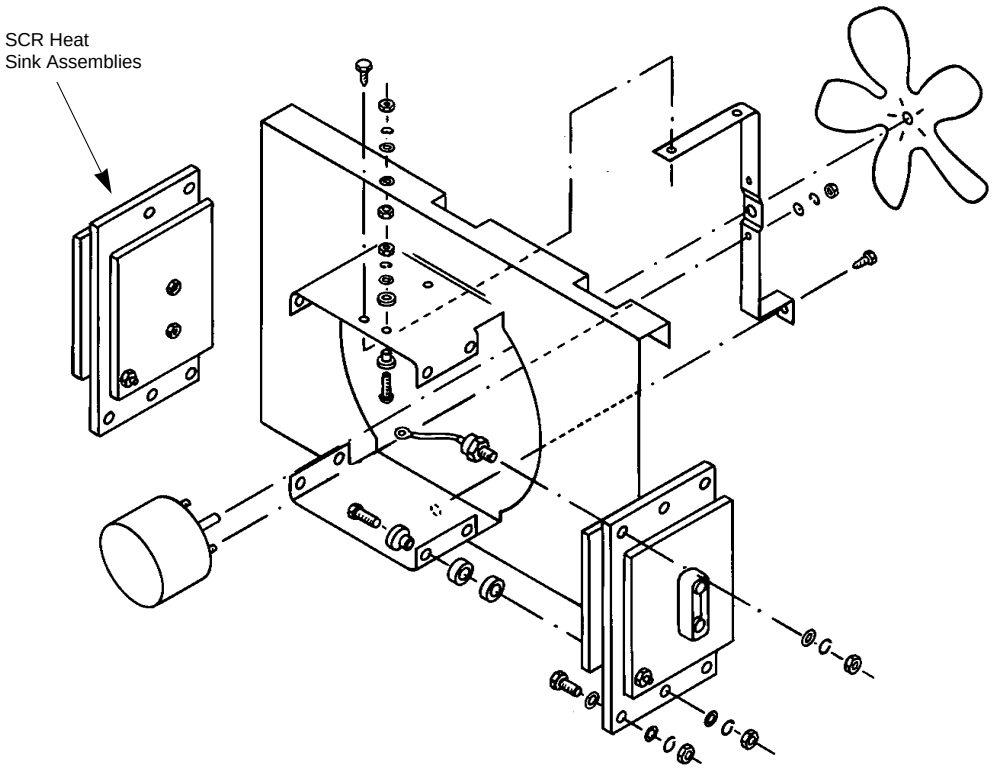
TEST DESCRIPTION

The following procedure will aid the technician in the removal and replacement of either or both of the two SCR heat sink assemblies.

MATERIALS REQUIRED

7/16” socket and box wrench
1/2" socket and box wrench
9/16” socket and box wrench
ohmmeter (multimeter)
Dow 340 heat sink compound

SCR HEAT SINK ASSEMBLY REMOVAL *(continued)*



TEST PROCEDURE

1. Remove main power supply to machine.
2. Remove case sides and top.
3. Locate SCR heat sink assemblies.
4. Remove all gate, snubber and cable leads from the SCR heat sink assembly that is to be serviced.
5. Remove the four 1/4”-20 hex nuts and associated plain and lock washers from the four 1/4”-20x1.75” hex head cap screws. Remove the heat sink assembly trying not to disturb the insulating washers and bushings. See figure above.
6. Reinstall the heat sink assembly in the same manner being certain that the insulating washers and bushings are installed correctly. See figure above.
7. Test with an ohmmeter to make certain that the heat sink assembly is electrically isolated from chassis ground by at least 500,000 ohms of resistance.
8. Reconnect the gate leads.
9. Reconnect the snubber and cable leads using a thin coating of Dow 340 heat sink compound on the connection surfaces. Be sure that the connection surfaces are clean and free from any dirt or paint.

RETEST AFTER REPAIR

Should a machine under test be rejected for any reason requiring the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced, the machine must be retested.

NOTE: 50 Hz machines may be tested using 60 Hz power.

INPUT IDLE AMPS

Input Volts/Hertz	Maximum Idle Amps
208/60	44.0
230/60	40.0
200/50	47.0
220/50	43.0
380/50	25.0
Voltage Across Power Factor Capacitors	447-473 VAC

OPEN CIRCUIT VOLTAGES

Stick Mode OCV	AC	69 – 73 VAC
	DC	69 – 73 VDC
TIG Mode OCV	AC	46 – 54 VAC
	DC	46 – 54 VDC

MAXIMUM ACCEPTABLE OUTPUT VOLTAGE – AT MINIMUM OUTPUT SETTINGS

TIG Modes	5 Amps @ 12 Volts

MINIMUM ACCEPTABLE OUTPUT VOLTAGE – AT MAXIMUM OUTPUT SETTINGS

TIG Modes	255 Amps @ 29 Volts

RECOMMENDED METERS FOR MACHINE OUTPUT TESTS

VOLTMETER: AC and DC True RMS Meter – Fluke 8922A or equivalent
AMMETER: Columbia Type AX AC or DC Tong Ammeter

IMPORTANT: IF OTHER TYPE METERS ARE USED RESULTS MAY NOT BE ACCURATE.

RETEST AFTER REPAIR (cont'd)

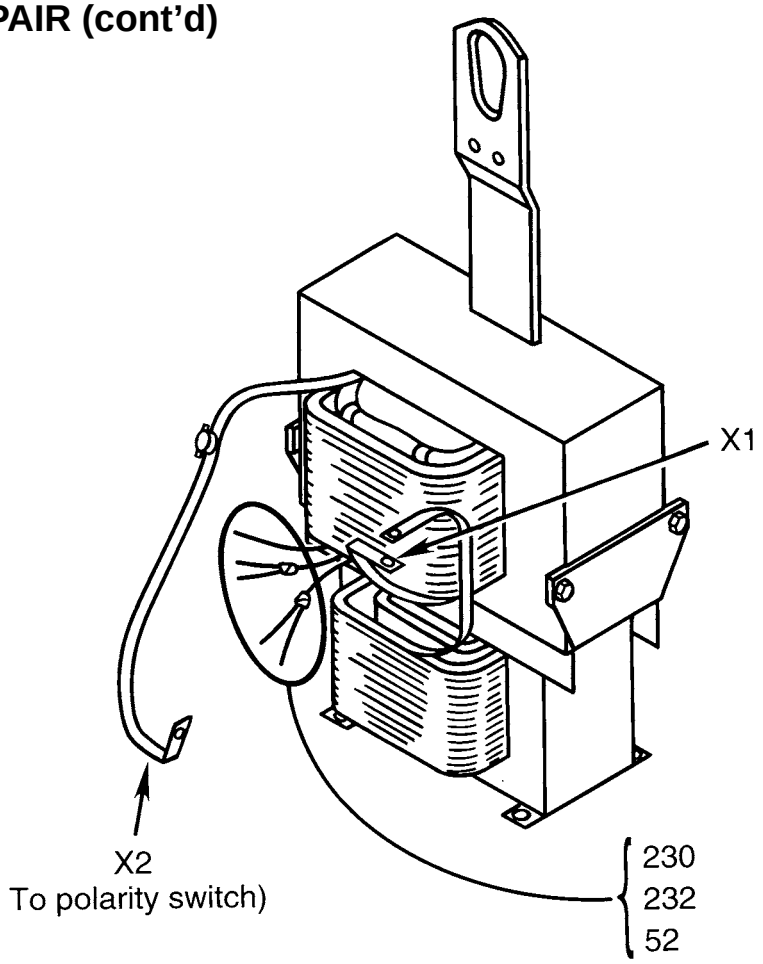


FIGURE F.16 - TRANSFORMER LEAD TEST POINTS.

MAIN TRANSFORMER SECONDARY VOLTAGES (See Figure F.16)

Test Points	Voltages
X1 – X2	73 – 78 VAC
X3 – X4 (230 – 232)	116 – 122 VAC
X3 – X5 (230 – 52A)	217 – 228 VAC

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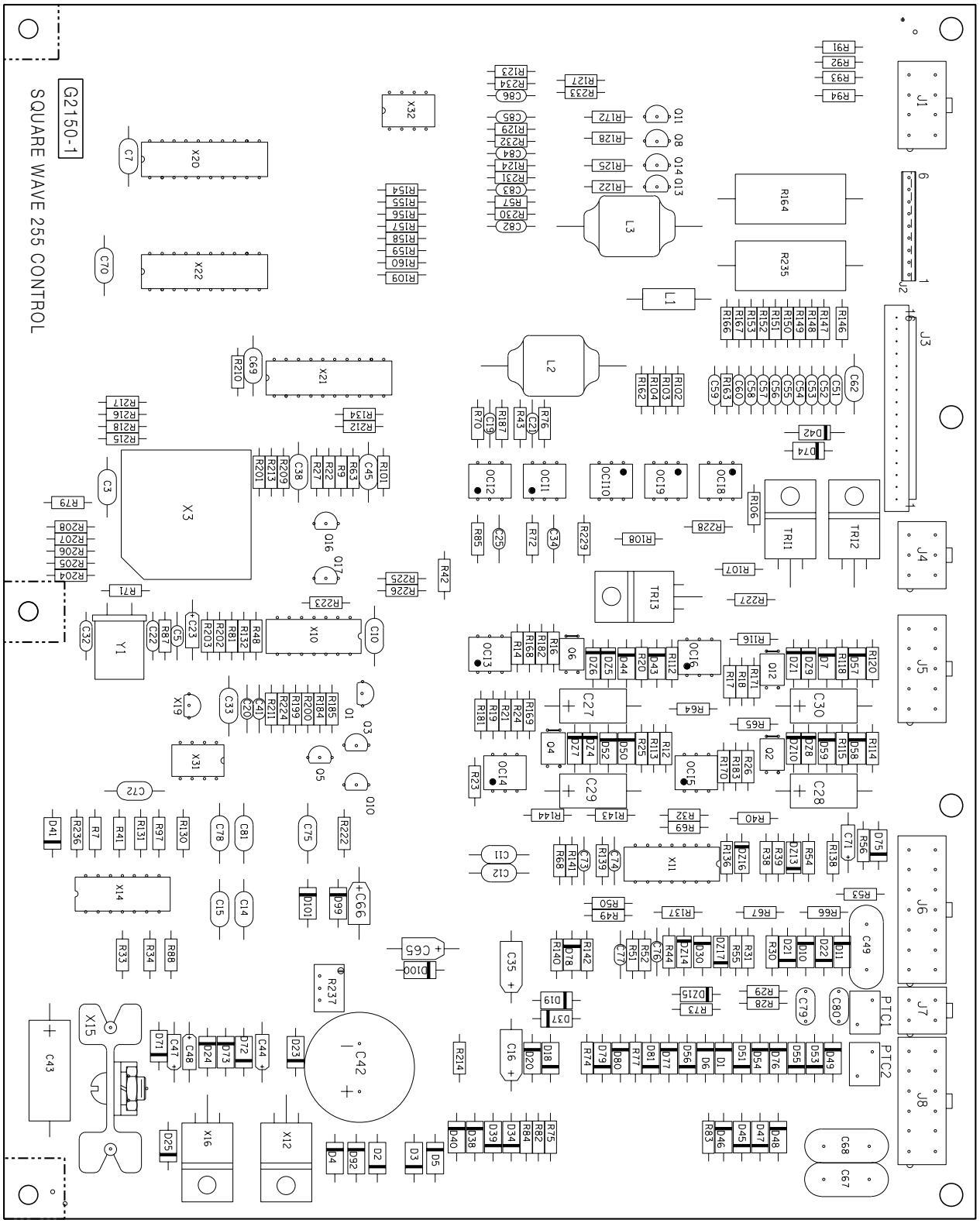
ELECTRICAL DIAGRAMS

CONTROL BOARD (G2150)



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CONTROL BOARD (G2150)

Item	Identification
X12	IC-VOLT REG,FIXED,3-T,(+),1A,5V
C22,C32	CAPACITOR-CEMO,22P,100V,5%
C51,C52,C53,C54, C55,C56,C57,C58, C59,C60,C82,C83, C84,C85,C86	CAPACITOR-CEMO,100P,100V,5%
C5,C20,C25,C34,C41, C73,C74,C76,C77	CAPACITOR-CEMO,.022,50V,20%
C19,C21	CAPACITOR-CEMO,150P,100V,5%
J7	CONNECTOR,MOLEX,MINI,PCB,4-PIN
J4	CONNECTOR,MOLEX,MINI,PCB,6-PIN
J1	CONNECTOR,MOLEX,MINI,PCB,8-PIN
PTC1,PTC2	THERMISTOR-PTC,56 OHMS,90MA
D1,D2,D3,D4,D5,D6,D7, D18,D19,D20,D23,D24, D25,D30,D34,D37,D38, D39,D40,D41,D43,D44, D45,D46,D47,D48,D49, D50,D51,D52,D53,D54, D55,D56,D57,D58,D59, D71,D72,D73,D74,D75, D76,D77,D78,D79,D80, D81,D92,D99,D100,D101	DIODE-AXLDS,1A,400V
L1	CHOKE-330UH,10%,110MA,MOLDED
L2,L3	CHOKE-390UH,5%,225MA,CONFORMAL
C16,C35	CAPACITOR-TAEL,18,15V,10%
C23,C44,C47,C48,C71	CAPACITOR-TAEL,1.0,35V,10%
C43	CAPACITOR-ALEL,20,50V,+75/-10%
C27,C28,C29,C30	CAPACITOR-TAEL,27,35V,10%
OCI1,OCI2,OCI3, OCI4,OCI5,OCI6*	OPTOCOUPLER-PHOTO-Q,70V, CNY17-3
X16	IC-VOLT REG,FIXED,3-T,(-),1A,15V
C3,C7,C10,C11,C12, C14,C15,C33,C38, C45,C62,C69,C70, C72,C75,C78,C81	CAPACITOR-CEMO,0.1,50V,10%
J5	CONNECTOR,MOLEX,MINI,PCB,10-PIN
J8	CONNECTOR,MOLEX,MINI,PCB,12-PIN
J6	CONNECTOR,MOLEX,MINI,PCB,14-PIN
DZ1,DZ6,DZ7,DZ10	ZENER DIODE-1W,30V,5%,1N4751A
DZ4,DZ5,DZ8,DZ9	ZENER DIODE-1W,18V,5%,1N4746A
Q1,Q3,Q5,Q8,Q10, Q11,Q13,Q14,Q16,Q17	TRANSISTOR-N,T226,0.5A,40V,2N4401
Q2,Q4,Q6,Q12	TRANSISTOR-NMF,4PDIP,1A,100V, RFD110
D42	DIODE-AXLDS,1A,30V,SCHOTTKY

Item	Identification
C42	CAPACITOR-ALEL,1000,35V,+30/-20%
R14,R17,R18,R21,R24, R26,R109,R154,R155, R156,R157,R158,R159, R160,R162,R163,R168, R169,R170,R171,R182, R183*	RESISTOR-MF,1/4W,100,1%
R20,R25,R41,R56,R57, R68,R69,R74,R77,R84, R87,R91,R92,R93,R94, R112,R113,R114,R115, R118,R120,R123,R124, R127,R129,R140,R144, R214,R225,R226,R227, R228,R229	RESISTOR-MF,1/4W,1.00K,1%
R9,R22,R49,R76,R122, R125,R128,R172,R187, R211,R223,R224*	RESISTOR-MF,1/4W,10.0K,1%
R39,R44,R67,R199, R222,R236	RESISTOR-MF,1/4W,100K,1%
R38,R54,R55,R71	RESISTOR-MF,1/4W,1.00M,%
R51,R52	RESISTOR-MF,1/4W,150,1%
R72,R85	RESISTOR-MF,1/4W,1.50K,1%
R137	RESISTOR-MF,1/4W,15.0K,1%
R50,R101,R134,R212	RESISTOR-MF,1/4W,2.21K,1%
R27,R63,R142	RESISTOR-MF,1/4W,221K,1%
R12,R23,R64,R106, R107,R108,R181,R184, R185	RESISTOR-MF,1/4W,267,1%
R34	RESISTOR-MF,1/4W,2.67K,1%
R138,R139	RESISTOR-MF,1/4W,26.7,1%
R88,R143,R146,R147, R148,R149,R150,R151, R152,R153,R166,R167	RESISTOR-MF,1/4W,3.32K,1%
R141	RESISTOR-MF,1/4W,33.2K,1%
R73,R75,R82,R83, R102,R103,R104*	RESISTOR-MF,1/4W,475,1%
R42,R48,R53,R66, R79,R81,R97,R130, R131,R132,R201,R202, R203,R204,R205,R206, R207,R208,R209,R210, R213,R215,R216,R217, R218	RESISTOR-MF,1/4W,4.75K,1%
R28,R29,R30,R31, R32,R40	RESISTOR-MF,1/4W,47.5K,1%
R16,R19,R43,R65, R70,R116,R136,R200	RESISTOR-MF,1/4W,475K,1%

CONT'D ON REVERSE PAGE

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Return to Section TOC Return to Master TOC

CONTROL BOARD (G2150) (cont'd)

Item	Identification
X19	IC-UNDERVOLTAGE-SENSING,RESET, MCU
X10	IC-CMOS,INVERTER,SCHMITT, HEX,HC14A
C65,C66	CAPACITOR-TAEL,4.7,35V,10%
X11,X14	IC-OP-AMP,QUAD,HIGH-PERF,33074A
C49,C67,C68	CAPACITOR-CD,.0047,3000V,20%
DZ13,DZ14,DZ15, DZ16,DZ17	ZENER DIODE-1W,12V,5%,1N4742A
J2	CONNECTOR,PCB,WW,MALE,DIL,1X9
X15	REGULATOR & HEATSINK ASBLY
D10,D11,D21,D22	DIODE-AXLDS,1A,1000V
C79,C80	CAPACITOR-CD,750P,1000V,10%
R33	RESISTOR-MF,1/4W,301,1%
Y1	CRYSTAL-QUARTZ,8.000MHZ
OCI8,OCI9,OCI10	OPTOCOUPLER-TRIAC DRIVER,ZVC, 3083
X20,X21,X22	IC-CMOS,LATCH,3-STATE,OCTAL, HC573A
TRI1,TRI2,TRI3	TRIAC-T220,6A,800V
R237	TRIMMER-MT,1/2W,10K,10%,LINEAR
X31,X32	IC-ARRAY,CLAMPING,PERIPHERAL
R164,R235	RESISTOR-WW,5W,150,5%,SQ
R7	RESISTOR-MF,1/4W,133K,1%
R230,R231,R232, R233,R234	RESISTOR-MF,1/4W,26.7K,1%

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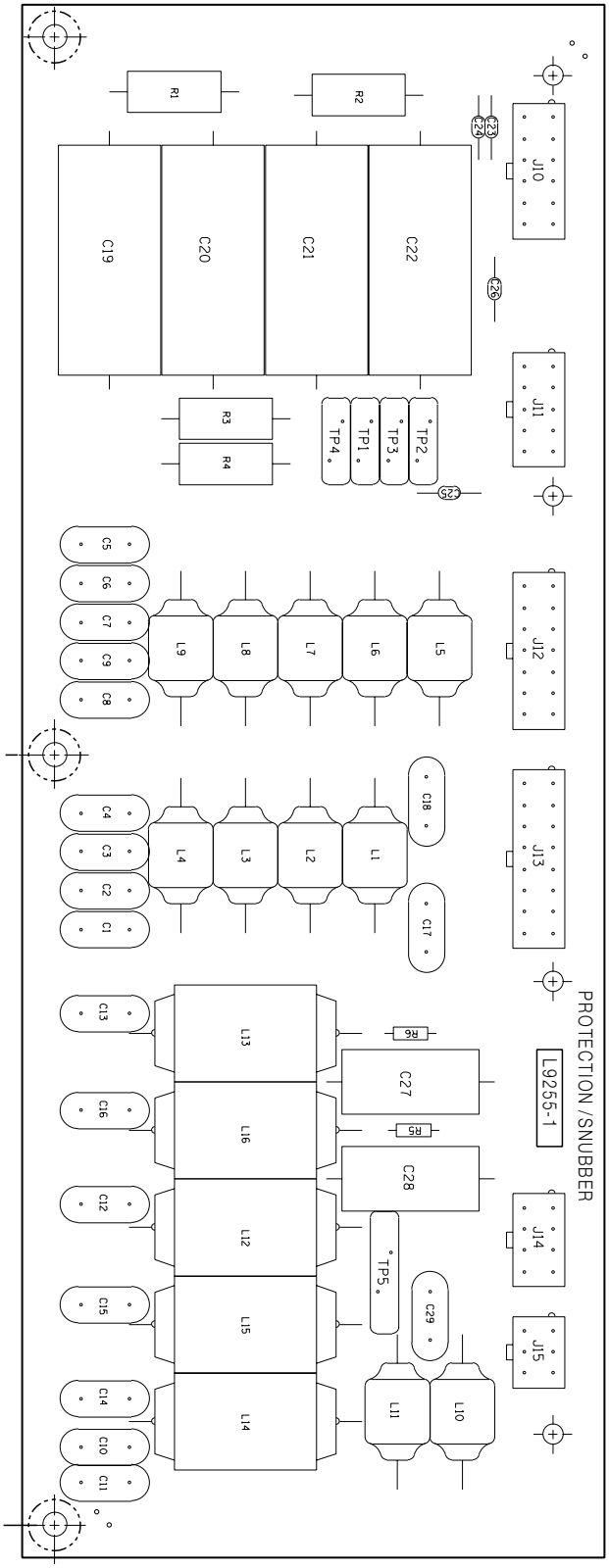
PROTECTION/SNUBBER BOARD (L9255)



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PROTECTION/SNUBBER BOARD (L9255)

Item	Identification
C23,C24,C25,C26	CAPACITOR-CEMO,4700P,50V,10%
J15	CONNECTOR,MOLEX,MINI,PCB,6-PIN
J14	CONNECTOR,MOLEX,MINI,PCB,8-PIN
L1,L2,L3,L4,L5,L6,L7, L8,L9,L10,L11	CHOKE-390UH,5%,225MA,CONFORMAL
R1,R2,R3,R4	RESISTOR-CC,2W,47,10%
J11	CONNECTOR,MOLEX,MINI,PCB,10-PIN
J10	CONNECTOR,MOLEX,MINI,PCB,12-PIN
J12	CONNECTOR,MOLEX,MINI,PCB,14-PIN
J13	CONNECTOR,MOLEX,MINI,PCB,16-PIN
C1,C2,C3,C4,C5,C6, C7,C8,C9,C10,C11, C12,C13,C14,C15, C16,C17,C18,C29	CAPACITOR-CD,.0047,3000V,20%
C19,C20,C21,C22	CAPACITOR-PEF,0.68,400V,10%
L12,L13,L14,L15,L16	CHOKE-RF,390UH,10%,1A,SLEEVED
TP1,TP2,TP3,TP4	MOV-150VRMS,45J,14MM
TP5	MOV-320VRMS,160J,20MM
C27,C28	CAPACITOR-PEF,0.1,400V,10%
R5,R6	RESISTOR-MF,1/4W,26.7,1%

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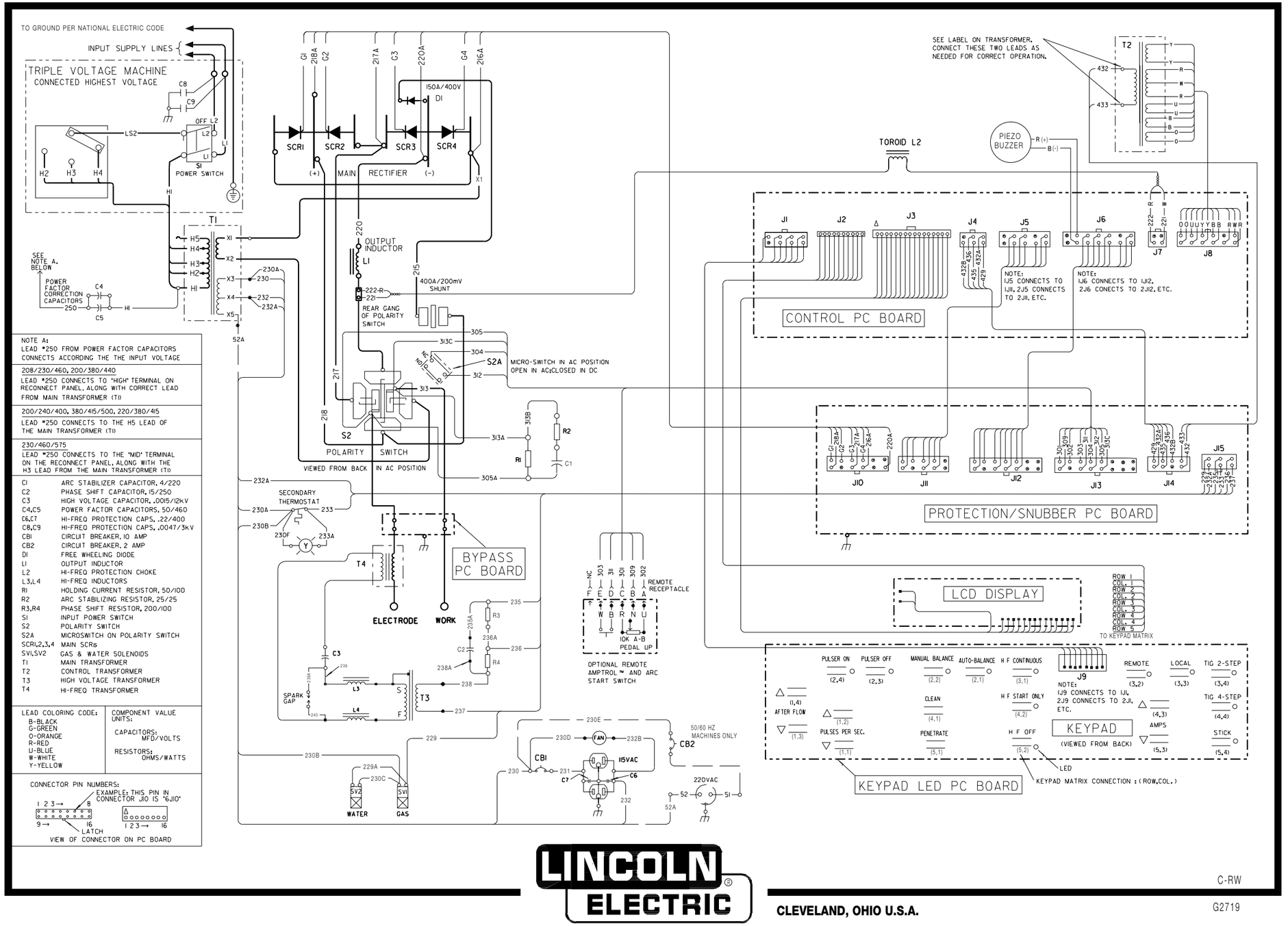
NOTES

WIRING DIAGRAM - SQUARE WAVE TIG 255



LINCOLN ELECTRIC

CLEVELAND, OHIO U.S.A.

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
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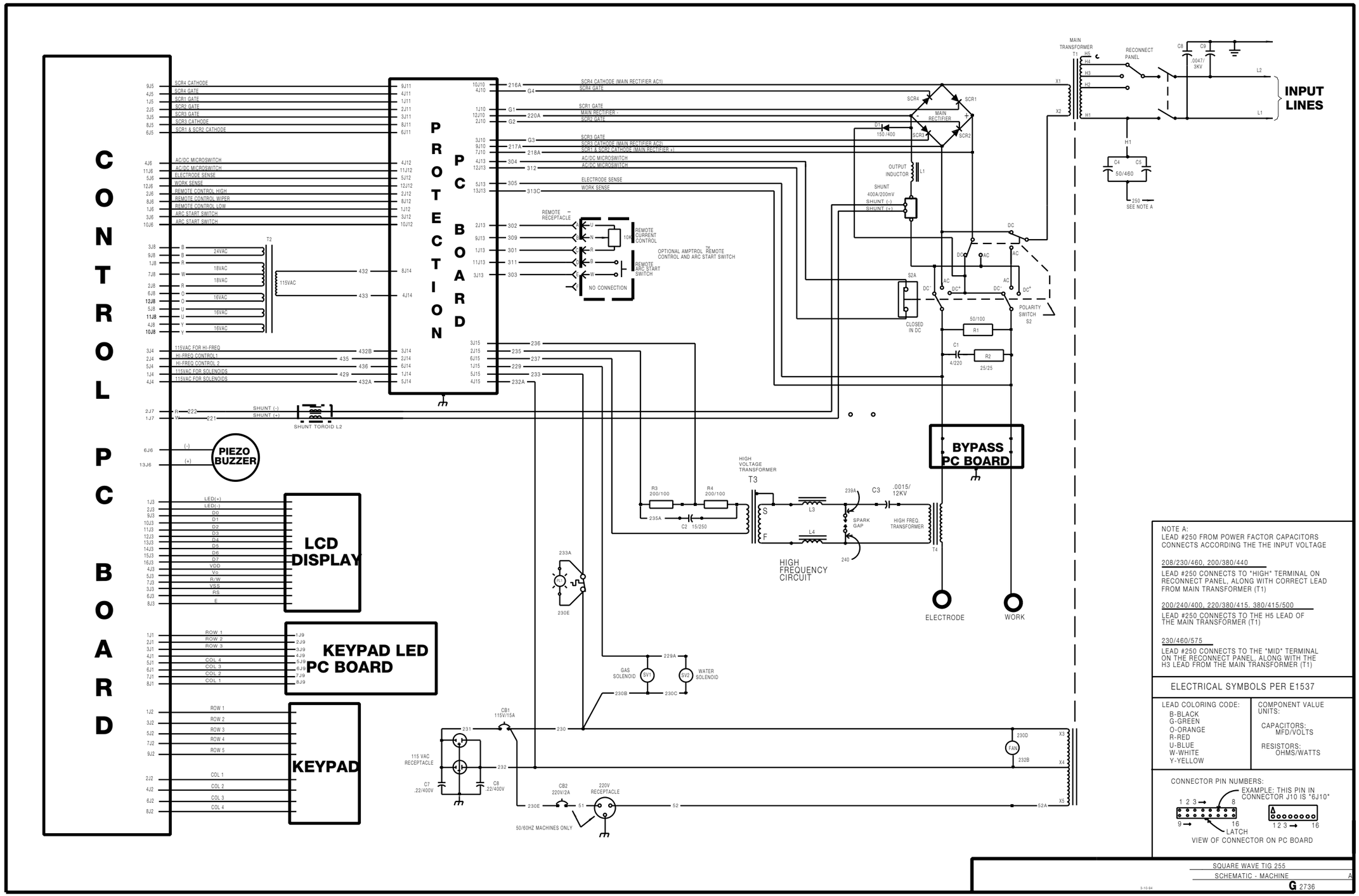
MACHINE SCHEMATIC — SQUARE WAVE TIG 255



NOTE A:
LEAD #250 FROM POWER FACTOR CAPACITORS CONNECTS ACCORDING THE THE INPUT VOLTAGE

208/230/460, 200/380/440
LEAD #250 CONNECTS TO "HIGH" TERMINAL ON RECONNECT PANEL, ALONG WITH CORRECT LEAD FROM MAIN TRANSFORMER (T1)

200/240/400, 220/380/415, 380/415/500
LEAD #250 CONNECTS TO THE H5 LEAD OF THE MAIN TRANSFORMER (T1)

230/460/575
LEAD #250 CONNECTS TO THE "MID" TERMINAL ON THE RECONNECT PANEL, ALONG WITH THE H3 LEAD FROM THE MAIN TRANSFORMER (T1)

ELECTRICAL SYMBOLS PER E1537

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

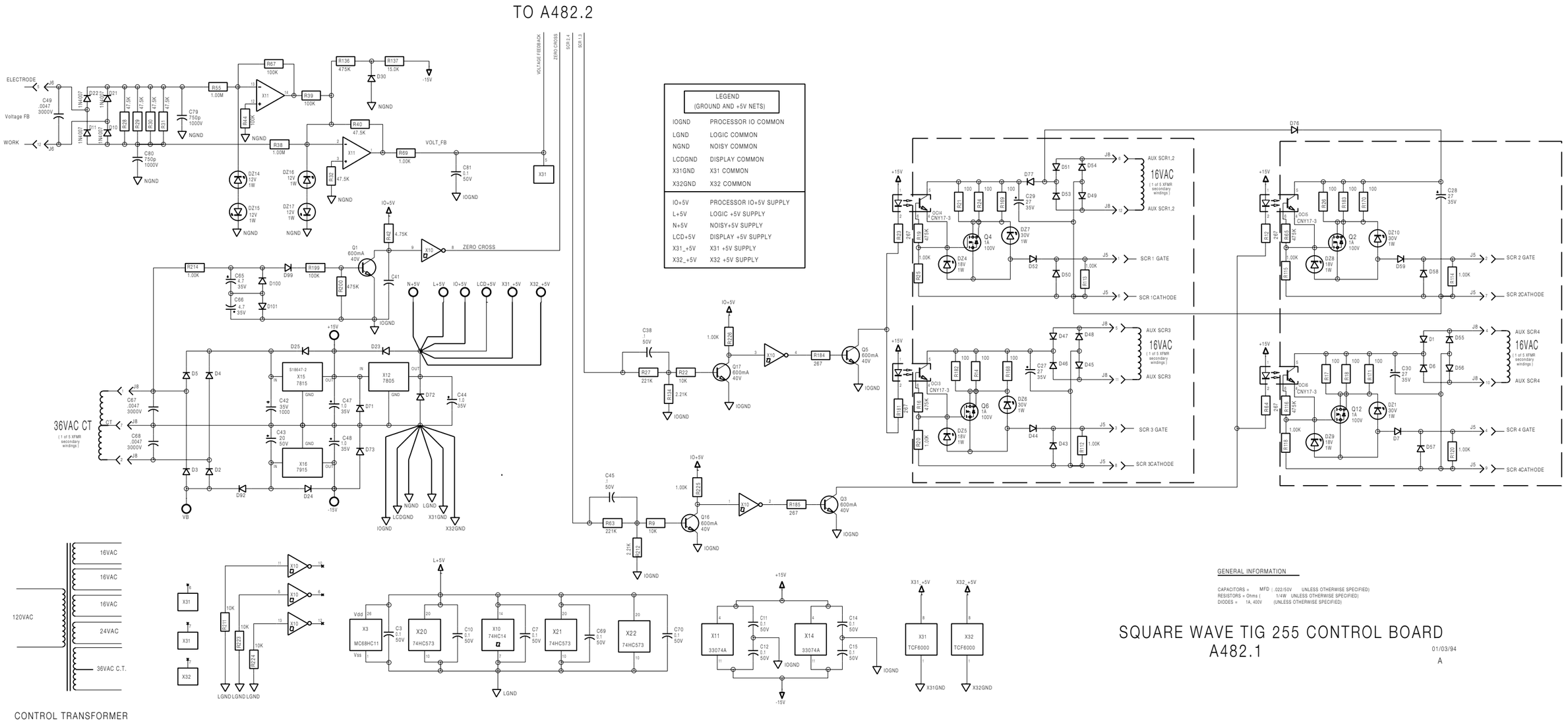
COMPONENT VALUE UNITS:
CAPACITORS: MFD/VOLTS
RESISTORS: OHMS/WATTS

CONNECTOR PIN NUMBERS:
EXAMPLE: THIS PIN IN CONNECTOR J10 IS "6J10"
LATCH
VIEW OF CONNECTOR ON PC BOARD

SQUARE WAVE TIG 255
SCHEMATIC - MACHINE
G 2736

NOTE: This machine schematic is provided for reference only and may not be totally applicable to every code covered in this manual.

CONTROL BOARD SCHEMATIC — SQUARE WAVE TIG 255 (G2150)



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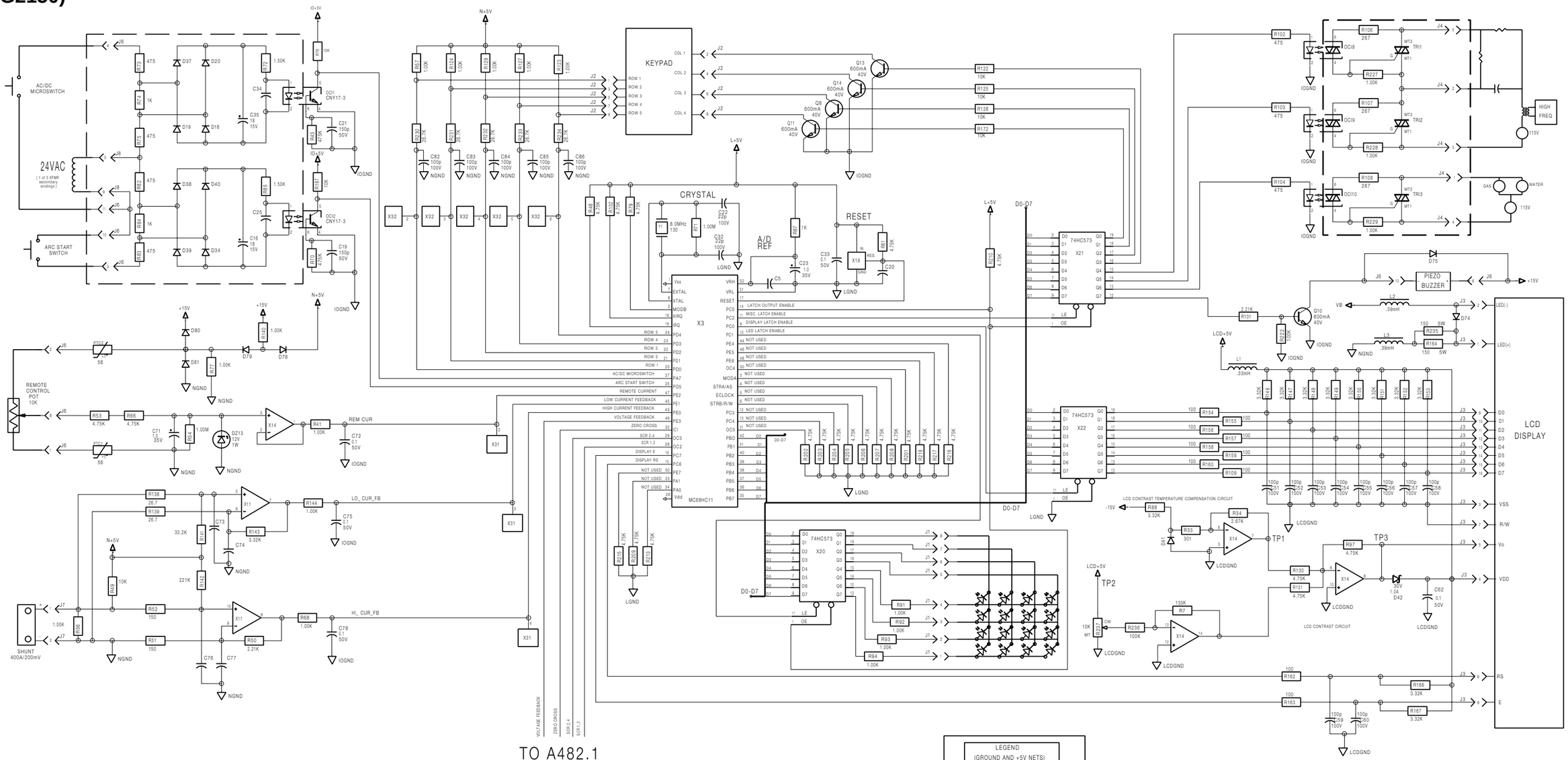
Return to Section TOC
Return to Master TOC

CONTROL BOARD SCHEMATIC — SQUARE WAVE TIG 255 (cont'd) (G2150)



LEGEND (GROUND AND +5V NETS)	
IOGND	PROCESSOR IO COMMON
LGND	LOGIC COMMON
NGND	NOISY COMMON
LCDGND	DISPLAY COMMON
X31GND	X31 COMMON
X32GND	X32 COMMON
IO+5V	PROCESSOR IO+5V SUPPLY
L+5V	LOGIC +5V SUPPLY
N+5V	NOISY+5V SUPPLY
LCD+5V	DISPLAY +5V SUPPLY
X31_+5V	X31 +5V SUPPLY
X32_+5V	X32 +5V SUPPLY

GENERAL INFORMATION

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

SQUARE WAVE TIG 255 CONTROL BOARD
A482.2

01/03/94
A

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Return to Section TOC
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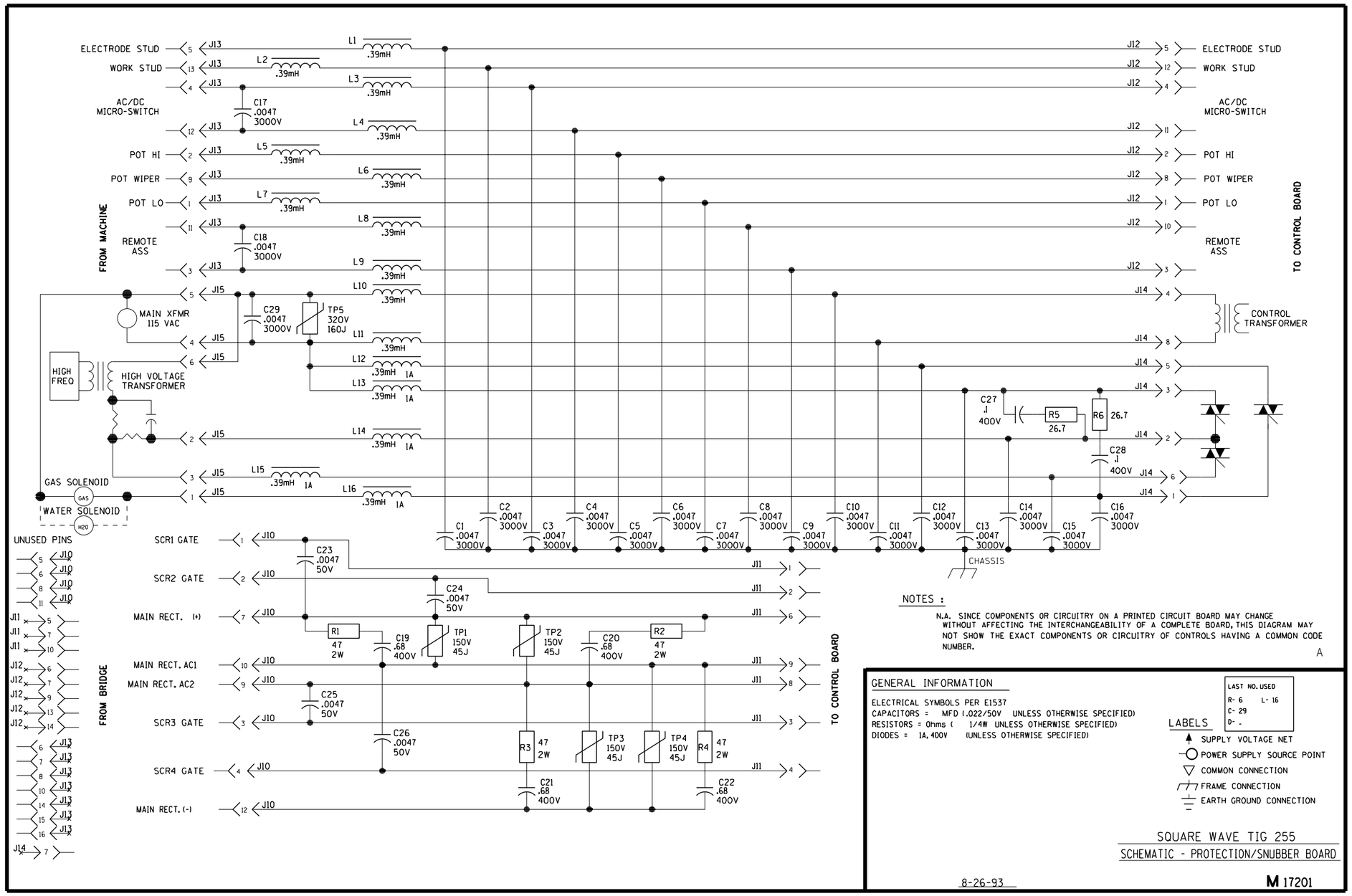
PROTECTION/SNUBBER BOARD SCHEMATIC — SQUARE WAVE TIG 255 (L9255)



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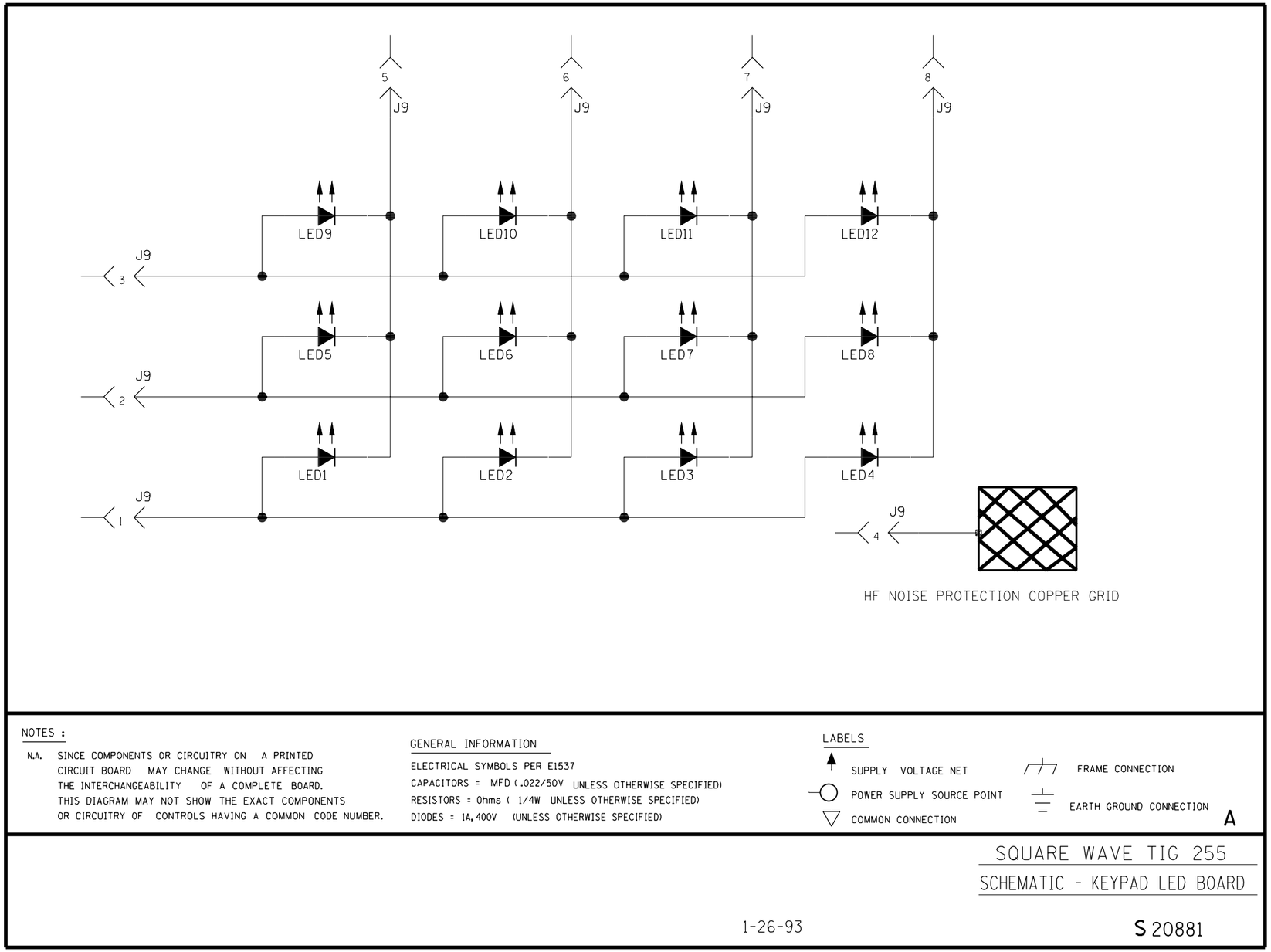
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

KEYPAD LED BOARD — SQUARE WAVE TIG 255 (L9212)



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