

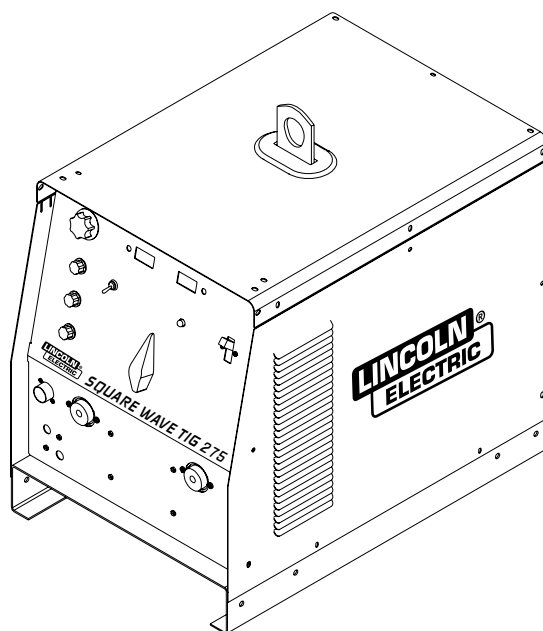


## **SQUARE WAVE TIG 275**

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

For use with machines having Code Numbers:  
**10523 & 10525**

# **SERVICE MANUAL**



Return to Master TOC

**⚠ WARNING**

**⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠**

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

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

The Above For Diesel Engines

The Above For Gasoline Engines

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

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


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

**⚠ FOR ENGINE powered equipment.**

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


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





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




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




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

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


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



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

**ELECTRIC AND MAGNETIC FIELDS may be dangerous**



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

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

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

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

- 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
- 2.d.2. Never coil the electrode lead around your body.
- 2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
- 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
- 2.d.5. Do not work next to welding power source.

Mar '95

**SQUARE WAVE TIG 275**





### ELECTRIC SHOCK can kill.

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

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

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

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

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

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

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

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

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

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

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

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



### ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

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

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



### FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and 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.**

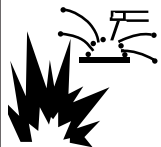
5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.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.

5.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.

5.e. Also see item 1.b.

Mar '95



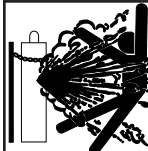
## WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area.

If this is not possible, cover them to prevent the welding sparks from starting a fire.

Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.



## CYLINDER may explode if damaged.

- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
  - Away from areas where they may be struck or subjected to physical damage.
  - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



## FOR ELECTRICALLY powered equipment.

- 8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- 8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- 8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Mar '95

SQUARE WAVE TIG 275



## PRÉCAUTIONS DE SÛRETÉ

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

### Sûreté Pour Soudage A L'Arc

1. Protégez-vous contre la secousse électrique:
  - a. Les circuits à l'électrode et à la pièce 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 vêtements mouillés. Porter des gants secs et sans trous pour isoler les mains.
  - b. Faire très attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher métallique ou des grilles métalliques, 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 de fonctionnement.
  - 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 précautions pour le porte-électrode s'appliquent 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 où 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 soleil, 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 latéraux 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 un endroit isolé de la masse. Un court-circuit accidentel peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus près 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 chaînes de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'échauffement des chaînes et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particulièrement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistilage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgène (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 châssis du poste conformément au code de l'électricité et aux recommandations du fabricant. Le dispositif de montage ou la pièce 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 faire des travaux à l'intérieur de poste, la débrancher à l'interrupteur à la boîte de fusibles.
4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Mar. '93

SQUARE WAVE TIG 275



	Page
<b>Safety</b> .....	i-iv
<hr/>	
<b>Installation</b> .....	<b>Section A</b>
Technical Specifications .....	A-2
Safety Precautions .....	A-3
Input Supply Connections .....	A-4
Input Reconnect Procedure .....	A-5
User Supplied Connectors .....	A-6
Output Connections.....	A-6
Work Cable Connection .....	A-6
TIG Torch Connection .....	A-7
Twist-Mate Adapter for LA-9 and LA-17 TIG Torch.....	A-8
Twist-Mate Adapter for LW-18 and LW-20 TIG Torch.....	A-8
Stick Electrode Cable Connection.....	A-9
<hr/>	
<b>Operation</b> .....	<b>Section B</b>
Safety Precautions .....	B-2
General Description.....	B-3
Recommended Processes and Equipment.....	B-3
Design Features and Advantages .....	B-3
Welding Capability.....	B-4
Limitations .....	B-4
Controls and Settings.....	B-5
Welding Operation.....	B-6
Stick Welding.....	B-9
Auxiliary Power.....	B-9
<hr/>	
<b>Accessories</b> .....	<b>Section C</b>
<hr/>	
<b>Maintenance</b> .....	<b>Section D</b>
Safety Precautions .....	D-2
Routine and Periodic Maintenance .....	D-2
Overload Protection .....	D-2
Fan As Needed (F.A.N.) .....	D-2
Service Procedures.....	D-2
Component Location and Access .....	D-3
Spark Gap Adjustment .....	D-3
<hr/>	
<b>Theory of Operation</b> .....	<b>Section E</b>
General Description.....	E-2
Input Power Circuit.....	E-2
Output Rectification, Control Board and Feedback.....	E-3
High Voltage / High Frequency Circuit.....	E-4
DC Welding Output .....	E-5
AC Welding Output.....	E-6
SCR Operation .....	E-7
Protective Circuits .....	E-8
<hr/>	
<b>Troubleshooting and Repair</b> .....	<b>Section F</b>
How to Use Troubleshooting Guide .....	F-2
PC Board Troubleshooting Procedures.....	F-3
Troubleshooting Guide .....	F-4
Test Procedures.....	F-18
Oscilloscope Waveforms .....	F-33
Replacement Procedures .....	F-42
Retest After Repair .....	F-59
<hr/>	
<b>Electrical Diagrams</b> .....	<b>Section G</b>
<hr/>	
<b>Parts Manual</b> .....	<b>P316 Series</b>

# TABLE OF CONTENTS - INSTALLATION SECTION -

<b>Installation .....</b>	<b>Section A</b>
Technical Specifications, Square Wave TIG 275 (K1617-1) .....	A-2
Safety Precautions.....	A-3
Select Suitable Location .....	A-3
Stacking.....	A-3
Lifting and Moving.....	A-3
Tilting .....	A-3
Environmental Rating .....	A-3
Machine Grounding and High Frequency Interference Protection .....	A-3
Input Supply Connections .....	A-4
Input Reconnect Procedure.....	A-5
User Supplied Connectors .....	A-6
Output Connections.....	A-6
Work Cable Connection.....	A-6
TIG Torch Connection.....	A-7
Twist-Mate Adapter for LA-9 and LA-17 TIG Torch.....	A-8
Twist-Mate Adapter for LW-18 and LW-20 TIG Torch .....	A-8
Stick Electrode Cable Connection.....	A-9

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



# INSTALLATION

## TECHNICAL SPECIFICATIONS - Square Wave TIG 275

### INPUT - SINGLE PHASE ONLY

Standard Voltage	Input Current at 40% Duty Cycle		Input Current at 60% Duty Cycle		Input Current at 100% Duty Cycle		Idle Current	Idle Power	Code Number
	DC	AC	DC	AC	DC	AC			
208/230/460/1/60 (K1617-1) 460/575/1/60 (K1617-2)	95/86/43 43/35	130/120/61 61/49	76/69/34 34/28	106/97/50 50/41	57/52/26 26/21	82/75/38 38/31	5/4/2 2/1.5	900 W Max. 900 W Max.	10523 10525

### RATED OUTPUT & ADDITIONAL OUTPUT CAPACITY

Duty Cycle	Amps	Volts at Rated Amperes	Current Range	Auxiliary Power
40% Duty Cycle DC TIG & AC/DC Stick NEMA Class II (40) AC TIG	275 A 255 A	31.0 V 16.1 V	5-315 Amps	115 Volts AC, 10 Amps Grounded NEMA-5-15R Receptacle and 10 Amp Circuit Breaker
60% Duty Cycle DC TIG & AC/DC Stick AC TIG	225 A 200 A	29.0 V 15.4 V		
100% Duty Cycle DC TIG & AC/DC Stick AC TIG	175 A 150 A	27.0 V 14.8 V	MAX O.C.V. AC & DC 80V	
			Normal O.C.V. 72 V (AC) 59 V (DC)	

### RECOMMENDED INPUT WIRE AND FUSE SIZES

For all Stick, DC TIG and Balanced AC TIG Welding at 275A 40% Duty Cycle w/o Optional K1620-1 Power Factor Capacitors Based on the 1996 U.S. National Electrical Code					For Unbalanced AC TIG Welding above 180A, 255A 40% Duty Cycle, Maximum Penetration w/o Optional K1620-1 Power Factor Capacitors Based on the 1996 U.S. National Electrical Code			
Input Voltage / phase/ Frequency	Fuse (Super Lag) or Breaker Size <sup>(1)</sup>	Input Amperes	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes 40°C (104°F) Ambient	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes	Fuse (Super Lag) or Breaker Size <sup>(1)</sup>	Input Amperes	Type 75°C Copper Wire in Conduit AWG (IEC) Sizes 40°C (104°F) Ambient	Type 75°C Copper Ground Wire in Conduit AWG (IEC) Sizes
208/1/60	125	111	4 (21.2 mm <sup>2</sup> )	6 (13.3 mm <sup>2</sup> )	150	130	3 (25.0 mm <sup>2</sup> )	6 (13.3 mm <sup>2</sup> )
230/1/60	125	100	4 (21.2 mm <sup>2</sup> )	6 (13.3 mm <sup>2</sup> )	150	120	3 (25.0 mm <sup>2</sup> )	6 (13.3 mm <sup>2</sup> )
460/1/60	60	50	8 (8.4 mm <sup>2</sup> )	10 (5.3 mm <sup>2</sup> )	70	61	8 (8.4 mm <sup>2</sup> )	8 (8.4 mm <sup>2</sup> )
575/1/60	50	40	10 (5.3 mm <sup>2</sup> )	10 (5.3 mm <sup>2</sup> )	60	49	8 (8.4 mm <sup>2</sup> )	10 (5.3 mm <sup>2</sup> )

<sup>(1)</sup> Also called "inverse time" or "thermal/magnetic" circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of current increases.

### PHYSICAL DIMENSIONS

	Height	Width	Depth	Weight
Power Source	24.06 in. 611 mm Lift Hook add 3.57" (91 mm)	19.15 in. 486 mm	28.00 in. 711 mm	Approx. 330 lbs. 150 kg.
Power Source on Undercarriage	33.40 in. 848 mm	27.65 in. 702 mm	40.65 in. 1033 mm	Approx. 375 lbs. 170 kg.

## SQUARE WAVE TIG 275



[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](#)



# INSTALLATION

Read this entire installation section before you start 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 275 grounding screw (located on the right rear corner of the base) to a good electrical earth ground.
- Always connect the Square Wave TIG 275 to a power supply grounded per the National Electrical Code and any local codes.

## 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 trips.

## STACKING

Square Wave TIG 275's cannot be stacked.

## LIFTING AND MOVING

The Square Wave TIG 275 should be lifted with a hoist. (It weighs approximately 330 lbs./150 kg.) An optional undercarriage is available to easily move the unit. Refer to the Accessories section of this manual. The Square Wave TIG 275 is designed to be used with a K932-1 Undercarriage. Complete installation instructions are included with the K932-1 Undercarriage. When the undercarriage is properly installed, the Square Wave TIG 275 lift bale is nonfunctional. **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 personal injury and/or damage to the Square Wave TIG 275.

## 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.

## ENVIRONMENTAL RATING

The Square Wave TIG 275 power source carries an IP21S environmental rating. It may be used in normal industrial and commercial environments. It is rated for use in damp, dirty rain-sheltered environments.

## MACHINE GROUNDING AND HIGH FREQUENCY INTERFERENCE PROTECTION

**The frame of the welder must be grounded.** A ground screw marked with the symbol  $\oplus$  is located at the right rear corner of the base for this purpose. See your local and national electrical codes for proper grounding methods.

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.

The Square Wave TIG 275 has been field tested under recommended installation conditions and has been found to comply with F.C.C. allowable radiation limits. A certificate (S14929) is being sent with each welder for customer convenience. If he desires or is required to obtain certification of compliance with F.C.C. RF Energy Radiation Limits, this certificate can be used. It is the customer's responsibility to obtain this certification. This welder has also been found to comply with NEMA standards for high frequency stabilized power sources.

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.

## SQUARE WAVE TIG 275



# INSTALLATION

1. Keep the welder power supply lines as short as possible and enclose as much of them as possible in rigid metallic conduit or equivalent shielding for a distance of 50 feet (15.2m). There should be good electrical contact between this conduit and the welder case ground. 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 piece must be connected to an earth ground close to the work clamp, 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. (This is not recommended).

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 helically-wrapped metallic conduit is generally not suitable.
8. When the welder is enclosed in a metal building, the metal building should be connected to several good earth driven electrical grounds (as in 5 (b) above) around the periphery of the building.

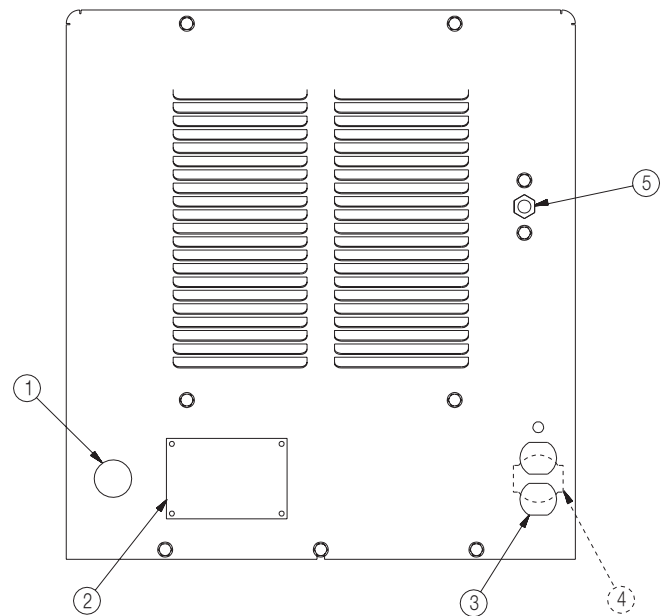
Failure to observe these recommended installation procedures can cause radio or TV and electronic equipment interference problems and result in unsatisfactory welding performance resulting from lost high frequency power.

## INPUT SUPPLY 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.

See Figure A.1 for the location of the rating plate, the entry hole, and the reconnect panel.

FIGURE A.1



- |  |  |
|--|--|
| 1. Input Entry   | 4. 220V Receptacle & Breaker<br>(50/60 HZ. Machines Only.) |
| 2. Rating Plate  | 5. Gas Input Fitting                                       |
| 3. 115V Receptacle & Breaker<br>(60 HZ. Machines only) |  |

Remove the right case side to reveal the reconnect panel. Welder supply line entry provision is in the case rear panel. Entry is through a 1.4 inch (36 mm) diameter hole in the case back.

All connections should be made in accordance with all local codes and national electrical codes. Installation by a qualified electrician is recommended.

1. Connect the terminal marked  $\oplus$  (at the base of the welder below the reconnect panel) to an earth ground.
2. Connect the input leads to terminals marked L1 (U) and L2 (V) on the reconnect panel. Use a single phase line or one phase of a two or three phase line.

SQUARE WAVE TIG 275



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

# INSTALLATION

Fuse the input circuit with the recommended super lag fuses or delay type<sup>1</sup> circuit breakers. Choose an input and grounding wire size according to local or national codes or refer to the **Technical Specifications** page at the beginning of this section. Using fuses or circuit breakers smaller than recommended may result in “nuisance” tripping 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 per the **Technical Specifications** page at the beginning of this section.

<sup>1</sup> 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.

## INPUT RECONNECT PROCEDURE

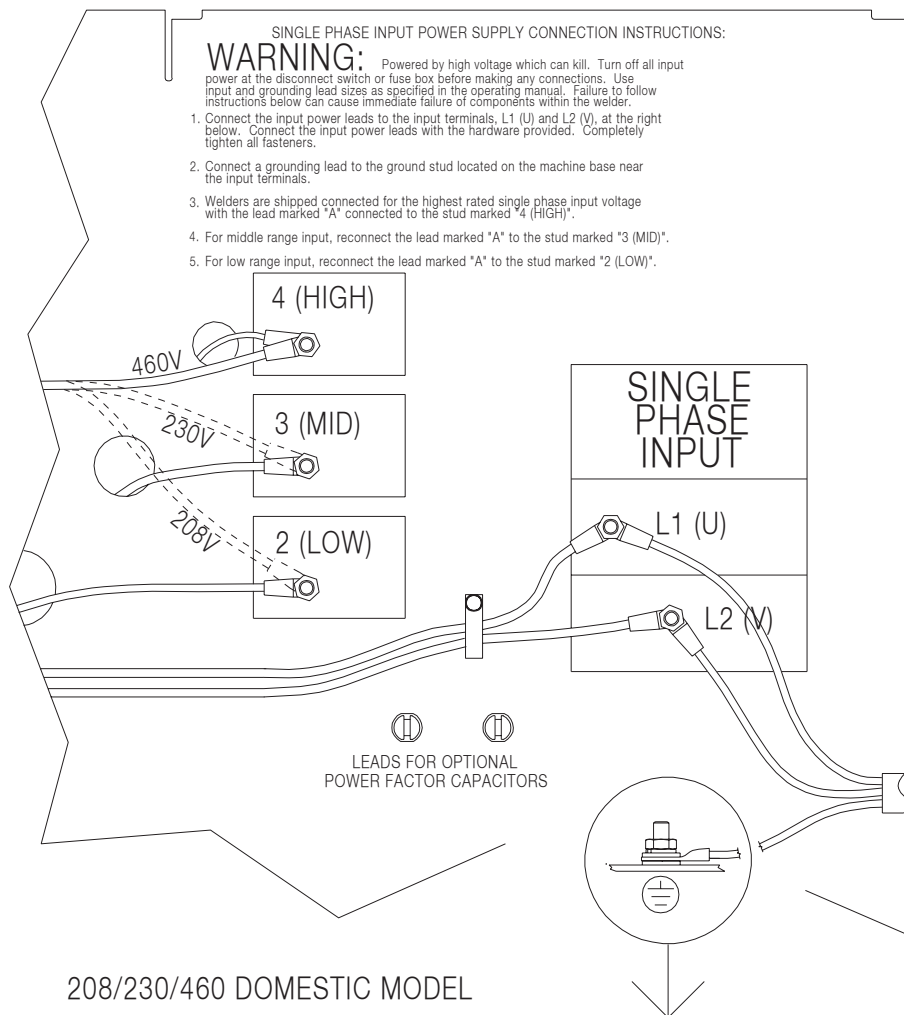
On multiple input voltage welders, be sure the reconnect panel is connected per the following instructions for the voltage being supplied to the welder.

Designations on the reconnect panel, LOW, MID, and HIGH correspond to the nameplated input voltages of a triple voltage welder. Dual voltage welders use only LOW and HIGH.

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

Make sure all connections are tight. Replace the case side and all screws.

**FIGURE A.2**  
**RECONNECT PANEL INSTRUCTIONS FOR 208/230/460/Domestic model**



# INSTALLATION

## USER SUPPLIED CONNECTORS

The Square Wave TIG 275 should be permanently wired into the power system. No plugs or connectors are necessary.

## OUTPUT CONNECTIONS

**⚠ WARNING**

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

### ELECTRIC SHOCK can kill.



- Turn the power switch of the power source "OFF" before installing adapters on cable or when connecting or disconnecting adapter plugs to power source.

See Figure B.1 for the location of the work and electrode terminals, the gas and optional water solenoids, and the Remote Receptacle. The Square Wave TIG 275 is equipped with Twist-Mate connectors for the electrode and work connection.

## WORK CABLE CONNECTION

The Twist-Mate connection allows fast and reliable work cable attachment to the work terminal of the Square Wave TIG 275 welding power supply.

Assemble the work cable by attaching the correct Twist-Mate adapter and work clamp to an adequately-sized welding cable. The Twist-Mate cable plug included with the machine is designed to accept a welding cable size of #2 to #1. See Table A.1 and A.2 for recommended sizes and corresponding hardware.

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

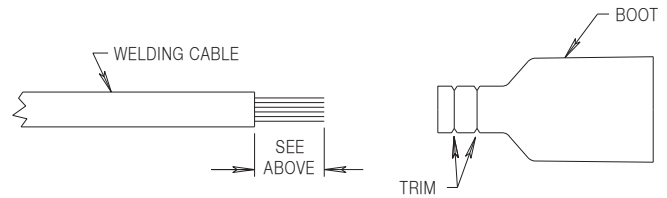
Machine Size	Lengths up to		
	100 ft	100 to 200 ft	200 to 250 ft
275 Amp 40% Duty Cycle	#1 (42.4mm <sup>2</sup> )	1/0 (53.5mm <sup>2</sup> )	2/0 (67.4mm <sup>2</sup> )

**TABLE A.2**  
Recommended Work and Stick Electrode Components

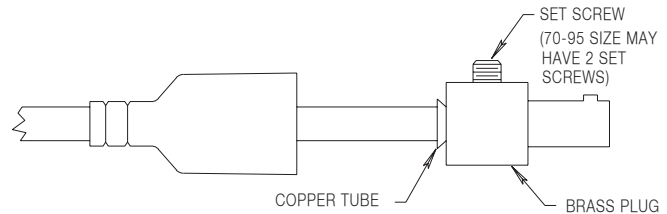
Twist Mate Cable Plug for Work Lead (#2 to #1)	Twist Mate Cable Plug for Work Lead (1/0 to 2/0)	Twist Mate Cable Plug for Work Lead (2/0 to 3/0)	Work Clamp	Electrode Holder
K852-50	K852-70	K852-95	K910-1	K909-4

Assemble the correct Twist-Mate-adapter plug to the work cable as follows:

1. Skin the cable jacket to 1.00 in (25.4 mm) for a #2 thru 2/0 (35 thru 70 mm<sup>2</sup>) cable. Skin the cable jacket to 1.50 in (38.1 mm) for a 2/0 thru 3/0 (70 thru 95 mm<sup>2</sup>) cable.
2. If necessary, trim the cable end of the rubber boot to match the diameter of the cable.
3. Slide the rubber boot onto the skinned cable end. Use soap for lubricant if required.



4. Slide the copper tube into the brass plug. Insert skinned cable into the copper tube.



5. Tighten set screw(s) to collapse copper tube. Screw(s) must apply firm pressure against welding cable.
6. Slide the rubber boot over the brass plug. The rubber boot must be positioned to completely cover all electrical surfaces after the plug is locked into the receptacle. For more details see S18737PRINT or instructions included with the adapter kit.

SQUARE WAVE TIG 275



Return to Section TOC | Return to Master TOC

# INSTALLATION

## TIG TORCH CONNECTION

The Twist-Mate connection allows fast and reliable TIG torch attachment to the electrode terminal of the Square Wave TIG 275 welding power supply. Twist-Mate TIG adapters are made of brass, combining high electrical conductivity with mechanical strength. They are available in several sizes and styles to accommodate a wide selection of gas and water-cooled TIG torches.

- For Air-Cooled TIG Torch connections refer to ***TWIST-MATE ADAPTER for LA-9 and LA-17 TIG TORCH*** section.
- For Water-Cooled TIG TORCH connections refer to ***TWIST-MATE ADAPTER for LW-18 and LW-20 TIG TORCH*** Section.

Any torch having hoses and cables equipped with Compressed Gas Association (CGA) style fittings can be connected to an appropriate Twist-Mate adapter (see ***ACCESSORIES*** section). **The power source must be switched off while making any of these connections.**

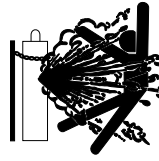
Do not operate a water-cooled torch without an adequate coolant supply. Set-ups using recirculated coolant require that the cooler be switched on and running. If the water solenoid valve option is used with a cooler, the coolant does not flow until the solenoid is actuated.

For set-ups using water as a single-pass through coolant, install a strainer into the system upstream of the Square Wave TIG 275 to reduce the concentration of particles that could contaminate the system. Otherwise, flow passages could become obstructed or clogged, causing torch overheating or failure. The optional water solenoid valve may also malfunction.

When the water solenoid valve option is installed into the Square Wave TIG 275, connect the coolant supply line from either cooler outlet or single-pass supply to the "Water Inlet" fitting located on the machine's case front. Connect the TIG torch's smaller water fitting to the "Water Out" fitting also located on the case front. A non-metallic coolant line is required between the electrode connection and the drain or cooler inlet. This reduces the possibility of an electrical hazard.

TIG welding torches are available with 12.5 and 25 foot cables (3.8m and 7.6m, respectively). Use the shorter length whenever possible to reduce radio interference problems.

### ⚠ WARNING



**CYLINDER could explode if damaged.**

- Keep cylinder upright and chained to a support.
- Keep cylinder away from areas where it could be damaged.
- Never allow the torch to touch the cylinder.
- Keep cylinder away from live electrical circuits.
- Maximum inlet pressure 150 psi.

The high-pressure cylinder of inert shielding gas must be equipped with a flow regulator that limits the gas pressure to 150 psi maximum at the machine's gas inlet. This brass inlet fitting is located on the rear panel of the Square Wave TIG 275. Install a hose between the gas flow meter and the inlet fitting.

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

SQUARE WAVE TIG 275



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

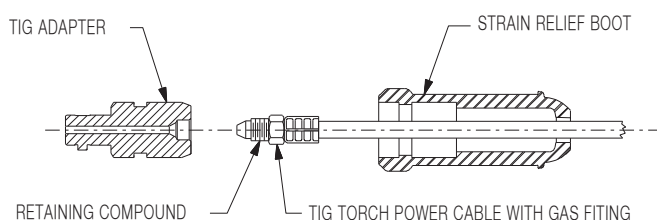
# INSTALLATION

## TWIST-MATE ADAPTER FOR LA-9 and LA-17 TIG TORCH

The Twist-Mate connection allows fast and reliable TIG torch connections to the electrode terminal of the Square Wave TIG 275. The Twist-Mate adapter, strain relief boot and retaining compound needed to connect an LA-9 or LA-17 torch (or any equivalent air-cooled TIG torch with a right-hand male 3/8-24 fitting) are included with the Square Wave TIG 275.

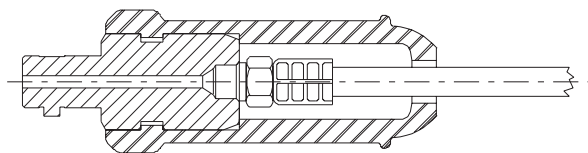
Assemble the the LA-9 or LA-17 TIG torch to the Twist-Mate adapter as follows:

1. Slide the strain relief boot over the TIG torch's power cable with gas fitting.



2. Apply a small amount of retaining compound to the fitting threads as shown. Thread the fitting to the TIG adapter and tighten to ensure a sealed gas connection and a good electrical connection. (35-45 in-lbs)
3. Hold the TIG adapter, with cable installed, firmly in place by securing it into the Twist-Mate receptacle on the power source or into a padded vise. Align the hex in the boot with the hex on the adapter. Firmly push the boot onto the adapter, rocking the boot to assist installation. Use soap for lubricant if required.

### COMPLETED ASSEMBLY



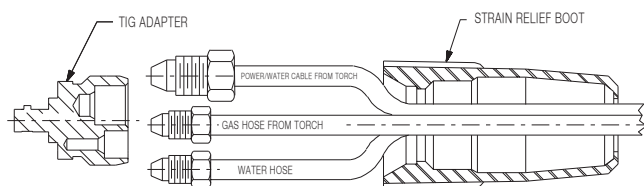
4. Examine the strain relief boot and TIG adapter for correct assembly. The boot should nest into the Twist-Mate receptacle on the power source. All electrical surfaces should be completely covered when in the Twist-Mate receptacle on the power source. For more details see M19115PRINT included with the machine.

## TWIST-MATE ADAPTER FOR LW-18 and LW-20 TIG TORCH

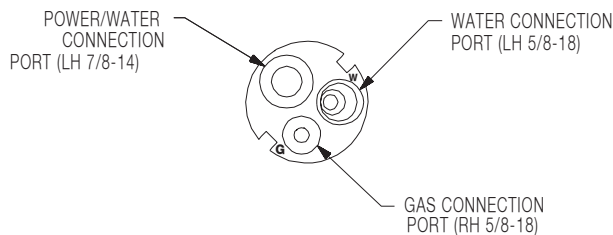
The Twist-Mate connection allows fast and reliable TIG torch connections to the electrode terminal of the Square Wave TIG 275. The Twist-Mate adapter and strain relief boot needed to connect an LW-18 or LW-20 torch (or any equivalent water-cooled TIG torch with the fittings shown in the diagrams under step 2 and 3) are included with the Square Wave TIG 275.

Assemble the the LW-18 or LW-20 TIG torch to the Twist-Mate adapter as follows:

1. Slide the strain relief boot over the TIG torch's power/water cable (large fitting) and gas hose (small fitting without notches on hex). Also slide a water hose into the strain relief boot as shown.

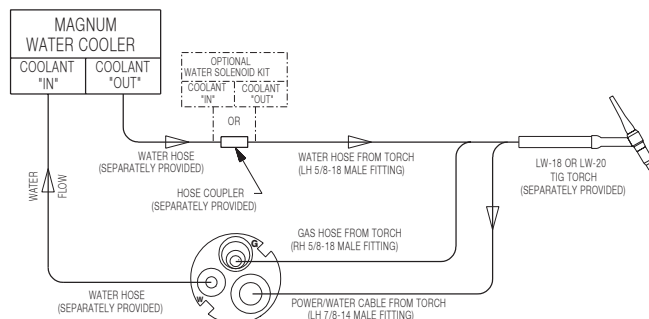


2. Thread the power/water cable (large fitting) from the torch to the large port on the TIG adapter and tighten to ensure a water tight connection. Next, thread the gas hose (small fitting without notches on hex) to the port marked "G" on the TIG adapter and tighten to ensure a sealed gas connection. Next, thread the water hose to cooler (or to water drain) to the port marked "W" on the TIG adapter.



3. Check all connections made in step 2 for gas and water leaks before proceeding.

### CONNECTION DIAGRAM



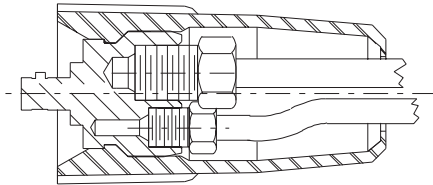
### SQUARE WAVE TIG 275



# INSTALLATION

4. Hold the TIG adapter, with cables and hoses installed, firmly in place by securing it into the Twist-Mate receptacle on the power source or into a padded vise. Apply a thin film of lubricant to the boot's lead in chamfer area. Also apply lubricant to the lead in chamfer and 2" diameter on the TIG adapter. Next align the strain relief boot keys with the TIG adapter slots. Now firmly push the boot onto the adapter, rocking the boot to assist installation.

COMPLETED ASSEMBLY



5. Examine the strain relief boot and TIG adapter for correct assembly. The boot should nest into the Twist-Mate receptacle on the power source. The boot face will be 1/8 inch away from the machine front. All electrical surfaces should be completely covered when in the Twist-Mate receptacle on the power source. For more details see M19116PRINT included with the machine.

## STICK ELECTRODE CABLE CONNECTION

The Twist-Mate connection allows fast and reliable stick electrode attachment to the electrode terminal of the Square Wave TIG 275 welding power supply.

Assemble the electrode cable by attaching the correct Twist-Mate adapter and electrode holder to an adequately-sized welding cable. See Table A.1 and A.2 for recommended sizes and corresponding hardware.

Assemble the correct Twist-Mate adapter plug to the stick electrode cable as detailed in **Work Cable Connection**.

### **⚠ 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.

SQUARE WAVE TIG 275



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

SQUARE WAVE TIG 275





# TABLE OF CONTENTS - OPERATION SECTION -

<b>Operation</b> .....	<b>Section B</b>
Safety Precautions .....	B-2
General Description .....	B-3
Recommended Processes and Equipment.....	B-3
Design Features and Advantages.....	B-3
Welding Capability .....	B-4
Limitations.....	B-4
Controls and Settings.....	B-5
Welding Operation .....	B-6
TIG Welding .....	B-6
TIG Welding Guidelines.....	B-6
TIG Welding Sequence of Operation (2-Step TIG Mode) .....	B-7
TIG Welding Sequence of Operation (4-Step TIG Mode) .....	B-7
Hand and Foot Amptrol Operation.....	B-8
Advanced TIG Welding Features .....	B-8
AC Wave Balance and Auto Balance™.....	B-8
Stick Welding .....	B-9
Auxiliary Power .....	B-9
60 Hertz Domestic Machines.....	B-9
50/60 Hertz European Machines.....	B-9

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

SQUARE WAVE TIG 275



# OPERATION

## SAFETY PRECAUTIONS

Read and understand this entire section before operating the machine.

### WARNING



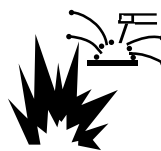
#### **ELECTRIC SHOCK** can kill.

- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground.
- Always wear dry insulating gloves.
- Read and follow “Electric Shock Warnings” in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the workpiece.



#### **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.

SQUARE WAVE TIG 275



# OPERATION

## GENERAL DESCRIPTION

The Square Wave TIG 275 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. A TIG Pulser Kit, Power Factor Capacitor Kit, and a Water Solenoid Kit are available as field installed options.

The Square Wave TIG 275 includes advanced features such as Digital Voltage and Current Meters, Auto Balance™, 2-Step/4-Step operation, adjustable Down slope Time control and Fan as Needed. It also features Twist Mate connections for the electrode and work leads. In addition, fixed preflow and variable post flow timers are included to control the shielding gas, as well as the water flow when using the optional water solenoid.

## RECOMMENDED PROCESSES AND EQUIPMENT

The Square Wave TIG 275 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, as well as many industry standard items, such as TIG torches, hoses, and water coolers.

## DESIGN FEATURES AND ADVANTAGES

- Meets NEMA CLASS II (40) and IP21S environmental certification. (Will be CSA NRTL/C certified in the future.) Domestic and Canadian Models Only.
- Meets IEC-974-1 and IP21S environmental certification. (Will be CE certified in the future.) European Model Only.
- Built in Digital Ammeter and Voltmeter for precise process control. This includes a persistence feature which captures and continues to display the peak welding current and it's corresponding voltage for five seconds after the weld is completed.
- AC Wave Balance control knob provides flexibility to the customer. Set it to the Auto Balance position and the circuitry automatically provides the proper amount of cleaning and penetration for normal AC TIG welding. For special applications simply dial in the amount of cleaning and penetration needed.
- Fan As Needed (FAN) circuit turns 'ON' the fan only when cooling is needed. FAN minimizes the amount of dust, dirt, and other foreign material drawn into the

machine. A build up of these materials can cause excessive operating temperatures and nuisance shut downs.

- 2-STEP/4-STEP TIG/STICK mode control switch. 4-STEP mode requires the use of an optional Arc Start Switch. This welding mode reduces fatigue by eliminating the need to manually control the weld current during the weld.
- Down Slope Time control is active in 4-STEP TIG mode. It controls the amount of time (approximately 1 to 10 seconds) it takes the weld current to ramp down from the Preset level to 25% ±10% of that level.
- Post Flow Time control is active in the 2 and 4-STEP TIG modes. It controls the amount of time (approximately 5 to 50 seconds) the shielding gas flows after the weld is completed.
- Robotic Interface connection on the PC board can be connected to the machines Remote Receptacle for automated welding procedures. This interface allows remote control of the trigger and output current of the machine as well as providing a signal when the weld is established. (For details contact the Lincoln Automation Center)
- Built in High Frequency Generator automatically performs in the correct mode. If the machine is in STICK mode, the HF stays 'OFF'. IF the machine is in DC TIG mode, the HF comes 'ON' and stays on until the arc is established. IF the machine is in AC TIG mode, the HF comes 'ON' and stays on continuously to stabilize the arc.
- Automatic Local/Remote current selection. The machine automatically senses if an Amptrol, Arc Start Switch or TIG Pulser is plugged in and transfers current control from local to remote.
- Built in preflow time of 0.5 seconds. Preflow time is eliminated if welding restarts during the pervious weld's post flow. This avoids unnecessary delays when making repeated welds.
- Simple dial and switch design provides the customer with flexible control of the welding process without unnecessary complication. Controls which are not needed in the weld mode selected are automatically locked out.
- Twist Mate connectors are provided for the electrode and work connections. This style connector makes the gas and current connections for the TIG torch at the same time. (Adaptor plugs are provided)
- DC+/AC/DC- Polarity Switch allows the welder to change polarity without reconnecting leads.

### SQUARE WAVE TIG 275



## OPERATION

- Provides excellent arc starting and stability throughout the machines wide current range (5 to 315 Amps) to handle the vast majority of TIG welding applications.
- Simple output current dial allows the user to preset the peak current within the full output range of the machine.
- Highly resistant to AC arc rectification.
- Thermostatically protected to prevent equipment damage.
- No tungsten spitting within current range of electrode.
- Designed to make maintenance and servicing easy.
- 115 Volt Receptacle with 10 Amp Circuit Breaker. Domestic and Canadian Models Only.
- 220 Volt European (Schuko) type Receptacle with 2 Amp Circuit Breaker. European Model Only.
- Low Voltage Trigger Circuit (18 VAC) for maximum operator safety.
- Remote Receptacle for Amptrol or Arc Start Switch connection.
- Gas Valve Inlet fitting conforms to Compressed Gas Association (CGA) standards.

## WELDING CAPABILITY

The Square Wave TIG 275 is rated at 275 amps, 31 volts, at 40% duty cycle on a ten minute basis for DC TIG and AC/DC stick processes. It is capable of higher duty cycles at lower output currents. If the duty cycle(s) are exceeded, the thermostatic protection will shut off the output until the machine cools to a normal operating temperature.

## LIMITATIONS

The Square Wave TIG 275 is not recommended for AC TIG welding when high concentrations of helium gas are used for shielding. This causes starting and arc rectification problems. Also the Square Wave 275 is not recommended for arc gouging due to it's limited output capacity. The Square Wave TIG 275 is also not recommended for pipe thawing.

SQUARE WAVE TIG 275

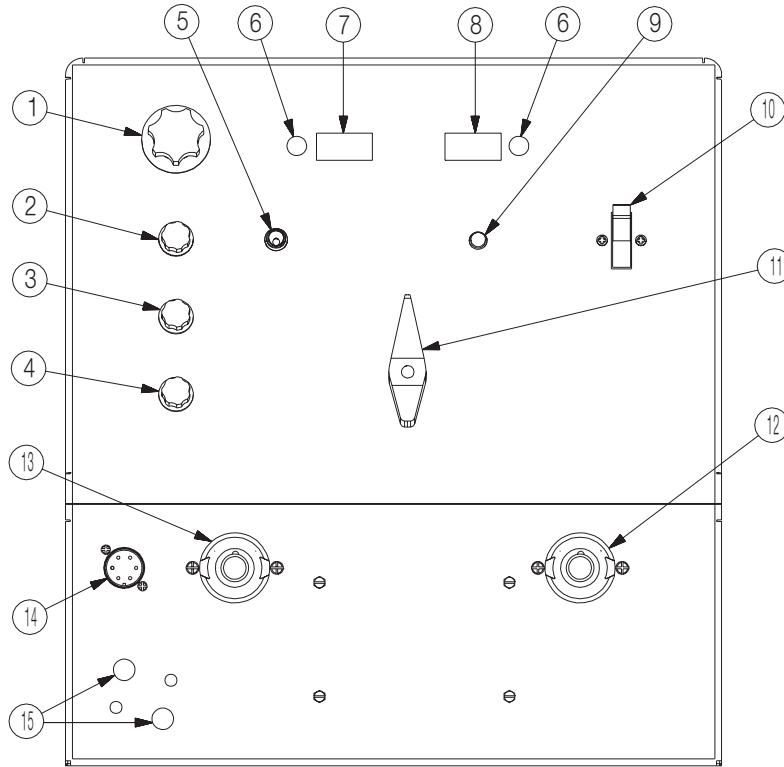


# OPERATION

## CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the Square Wave TIG 275. Refer to Figure B.1 and corresponding explanations following.

FIGURE B.1 - CONTROL PANEL



1. Output Control Knob
2. AC Wave Balance Knob
3. Post Flow Knob
4. Down Slope Time Knob
5. Mode Switch
6. Trimmer Potentiometer
7. Digital Ammeter
8. Digital Voltmeter
9. Thermal Protection Light
10. Power Switch
11. Polarity Switch
12. Electrode Connection (Twist-Mate Connector)
13. Work Connection (Twist-Mate Connector)
14. Remote Control Amphenol
15. Water Solenoid (Optional)

1. **Current Control** - This knob is used to set the welding current from 5 to 315 amps. Read the complete Operating Instructions section for more information on Local and Remote setting of current.
2. **AC Wave Balance Control** - This knob is active in the AC TIG mode only. It is 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 balance can be adjusted from +0 (maximum cleaning) to +10 (maximum penetration). Read the Advanced Features section for a complete explanation of the AC Wave Balance.
3. **Post Flow Time Control** - This knob is active in the TIG mode only. It adjusts the post flow time from 5 to 50 seconds for shielding gas. It also adjusts cooling water flow when the optional K1621-1 Water Solenoid Kit is used.
4. **Down Slope Time Control** - This knob is active in 4-Step TIG mode only. It adjusts the time (from 0.5 to 10 seconds) the welding output takes to ramp down from the preset level to 25% of that level.
5. **2-Step/4-Step TIG/Stick Mode Control Switch** - This switch selects the welding 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.
6. **Trimmer Potentiometers** - Allows the meters to be calibrated in the field.
7. **Digital Ammeter** - The ammeter displays actual welding current during a weld cycle and displays the peak current for approximately 5 seconds after welding is complete. Read the complete Operating Instructions section for more information on the Ammeter.

SQUARE WAVE TIG 275



# OPERATION

8. **Digital Voltmeter** - This meter displays welding voltage, as measured on the output studs of the Square Wave TIG 275. After welding is complete, the meter displays the welding voltage corresponding to the peak welding current and displays this value for approximately 5 seconds.
9. **Thermal Protection Light** - A yellow light which only lights when an over temperature situation occurs. See the **Maintenance Section** for more information on thermostatic protection.
10. **Power Switch** - Controls the input power to the Square Wave TIG 275.
11. **Polarity Switch** - Selects DC+, AC or DC- welding polarity without reconnecting leads. **DO NOT SWITCH WHILE WELDING.**
12. **Twist Mate Electrode and**
13. **Work Connections** - Easy to connect electrode and work connections. This style Electrode Connection makes the gas and current connections for the TIG torch at the same time. (Adapter plugs are provided with the machine.)
14. **Remote Receptacle** - For Amptrol, Arc Start Switch or Robotic Interface connection.
15. **Optional Water Solenoid Connections** - Easy to install this optional feature which allows for water flow control for water cooled torches.

## WELDING OPERATION

### TIG WELDING

Familiarize yourself with the Controls and Settings Section before attempting operation of the Square Wave TIG 275.

### 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 typically uses an Arc Start switch and Local Current Control, because it provides a very brief current upslope, and a .5 to 10 second adjustable current downslope. TIG 4-Step also functions like a trigger interlock, making it unnecessary to hold down the Arc Start switch during a weld. This feature requires that the remote control device in use must have separate Arc Start and Output Control mechanisms. Read the TIG Welding Sequence of Operation sections for more details on 2-Step and 4-Step operation.

Recommended tungsten electrode sizes, stickouts, currents, cup or nozzle sizes are shown in Table B.1. **SINCE WELDING APPLICATIONS CAN VARY, THIS CHART IS INTENDED AS A GUIDE ONLY.**

**TABLE B.1 TYPICAL CURRENT RANGES FOR TUNGSTEN ELECTRODES** <sup>(2)</sup>

Tungsten Electrode Diameter in. (mm)	DCEN (-)	DCEP (+)	AC				Approximate Argon Gas Flow Rate C.F.H. (l/min.)		TIG Torch Nozzle Size <sup>(4), (5)</sup>
			Unbalanced Wave		Balanced Wave		Aluminum	Stainless Steel	
			Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated	Pure Tungsten	1%, 2% Thoriated Tungsten Zirconiated			
.010 (.25)	2-15	<sup>(3)</sup>	2-15	2-15	2-15	---	3-8 (2-4)	3-8 (2-4)	#4, #5, #6
0.020 (.50)	5-20	<sup>(3)</sup>	5-15	5-20	10-20	5-20	5-10 (3-5)	5-10 (3-5)	
0.040 (1.0)	15-80	<sup>(3)</sup>	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 . . . . . EWT-1
- 2% Thoriated . . . . . EWT-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.

## SQUARE WAVE TIG 275



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

# OPERATION

## TIG WELDING SEQUENCE OF OPERATION (2-Step TIG Mode)

1. Connect an Arc Start Switch or an Amptrol to the Remote Amphenol.
2. Turn the welder, gas supply and water supply (if equipped), on. The digital ammeter/voltmeter displays will illuminate when the power is on.
3. Select the 2-Step TIG Mode with the 2-Step/4-Step TIG/Stick switch.
4. Set the maximum output current using the output control knob.
5. Select AC or DC- electrode polarity. See Table B.2.

**TABLE B.2  
RECOMMENDED POLARITY  
SETTINGS FOR TIG WELDING**

Type of Welding	Electrode Polarity
Stainless Steel	DC-
Aluminum & Magnesium	AC
Other Metals	DC-

6. If welding with AC polarity, set the AC Wave Balance Knob to Auto Balance™. This gives the optimum ratio between cleaning and penetration, automatically adjusted of the AC Wave Balance is desired, adjust the wave balance to the desired settings. See the Advanced Features section for more information on setting and using the AC Wave Balance.
7. Set the post flow time with the post flow knob. Post flow control knob adjusts the time that the shielding gas flows (and cooling water flow, if the optional water solenoid is used) after the weld cycle. Use short post flow times with low currents and small tungstens, use long post flow times at high output currents with large tungstens.
8. Press and release the Arc Start Switch, and set the gas flow meter. The welder is now ready for welding.
9. 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" (4 mm) above the work piece. Press the Arc Start Switch. This opens the gas (and optional water solenoid) 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.

10. 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 Post Flow timer. After the Post Flow time has expired, the gas and (optional water solenoid) valves will close. To make another weld, repeats steps 9 and 10.

## TIG WELDING SEQUENCE OF OPERATION (4-Step TIG Mode)

1. Connect an Arc Start Switch to the Remote Amphenol.
2. Turn the welder, gas supply and water supply (if so equipped), on. The digital ammeter/voltmeter display will illuminate when the power is on.
3. Select the 4-Step TIG Mode with the 2-Step/4-Step TIG/Stick switch.
4. Set the maximum output current using the output control knob.
5. Select AC or DC- electrode polarity. See Table B.2.
6. If welding with AC polarity, set the AC Wave Balance Knob to 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, adjust the wave balance to the desired settings. See the Advanced Features section for more information on setting and using the AC Wave Balance.
7. Set the Post Flow time with the Post Flow knob. Post Flow time provides shielding gas flow (and cooling water, if used) after the weld. Use short Post Flow times with low currents and small tungstens and long Post flow times at high output currents and large tungstens.
8. Set the Downslope Time with the Downslope Time Knob. This will adjust the time of the crater fill period.
9. Press and release the Arc Start Switch, to set the gas flow meter if necessary. The welder is now ready for welding.
10. 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" (4 mm) 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.

### SQUARE WAVE TIG 275



# OPERATION

11. Hold the Arc Start Switch down until an arc is established. The arc will start at a low current value that is equal to 25% of the preset current established in Step 4. It will remain at this current as long as the Arc Start Switch is closed. Release the Arc Start Switch. At this point, the Square Wave TIG 275 will quickly ramp up to the preset maximum welding current, (0.5 seconds upslope time) and the weld will continue indefinitely. Press the Arc Start Switch a second time to initiate the Downslope time. 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 Post flow timer. After the Post flow time has expired, the gas and optional water valves will close. To make another weld, repeat steps 10 and 11.

## HAND AND FOOT AMPCTRL OPERATION

Both the Hand and Foot Ampctrl work in a similar manner. They are meant to be used for remote current control. The TIG 2-Step mode must be selected when using an Ampctrl for remote current control.

For simplicity, the following explanation will refer only to "Ampctrls", 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 Ampctrl in the relaxed position, with no thumb pressure. "Maximum" refers to a fully depressed Foot Ampctrl, or a fully extended Hand Ampctrl.

The Ampctrl is capable of controlling the output current from 5 amps to the preset current on the output control knob. For example, if the preset is at 200 amps, the Ampctrl, when depressed just past its minimum position, will cause the Square Wave TIG 275 to weld at 5 amps. At the Ampctrl's maximum position, the output will be near 200 amps.

It is important to note that, for many applications, the tungsten will not start an arc at only 5 amps. (Refer to the TIG Welding Guidelines for recommended tungsten currents.) To start an arc reliably, it is important to depress the Ampctrl 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 Ampctrl approximately 1/4 of the way down, or to nearly 50 amps, in order to start the arc. Merely depressing the Ampctrl to its 5 amp minimum position will not start the arc.

## ADVANCED TIG WELDING FEATURES

### AC WAVE BALANCE AND AUTO BALANCE™

The AC Wave Balance feature is unique to the Square Wave TIG 275. 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 275 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. Manual Balance settings vary from 0 (maximum cleaning) to 10 (maximum penetration). A setting of 3 yields a balanced output (equal amounts of cleaning and penetration). Use the following as a guide when setting the Balance manually:

**BALANCED (3):** The amounts of positive and negative are the same.

**CLEANING (0 to 2):** Provides more positive current than negative current. Since the positive current produces the "cleaning" or oxide removal on aluminum, this setting is used for welding on heavily oxidized aluminum.

**PENETRATION (4 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 of the puddle.

## SQUARE WAVE TIG 275





## STICK WELDING

1. Turn the welder “on”. The digital ammeter/voltmeter will illuminate when the power is on.
2. Set the Mode Switch to “STICK”. Set the output current using the Output Control Knob. No other functions or adjustments operate in the Stick Mode.
3. Select the desired DC+/AC/DC- electrode polarity.
4. Clamp the electrode in the electrode holder, start the weld by lightly touching the electrode to the work. Stop the weld by pulling the electrode away from the work piece.

## AUXILIARY POWER

### 60 HERTZ DOMESTIC MACHINES

The Square Wave TIG 275 machines rated for 60 Hz operation 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. 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 275 auxiliary for that equipment.

### 50/60 HERTZ EUROPEAN MACHINES

The Square Wave TIG 275 machines rated for 50/60Hz operation provides 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. 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 275 auxiliary for that equipment.

SQUARE WAVE TIG 275



# NOTES

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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

Return to Section TOC  
Return to Master TOC

SQUARE WAVE TIG 275



# TABLE OF CONTENTS - ACCESSORIES -

---

<b>Accessories.....</b>	<b>Section C</b>
Accessories Included with Machine.....	C-2
Optional Accessories .....	C-2

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

SQUARE WAVE TIG 275



# ACCESSORIES

## ACCESSORIES INCLUDED WITH MACHINE

**K852-50** - Twist Mate Cable Plug for #2 to #1 Work Lead.

**K1622-1** - Twist Mate Adapter Kit for LA9 and LA17 Torches.

**K1622-2** - Twist Mate Adapter Kit for LW18 and LW20 Torches.

**K932-1** Undercarriage. When the undercarriage is properly installed, the Square Wave TIG 275 lift bail is nonfunctional. 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 personal injury and/or damage to the Square Wave TIG 275.

**K1622-1** Twist-Mate Adapter Kit for LA9 & LA17 Torches (Included with machine)

**K1622-2** Twist Mate Adapter Kit for LW18 & LW20 Torches (Included with machine)

## OPTIONAL ACCESSORIES

Any necessary installation instructions are included for the following accessories:

**K963-1, -2** - Hand Amptrol

**K870** - Foot Amptrol

**K814** - Arc Start Switch

**K559-2** - Magnum® Cooler Mounting Bracket

**K932-1** - Undercarriage

**K1619-1** - TIG Pulser Kit

**K1620-1** - Power Factor Capacitor Kit

**K1621-1** - Water Solenoid Kit

**K1622-3** - Twist Mate Adapter Kit for LA26 Torch

**K852-70** - Twist Mate Cable Plug for 1/0 to 2/0 Work Lead

**K852-95** - Twist Mate Cable Plug for 2/0 to 3/0 Work Lead

**K852-50** Twist-Mate Cable Plug for #2 to #1 Work Lead (Included with machine)

SQUARE WAVE TIG 275



# TABLE OF CONTENTS - MAINTENANCE SECTION -

---

**Maintenance .....Section D**

- Safety Precautions.....D-2
- Routine and Periodic Maintenance.....D-2
- Overload Protection .....D-2
- Fan As Needed (F.A.N.).....D-2
- Service Procedures.....D-2
- Component Location and Access .....D-3
  - Control PC Board .....D-3
  - Display PC Board, Arc Starter/Bypass PC Board .....D-3
  - Spark Gap Assembly, High Voltage Transformer .....D-3
  - Main Rectifier.....D-3
- Spark Gap Adjustment.....D-3

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



# 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.

### ⚠ WARNING

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

## ROUTINE AND PERIODIC MAINTENANCE

Very little routine maintenance is necessary to keep your Square Wave TIG 275 running in top condition. No specific schedule can be set for performing the following items; factors such as hours of usage and machine environment should be considered when establishing a maintenance schedule.

1. Periodically blow out dust and dirt which may accumulate within the welder using an air stream.
2. Inspect welder output and control cables for fraying, cuts, and bare spots.
3. Inspect the spark gap at regular intervals to maintain the recommended spacing. See the Service Procedures Section for complete information on spark gap settings.
4. The fan motor has sealed ball bearings which require no maintenance.

## 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. 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.

## FAN AS NEEDED (F.A.N.)

The Square Wave TIG 275 has the F.A.N. circuit feature, which means the cooling fan will operate only while welding, then for about 6 minutes after welding has stopped. The cooling fan will operate continuously if the yellow Thermostatic Protection Light is "ON."

## SERVICE PROCEDURES

### ⚠ WARNING

Use extreme caution when working with the secondary circuit of the high frequency transformer. Turn the input power off using the disconnect switch or fuse box before working inside the machine. This is particularly important when working on the secondary circuit of the high voltage transformer (T3) because the output voltage is dangerously high.

#### **DO NOT APPLY POWER TO THE SQUARE WAVE TIG 275 WITH THE SIDES AND ROOF REMOVED.**

The case front and case back assemblies tend to lean in towards the center assembly; there is a danger of a short circuit when this occurs. If you must troubleshoot the machine with power applied, do so with the roof in place, and check for shorts before applying power.

Operation of the Square Wave TIG 275 should be trouble-free for the life of the machine. Should a malfunction occur, however, the following procedures will be useful to trained service personnel with experience in repairing arc welding equipment.

SQUARE WAVE TIG 275



# MAINTENANCE

## COMPONENT LOCATION AND ACCESS

### CONTROL PC BOARD

Remove the left case side. Use a 3/8" Nut Driver or other suitable tool.

**NOTE:** The Case side can be removed while roof is in place, as long as the three screws which secure the roof to the case side are removed. The PC Board is mounted on left divider assembly and can be removed with a phillips head screwdriver.

### DISPLAY PC BOARD, ARC STARTER/BYPASS PC BOARD

Remove the roof and both case sides. Use a 3/8" Nut Driver or other suitable tool. These PC Boards are located on the inside case front of the machine.

### SPARK GAP ASSEMBLY, HIGH VOLTAGE TRANSFORMER

Remove the right case side. Use a 3/8" Nut Driver or other suitable tool. The high voltage transformer is mounted to the base. The spark gap assembly is located on the inside case front.

### MAIN RECTIFIER

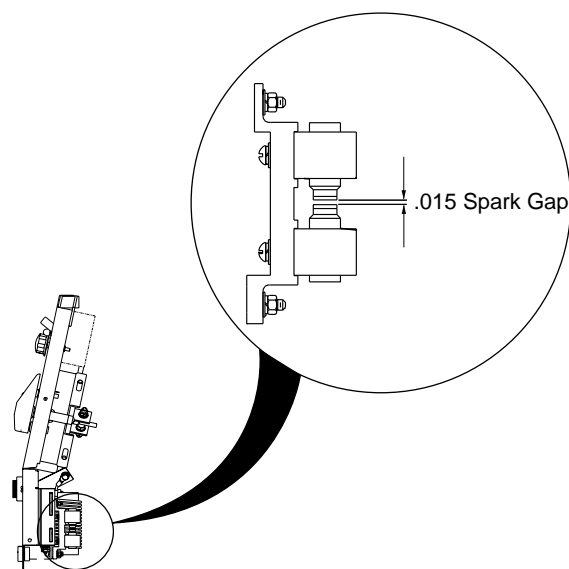
Remove the roof and both case sides. Next, remove the case back assembly. Use a 3/8" Nut Driver or other suitable tool. The main rectifier is mounted to the main transformer, in front of the cooling fan.

## SPARK GAP ADJUSTMENT

The spark gap is set at the factory to a gap of 0.015 inches (0.4 mm). This setting is adequate for most applications. Where less high frequency is desired, the setting can be reduced to 0.008 inches (0.2 mm).

To adjust the spark, first be sure that the input power to the machine is 'OFF' AT THE DISCONNECT SWITCH OR FUSE BOX. The high voltages developed in the high frequency circuit can be lethal. Next, remove the right case side. Use a 3/8" Nut Driver or other suitable tool. Check the spark gap spacing with a feeler gauge. If adjustment is required, pull off one of the two leads going to the aluminum spark gap blocks. Adjust the gap by loosening the Allen head screw, reset the gap and tightening the screw in the new position. Reattach the lead removed earlier, and reinstall the case side.

FIGURE D.1 SPARK GAP



RIGHT SIDE VIEW OF MACHINE

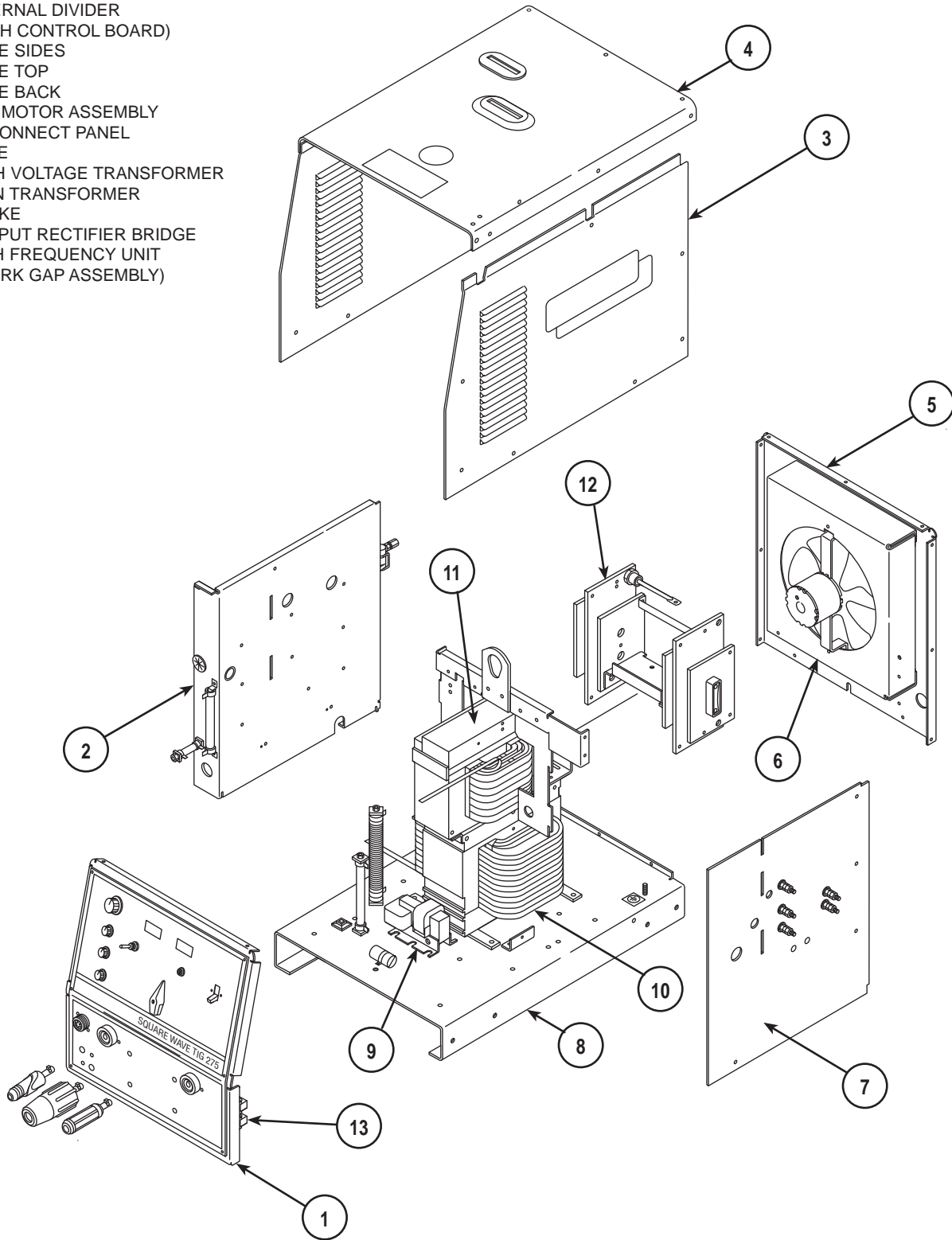
SQUARE WAVE TIG 275



# MAINTENANCE

## FIGURE D.2 - MAJOR COMPONENT LOCATIONS

- 1. CASE FRONT (WITH DISPLAY BOARD)
- 2. INTERNAL DIVIDER (WITH CONTROL BOARD)
- 3. CASE SIDES
- 4. CASE TOP
- 5. CASE BACK
- 6. FAN MOTOR ASSEMBLY
- 7. RECONNECT PANEL
- 8. BASE
- 9. HIGH VOLTAGE TRANSFORMER
- 10. MAIN TRANSFORMER
- 11. CHOKE
- 12. OUTPUT RECTIFIER BRIDGE
- 13. HIGH FREQUENCY UNIT (SPARK GAP ASSEMBLY)



SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC



# TABLE OF CONTENTS - THEORY OF OPERATION SECTION -

**Theory of Operation .....Section E**

General Description .....E-2

Input Power Circuit.....E-2

Output Rectification, Control Board and Feedback .....E-3

High Voltage/High Frequency Circuit.....E-4

DC Welding Output .....E-5

AC Welding Output .....E-6

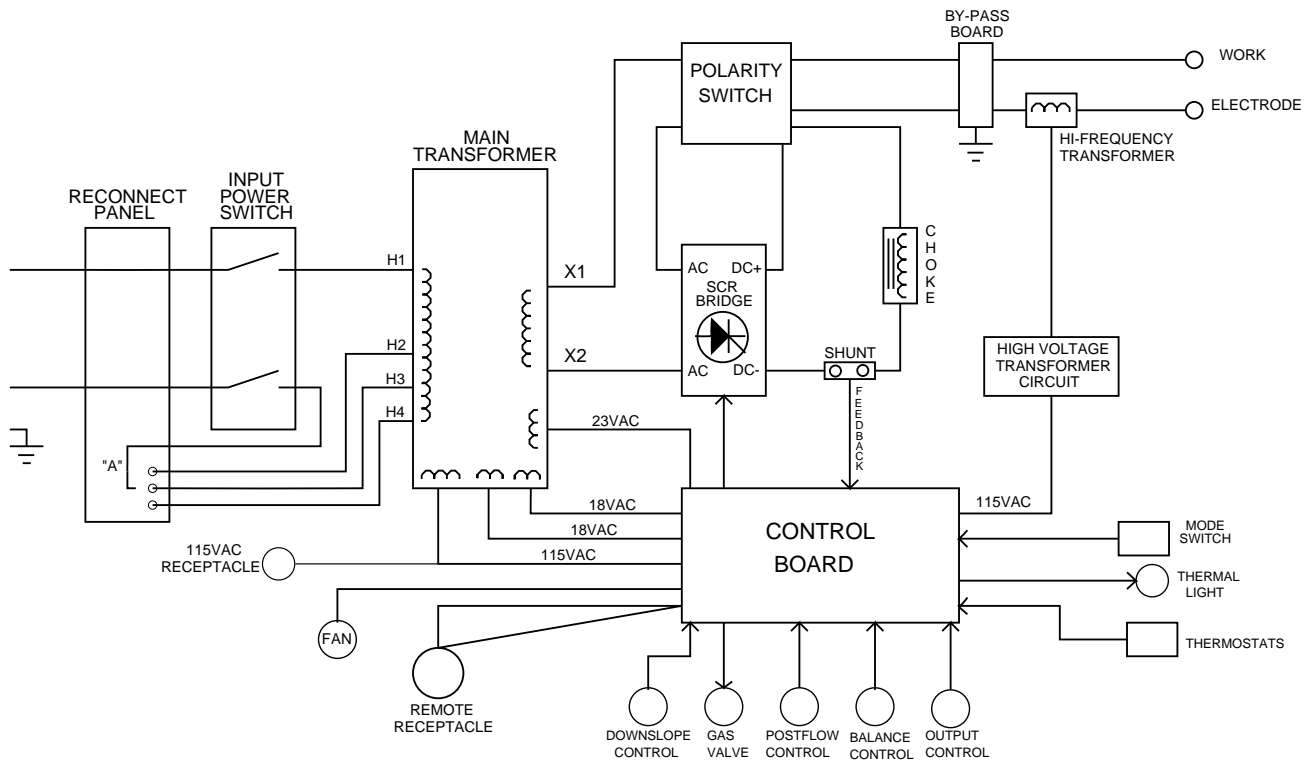
SCR Operation.....E-7

Protective Circuits .....E-8

    Thermal Protection .....E-8

    Overload Protection .....E-8

**FIGURE E.1 - SQUARE WAVE TIG 275 BLOCK LOGIC DIAGRAM**



**SQUARE WAVE TIG 275**



Return to Master TOC

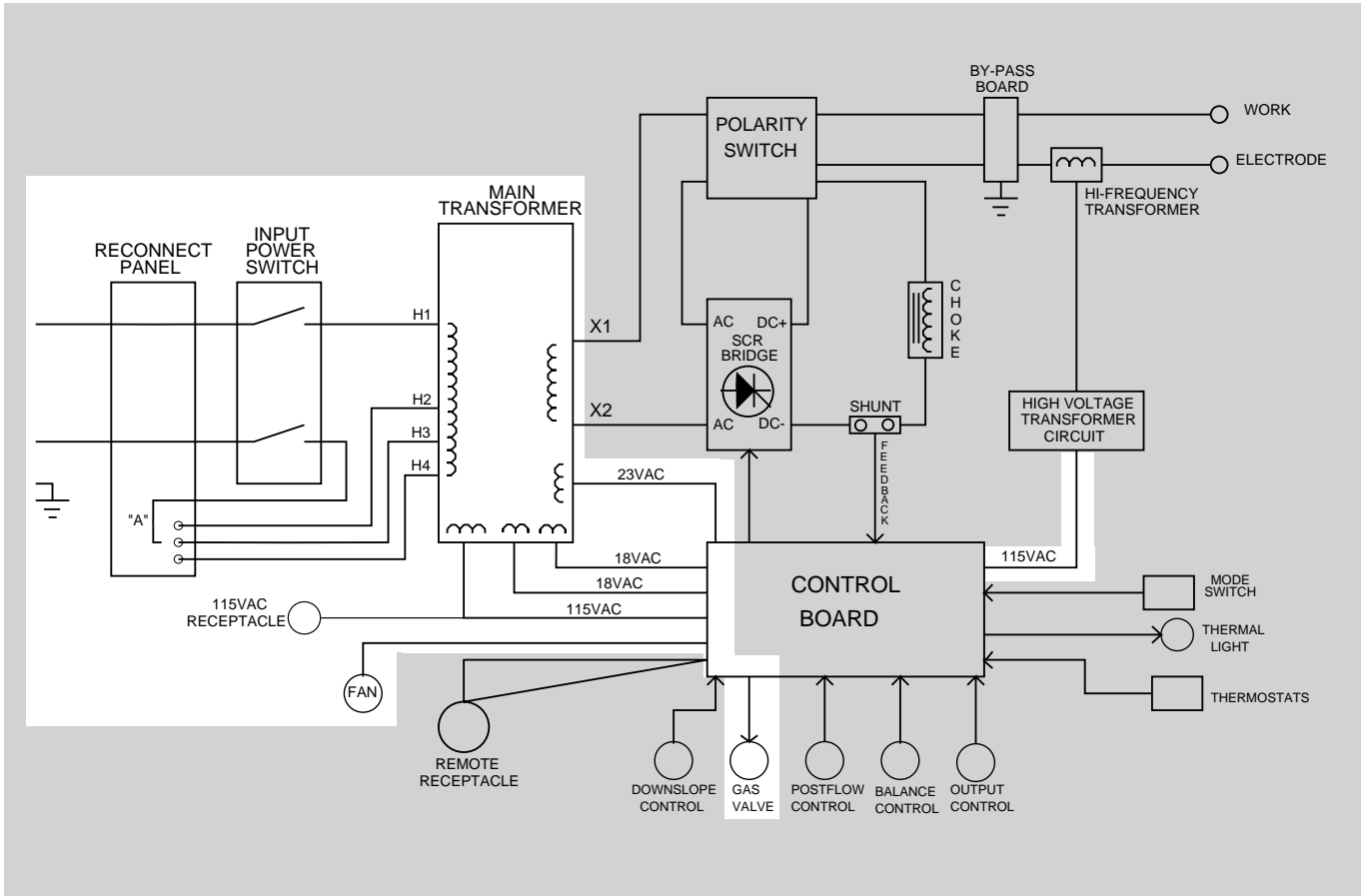
Return to Master TOC

Return to Master TOC

Return to Master TOC

# THEORY OF OPERATION

## FIGURE E.2 – MAIN TRANSFORMER AND INPUT POWER



### GENERAL DESCRIPTION

The Square Wave TIG 275 machine 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 welding (SMAW) capability. The machine includes advanced features such as Digital Voltage and Current Meters, Auto Balance, 2-Step/4-Step operation, adjustable Downslope Time Control and Fan as Needed. The Square Wave TIG 275 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 polarities.

### INPUT POWER CIRCUIT

The desired single-phase input power is connected to the TIG 275 through the reconnect panel to the input power switch located in the front panel of the machine. The machine can be configured for any one of three input voltages (208 VAC, 230 VAC or 460 VAC) by connecting the "A" lead to the appropriate terminal on

the reconnect panel. When the input power switch is turned "on," the input voltage is applied directly to the primary winding of the main transformer.

The main transformer changes the high voltage, low current input power to a low voltage, high current output available at the main secondary winding (X1 and X2). This 78 VAC winding supplies power to the welding arc. In addition, four auxiliary windings are incorporated in the main transformer. The 115 VAC winding supplies power to the 115 VAC receptacle. Through the control board, it also powers the gas solenoid, the high voltage transformer, and the cooling fan. The cooling fan is activated only when welding current is sensed. The 23 VAC winding provides power for the DC background current. This circuit is active in the DC welding mode. Two 18 VAC windings are included in the main transformer assembly. One 18 VAC winding is rectified on the control board and is used in the trigger circuitry. The other 18 VAC winding is used by the control board for phase detection. This voltage is also rectified and regulated to +15 VDC and +5 VDC power supplies that operate the circuitry on the control board.

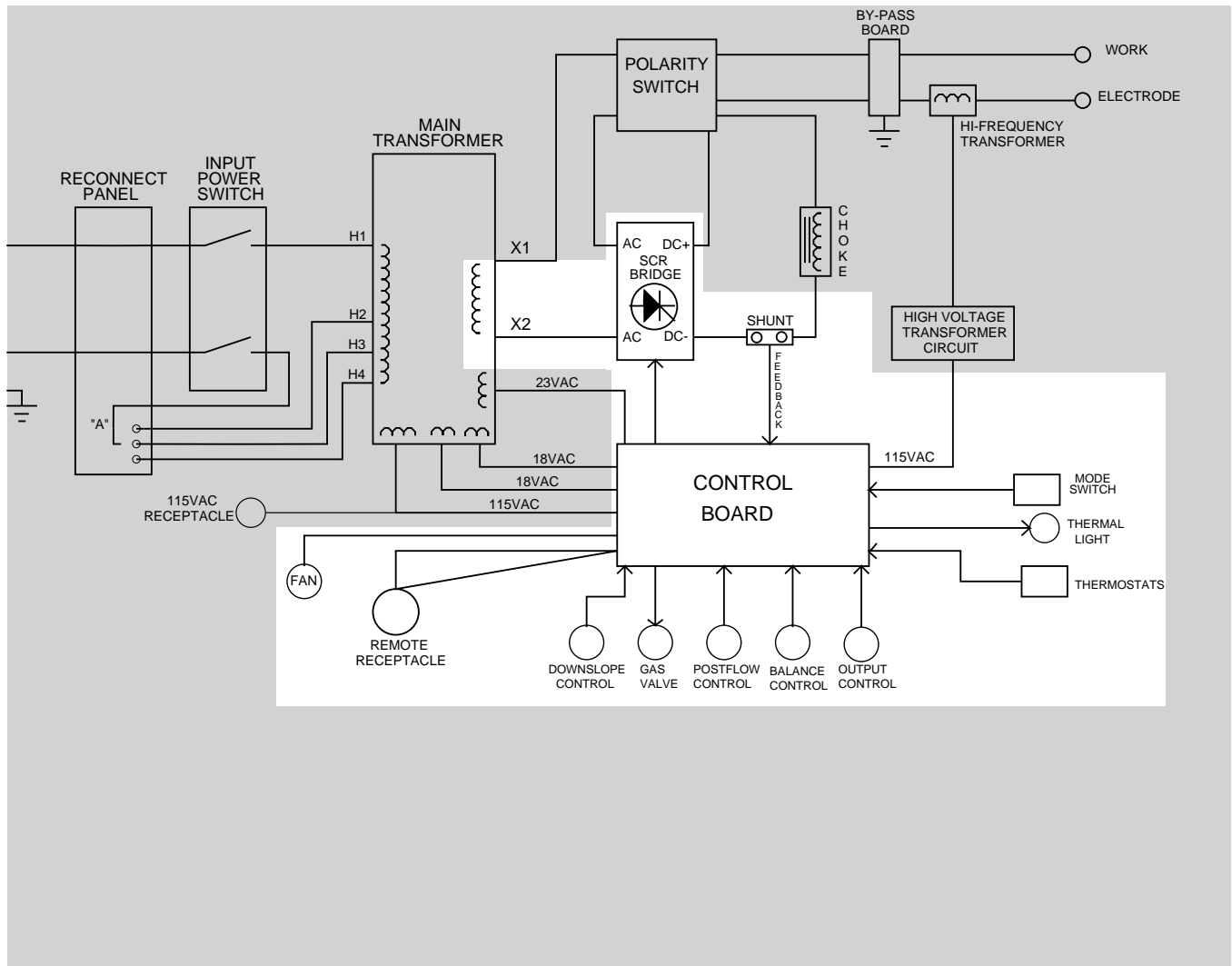
**NOTE:** Unshaded areas of Block Logic Diagram are the subject of discussion.

### SQUARE WAVE TIG 275



Return to Section TOC | Return to Master TOC

FIGURE E.3 – OUTPUT RECTIFICATION, CONTROL BOARD AND FEEDBACK



## OUTPUT RECTIFICATION, CONTROL BOARD AND FEEDBACK

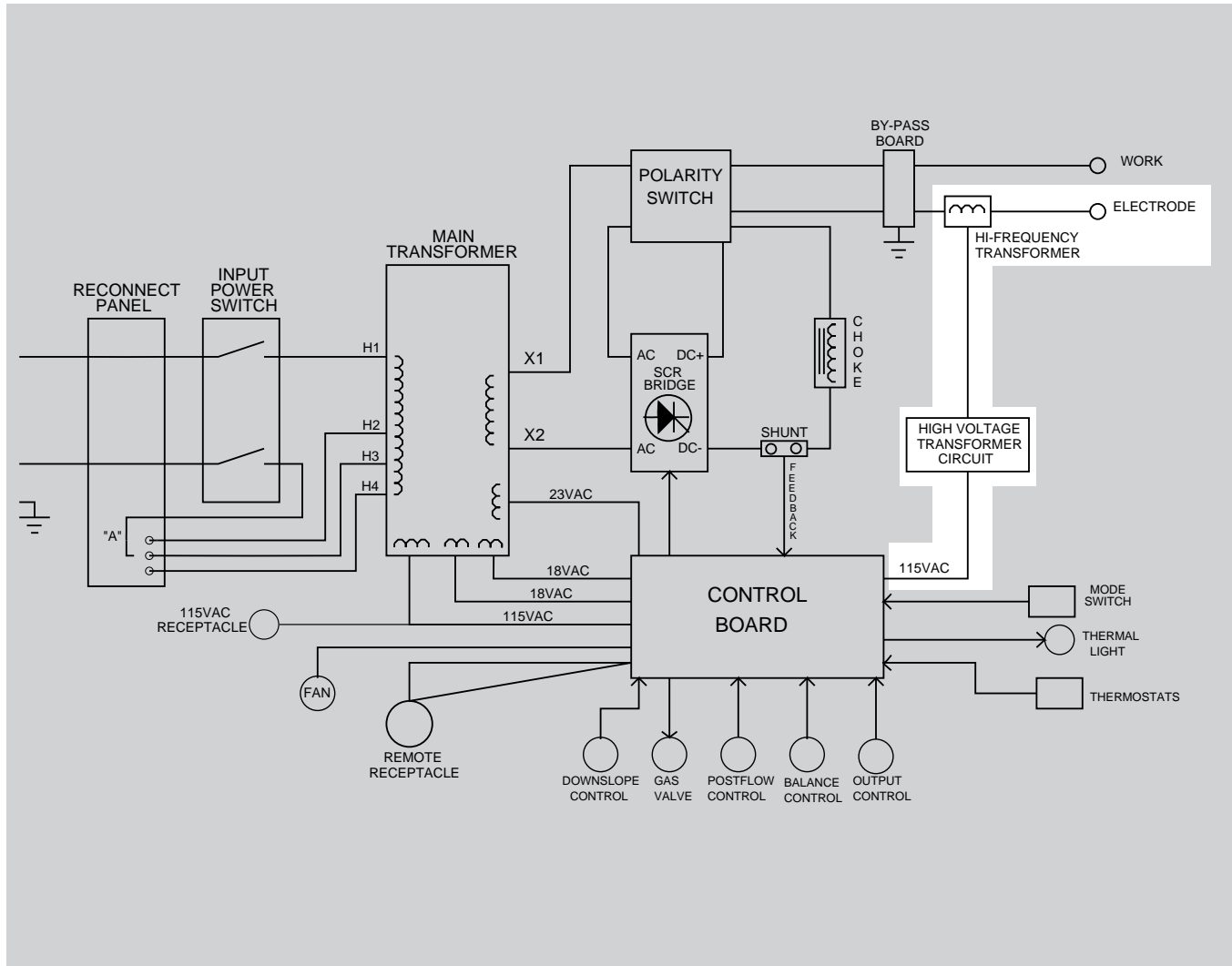
The AC output from the main transformer secondary is rectified and controlled through the SCR bridge. Output current is sensed at the shunt as a low voltage signal and fed back to the control board. The control board senses the status and settings of the various operator controls such as the mode switch, the output control, the remote control receptacle, the downslope control, the balance control and the postflow control. Circuitry on the control board evaluates these commands, compares them to the feedback information received from the shunt and sends the appropriate gate firing signals to the output SCR bridge. The control board regulates the firings of the output SCRs, which control the output of the machine. See **SCR Operation**. The control board also monitors the thermostats and controls the gas solenoid, the thermal light and the cooling fan.

SQUARE WAVE TIG 275



# THEORY OF OPERATION

## FIGURE E.4 – HIGH VOLTAGE / HIGH FREQUENCY CIRCUIT



## HIGH VOLTAGE / HIGH FREQUENCY CIRCUIT

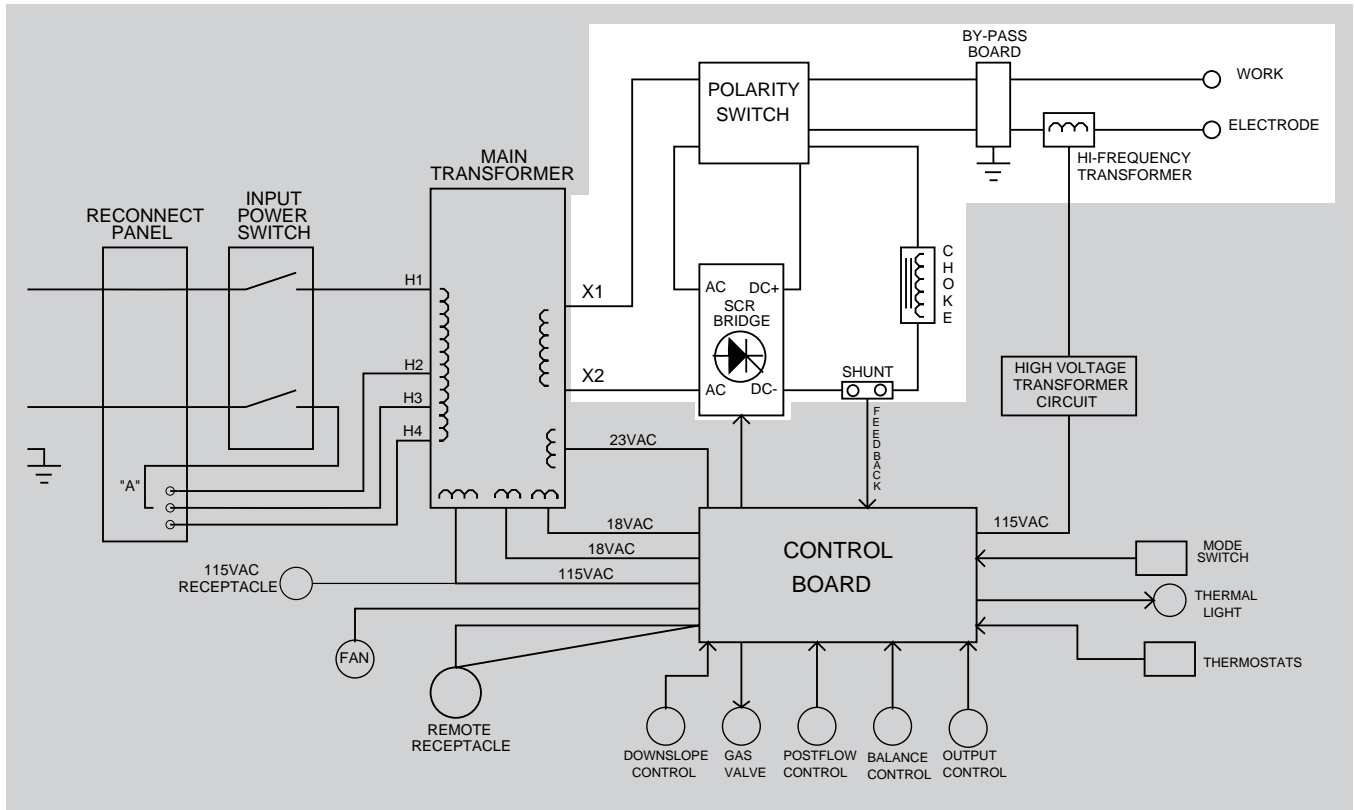
The control board passes the 115 VAC voltage to the primary of the high voltage transformer. The secondary of the high voltage transformer is coupled to a spark gap generator and also to the high frequency transformer. The high frequency transformer transfers the high frequency “spark” to the electrode terminal, which is coupled to the TIG torch.

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

SQUARE WAVE TIG 275



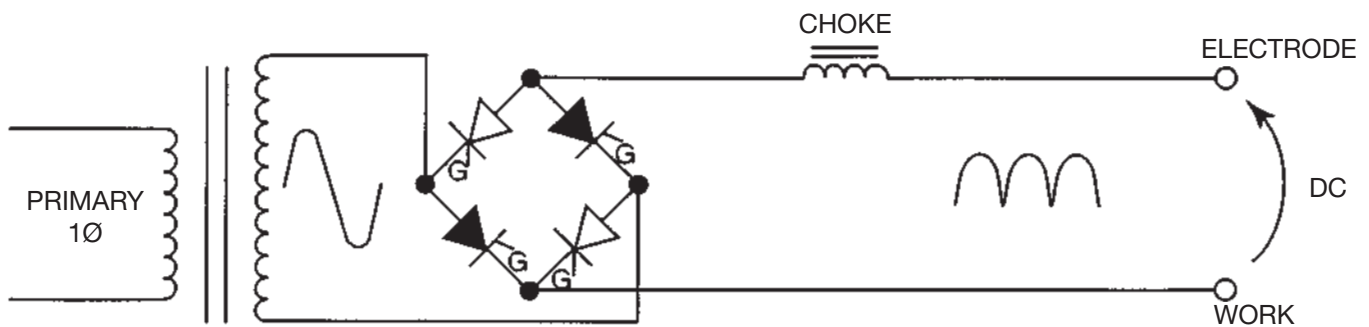
### FIGURE E.5 – DC WELDING OUTPUT



## 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 output terminals. The bypass board protects the internal circuitry from interference.

### FIGURE E.6 – DC WELDING CURRENT GENERATION



SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

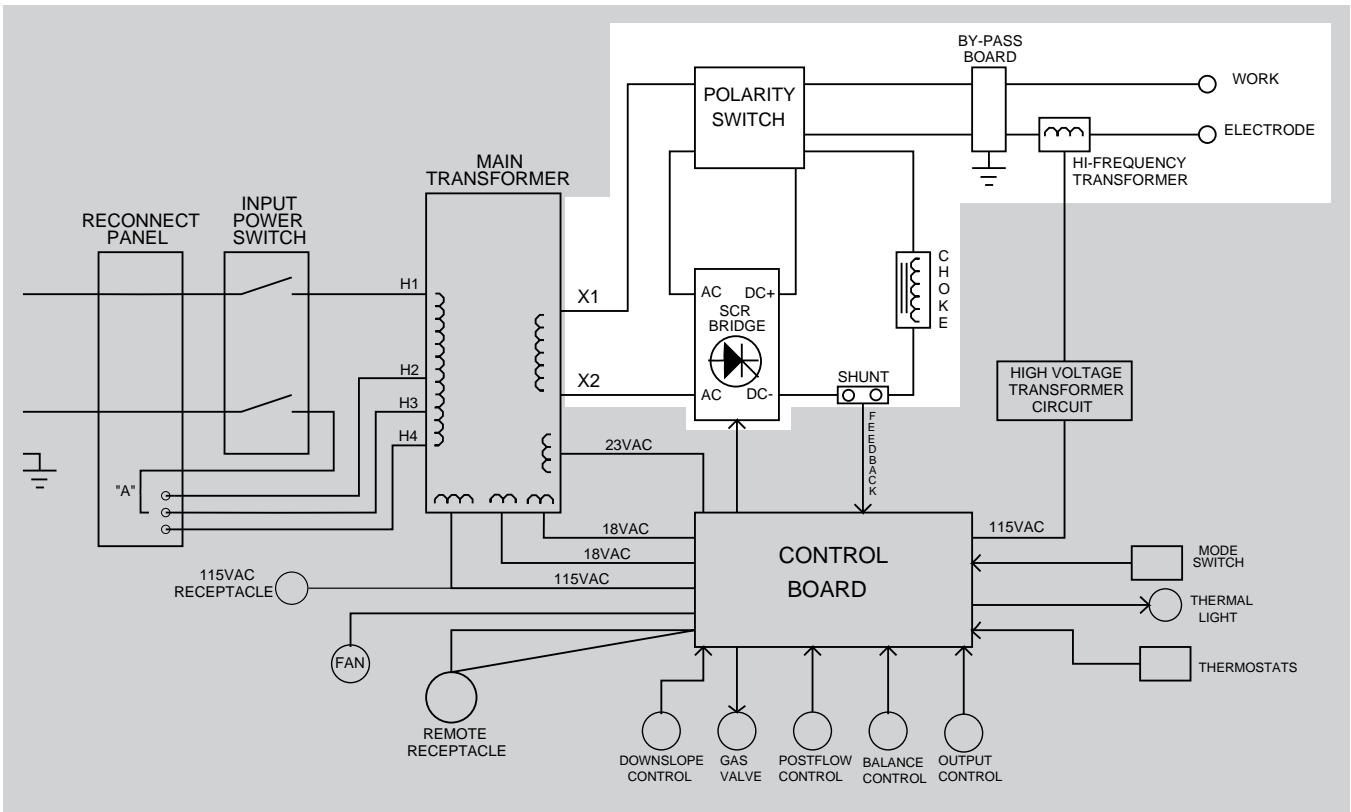
Return to Master TOC

Return to Master TOC

Return to Master TOC

# THEORY OF OPERATION

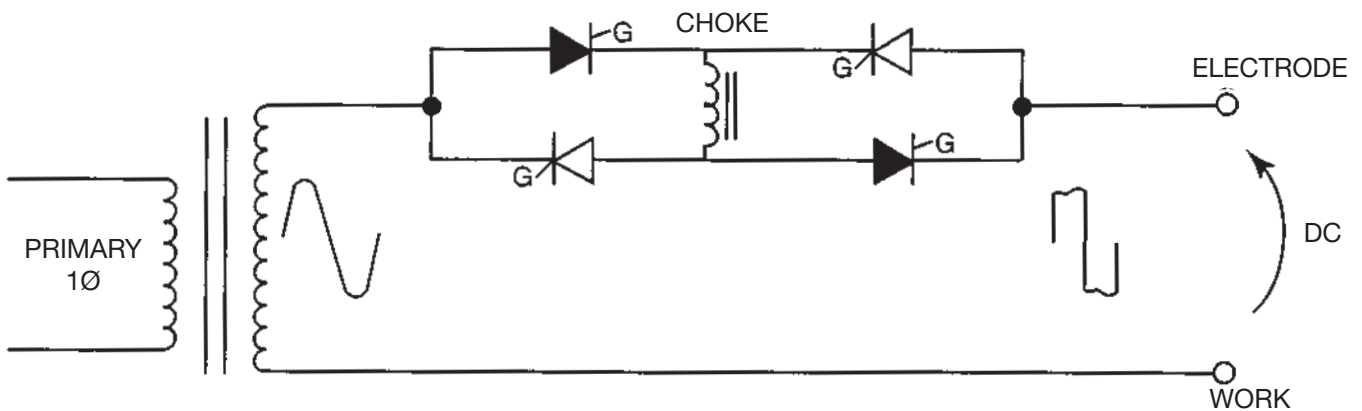
FIGURE E.7 – AC WELDING OUTPUT



## AC WELDING OUTPUT

Rotating the polarity switch to the AC position changes the welding power circuit. One lead (X1) of the main transformer secondary is connected to the machine's output work terminal. The other secondary lead (X2) is connected to one of the AC connections of the SCR bridge. The electrode terminal is connected to the other AC side of the bridge. The choke is now electrically across the negative and positive SCR bridge connections. With the ability of the choke to store energy and the SCRs to turn on at the appropriate times, an AC square wave is developed and applied to the output terminals.

FIGURE E.8 – AC SQUARE WAVE WELDING CURRENT GENERATION



SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

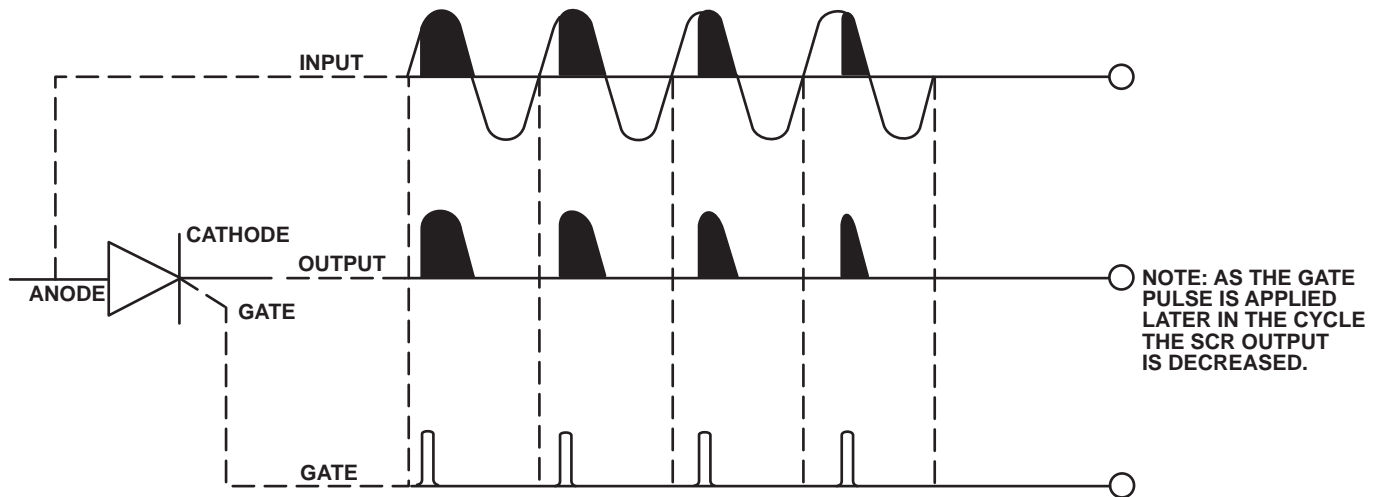
Return to Master TOC

Return to Master TOC

Return to Master TOC

# THEORY OF OPERATION

FIGURE E.9 – SCR OPERATION



## 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.

## PROTECTIVE CIRCUITS

Protective circuits are designed into the Square Wave TIG 275 to sense trouble and shut down the machine before the trouble damages the internal machine components. Both thermal protection and current overload are included.

## THERMAL PROTECTION

Thermostats protect the machine from excessive operating temperatures. Excessive operating temperatures may be caused by a lack of cooling air or by operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, causing a thermostat to open, the Thermal Light will illuminate, the fan will continue to run and welding output will be disabled. Once the machine cools sufficiently, the thermostats are self-resetting. If the shutdown is caused by excessive output or duty cycle and the fan is operating normally, the power may be left on and the reset should occur within a 15 minute period. If the fan is not functioning properly or the air intake louvers are obstructed, the input power must be removed and the fan problem or air obstruction corrected.

## OVERLOAD PROTECTION

The machine is electronically protected from producing excessively high output currents. The output is limited to 350 amps.



## TABLE OF CONTENTS - TROUBLESHOOTING & REPAIR SECTION -

---

<b>Troubleshooting &amp; Repair Section</b> .....	<b>Section F</b>
How to Use Troubleshooting Guide .....	F-2
PC Board Troubleshooting Procedures.....	F-3
Troubleshooting Guide .....	F-4
Test Procedures	
High Frequency Circuit Disable Procedure .....	F-18
T1 Main Transformer Test.....	F-20
Gas (Water) Solenoid Test.....	F-24
Static SCR Test.....	F-26
Active SCR Test.....	F-29
Oscilloscope Waveforms	
Normal Open Circuit Voltage Waveform—AC TIG Mode .....	F-33
Normal Open Circuit Voltage Waveform—DC TIG Mode.....	F-34
Normal Open Circuit Voltage Waveform—AC Stick Mode .....	F-35
Normal Open Circuit Voltage Waveform—DC Stick Mode .....	F-36
Typical Output Voltage Waveform—Machine Loaded—AC TIG Mode .....	F-37
Typical Output Voltage Waveform—Machine Loaded—DC TIG Mode .....	F-38
Typical Output Voltage Waveform—Machine Loaded—AC Stick Mode.....	F-39
Typical Output Voltage Waveform—Machine Loaded—DC Stick Mode .....	F-40
Abnormal Open Circuit Voltage—DC TIG Mode—One Output SCR Not Functioning .....	F-41
Replacement Procedures	
High Voltage Transformer Removal and Replacement .....	F-42
SCR Bridge Assembly Removal and Replacement.....	F-45
Polarity Switch Removal and Replacement.....	F-49
Main Transformer and Output Choke Assembly Removal and Replacement.....	F-54
Retest After Repair .....	F-59

# TROUBLESHOOTING & REPAIR

## HOW TO USE TROUBLESHOOTING GUIDE

### ⚠ WARNING

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

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

**Step 1. LOCATE PROBLEM (SYMPTOM).** Look under the column labeled "PROBLEM" (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into the following categories: Output Problems, TIG Welding Problems, Stick Welding Problems, and Function Problems.

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

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

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this section. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to 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 test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

### ⚠ WARNING

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and wave form checks with high frequency circuit OFF. Perform **High Frequency Disable Procedure**.

SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## PC BOARD TROUBLESHOOTING PROCEDURES

### ⚠ WARNING



#### ELECTRIC SHOCK can kill.

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

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

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

#### PC Board can be damaged by static electricity.



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

Reusable  
Container  
Do Not Destroy

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC Board must be either conductive, anti-static or static-dissipative.

- Remove the PC Board from the static-shielding bag and place it directly into the equipment. Don't set the PC Board on or near paper, plastic or cloth which could have a static charge. If the PC Board can't be installed immediately, put it back in the static-shielding bag.
  - If the PC Board uses protective shorting jumpers, don't remove them until installation is complete.
  - If you return a PC Board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.
4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

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

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

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

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

SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The machine is dead. No weld output - no 115 VAC at the receptacle. (220 VAC receptacle on European models only).</p>	<ol style="list-style-type: none"> <li>1. Check the input voltage. The input voltage must match the rating plate and the voltage connection. Refer to <b>Reconnect Procedure</b> in the Installation section of this manual.</li> <li>2. Make sure the input power switch is in the "ON" position.</li> <li>3. Check for blown or missing fuses in the input lines.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the input power switch, reconnect panel and associated wires for loose or faulty connections.</li> <li>2. The input power switch may be faulty.</li> <li>3. Perform the <b>T1 Transformer Test</b>.</li> </ol>

### CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

SQUARE WAVE TIG 275



Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>No welding output. The 115 VAC is present at the receptacle. (220 VAC receptacle on European models only).</p>	<ol style="list-style-type: none"> <li>1. Make sure the polarity switch is in the proper position and functioning correctly.</li> <li>2. One of the thermostats may be tripped. Allow the machine to cool. The thermal light will be on.</li> <li>3. Make sure the welding cables, torch and connections are in good operating condition.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for loose or faulty connections on the heavy current carrying leads. (Polarity switch, output choke, output terminals, etc.)</li> <li>2. Check for faulty connections or a defective thermostat. Check leads #313, #314, #315 and #316. See the Wiring Diagram. The thermal light will be on.</li> <li>3. Perform the <b>T1 Transformer Test</b>.</li> <li>4. Perform the <b>SCR Bridge Test</b>.</li> <li>5. Check the current control R1 for proper operation. Normal resistance is 10,000 ohms. Also check associated leads for loose or faulty connections.</li> <li>6. The control board may be faulty.</li> </ol>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

# TROUBLESHOOTING & REPAIR

Observe Safety Guidelines detailed in the beginning of this manual.

## TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>No output from the machine in either Stick or TIG modes. The thermal light is on.</p>	<ol style="list-style-type: none"> <li>1. The welding application may have exceeded the recommended duty cycle. Allow the fan to cool the unit until the thermal light is off.</li> <li>2. The air louvers may be blocked. Remove the air obstruction and allow the unit to cool.</li> </ol>	<ol style="list-style-type: none"> <li>1. One of the thermostats may be faulty. Check or replace. See the Wiring Diagram.</li> <li>2. Check for loose or faulty wires on the thermostats and associated circuitry. See the Wiring Diagram.</li> <li>3. The fan motor may be faulty or mechanically obstructed. The fan should run when welding or when a thermostat is open.</li> <li>4. The control board may be faulty.</li> </ol>
<p>The machine does not respond (no gas flow, no high frequency and no open circuit voltage) when the arc start switch or Amptrol is activated. The thermal light is not lit.</p>	<ol style="list-style-type: none"> <li>1. Make certain the machine is in the TIG mode.</li> <li>2. The Amptrol or arc start switch may be defective. Check for continuity (zero ohms) between pins "D" and "E" on the cable connector when the Amptrol or arc start switch is pressed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the continuity (zero ohms) of the leads between the remote receptacle and plug J7 on the control board. See the Wiring Diagram.</li> <li>2. Perform the <b>T1 Transformer Test</b>.</li> <li>3. The control board may be faulty.</li> </ol>

### ⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

-----  
**SQUARE WAVE TIG 275**



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

# TROUBLESHOOTING & REPAIR

## 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		
The machine does not have welding output in the Stick mode. The machine operates correctly in the TIG mode.	<ol style="list-style-type: none"> <li>1. Check the electrode cable and holder for loose or faulty connections.</li> <li>2. Make sure the Stick/TIG switch (S3) is in the proper position and operating correctly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the Stick/TIG switch (S3) and associated leads. See the Wiring Diagram.</li> <li>2. The control board may be faulty.</li> </ol>
The machine welds at a very low output regardless of the current control setting.	<ol style="list-style-type: none"> <li>1. If welding in the TIG mode, the remote control device may be defective.</li> <li>2. Make certain the input line voltage is correct for the machine's reconnect configuration.</li> <li>3. Check the welding cables and/or torch for loose or faulty connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the polarity switch and associated leads.</li> <li>2. Check the interior connections of the heavy current carrying leads.</li> <li>3. Perform the <b>SCR Bridge Test</b>.</li> <li>4. Perform the <b>T1 Transformer Test</b>.</li> <li>5. Check the current control for proper operation. Normal resistance is 10,000 ohms. See the Wiring Diagram.</li> <li>6. The control board may be faulty.</li> </ol>

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

-----  
**SQUARE WAVE TIG 275**



Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The machine welds at a very high output regardless of the current control setting.</p>	<ol style="list-style-type: none"> <li>1. If welding in the TIG mode, the remote control device may be defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <i>SCR Bridge Test</i>.</li> <li>2. Perform the <i>T1 Transformer Test</i>.</li> <li>3. Check the current control for proper operation. Normal resistance is 10,000 ohms. See the Wiring Diagram.</li> <li>4. Check leads #221 and #222 between the output shunt and the control board. See the Wiring Diagram.</li> <li>5. The control board may be faulty.</li> </ol>
<p>Accessories plugged into the 115 volt receptacle do not work. (220 VAC receptacle on European models only).</p>	<ol style="list-style-type: none"> <li>1. Make sure the accessory, plug and associated leads are in good working condition.</li> <li>2. Make certain the correct input voltage is being applied to the machine. (The reconnect lead must be in the correct position.)</li> <li>3. The circuit breaker may be tripped. Reset if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. The circuit breaker (CB) may be faulty.</li> <li>2. Check the receptacle and associated leads for loose or faulty connections.</li> <li>3. Perform the <i>T1 Transformer Test</i>.</li> </ol>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

SQUARE WAVE TIG 275



Return to Section TOC
Return to Master TOC



# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>The machine makes a very loud buzzing noise in DC Stick or in DC TIG modes. There is no current draw from the machine's output terminals. (The machine is not externally loaded).</p>	<ol style="list-style-type: none"> <li>1. Inspect the output terminal insulators for cracks or signs of overheating.</li> </ol>	<ol style="list-style-type: none"> <li>1. Diode D1 may be shorted. Check and replace if necessary.</li> <li>2. Check the polarity switch (S2) for proper function and correct connections.</li> <li>3. Perform the <b>SCR Bridge Test</b>.</li> </ol>

**⚠ CAUTION**

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SQUARE WAVE TIG 275



Return to Section TOC
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>TIG WELDING PROBLEMS</b>		
<p>The machine output is intermittently lost. Gas flow and high frequency are also interrupted.</p>	<ol style="list-style-type: none"> <li>1. The 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.</li> <li>2. Make sure the Amptrol is operating properly.</li> <li>3. Check to make sure that the input voltage is correct for the machine to reconnect configuration. Refer to <b>Reconnect Procedure</b> in the Installation section of this manual.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for loose or faulty connections on the leads between the remote receptacle and plug J7 on the control board. See the Wiring Diagram.</li> <li>2. Check the plugs on the control board for loose connections.</li> <li>3. The control board may be faulty.</li> </ol>
<p>No gas or water flow (with optional water solenoid) when the arc start switch or Amptrol is activated in the TIG mode. All other machine functions are normal.</p>	<ol style="list-style-type: none"> <li>1. The gas (or water) supply is either empty or not turned on.</li> <li>2. The flow regulator may be set too low.</li> <li>3. Check the supply hoses for kinks or blockages.</li> <li>4. The filters may be blocked.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <b>Gas Solenoid Test</b>.</li> <li>2. The control board may be faulty.</li> </ol>

### ⚠ CAUTION

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-----

### SQUARE WAVE TIG 275




Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>TIG WELDING PROBLEMS</b>		
<p>No high frequency. The machine is in the TIG mode and has normal output.</p>	<ol style="list-style-type: none"> <li>1. If the machine is in a highly dirty environment with conductive contaminants, check and clean the spark gap with a low pressure air stream per the maintenance instructions.</li> <li>2. Check the spark gap operation and setting. Normal is (0.015"). Refer to the <i>Maintenance Section</i> of this manual.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the high voltage transformer (T2). The normal resistance of the secondary winding is 12.5k ohms.</li> </ol> <div style="background-color: black; color: white; padding: 5px; text-align: center;"> <p><b>⚠ WARNING</b></p> </div> <div style="display: flex; align-items: center;">  <p><b>ELECTRIC SHOCK CAN KILL.</b> When 115 VAC is applied to the primary of T2, a very high voltage is developed on the secondary winding. For assistance, call the Lincoln Electric Service Department. (216-383-2531 or 1-888-935-3877).</p> </div> <hr style="border-top: 1px dashed black;"/> <ol style="list-style-type: none"> <li>2. Check R5, C6, C5, L3 and L4. Replace if defective.</li> <li>3. The control board may be faulty.</li> </ol>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

SQUARE WAVE TIG 275



Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>TIG WELDING PROBLEMS</b>		
<p>The high frequency “spark” is present but weak.</p>	<ol style="list-style-type: none"> <li>1. The spark gap may be too large. Check and reset per instructions in the <i>Maintenance Section</i> of this manual.</li> <li>2. The work and/or torch cables may be in poor condition allowing the high frequency to “lead” to ground. Use good quality cables, preferably those with a high natural rubber content and as short as possible.</li> <li>3. If helium shielding gas is being used, reduce the percentage of helium.</li> <li>4. Make sure the tungsten electrode is the correct size for the process.</li> </ol>	<ol style="list-style-type: none"> <li>1. The high voltage transformer (T2) may be faulty.</li> <li>2. Capacitor C5 may be faulty.</li> <li>3. The high frequency transformer (T3) may be faulty.</li> </ol>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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**SQUARE WAVE TIG 275**



Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>TIG WELDING PROBLEMS</b>		
<p>The high frequency “spark” is present at the tungsten electrode, but the operator is unable to establish a welding arc. The machine has normal open circuit voltage. Refer to <b>Technical Specifications</b> in the Installation section.</p>	<ol style="list-style-type: none"> <li>1. The torch may be faulty. Check or replace.</li> <li>2. The current control may be set too low.</li> <li>3. The tungsten electrode may be contaminated. Replace or sharpen.</li> <li>4. The electrode may be too large for the process.</li> <li>5. If a helium blend is being used as a shielding gas, reduce the percentage of helium.</li> <li>6. Check the welding cables for loose or faulty connections.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check spark gap adjustment. See the <b>Maintenance</b> section.</li> <li>2. This may be a welding procedure problem.  Contact the Lincoln Service Department (216) 383-2531 or 1-888-935-3877.</li> </ol>
<p>When AC TIG welding, the arc is erratic and there is a loss of “cleaning” of the work piece.</p>	<ol style="list-style-type: none"> <li>1. The tungsten electrode may be small for the process. Use a larger diameter tungsten or a pure tungsten.</li> <li>2. If a helium blend is used as a shielding gas, reduce the percentage of helium.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check components R5 and C6 in the high voltage transformer primary circuit.</li> <li>2. Perform the <b>SCR Bridge Test</b>.</li> </ol>

### ⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

-----  
**SQUARE WAVE TIG 275**



Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## 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		
The stick electrode “blasts-off” when touched to the work piece.	<ol style="list-style-type: none"> <li>1. The welding current may be too high for the electrode size. Reduce current control setting or use a larger diameter electrode.</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform the <i><b>SCR Bridge Test.</b></i></li> <li>2. The control board may be faulty.</li> </ol>
Variable or sluggish welding arc when welding in the Stick mode.	<ol style="list-style-type: none"> <li>1. Check the work and electrode cables for loose or poor connections.</li> <li>2. The welding cables may be too small or too long to permit the desired current to flow.</li> <li>3. The welding current may be set too low.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the polarity switch for excessive wear or faulty connections.</li> <li>2. Check the interior heavy current carrying leads and connections.</li> </ol>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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### SQUARE WAVE TIG 275



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

Return to Master TOC  
Return to Master TOC  
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# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines  
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>FUNCTION PROBLEMS</b>		
<p>The control panel displays do not function correctly.</p>	<p>1. The displays will read "000" until the torch trigger is activated and/or the welding arc is established. The voltmeter will normally display open circuit voltage in the Stick mode before the arc is established.</p>	<p>1. Check the connections and associated leads between the display board and the control board. (Plugs P4, P20 and P21). See the Wiring Diagram.</p> <p>2. The display board may be faulty.</p> <p>3. The control board may be faulty.</p>
<p>The voltmeter always reads "000" but the welding output is normal.</p>	<p>1. None</p>	<p>1. Check the continuity (zero ohms) of leads #252 and #253 between the polarity switch and plug J6 on the control board. See the Wiring Diagram.</p> <p>2. Check for open circuit voltage at leads #252 to #253 at plug J6 on the control board. If open circuit voltage is present, also check for same voltage at plug J4 pin-8 to pin-5. If the same voltage is NOT present at plug J4, the control board may be faulty.</p> <p>3. If the correct voltages are present in Step #2, check the leads, plugs and connections between the control board and the display board.</p> <p>4. The display board may be faulty.</p>

⚠ **CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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**SQUARE WAVE TIG 275**



Return to Section TOC  
Return to Master TOC

# TROUBLESHOOTING & REPAIR

## TROUBLESHOOTING GUIDE

Observe Safety Guidelines  
detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>FUNCTION PROBLEMS</b>		
The ammeter display reads "000." The machine has output but no control.	1. None	1. Check leads #221 and #222 between the output shunt and plug J2 on the control board. See the Wiring Diagram.  2. The control board may be faulty.
One of the display meters is blank.	1. None	1. Check the leads and connections between the display board and the control board. See the Wiring Diagram.  2. The display board may be faulty.

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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**SQUARE WAVE TIG 275**



Return to Section TOC

Return to Master TOC



# INSTALLATION

## TROUBLESHOOTING & REPAIR

### TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
<b>FUNCTION PROBLEMS</b>		
<p>The AC wave balance control does not function properly.</p>	<p>1. The AC wave balance control is operational only in the TIG mode.</p>	<p>1. Check the AC balance control (R2) and associated leads for loose or faulty connections. See the Wiring Diagram.</p> <p>2. The control board may be faulty.</p>

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

## HIGH FREQUENCY CIRCUIT DISABLE PROCEDURE

### WARNING

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

### TEST DESCRIPTION

This procedure will disable the high frequency circuit. The technician will then be able to take voltage measurements without the possibility of high frequency damage to his test equipment.

### MATERIALS NEEDED

3/8" Nut driver  
Electrical insulating tape

This procedure takes approximately 8 minutes to perform.

### WARNING

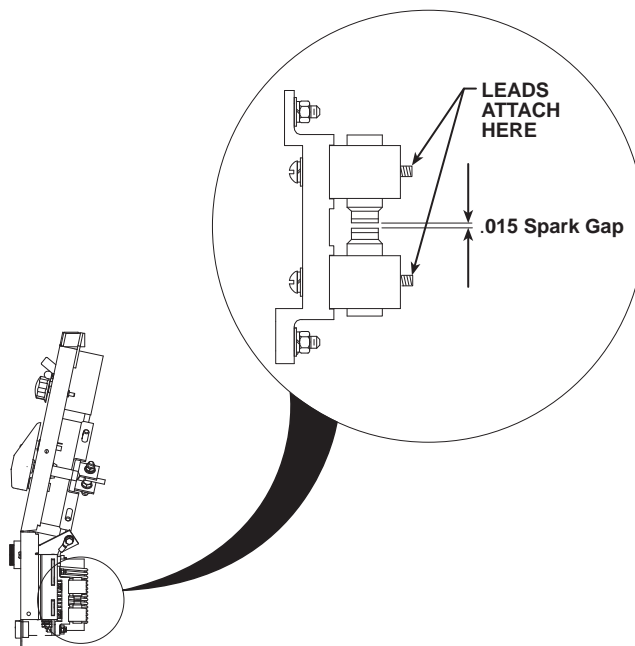
HIGH VOLTAGE IS STILL PRESENT IN THE HIGH FREQUENCY CIRCUIT.

SQUARE WAVE TIG 275



HIGH FREQUENCY CIRCUIT DISABLE PROCEDURE (*continued*)

FIGURE F.1 – SPARK GAP ASSEMBLY



RIGHT SIDE VIEW OF MACHINE

## PROCEDURE

1. Remove the input power to the TIG 275 machine.
2. Using the 3/8" nut driver, remove the right side case cover.
3. Locate the Spark Gap Assembly at the lower right side of the machine. See Figure F.1.
4. Carefully remove the two leads and washers from the Spark Gap Assembly.
5. Insulate the leads from each other and from the case.

 **WARNING**


When power is applied to the machine there is a very high voltage present at these leads.

- 
6. When voltage testing and scope measurements are complete, attach the two leads and washers to the Spark Gap Assembly. **NOTE:** Make sure insulation is still in place.
  7. Reassemble the right side case cover.

SQUARE WAVE TIG 275



## T1 MAIN TRANSFORMER TEST

### WARNING

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

### TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of the T1 transformer and also if the correct voltages are being induced on the secondary windings of the transformer.

### MATERIALS NEEDED

Volt/Ohmmeter (Multimeter)  
TIG 275 Wiring Diagrams  
3/8" Nut driver

This procedure takes approximately 15 minutes to perform.

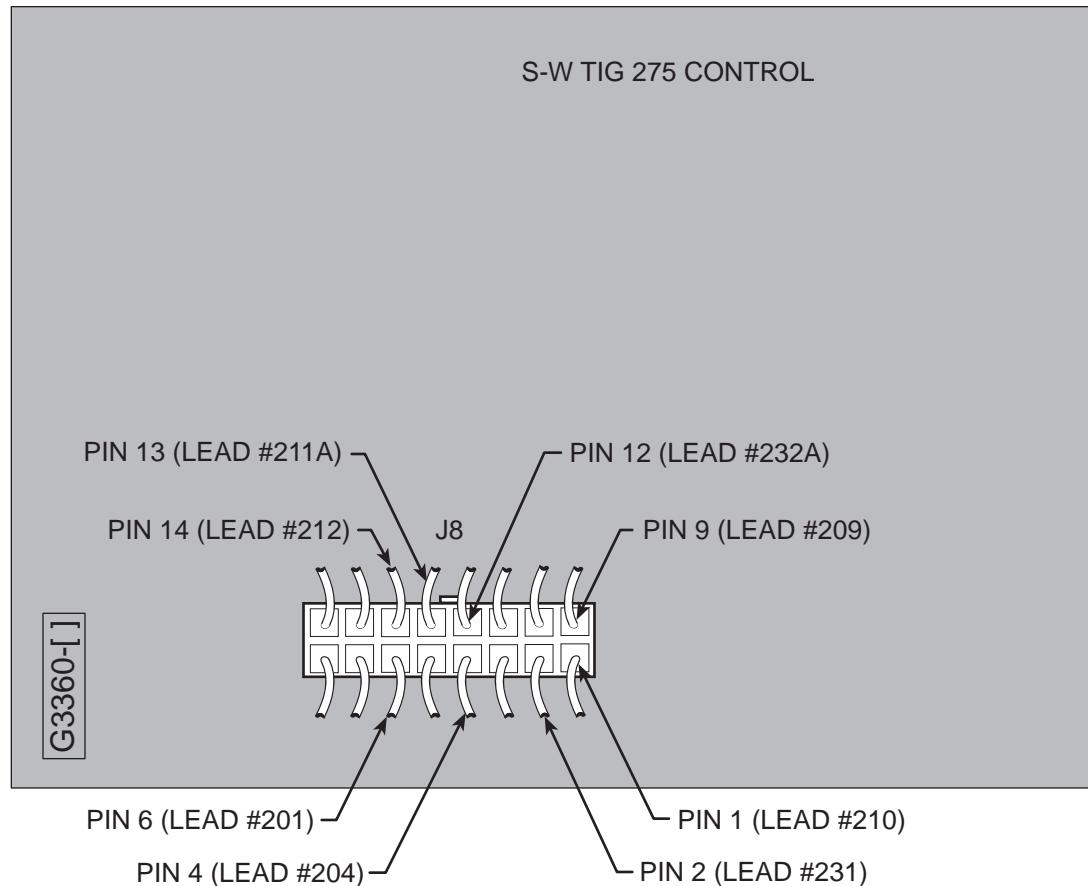
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## T1 MAIN TRANSFORMER TEST *(continued)*

FIGURE F.2 – PLUG J8 LOCATION ON CONTROL BOARD



### TEST PROCEDURE

1. Remove main supply power to the machine.
2. Using the 3/8" nut driver, remove the case left and right side covers.
3. Locate plug J8 on the control board. See Figure F.2.
4. Carefully apply the correct input power making certain the reconnect configuration at the reconnect panel is correct for the input voltage applied. Turn the TIG 275 ON.
5. Using the voltmeter, carefully test for the correct transformer secondary voltages per Table F.1.

### ⚠ WARNING



#### ELECTRIC SHOCK can kill.

- With input power ON, there are high voltages inside the machine. Do not reach into the machine or touch any internal part.

SQUARE WAVE TIG 275



## TROUBLESHOOTING & REPAIR

### T1 MAIN TRANSFORMER TEST *(continued)*

6. If all of the secondary voltages are correct, the T1 transformer is functioning properly.
  - a. If all of the secondary voltages are missing or incorrect, make certain that the correct input voltage is being applied to the correct primary leads. See Table F.1.
  - b. If the correct input voltage is being applied to the primary leads and any or all of the secondary voltages are incorrect, the T1 transformer may be faulty. See **Main Transformer and Output Choke Removal and Replacement**. Also check the leads for broken or loose connections between plug J8 and the T1 transformer.
7. Replace the case side covers.

SQUARE WAVE TIG 275



Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

Return to Section TOC

Return to Master TOC

# TROUBLESHOOTING & REPAIR

## T1 MAIN TRANSFORMER TEST *(continued)*

TABLE F.1.

T1 TRANSFORMER VOLTAGES

TEST POINTS	ACCEPTABLE VOLTAGES
<b>SECONDARY WINDINGS</b>	<b>SECONDARY VOLTAGES</b>
PLUG J8 PIN 1 (LEAD #210) TO PLUG J8 PIN 9 (LEAD #209)	18 VAC
PLUG J8 PIN 6 (LEAD #201) TO PLUG J8 PIN 4 (LEAD #204)	18 VAC
PLUG J8 PIN 2 (LEAD #231) TO PLUG J8 PIN 12 (LEAD #232A)	115 VAC
PLUG J8 PIN 13 (LEAD #211A) TO PLUG J8 PIN 14 (LEAD #212)	23 VAC
X1 TO X2	78 VAC
<b>PRIMARY WINDINGS<sup>1</sup></b>	<b>PRIMARY VOLTAGES</b>
H1 TO H2	208 VAC
H1 TO H3	230 VAC
H1 TO H4	460 VAC

NOTE: If the input voltages vary, the secondary voltages will vary accordingly.

<sup>1</sup>Based on 208/230/460 models. For other voltage models refer to appropriate wiring diagram.

SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## GAS (WATER) SOLENOID TEST

### **⚠ WARNING**

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

### TEST DESCRIPTION

This procedure will help the technician to determine if the solenoid is receiving the correct voltage and also if the solenoid is functional.

### MATERIALS NEEDED

- 3/8" Nut driver
- Volt/Ohmmeter (Multimeter)
- Isolated 115 VAC power supply

This procedure takes approximately 10 minutes to perform.

SQUARE WAVE TIG 275

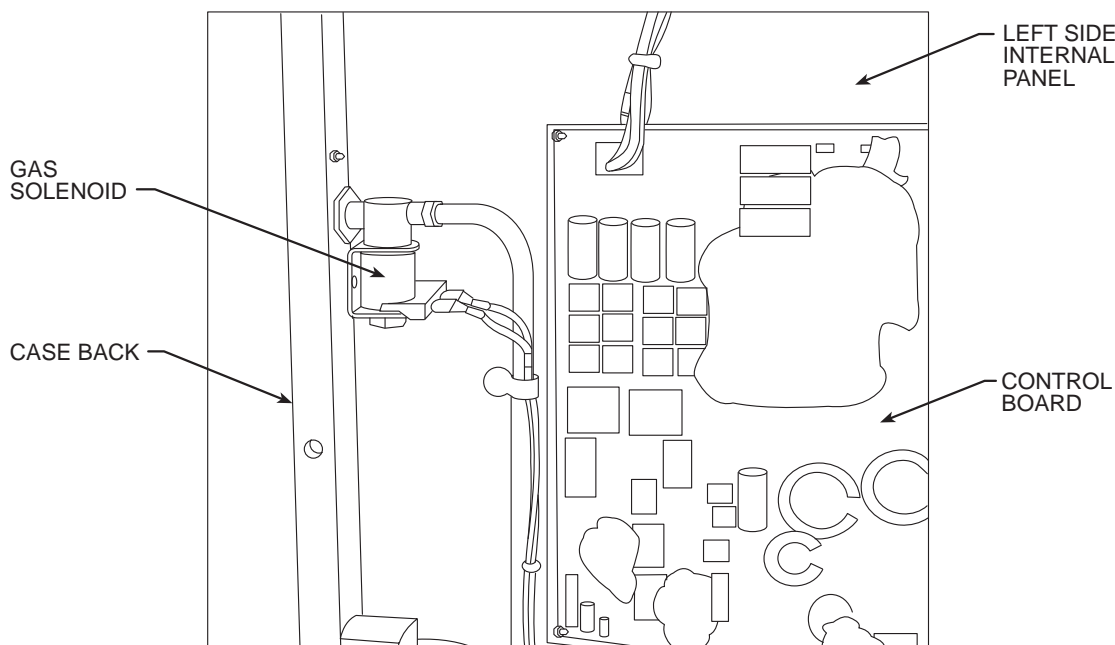




# TROUBLESHOOTING & REPAIR

## GAS (WATER) SOLENOID TEST (*continued*)

FIGURE F.3 – GAS SOLENOID LOCATION



### TEST PROCEDURE

1. Remove input power to the TIG 275 machine.
2. Remove the left case side.
3. Perform the **High Frequency Circuit Disable Procedure**.
4. Locate the gas solenoid. See Figure F.3.
5. Put the mode switch S3 in the 2-Step TIG position.

### ⚠ WARNING



### ELECTRIC SHOCK can kill.

- With input power ON, there are high voltages inside the machine. Do not reach into the machine or touch any internal part.

6. Apply the correct input power to the TIG 275.
7. Activate the torch trigger and check for approximately 115 VAC at the solenoid

leads (#234 and #235). If the correct voltage is present, the solenoid should activate and gas should flow.

8. If voltage is present at leads #234 and #235 and the solenoid does not activate, the solenoid may be defective. The solenoid can be further checked by removing leads #234 and #235 from the solenoid and applying the external isolated 115 VAC supply to the solenoid terminals. If the solenoid activates with the external supply but not when powered by the control board, the problem may be in the control board. If you hear solenoid activation but there is still no gas flow, check for restrictions in the line.
9. When the test is complete, replace leads #234 and #235.
10. Reassemble the two leads previously removed in the **High Frequency Circuit Disable Procedure**.
11. Reassemble the left case side.
12. If a water solenoid is used, it can be tested using the same procedures.

SQUARE WAVE TIG 275

# TROUBLESHOOTING & REPAIR

## STATIC SCR TEST

### **⚠ WARNING**

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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### TEST DESCRIPTION

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

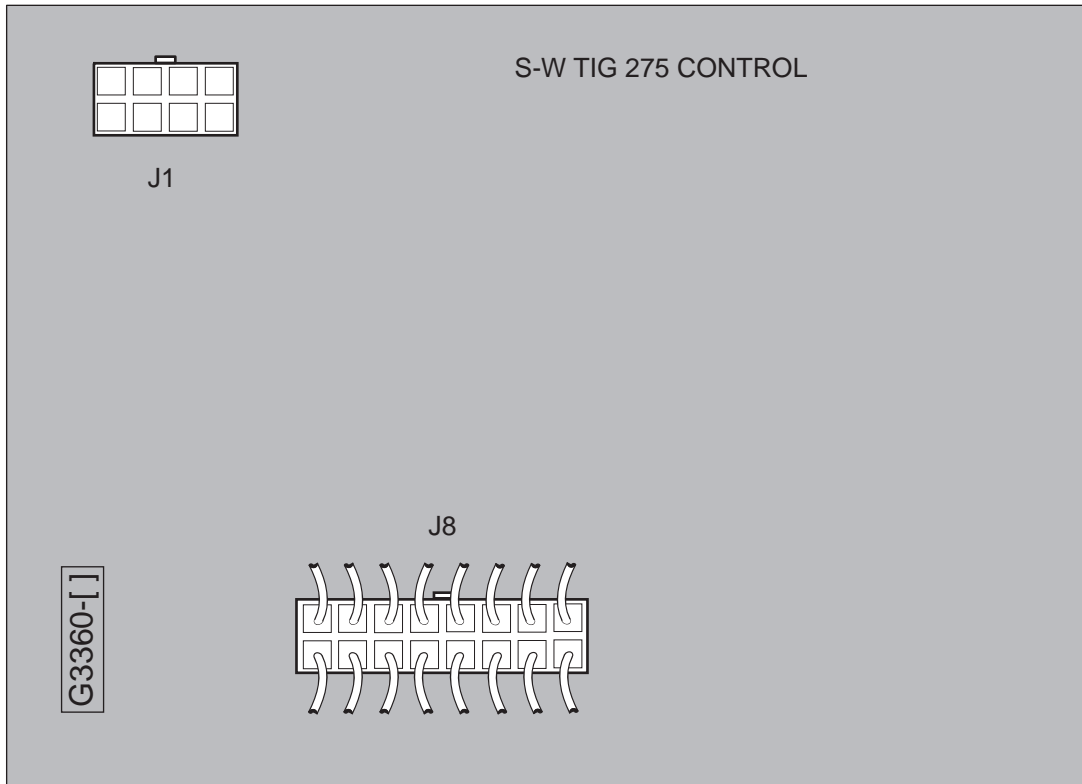
### MATERIALS NEEDED

- Analog Ohmmeter (Multimeter)
- TIG 275 Wiring Diagrams
- SCR Heat Sink Assembly Drawing
- 3/8” Nut driver

This procedure takes approximately 12 minutes to perform.

SQUARE WAVE TIG 275



**STATIC SCR TEST (continued)****FIGURE F.4 – PLUG J1 LOCATION ON CONTROL BOARD****TEST PROCEDURE**

1. Remove main supply power to the TIG 275 and remove the case top and left side.
2. Locate and remove plug J1 from the control board. See Figure F.4.

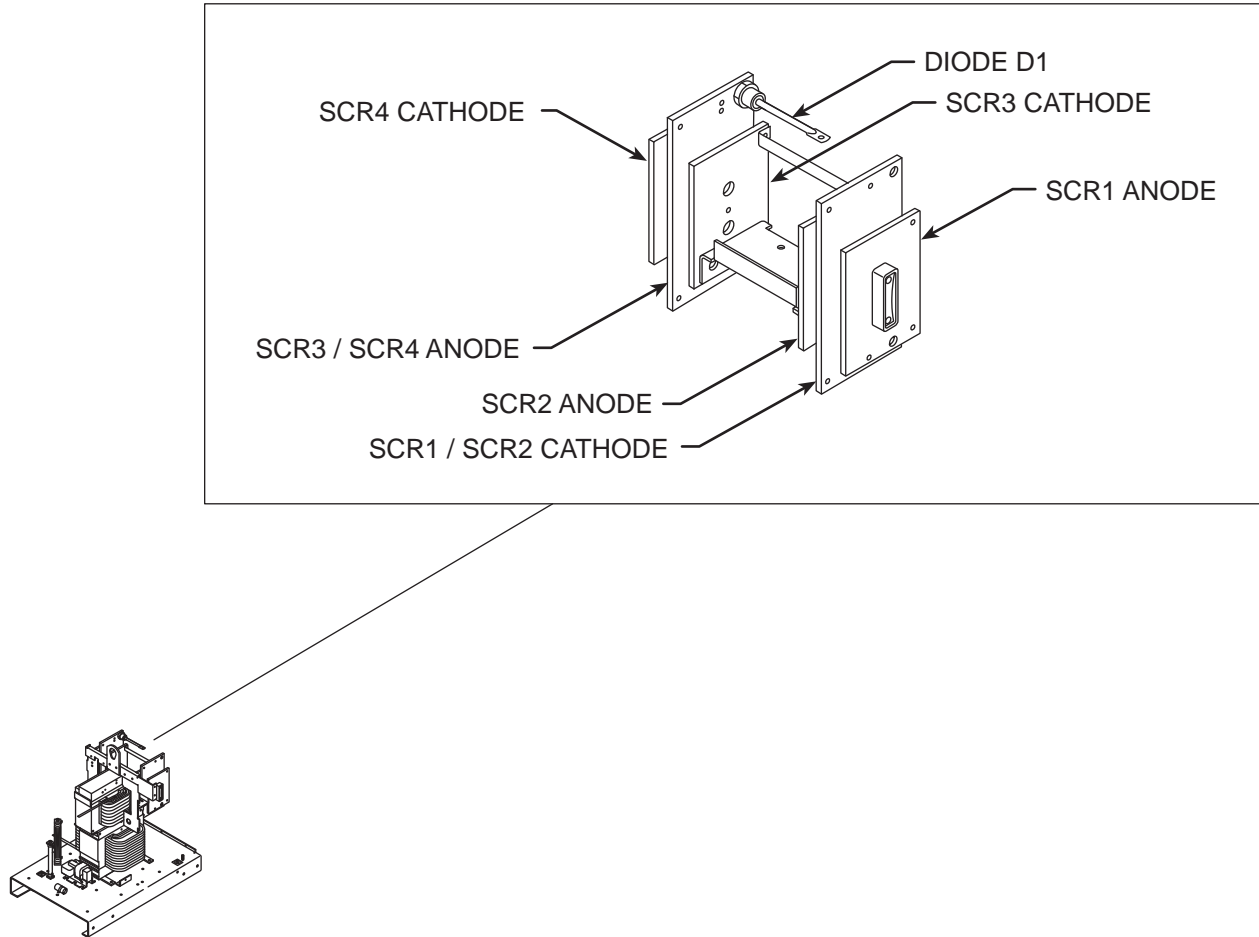
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## STATIC SCR TEST (*continued*)

FIGURE F.5 – SCR TEST POINTS



3. 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. See Figure F.5. If a low resistance is indicated in either direction, SCR1 is faulty. Replace the SCR Bridge Assembly. See **SCR Bridge Assembly Removal and Replacement**.
4. Repeat Step #3 testing SCR2, SCR3 and SCR4.
5. To further check the SCR's functions, use an SCR tester and proceed to the **Active SCR Test**.  
**NOTE:** Also check diode D1.
6. Replace plug J1 on the control board.
7. Replace the case top and left side.

SQUARE WAVE TIG 275



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

## ACTIVE SCR TEST

### WARNING

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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### 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 275 Wiring Diagram  
3/8" Nut driver

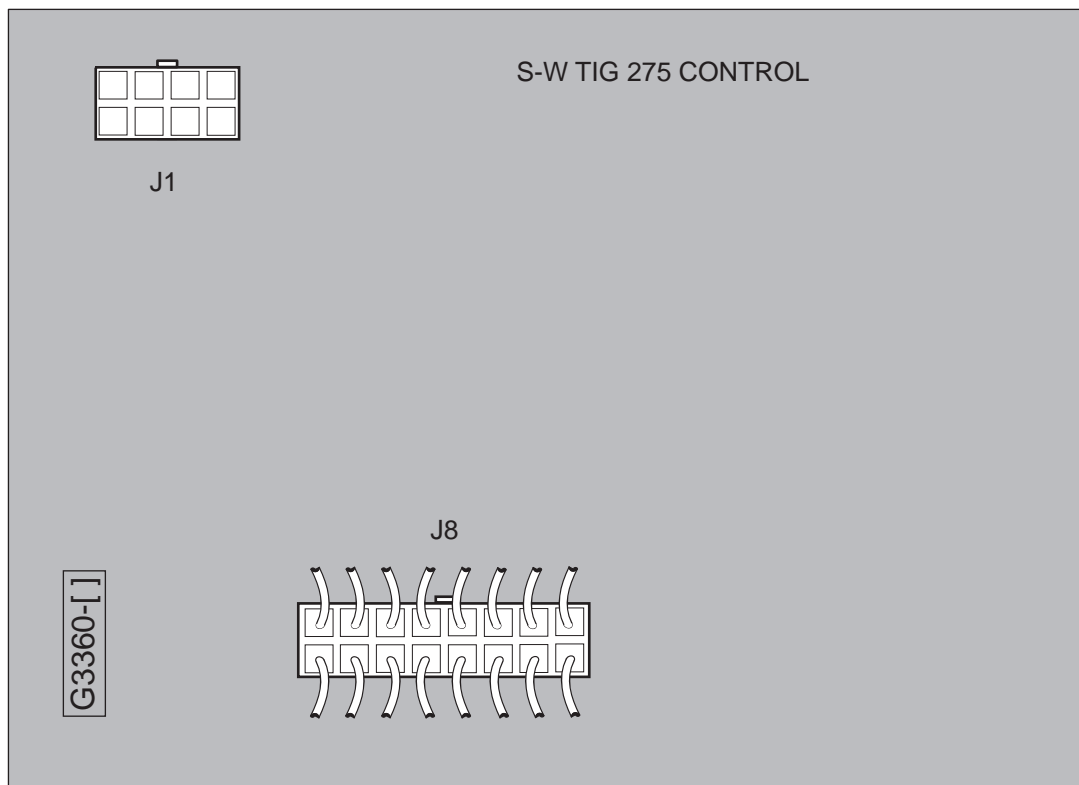
This procedure takes approximately 20 minutes to perform.

SQUARE WAVE TIG 275



ACTIVE SCR TEST (*continued*)

FIGURE F.6 – PLUG J1 LOCATION ON CONTROL BOARD



## TEST PROCEDURE

1. Remove main supply power to the TIG 275 machine.
2. Locate and remove plug J1 from the control board. See Figure F.6.
3. Perform the following test for all four SCRs. See **Figure F.8**.
4. Construct the circuit outlined in **Figure F.7**. One 6V lantern battery can be used. Resistor values are  $\pm 10\%$ . The voltmeter scale should be low, approximately 0-5 or 0-10 volts.
5. Battery Test – Check the battery by shorting leads (A) and (C) and then close switch SW-1. Replace the battery if voltage is less than 4.5 volts.

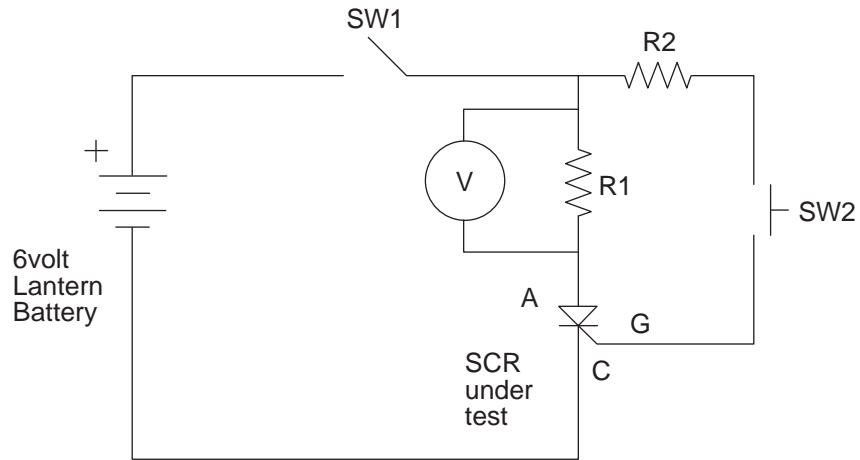
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## ACTIVE SCR TEST (continued)

FIGURE F.7 – ACTIVE SCR TEST SETUP



R1 = 4 ohms / 10 watts

R2 = 3 ohms / 10 watts

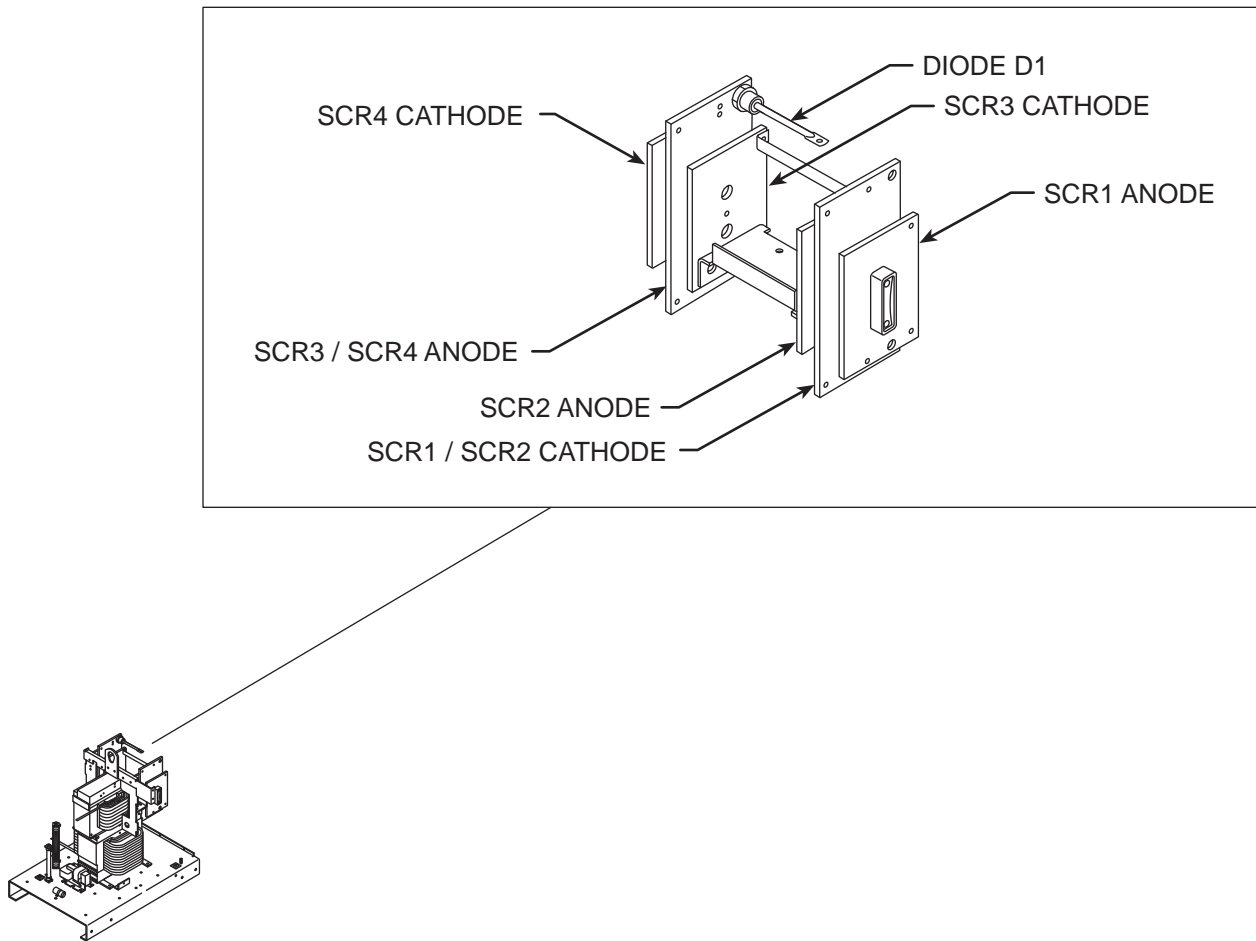
Resistor values are  $\pm 10\%$

SQUARE WAVE TIG 275

# TROUBLESHOOTING & REPAIR

## ACTIVE SCR TEST (continued)

FIGURE F.8 – SCR GATE LOCATIONS



6. Connect SCR into the test circuit as shown in **Figure F.7**: (A) lead to anode (C) lead to cathode and (G) lead to the gate.
7. Close switch SW-1 (Switch SW-2 should be open). The voltmeter should read zero. If the voltmeter reads higher than zero, the SCR is shorted.
8. 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 described in Step 5.)
9. 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.
10. Replace the SCR Bridge Assembly if any SCRs do not pass the test in Step #3. See **SCR Bridge Assembly Removal and Replacement**.
11. Replace plug J1 on the control board.
12. Replace the case sides and top.

SQUARE WAVE TIG 275





# TROUBLESHOOTING & REPAIR

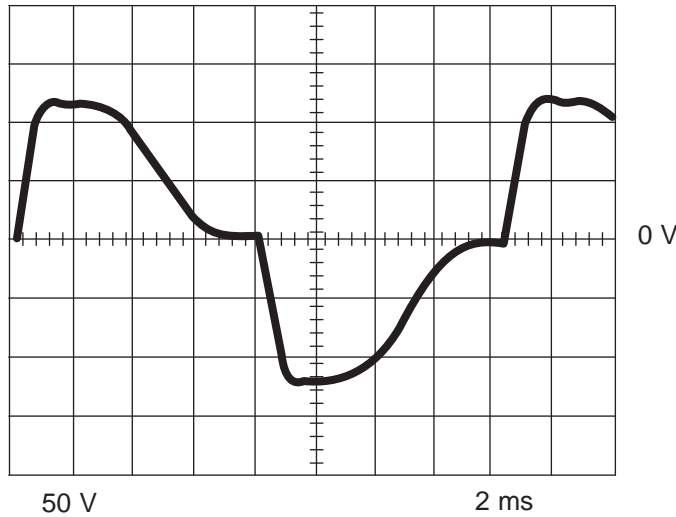
## NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM

### AC TIG MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



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 terminals: (+) probe to electrode, (-) probe to work.

**NOTE:** AC balance control set at "Balanced" position.

### SCOPE SETTINGS

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

SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

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Return to Master TOC

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# TROUBLESHOOTING & REPAIR

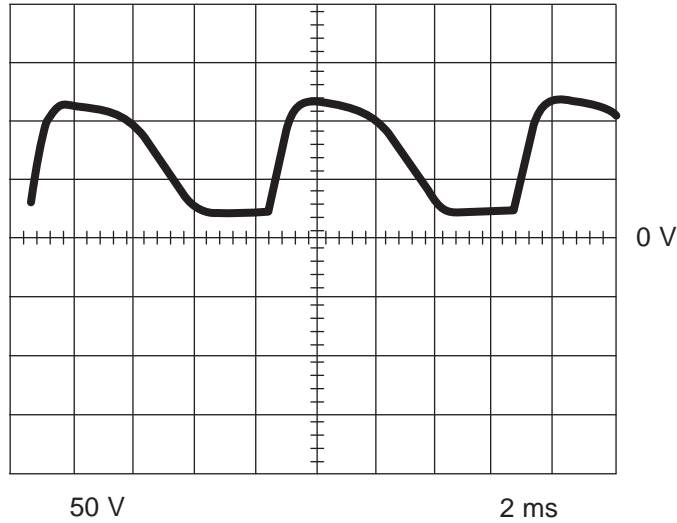
## NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM

### DC TIG MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY** can damage test equipment.

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



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 terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

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

### SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

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Return to Master TOC

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# TROUBLESHOOTING & REPAIR

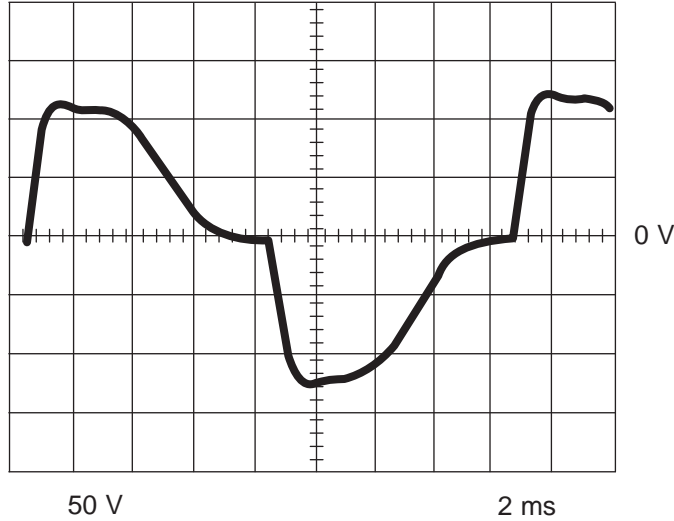
## NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM

### AC STICK MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



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 terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

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

SQUARE WAVE TIG 275



Return to Section TOC

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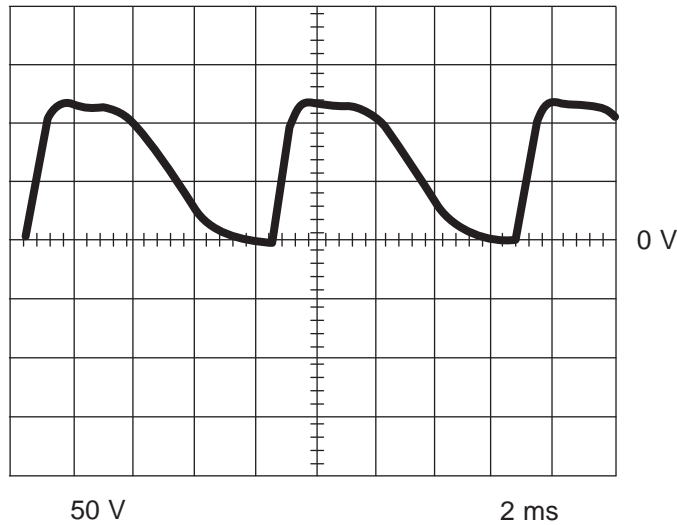
# TROUBLESHOOTING & REPAIR

## 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.
- Perform High Frequency Disable Procedure.



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 terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

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

SQUARE WAVE TIG 275



Return to Section TOC  
Return to Master TOC

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# TROUBLESHOOTING & REPAIR

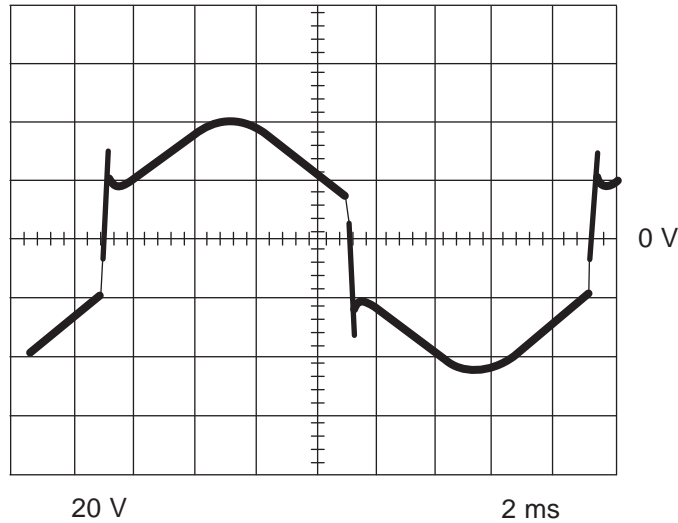
## TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED

### AC TIG MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



### MACHINE LOADED TO 255 AMPS AT 30 VAC.

This is the typical AC 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.

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

**NOTE:** AC balance control set at "Balanced" position.

### SCOPE SETTINGS

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

### SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

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Return to Master TOC

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# TROUBLESHOOTING & REPAIR

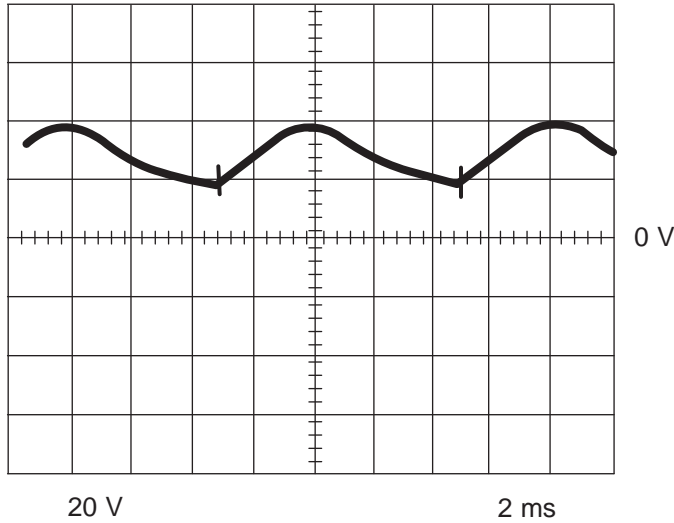
## TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED

### DC TIG MODE

#### ⚠ CAUTION

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



#### MACHINE LOADED TO 275 AMPS AT 31 VDC.

This is the 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.

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

#### SCOPE SETTINGS

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

#### SQUARE WAVE TIG 275



Return to Section TOC

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# TROUBLESHOOTING & REPAIR

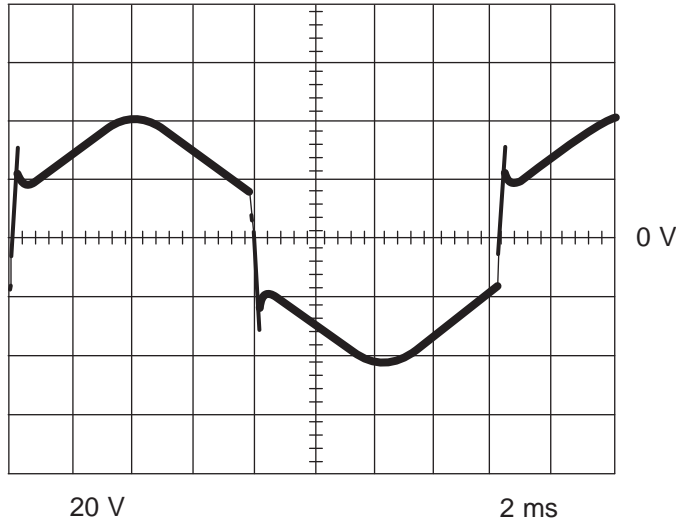
## TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED

### AC STICK MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



### MACHINE LOADED TO 275 AMPS AT 31 VDC.

This is the typical AC 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.

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

### SCOPE SETTINGS

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

### SQUARE WAVE TIG 275



Return to Section TOC

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# TROUBLESHOOTING & REPAIR

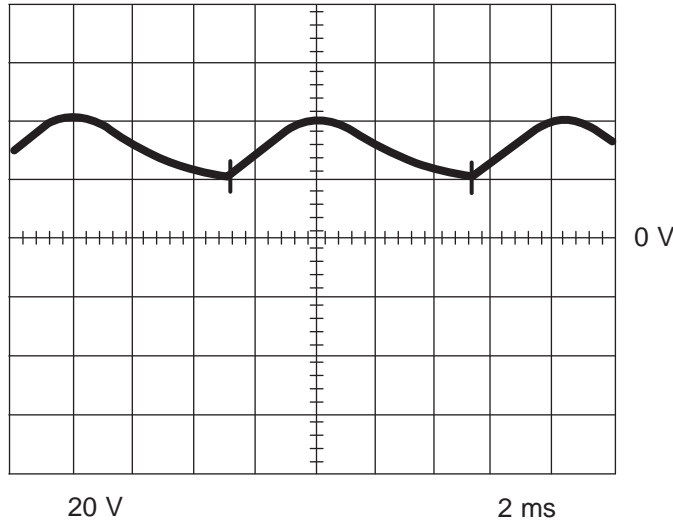
## TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED

### DC STICK MODE

**⚠ CAUTION**

**HIGH VOLTAGE / HIGH FREQUENCY can damage test equipment.**

- Perform all voltage and waveform checks with high frequency circuit OFF.
- Perform High Frequency Disable Procedure.



### MACHINE LOADED TO 275 AMPS AT 31 VDC.

This is the typical AC 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.

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

### SCOPE SETTINGS

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

### SQUARE WAVE TIG 275



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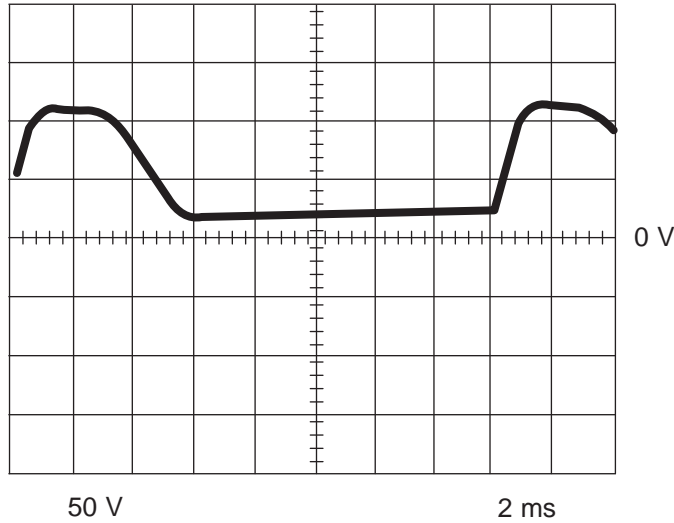
# TROUBLESHOOTING & REPAIR

## ABNORMAL OPEN CIRCUIT VOLTAGE - DC TIG 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.
- Perform High Frequency Disable Procedure.



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. 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 terminals: (+) probe to electrode, (-) probe to work.

### SCOPE SETTINGS

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

SQUARE WAVE TIG 275



Return to Section TOC  
Return to Master TOC

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# TROUBLESHOOTING & REPAIR

## HIGH VOLTAGE TRANSFORMER REMOVAL AND REPLACEMENT

### **WARNING**

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

---

### DESCRIPTION

This procedure will aid the technician in the removal and replacement of the high voltage transformer.

### MATERIALS NEEDED

- 3/8" Nut driver
- Needle nose pliers
- Phillips head screw driver
- Wire cutters

This procedure takes approximately 25 minutes to perform.

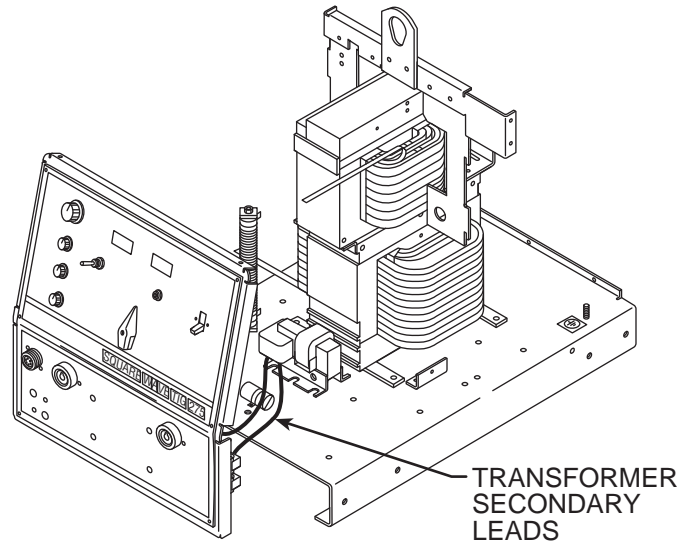
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## HIGH VOLTAGE TRANSFORMER REMOVAL AND REPLACEMENT *(continued)*

FIGURE F.9 – SECONDARY LEADS AT HIGH FREQUENCY STARTER BOARD



### REMOVAL PROCEDURE

1. Remove input power to the TIG 275 machine.
2. Using the 3/8" nut driver, remove the case sides.
3. With the needle nose pliers, remove the two secondary leads from the quick-connects on the high frequency arc starter board assembly. See Figure F.9.
4. Disconnect the in-line splice quick connect from one primary lead to lead #238. Cut any necessary cable ties.
5. Remove the lead splice from the other primary lead that is connected to lead #237, C6 capacitor and R5 resistor. See the Wiring Diagram. Cut any necessary cable ties.
6. Using the phillips head screw driver, remove the front mounting screw from the base of the high voltage transformer. Take note of insulator placement for reassembly.
7. With the phillips head screw driver, loosen the two rear mounting screws.
8. Carefully slide the transformer forward and remove it from the TIG 275 machine.

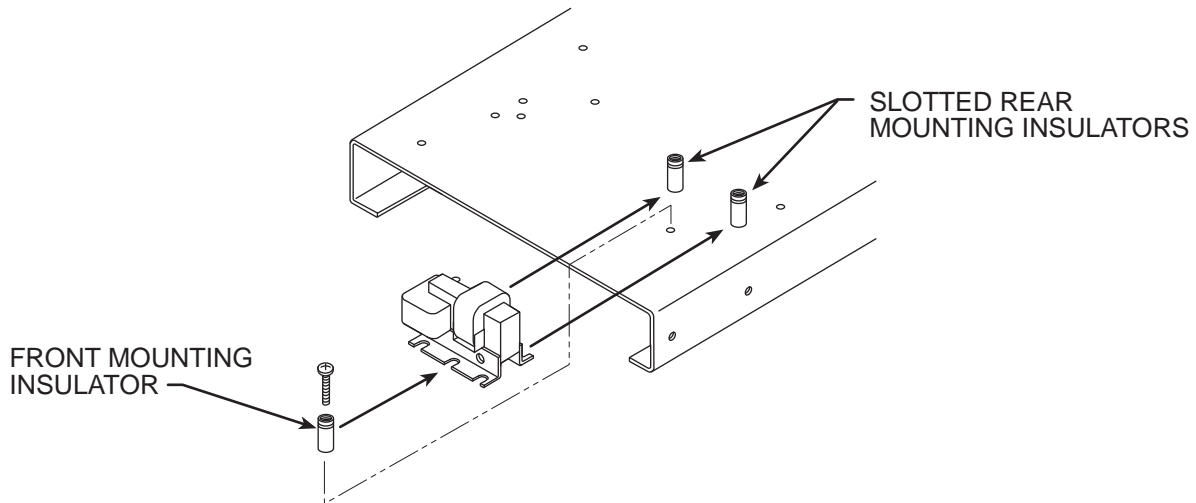
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## HIGH VOLTAGE TRANSFORMER REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.10 – HIGH VOLTAGE TRANSFORMER MOUNTING INSULATORS



### REPLACEMENT PROCEDURE

1. Carefully position the new high voltage transformer in place in the two rear mounting insulators. See Figure F.10.
2. Install the front mounting insulator and mounting screw.
3. Using the phillips head screw driver, tighten all three mounting screws making certain the insulators are positioned correctly.
4. Reconnect the two primary leads.
5. Reconnect the two secondary leads to the high frequency arc starter board assembly.
6. Replace any previously removed cable ties.
7. Replace the case sides.

SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## SCR BRIDGE ASSEMBLY REMOVAL AND REPLACEMENT

### **WARNING**

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

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### **DESCRIPTION**

The following procedure will aid the technician in removing the SCRs from the output rectifier heat sink for maintenance or replacement.

### **MATERIALS NEEDED**

- 3/8" Nut driver
- 1/2" Wrench
- 7/16" Wrench
- 3/8" Wrench
- Penetrax A13 joint compound

This procedure takes approximately 40 minutes to perform.

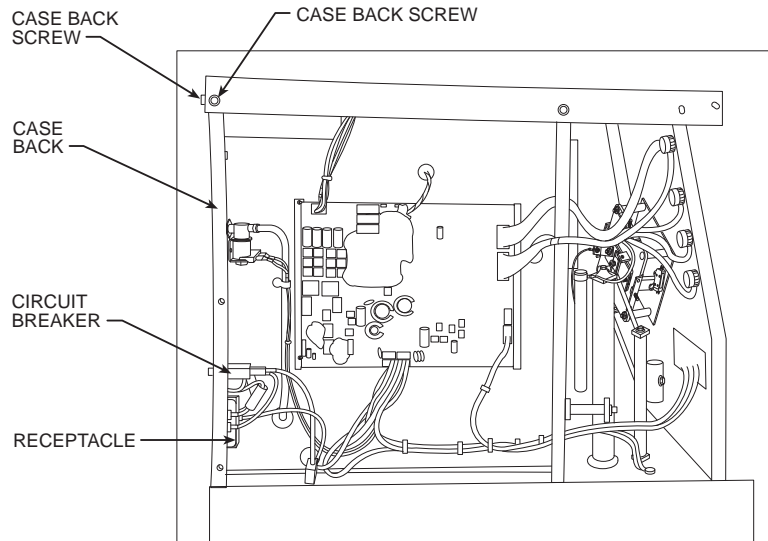
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## SCR BRIDGE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.11 – RECEPTACLE/CIRCUIT BREAKER LEADS

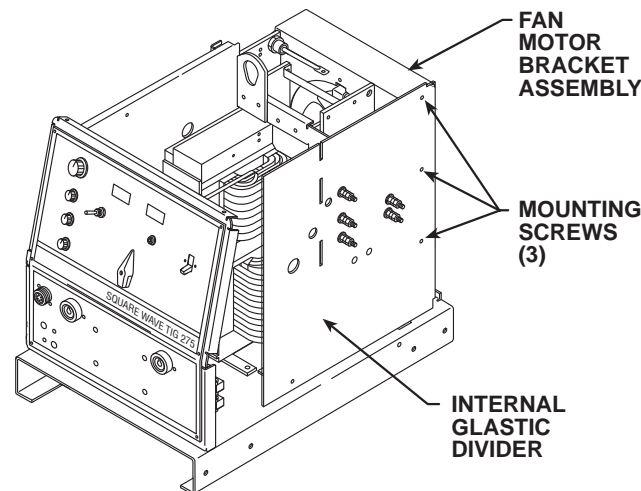


### PROCEDURE

**NOTE:** “Left” and “right” are from the rear of the machine looking in.

1. Remove input power to the TIG 275 machine.
2. Using the 3/8” nut driver, remove the case sides and top.
3. Using the 3/8” nut driver, remove the nine screws from the case back.

FIGURE F.12 – FAN MOTOR BRACKET ASSEMBLY MOUNTING



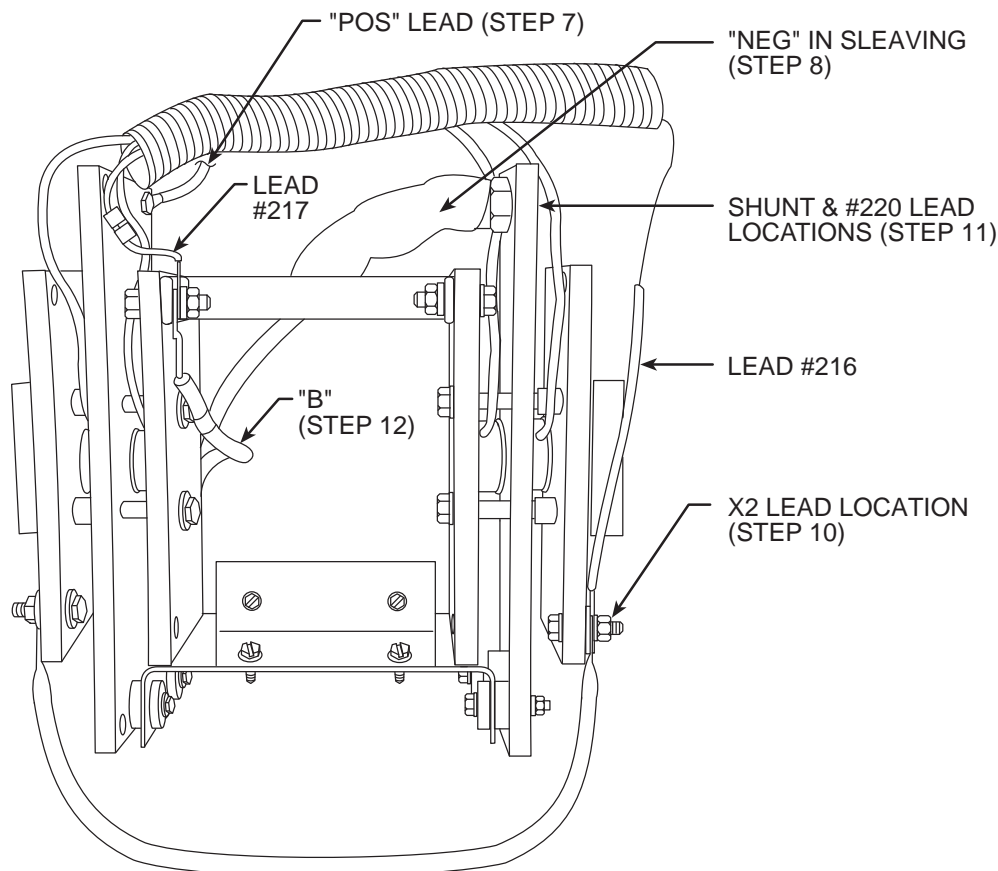
4. Carefully remove the case back and set aside.  
**NOTE:** The receptacle and circuit breaker leads will still be attached. See Figure F.11.
5. With the 3/8” nut driver, remove the three screws mounting the fan motor bracket assembly to the internal glastic divider panel. See Figure F.12.
6. Carefully pull the fan assembly away to allow access to the SCR Bridge Assembly. Support the fan assembly so as not to stress the fan motor leads. It is not necessary to disconnect the fan motor leads.

SQUARE WAVE TIG 275

# TROUBLESHOOTING & REPAIR

## SCR BRIDGE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.13 – SCR BRIDGE CONNECTIONS



For Steps 7-13, see Figure F.13.

7. Using the 7/16" wrench, label and remove the "POS" lead from the left side heat sink assembly. It is not necessary to remove the #218 lead.
8. Using the 7/16" wrench, label and remove the "NEG" lead from the D1 diode pigtail. **NOTE:** It will be necessary to remove the sleeve insulation to gain access to the connection.
9. Remove plug J1 from the control board. Also remove the plug and lead harness from the internal divider panel.
10. With the 1/2" wrench, remove the X2 transformer secondary lead from the right side heat sink assembly. It is not necessary to remove the jumper lead or the #216 lead.
11. With the 7/16" wrench, remove the shunt and one #220 lead from the right side negative heat sink assembly. It is not necessary to remove the other #220 lead.
12. Using the 1/2" wrench, remove the "B" lead from the AC left side heat sink. It is not necessary to remove the copper jumper or the #217 lead.
13. Using the 3/8" wrench, remove the four mounting screws holding the SCR Bridge Assembly to the transformer iron assembly.
14. Carefully remove the SCR Bridge assembly from the machine.

SQUARE WAVE TIG 275



## TROUBLESHOOTING & REPAIR

### SCR BRIDGE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

#### REPLACEMENT PROCEDURE

Refer to Figures F.11 - F.13.

1. Carefully place the new SCR bridge assembly in position in the TIG 275.
2. Using the 3/8" wrench, install the four mounting screws.

**Use Penetrox A13 joint compound on all aluminum connections.**

3. Assemble lead "B" onto the AC left heat sink.
4. Assemble the shunt to the right side negative heat sink.
5. Assemble the X2 transformer secondary lead onto the right side heat sink.
6. Feed the J1 plug and harness through the internal divider and install the plug into the control board.
7. Assemble the "NEG" lead to the D1 diode pig-tail. Replace and secure sleeve insulation.
8. Assemble the "POS" lead to the left side heat sink.
9. Carefully position the fan motor assembly into place.
10. Attach the fan motor assembly onto the glass-tic divider using the three screws previously removed.
11. Carefully position the case back into place, being careful not to disconnect the leads from the circuit breaker or receptacle.
12. Secure the case back with the nine screws previously removed.
13. Assemble the case sides and top.

SQUARE WAVE TIG 275





# TROUBLESHOOTING & REPAIR

## POLARITY SWITCH REMOVAL AND REPLACEMENT

### **WARNING**

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

---

### **DESCRIPTION**

This procedure will aid the technician in the removal and replacement of the polarity switch.

### **MATERIALS NEEDED**

- 3/8" Nut driver
- 1/2" Wrench
- 7/16" Wrench
- Phillips head screw driver
- 5/64" Allen type wrench
- Needle nose pliers
- Slot head screw driver (2 required)
- Wiring diagram

This procedure takes approximately 60 minutes to perform.

SQUARE WAVE TIG 275

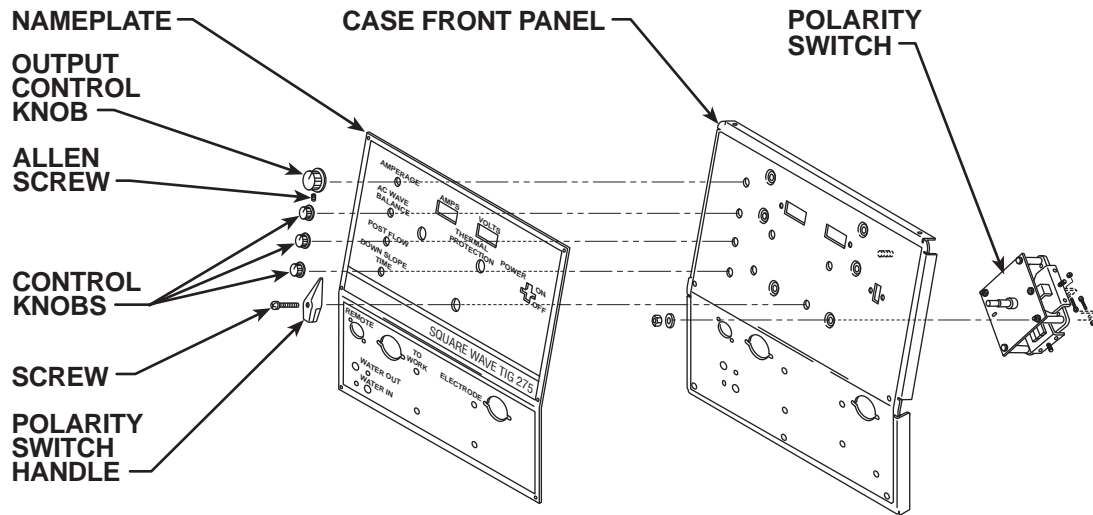


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# TROUBLESHOOTING & REPAIR

## POLARITY SWITCH REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.14 – NAMEPLATE REMOVAL



### PROCEDURE

1. Remove the input power to the TIG 275 machine.
2. Using the 3/8" nut driver, remove the case sides and top. *For Steps 3-8, see Figure F.14.*
3. Using the 5/64" allen type wrench, remove the output control knob.
4. Using the phillips head screw driver, remove the screw from the polarity switch handle.
5. With the 2 slot head screw drivers, carefully pry the polarity switch handle from the shaft.
6. Using the small slot head screw driver, remove the three small control knobs.
7. Remove the seven plastic snap rivets holding the nameplate to the case front.
8. Remove the nameplate.

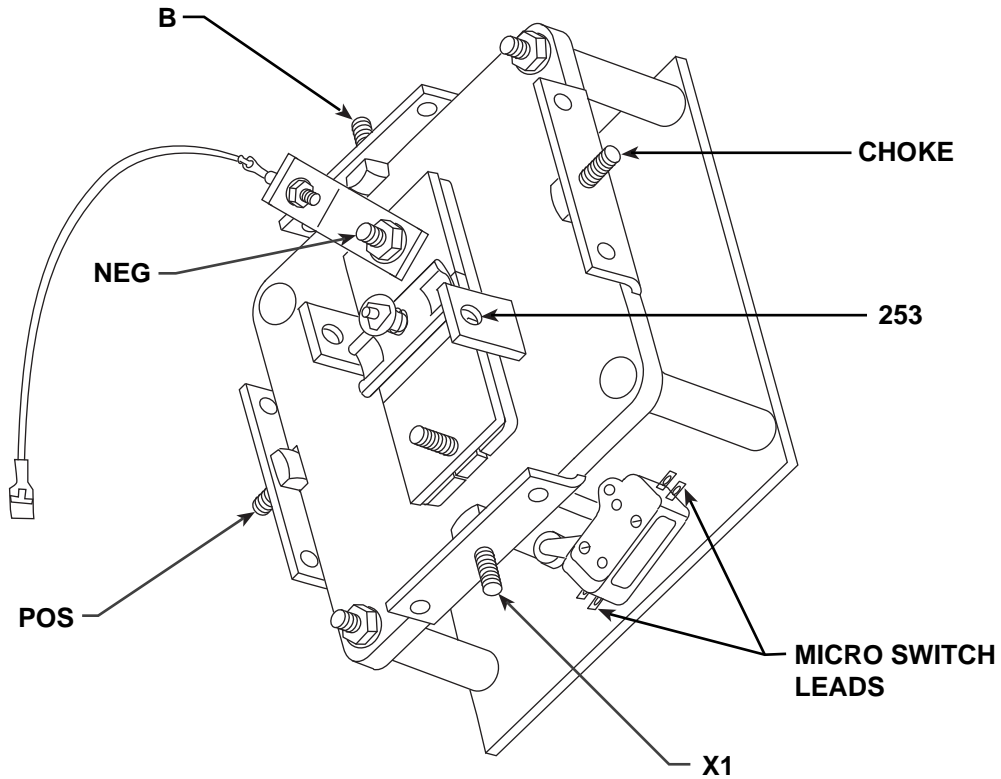
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## POLARITY SWITCH REMOVAL AND REPLACEMENT (continued)

FIGURE F.15 - POLARITY SWITCH CONNECTIONS



SQUARE WAVE TIG 275



Return to Section TOC

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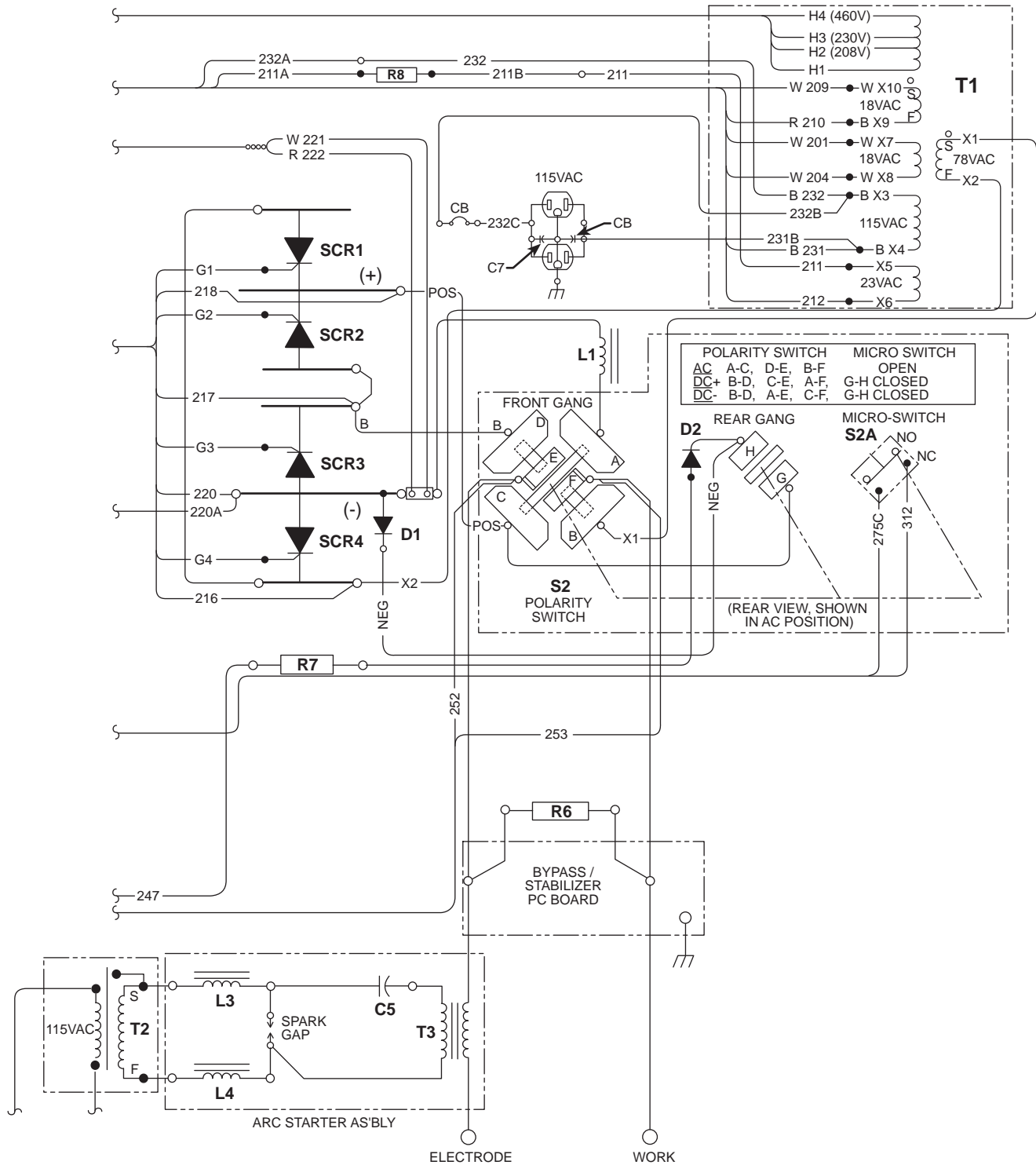
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# TROUBLESHOOTING & REPAIR

## POLARITY SWITCH REMOVAL AND REPLACEMENT (continued)

FIGURE F.16 – POLARITY SWITCH WIRING DIAGRAM



SQUARE WAVE TIG 275



Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Section TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

Return to Master TOC

## POLARITY SWITCH REMOVAL AND REPLACEMENT (*continued*)

For Steps 9--17, see **Figure F.15** and **F.16**.

9. With the 1/2" wrench, remove the "POS" flex lead from the polarity switch. See the Wiring Diagram. Label lead and connection point for reassembly.
10. With the 1/2" wrench, remove the "B" flex lead from the polarity switch. This lead connects to the AC plate on the SCR bridge. See Wiring Diagram. Label lead and connection point for reassembly.
11. Using the 1/2" wrench, remove the "NEG" flex lead from the rear gang of the polarity switch. This lead connects to the D1 diode on the SCR bridge. See the Wiring Diagram. Label lead and connection point for reassembly. Also label and remove the D2 diode heat sink assembly.
12. Using the 1/2" wrench, remove the flex lead from the polarity switch. This lead connects to the high frequency transformer coil and the by-pass board. See the Wiring Diagram. Label lead and connection point for reassembly. Also remove lead #252.
13. Using the 1/2" wrench, remove the other flex lead from the polarity switch. This lead connects to the upper terminal on the by-pass and the "work" output terminal lead. See the Wiring Diagram. Label lead and connection point for reassembly. Also remove lead #253.
14. Using the 1/2" wrench, remove the choke lead from the polarity switch. See the Wiring Diagram. Label lead and connection point for reassembly.
15. With the 1/2" wrench, remove the X1 secondary lead from the polarity switch. See the Wiring Diagram. Label lead and connection point for reassembly.
16. Carefully unsolder the two leads (#275C and #312) from the microswitch located on the polarity switch assembly. See the Wiring Diagram. Label leads and connections points for reassembly.

17. Remove the cable tie that holds the thermal protection light leads to the polarity switch.
18. With the 7/16" wrench, remove the two nuts and washers that hold the polarity switch to the front panel. See **Figure F.14**.
19. Carefully remove the polarity switch assembly from the machine.

### Replacement Procedure

Refer to **Figures F.14 - F.16**.

1. Mount the polarity switch to the front panel with two nuts and washers.
2. Replace the cable tie holding the thermal protection light leads to the polarity switch.
3. Resolder leads #275C and #312 to the microswitch.
4. Attach the following leads to the polarity switch. See **Figures F.15 and F.16**.
  - X1 secondary lead
  - choke lead
  - #253 and flex lead
  - #252 and flex lead
  - NEG lead (at rear gang)
  - POS lead
  - B lead
5. Install the nameplate with 7 rivets.
6. Re-install and secure the three small plastic control knobs.
7. Install the polarity switch handle with the phillips head screw.
8. Install the output control knob with the allen screw.
9. Install the case top and sides.

# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER AND OUTPUT CHOKE ASSEMBLY REMOVAL AND REPLACEMENT

### WARNING

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

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-888-935-3877.

---

### DESCRIPTION

This procedure will aid the technician in the removal and replacement of the main transformer and choke assembly.

### MATERIALS NEEDED

- 3/8" Nut driver
- 5/16" Nut driver
- 1/2" Wrench
- Wire cutters
- Molex extraction tool # HT60630B

This procedure takes approximately 2 hours to perform.

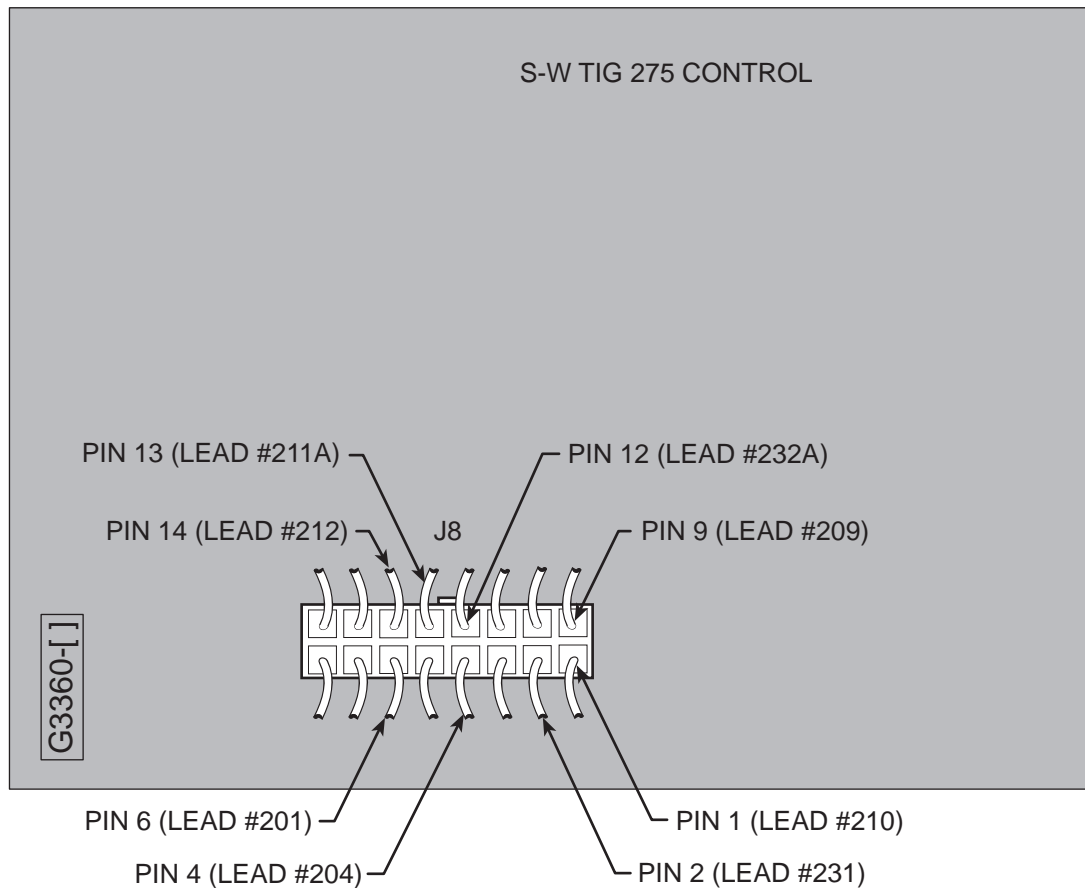
SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER AND OUTPUT CHOKE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.17 – PLUG J8 LOCATION ON CONTROL BOARD



### PROCEDURE

1. Remove the input power to the TIG 275 machine.
2. Perform the **SCR Bridge Assembly Removal Procedure**.
3. Label and remove lead #232B from the circuit breaker located on the case back.
4. Label and remove lead #231B from the receptacle located on the case back.
5. Remove Plug J8 from the control board. See Figure F.17.
6. Using the mini-molex extraction tool, remove the following six leads from plug J8. See Figure F.17 for lead locations. Cut any necessary cable ties. Note lead and pin placement for reassembly.  
#212, #201, #204, #209, #210, #231
7. Disconnect lead #232A at the quick-connect.
8. Disconnect lead #211 at the quick-connect.
9. Feed the disconnected leads through the internal baffle along with leads #232B and 231B.

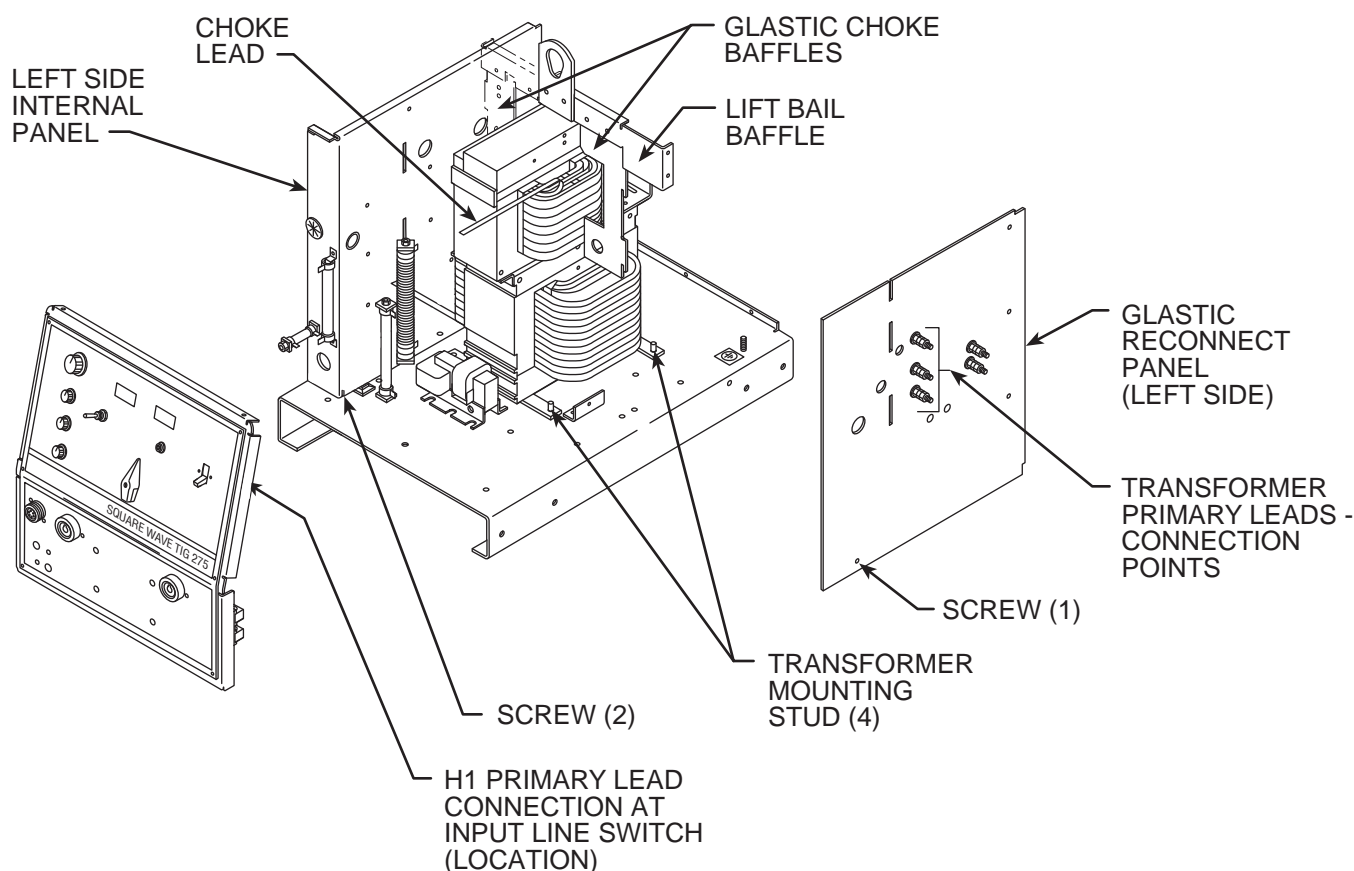
SQUARE WAVE TIG 275



## TROUBLESHOOTING &amp; REPAIR

## MAIN TRANSFORMER AND OUTPUT CHOKE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.18 – TRANSFORMER CONNECTIONS



10. Using the 7/16" wrench, disconnect the transformer primary leads from the reconnect studs. See the Wiring Diagram and Figure F.18. Label the leads for reassembly.
11. Using the 5/16" nut driver, remove the one screw from the lower front corner of the glastic reconnect panel.
12. Remove the H1 capacitor lead from the capacitor terminal.
13. Using the 5/16" nut driver, remove the four screws from the glastic choke baffles.
14. Remove the glastic reconnect panel by lifting up on the choke baffle and sliding the reconnect panel away from the machine. (Clear all leads.)
15. Clear the glastic choke baffle and associated leads for transformer removal.
16. With the 3/8" wrench, disconnect the H1 primary lead from the input line switch.
17. Using the 1/2" wrench, disconnect the choke lead from the polarity switch. See the Wiring Diagram and **Figure F.19**. Label for reassembly.
18. Using the 1/2" wrench, disconnect the X1 transformer secondary lead from the polarity switch. Label for reassembly. See **Figure F.19**.
19. Using the 3/8" nut driver, remove the screw holding the left side internal panel to the metal lift bail baffle. See Figure F.18.

SQUARE WAVE TIG 275

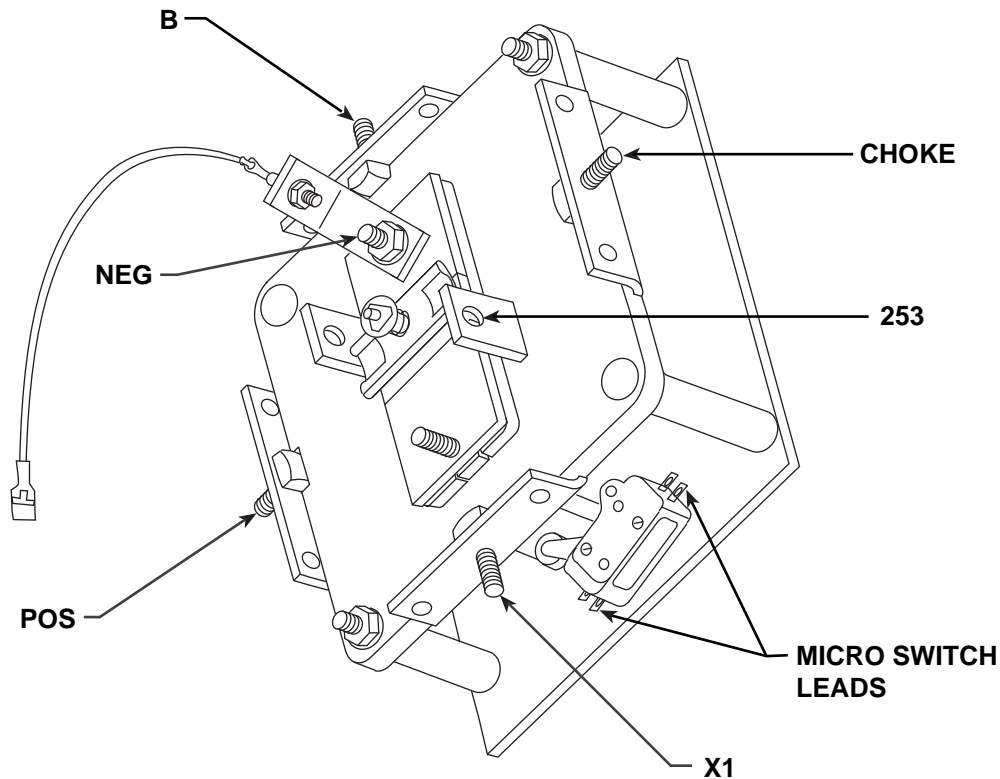




# TROUBLESHOOTING & REPAIR

## MAIN TRANSFORMER AND OUTPUT CHOKE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

FIGURE F.19 – POLARITY SWITCH CONNECTIONS



20. Using the 3/8" wrench, remove the two screws holding the left side panel to the base of the machine. See **Figure F.18**.
21. With the 1/2" wrench, disconnect the shunt assembly from the choke lead.
22. Carefully slide the panel away from the transformer about two inches.
23. Remove the left side choke glastic baffle.
24. Remove leads #314 and #316 from the choke thermostat. See the Wiring Diagram.
25. Remove lead #315 and #316 from the X1 secondary lead thermostat. See the Wiring Diagram.
26. Disconnect the primary thermostat lead splices #313 and #315. See the Wiring Diagram.
27. With the 9/16" wrench, remove the four nuts from the transformer mounting studs. See **Figure F.18**.
28. Carefully lift the transformer and choke assembly from the machine base. Clear all leads.

SQUARE WAVE TIG 275



## TROUBLESHOOTING & REPAIR

### MAIN TRANSFORMER AND OUTPUT CHOKE ASSEMBLY REMOVAL AND REPLACEMENT (*continued*)

#### Reassembly Procedure

Refer to Figures F.17 - F.19.

1. Set the transformer onto the four mounting studs on the base. Attach the four nuts.
2. Connect the lead splices to the three thermostats:
  - #313 and #315 to the primary thermostat.
  - #315 and #316 to the X1 secondary thermostat
  - #314 and #316 to the choke thermostat.
3. Attach the shunt assembly to the choke lead.
4. Attach the lead side panel to the base with two screws.
5. Attach the left side panel to the metal lift bail baffle.
6. Connect the X1 transformer lead and the choke lead to the polarity switch.
7. Connect the H1 primary lead to the input line switch.
8. Fit the choke baffle and glastic reconnect panel together and attach them with screws.
9. Attach the H1 capacitor lead to the capacitor terminal.
10. Connect the transformer primary leads to the reconnect panel studs.
11. Feed the following leads through the internal panel and attach them as follows:
  - #211 and #232A at the quick-connects
  - #231B to the receptacle
  - 232B to the circuit breaker
  - #212, #201, #204, #209, #210, #231 at molex plug J8. See **Figure F.17**.
  - Install plug J8 into the control board.
12. Install necessary cable ties.
13. Perform the **SCR Bridge Assembly** reassembly procedure.

SQUARE WAVE TIG 275



# TROUBLESHOOTING & REPAIR

## 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.

INPUT IDLE AMPS		
Input Volts/Hertz	Maximum Idle Amps (without PFC)	Maximum Idle Amps (with PFC)
208/60	5	38
230/60	4	35
460/60	2	18

OPEN CIRCUIT VOLTAGES	
STICK MODE OCV	AC 70 - 74 VAC DC 56.5 - 61.5 VDC
TIG MODE OCV	AC 70 - 76 VAC DC 59 - 67 VDC

MAXIMUM ACCEPTABLE OUTPUT VOLTAGE - AT MINIMUM OUTPUT SETTINGS	
DC TIG Mode	5 Amps @ 13 Volts

MINIMUM ACCEPTABLE OUTPUT VOLTAGE - AT MAXIMUM OUTPUT SETTING	
DC TIG Mode	300 Amps @ 32 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.**

SQUARE WAVE TIG 275



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

SQUARE WAVE TIG 275



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**TABLE OF CONTENTS**  
**ELECTRICAL DIAGRAMS SECTION**

---

<b>Electrical Diagrams Section .....</b>	<b>Section G</b>
Wiring Diagram (L10747).....	G-2
Wiring Diagram (L10747-2) .....	G-3
Control Board Schematic (G3358-1) .....	G-4
Control Board Schematic (G3358-2) .....	G-5
Display Board Schematic (L10768) .....	G-6
Bypass Board Schematic (S22530).....	G-7
Display Board Layout (L10770-1).....	G-8
Control Board Layout (G3360-1) .....	G-9
Bypass Board Layout (L10121-1).....	G-10

Return to Master TOC

Return to Master TOC

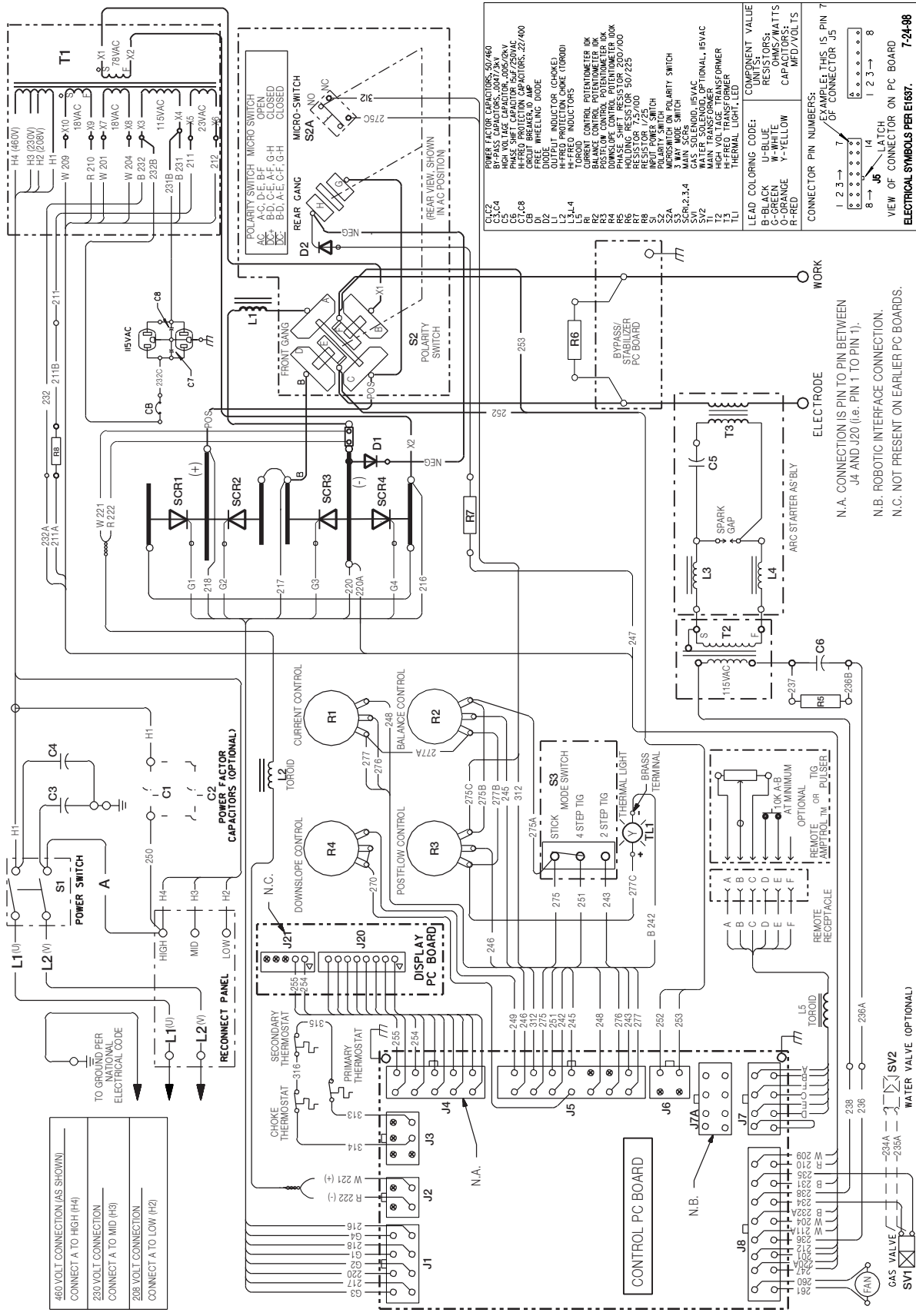
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Wiring Diagram (L10747)

Return to Section TOC
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Return to Section TOC



460 VOLT CONNECTION (AS SHOWN)
CONNECT A TO HIGH (H4)
230 VOLT CONNECTION
CONNECT A TO MID (H3)
208 VOLT CONNECTION
CONNECT A TO LOW (H2)

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

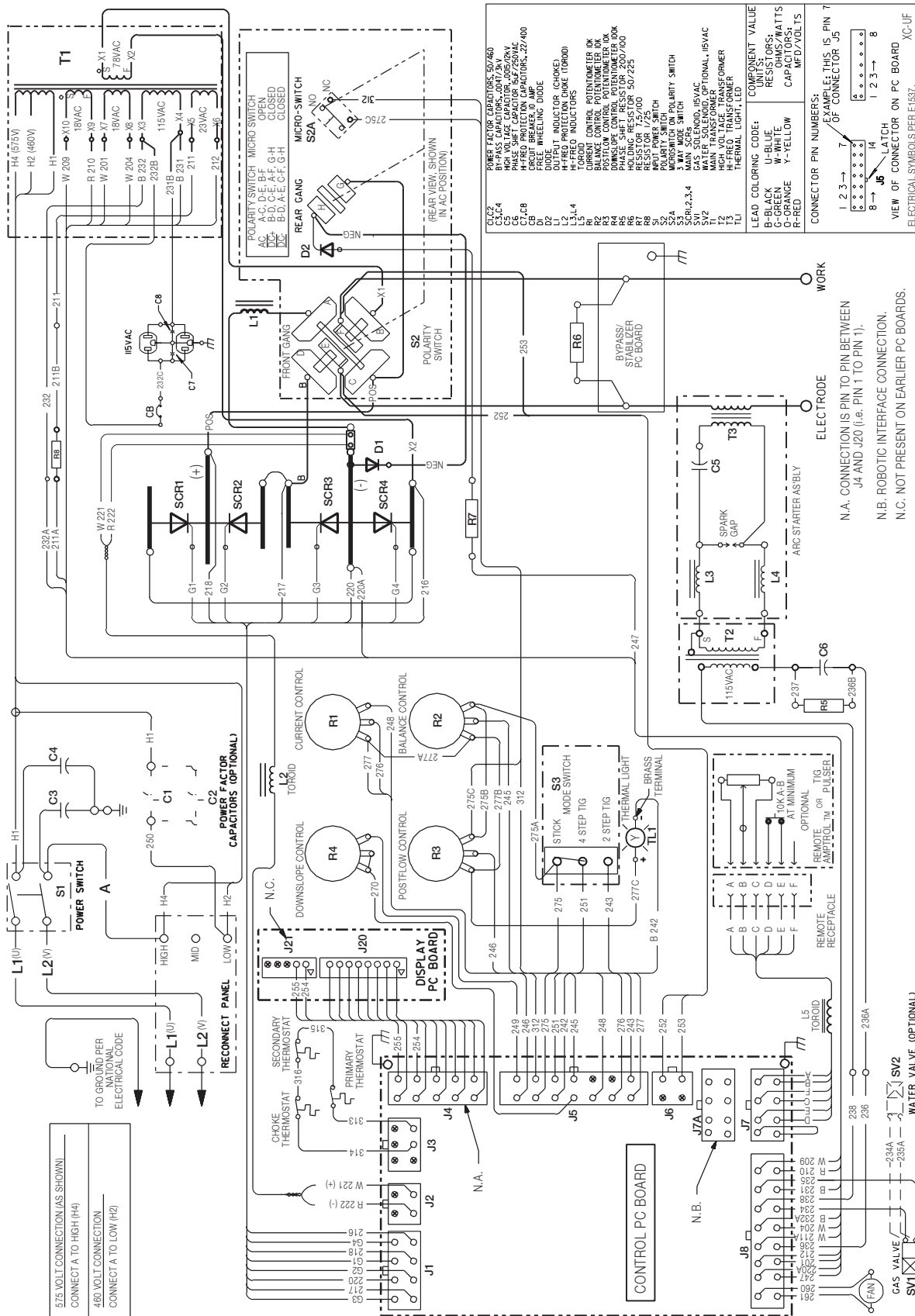
SQUARE WAVE TIG 275



L10747
7-24-98

- Component list including: CL2,C4; C5; C6; C7,C8; CB; D1; D2; D3; D4; DIODE; D5; DIODE; DIODE; D6; DIODE; D7; DIODE; D8; DIODE; D9; DIODE; D10; DIODE; D11; DIODE; D12; DIODE; D13; DIODE; D14; DIODE; D15; DIODE; D16; DIODE; D17; DIODE; D18; DIODE; D19; DIODE; D20; DIODE; D21; DIODE; D22; DIODE; D23; DIODE; D24; DIODE; D25; DIODE; D26; DIODE; D27; DIODE; D28; DIODE; D29; DIODE; D30; DIODE; D31; DIODE; D32; DIODE; D33; DIODE; D34; DIODE; D35; DIODE; D36; DIODE; D37; DIODE; D38; DIODE; D39; DIODE; D40; DIODE; D41; DIODE; D42; DIODE; D43; DIODE; D44; DIODE; D45; DIODE; D46; DIODE; D47; DIODE; D48; DIODE; D49; DIODE; D50; DIODE; D51; DIODE; D52; DIODE; D53; DIODE; D54; DIODE; D55; DIODE; D56; DIODE; D57; DIODE; D58; DIODE; D59; DIODE; D60; DIODE; D61; DIODE; D62; DIODE; D63; DIODE; D64; DIODE; D65; DIODE; D66; DIODE; D67; DIODE; D68; DIODE; D69; DIODE; D70; DIODE; D71; DIODE; D72; DIODE; D73; DIODE; D74; DIODE; D75; DIODE; D76; DIODE; D77; DIODE; D78; DIODE; D79; DIODE; D80; DIODE; D81; DIODE; D82; DIODE; D83; DIODE; D84; DIODE; D85; DIODE; D86; DIODE; D87; DIODE; D88; DIODE; D89; DIODE; D90; DIODE; D91; DIODE; D92; DIODE; D93; DIODE; D94; DIODE; D95; DIODE; D96; DIODE; D97; DIODE; D98; DIODE; D99; DIODE; D100; DIODE.

Wiring Diagram (L10747-2)



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

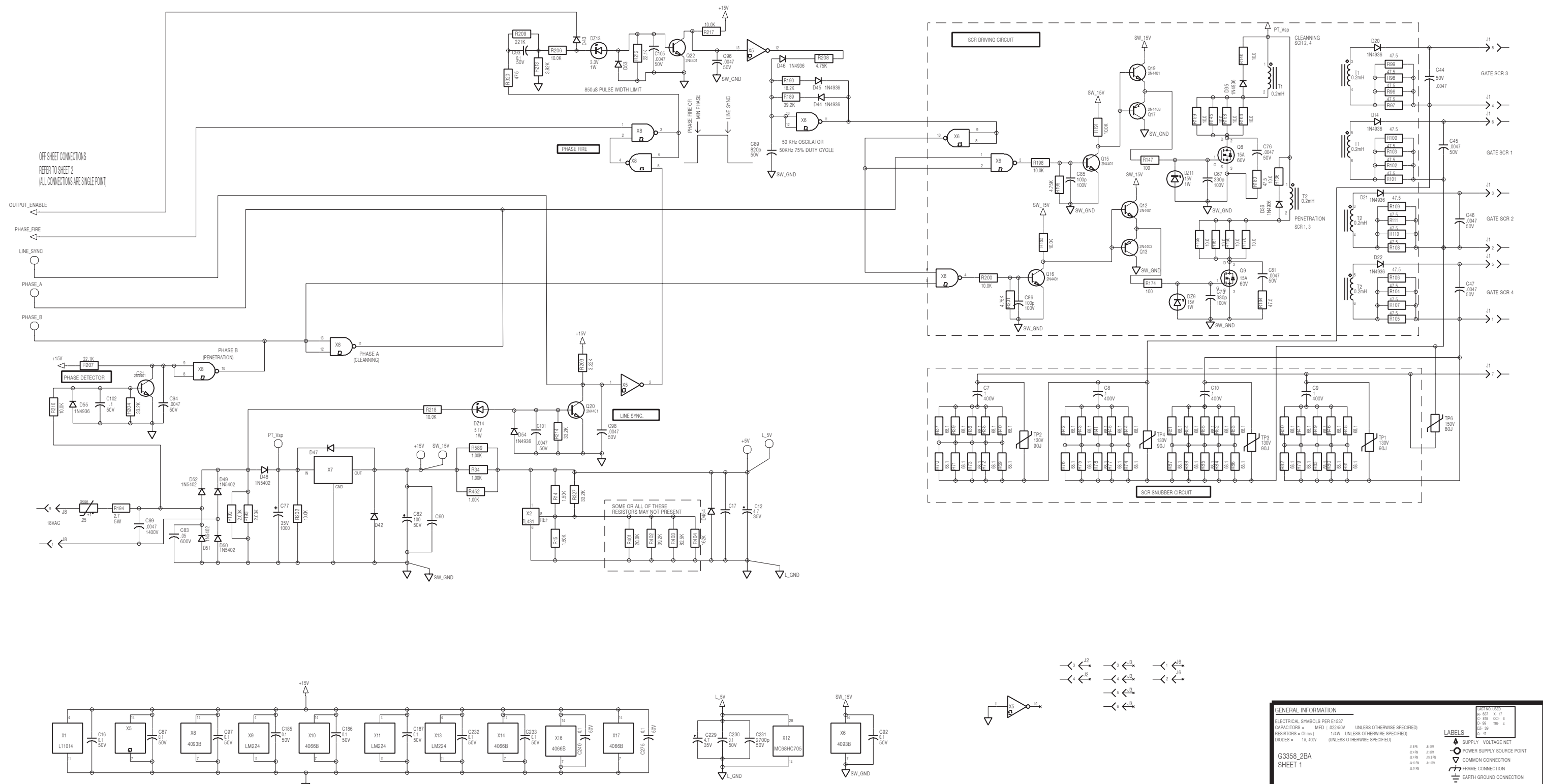
SQUARE WAVE TIG 275



Return to Section TOC

Return to Master TOC

Control Board Schematic (G3358-1)



OFF SHEET CONNECTIONS  
REFER TO SHEET 2  
(ALL CONNECTIONS ARE SINGLE POINT)

OUTPUT\_ENABLE  
PHASE\_FIRE  
LINE\_SYNC  
PHASE\_A  
PHASE\_B

+15V  
22.1K  
R207  
PHASE DETECTOR

PHASE B (PENETRATION)  
PHASE A (CLEANING)

18VAC  
R196  
C99  
C87  
C88  
C89  
C90  
C91  
C92  
C93  
C94  
C95  
C96  
C97  
C98  
C99

PT\_Vsp  
D47  
D48  
D49  
D50  
D51  
D52  
D53  
D54

SW\_15V  
SW\_GND  
L\_5V  
L\_GND

PHASE FIRE  
PHASE FREQ  
LINE SYNC

SCR DRIVING CIRCUIT  
SCR SNUBBER CIRCUIT

GATE SCR 1  
GATE SCR 2  
GATE SCR 3  
GATE SCR 4

TP1  
TP2  
TP3  
TP4  
TP5  
TP6

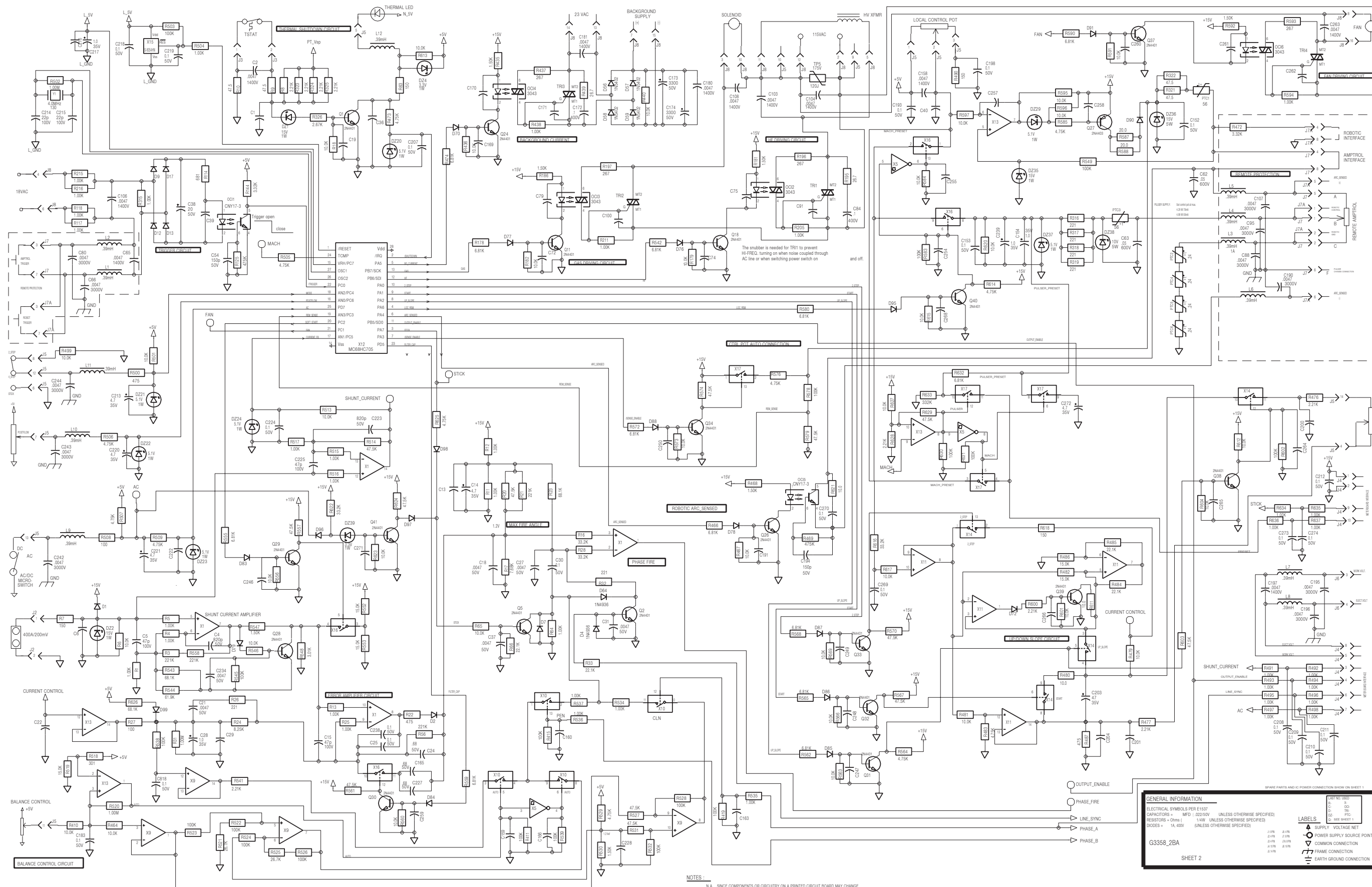
GENERAL INFORMATION  
ELECTRICAL SYMBOLS PER E1637  
CAPACITORS = MFD (0.02-50V UNLESS OTHERWISE SPECIFIED)  
RESISTORS = Ohms ( 1/4W UNLESS OTHERWISE SPECIFIED)  
DIODES = 1A, 400V (UNLESS OTHERWISE SPECIFIED)

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

NOTES:  
N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.



Control Board Schematic (G3358-2)



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



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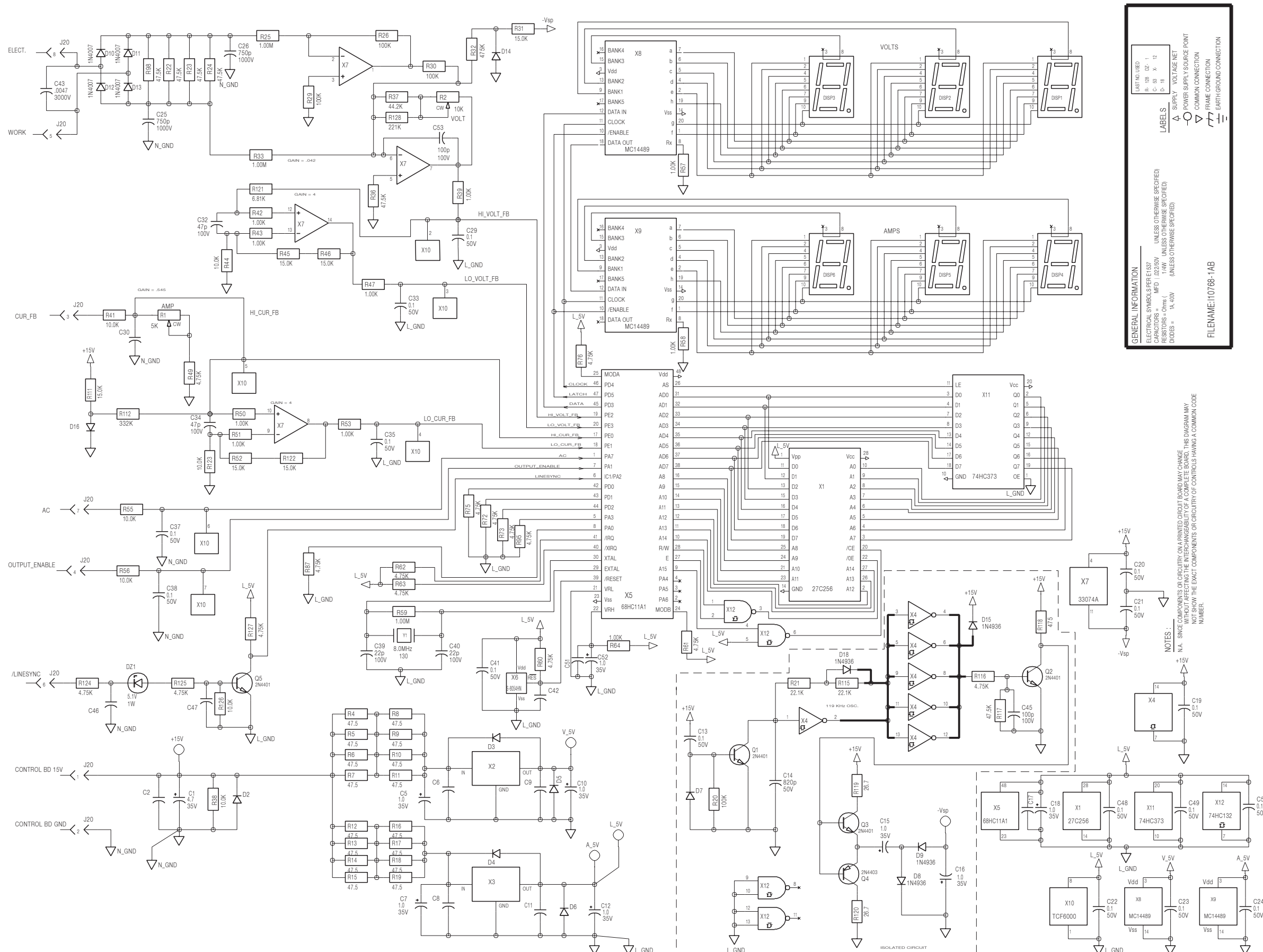
Return to Section TOC

Return to Master TOC

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Return to Master TOC

Display Board Schematic (L10768)



**GENERAL INFORMATION**

ELECTRICAL SYMBOLS REFER TO: UNLESS OTHERWISE SPECIFIED

CAPACITORS = MFD 102/50V UNLESS OTHERWISE SPECIFIED

RESISTORS = Ohms 1.4W UNLESS OTHERWISE SPECIFIED

DIODES = 1A 400V UNLESS OTHERWISE SPECIFIED

FILENAME: L10768-1AB

**LEGEND**

▲ SUPPLY VOLTAGE NET

○ POWER SUPPLY SOURCE POINT

□ COMMON CONNECTION

▭ FRAME CONNECTION

⊕ EARTH GROUND CONNECTION

**NOTES:**

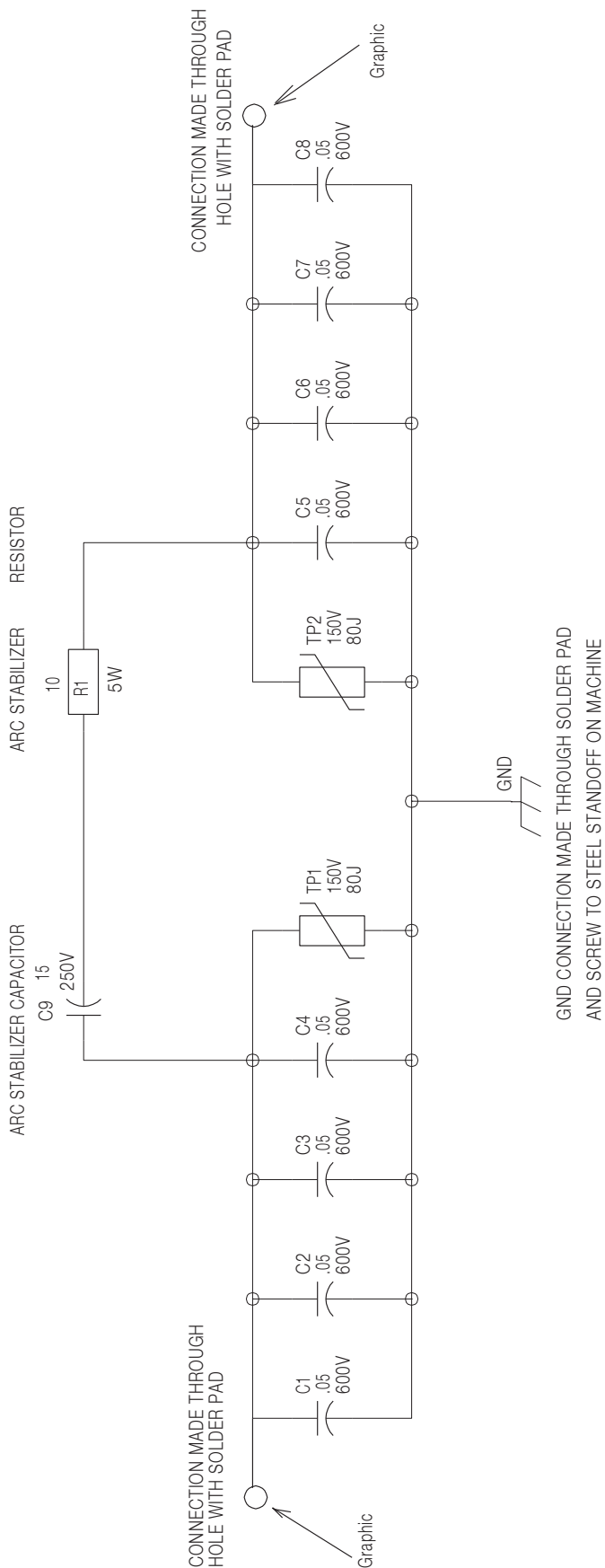
N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGIBILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

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



Return to Section TOC

## Bypass Board Schematic (S22530)



SQUARE WAVE TIG 275



**NOTES:**

N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

**GENERAL INFORMATION**

ELECTRICAL SYMBOLS PER E1537

CAPACITORS = MFD (.002/50V UNLESS OTHERWISE SPECIFIED)

RESISTORS = Ohms ( 1/4W UNLESS OTHERWISE SPECIFIED)

DIODES = 1A, 400V (UNLESS OTHERWISE SPECIFIED)

**LABELS**

▲ SUPPLY VOLTAGE NET

○ POWER SUPPLY SOURCE POINT

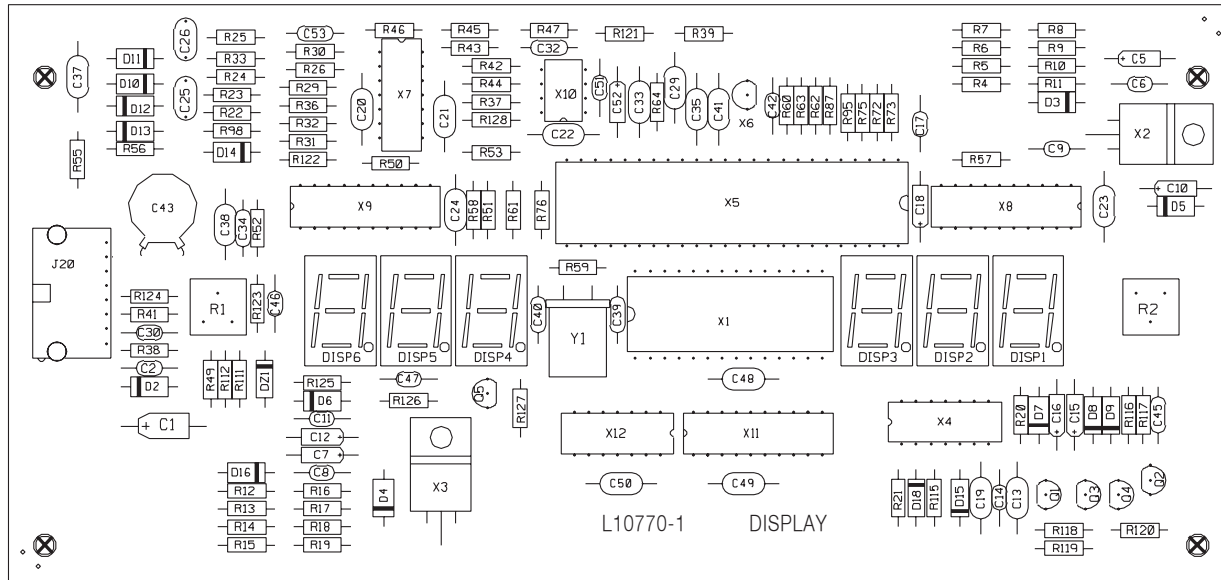
▽ COMMON CONNECTION

⎓ FRAME CONNECTION

⎓ EARTH GROUND CONNECTION

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

Display Board Layout (L10770-1)



ITEM	REQ'D	PART NO.	DESCRIPTION
C 1	1	S 13490-25	4. 7/35
C 2, C 6, C 8, C 9, C 11, C 17, C 30 C 42, C 46, C 47, C 51	11	S 16668-5	. 022/50
C 5, C 7, C 10, C 12, C 15, C 16, C 18 C 52	8	S 13490-42	1. 0/35
C 13, C 19, C 20, C 21, C 22, C 23 C 24, C 29, C 33, C 35, C 37, C 38 C 41, C 48, C 49, C 50	16	S 16668- 11	. 1/50
C 14	1	S 16668- 7	820pF/50
C 25, C 26	2	T 11577- 54	750pF/ 1000V CAPACIT OR
C 32, C 34	2	S 16668- 2	47pF/ 100
C 39, C 40	2	S 16668- 1	22pF/ 100
C 43	1	T 11577- 58	. 0047/3000V
C 45, C 53	2	S 16668- 3	100pF/ 100
D 2, D 3, D 4, D 5, D 6, D 7, D 14, D 16 D 8, D 9, D 15, D 18	8	T 12199- 1	1N4004
D 10, D 11, D 12, D 13	4	T 12705- 34	1N4936
D 10, D 11, D 12, D 13	4	T 12199- 2	1N4007
DI SP 1, DI SP 2, DI SP 3, DI SP 4 DI SP 5, DI SP 6	6	S 17395- 2	DI SPLAY
DZ 1	1	T 12702- 52	1N4733A
J20	1	S 19365- 8	RI GH T ANGLE HEADER
Q 1, Q 2, Q 3, Q 5	4	T 12704- 68	2N440 1
Q 4	1	T 12704- 69	2N4403
R 1	1	T 10812- 36	5K 1/2W TRIMMER
R 2	1	T 10812- 41	10K 1/2W TRIMMER
R 4, R 5, R 6, R 7, R 8, R 9, R 10, R 11 R 12, R 13, R 14, R 15, R 16, R 17 R 18, R 19	16	S 19400- 47R5	47. 5 1/4W
R 20, R 26, R 29, R 30	4	S 19400- 1003	100K 1/4W
R 21, R 115	2	S 19400- 2212	22. 1K 1/4W
R 22, R 23, R 24, R 36, R 98, R 117	6	S 19400- 4752	47. 5K 1/4W
R 25, R 33, R 59	3	S 19400- 1004	1M 1/4W
R 31, R 45, R 46, R 52, R 111, R 122	6	S 19400- 1502	15K 1/4W
R 32	1	S 19400- 4753	475K 1/4W
R 37	1	S 19400- 4422	44. 2K 1/4W
R 38, R 41, R 44, R 55, R 56, R 123 R 126	7	S 19400- 1002	10K 1/4W
R 39, R 42, R 43, R 47, R 50, R 51 R 53, R 57, R 58, R 64	10	S 19400- 100 1	1K 1/4W
R 49, R 60, R 61, R 62, R 63, R 72 R 73, R 75, R 76, R 87, R 95, R 116 R 124, R 125, R 127	15	S 19400- 475 1	4. 75K
R 112	1	S 19400- 3323	332K 1/4W
R 118	1	S 19400- 4750	475 1/4W
R 119, R 120	2	S 19400- 26R7	26. 7 1/4W
R 121	1	S 19400- 68 11	6. 81K 1/4W
R 128	1	S 19400- 2213	221K 1/4W
X 1	1	S 24056- 2	ROM ASSEMBLY
X 2, X 3	2	S 15128- 5	+5V REG.
X 4	1	S 15018- 4	MC 14584 ( SS)
X 5	1	M 15101- 3	HI CH DENSIT Y CMOS MCU( SS)
X 6	1	M 15102- 3	RESET I. C. UNDERVOLT. SENSING CI R. ( SS)
X 7	1	S 15128- 18	QUAD- OP AMP
X 8, X 9	2	S 20496- 1	LED DRI VER ( SS)
X 10	1	S 15018- 18	I C, ARRAY, CLAMPING
X 11	1	S 17900- 5	TRI -STATE OCTAL LATCH ( SS)
X 12	1	S 17900- 24	QUAD 2-INPUT SCHMI TT TRI G- NAND ( SS)
Y 1	1	S 16665- 5	8. 0 MHZ

SQUARE WAVE TIG 275



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NOTE:  
L10770-1  
7-24-98

Return to Section TOC

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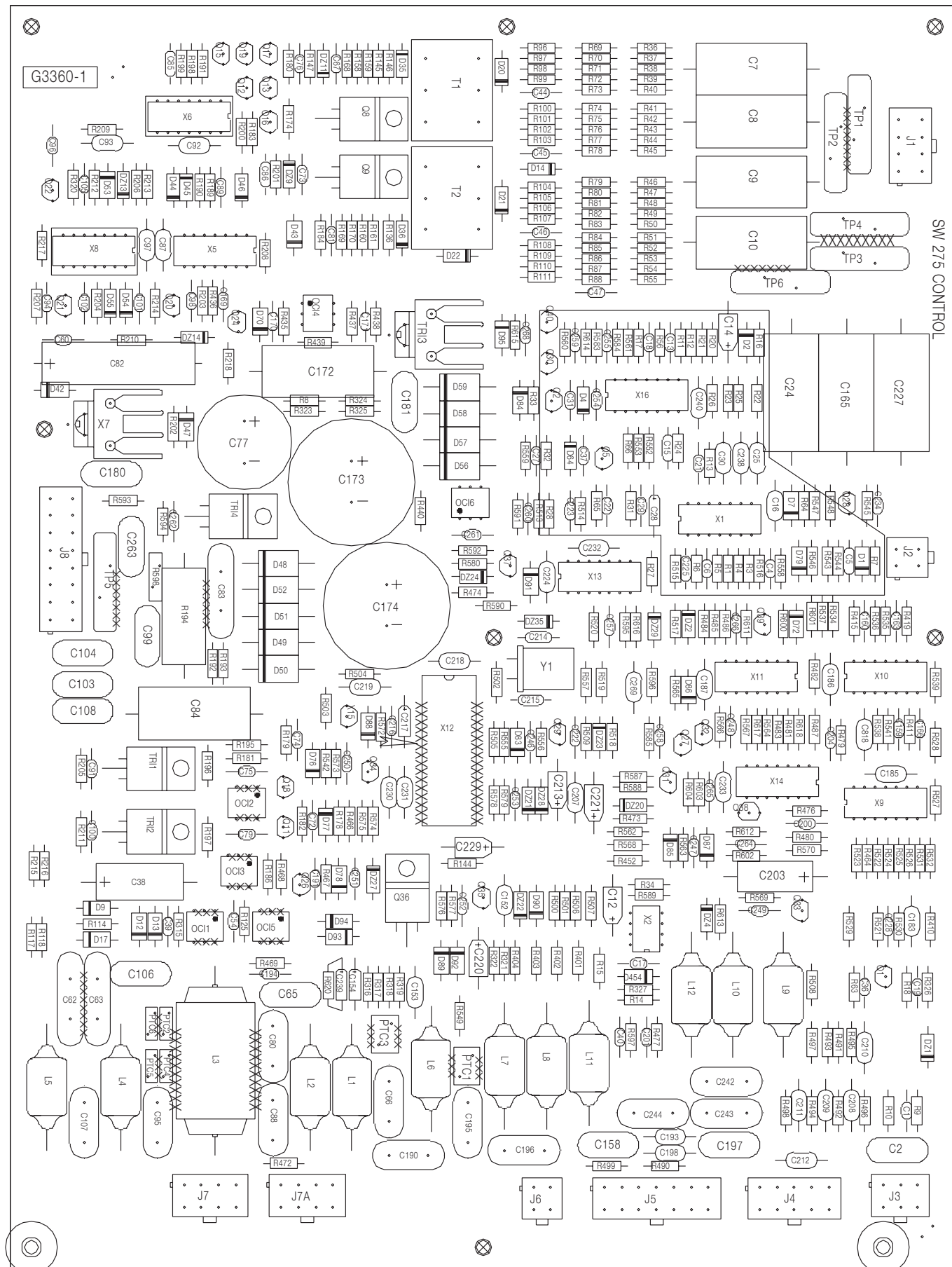
Return to Section TOC

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ITEM	REQ'D	PART NO.	DESCRIPTION
R17, R578	2	S19400-7681	7.68K 1/4W
R20, R514, R527, R531, R557	10	S19400-4752	47.5K 1/4W
R561, R567, R570, R577, R603	9	S19400-4750	475 1/4W
R22, R316, R317, R318, R319			
R320, R473, R487, R500			
R23, R543	2	S19400-6812	68.1K 1/4W
R24	1	S19400-8251	8.25K 1/4W
R26, R32	2	S19400-2210	22.1 1/4W
R27, R147, R174, R508	4	S19400-1000	100 1/4W
R31, R502, R520	3	S19400-1004	1M 1/4W
R33, R66, R207, R212, R484	6	S19400-2212	22.1K 1/4W
R485			
R36, R37, R38, R39, R40, R41			
R42, R43, R44, R45, R46, R47			
R48, R49, R50, R51, R52, R53			
R54, R55, R69, R70, R71, R72			
R73, R74, R75, R76, R77, R78			
R79, R80, R81, R82, R83, R84			
R85, R86, R87, R88			
R65, R482, R486, R519, R552	6	S19400-1502	15K 1/4W
R553			
R114	1	S19400-6810	681 1/4W
R125, R469	2	S19400-4753	475K 1/4W
R136, R145, R146, R158, R159			
R160, R161, R168, R169, R170			
R480, R611			
R144, R203, R468, R579	4	S19400-3321	3.32K 1/4W
R178, R466, R474, R542, R555			
R559, R562, R565, R568, R572			
R580, R590			
R189, R402	2	S19400-3922	39.2K 1/4W
R190	1	S19400-1822	18.2K 1/4W
R192, R193	2	S19400-2001	2.0K 1/4W
R194	1	T14648-21	2.7 5W
R195, R439	2	S19400-26R7	26.7 1/4W
R196, R197, R437, R490, R593			
R199, R201, R208, R473, R483			
R505, R506, R507, R509, R529			
R564, R576, R585, R614			
R213	1	S19400-3921	3.92K 1/4W
R26	1	S19400-2671	2.67K 1/4W
R401	1	S19400-2002	20K 1/4W
R403	1	S19400-8252	82.5K 1/4W
R404	1	S19400-1623	162K/25W
R411, R415, R419, R503, R522			
R523, R524, R526, R528, R532			
R535, R539, R545, R549, R583			
R518	1	S19400-3010	301 1/4W
R521, R525	2	S19400-2672	26.7K 1/4W
R544	1	S19400-6192	61.9K 1/4W
R548	1	S19400-3011	3.01K 1/4W
R587, R588	2	S19400-20R0	20 1/4W
R598	1	S18380-4	PTC THERM STOR
T1, T2	2	T12737-2	1/2 1/1
TP1, TP2, TP3, TP4	4	T13640-25	MOV, 50J
TP5	1	T13640-24	MOV, 120J
TP6	1	T13640-16	80J
TRI 1, TRI 2, TRI 4	3	S15161-23	T25000
TRI 3	1	S18395-20	TRI AC/HEAT SINK ASSEMBLY
X1	1	S15128-16	IC, L11014, LINEAR INTEGRATED
X2	1	S15128-10	IC, 431, VOLTAGE REF.
X5	1	S15018-4	MC14584 (SS)
X6, X8	2	S15018-15	14 PIN I.C. (SS)
X7	1	S18395-18	REGULATOR ASSEMBLY
X9, X11, X13	3	S15128-4	IC, LM224, OP-AMP
X10, X14, X16	3	S15018-6	DIGITAL INTEGRATED CIRCUIT (SS)
X12	1	S24117-1	ROM ASSEMBLY (SS)
X15	1	M15102-3	IC, SB0544H, CMOS, UNDERVOLT-SENSING (SS)
Y1	1	S16665-2	4.0 MHz

ITEM	REQ'D	PART NO.	DESCRIPTION
C1, C6, C13, C17, C19, C22, C29	51	S16668-5	.022/50
C36, C39, C40, C60, C72, C74			
C75, C79, C91, C100, C159, C160			
C163, C166, C169, C170, C171			
C191, C200, C201, C204, C216			
C222, C228, C245, C247, C248			
C249, C250, C251, C252, C253			
C254, C255, C257, C258, C259			
C260, C261, C262, C264, C265			
C266, C268			
C2, C65, C99, C103, C104, C106	12	T11577-52	.0047 or .005/1400
C108, C158, C180, C181, C197			
C269			
C4, C89, C223	3	S16668-7	820pF/50
C5, C15, C225	3	S16668-2	47pF/100
C7, C8, C9, C10, C84, C172	6	T11577-57	0.1/400
C12, C14, C213, C220, C221	6	S13490-25	4.7/35
C229			
C16, C25, C30, C87, C92, C93	31	S16668-11	.1/50
C97, C152, C153, C183, C185			
C186, C187, C193, C198, C207			
C208, C209, C210, C211, C212			
C218, C219, C224, C230, C232			
C233, C238, C240, C269, C818			
C18, C21, C27, C31, C37, C44			
C45, C46, C47, C76, C81, C94			
C96, C98, C101, C102, C105			
C24			
C24, C165, C227	3	S13490-70	.68/50
C28, C154, C217, C239	4	S13490-42	1.0/35
C38	1	S13490-73	20/50
C54, C194	2	S16668-9	150pF/100
C62, C63, C83	3	T11577-46	.05/600V
C66, C80, C88, C95, C107, C190	11	T11577-58	.0047/3000V
C195, C196, C242, C243, C244			
C67, C73	2	S16668-8	330pF/100
C77	1	S13490-121	1000/35
C82	1	S13490-71	100/50
C85, C86	2	S16668-3	100pF/100
C173, C174	2	S13490-92	3300/50
C203	1	S13490-66	47/35
C214, C215	2	S16668-1	220/100
C231	1	S16668-4	2700pF/50
D1, D2, D7, D9, D12, D13, D17	27	T12199-1	1N4004
D42, D43, D47, D53, D70, D72			
D76, D77, D78, D79, D83, D84			
D85, D86, D87, D88, D89, D91			
D90, D454			
D14, D20, D21, D22, D36, D36	13	T12705-34	1N4936
D44, D45, D46, D54, D55, D64			
D48, D49, D50, D51, D52, D56	9	T12705-14	DJ ODE
D57, D58, D59			
D90, D92, D93, D94	4	T12199-2	1N4007
DZ1, DZ2, DZ9, DZ11, DZ27, DZ35	6	T12702-29	1N4744A
DZ4, DZ13	2	T12702-53	1N4728A
DZ14, DZ20, DZ21, DZ22, DZ23	8	T12702-52	1N4733A
DZ24, DZ28, DZ29			
J1, J7, J7A	3	S18248-8	HEADER
J2, J6	2	S18248-4	HEADER
J3	1	S18248-6	HEADER
J4	1	S18248-10	HEADER
J5	1	S18248-14	HEADER
J8	1	S18248-16	HEADER
L1, L2, L4, L5, L6, L7, L8, L9	11	T12218-9	.39uH
L10, L11, L12			
L3	1	T12218-10	.39uH 1A
OC1, OC15	2	S15000-10	OPTO ISOLATOR
OC2, OC3, OC4, OC16	4	S15000-11	3043
PTC1, PTC3	2	S18380-1	PTC THERM STOR
PTC2, PTC4, PTC5, PTC6	4	S18380-5	PTC THERM STOR
Q1, Q2, Q5, Q11, Q12, Q15, Q16	25	T12704-68	2N4401
Q18, Q19, Q20, Q21, Q22, Q24			
Q26, Q28, Q29, Q30, Q31, Q32			
Q33, Q34, Q37, Q38, Q39, Q40			
Q8, Q9	2	T12704-54	N-CHANNEL FET (SS)
D13, D17, Q27, Q35	4	T12704-69	2N4403
Q36	1	T12704-58	-6A, -100V, P-CHANNEL (SS)
R1, R4, R5, R11, R12, R13, R25			
R34, R64, R117, R118, R205			
R211, R215, R216, R315, R438			
R452, R491, R492, R493, R494			
R495, R496, R497, R498, R504			
R515, R516, R517, R534, R535			
R536, R537, R574, R589, R594			
R3, R21, R56, R209, R595	5	S19400-2213	22.1K 1/4W
R6, R18, R179, R182, R183, R191			
R198, R200, R202, R206, R210			
R217, R218, R410, R436, R440			
R464, R467, R472, R481, R499			
R501, R513, R546, R556, R560			
R563, R566, R569, R573, R575			
R584, R591, R595, R596, R597			
R601, R604, R612, R613, R615			
R617, R620			
R7, R63, R618	3	S19400-1500	150 1/4W
R8, R323, R324, R325, R476	8	S19400-2211	2.2 1K 1/4W
R477, R541, R600			
R5, R10, R56, R97, R98, R99	22	S19400-47R5	47.5 1/4W
R100, R101, R102, R103, R104			
R105, R106, R107, R108, R109			
R110, R111, R180, R184, R321			
R322			
R14, R15, R181, R186, R435	8	S19400-1501	1.5K 1/4W
R530, R547, R592			
R16, R28, R204, R214, R327	6	S19400-3322	33.2K 1/4W
R616			

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



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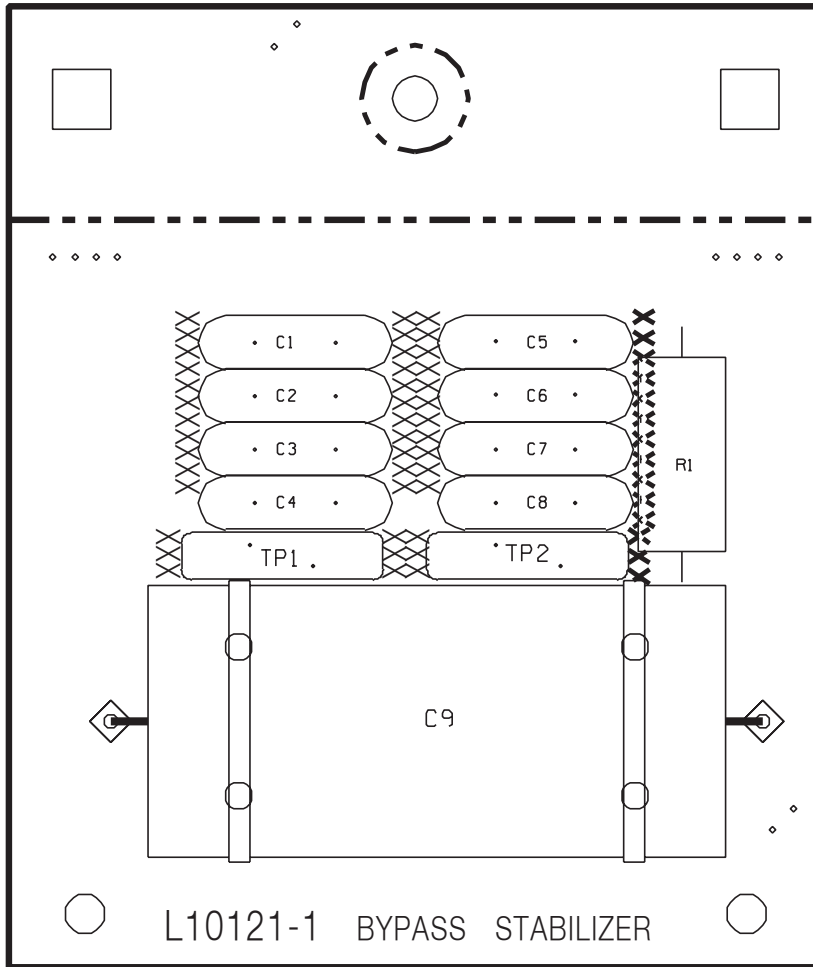
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Bypass Board Layout (L10121-1)



ITEM	REQ'D	PART NO.	IDENTIFICATION
C 1, C2, C3, C4, C5, C6, C7, C8	8	T 11577- 46	.05/600V
C9	1	S 13490- 155	15/250V
R 1	1	T 14648-25	10 5W
TP 1, TP2	2	T 13640- 16	150V, 80J

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

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