

# INSTALLATION - OPERATION MAINTAINANCE

DIRECT CURRENT  
POWER SOURCE

*Welders*

*used camlock leads connections*

*ST-301R*

*ST-401R*

*ST-501R*

*(INC. - HI - PRO.)*

# SECTION 1 - SAFETY RULES FOR OPERATION OF ARC WELDING MACHINE

## NOTE

This manual replaces ADE 872R, RECOMMENDED SAFE PRACTICES IN CUTTING & WELDING, AND ADI 1261E, ARC WELDING SAFETY RULES.

## S-INTRODUCTION

**WE LEARN BY EXPERIENCE.** Learning safety through personal experience, like a child touching a hot stove is harmful, wasteful, and unwise. Let the experience of others teach you.

**SAFE PRACTICES DEVELOPED FROM EXPERIENCE** in the use of welding and cutting are described in this manual. Research, development, and field experience have evolved reliable equipment and safe installation, operation, and servicing practices. Accidents occur when equipment is improperly used or maintained. The reason for the safe practices may not always be given. Some are based on common sense, others may require technical volumes to explain. It is wiser to follow the rules.

**READ AND UNDERSTAND THESE SAFE PRACTICES** before attempting to install, operate, or service the equipment. Comply with these procedures as applicable to the particular equipment used and their instruction manuals, for personal safety and for the safety of others.

**FAILURE TO OBSERVE THESE SAFE PRACTICES** may cause serious injury or death. When safety becomes a habit, the equipment can be used with confidence.

**RESPONSIBILITIES OF INSTALLER, USER, AND SERVICEMAN.** Installation, operation, checking, and repair of this equipment must be done only by a competent person, experienced with such equipment.

**THESE SAFE PRACTICES ARE DIVIDED** into two Sections: 1 - General Precautions, common to arc welding and cutting; and 2 - Arc Welding (and Cutting) (only).

**REFERENCE STANDARDS:** Published Standards on safety are also available for additional and more complete procedures than those given in this manual. They are listed in the Standards Index in this manual. ANSI Z49.1 is the most complete.

The National Electrical Code, Occupational Safety and Health Administration, local industrial codes, and local inspection requirements also provide a basis for equipment installation, use, and service.

## S-1 GENERAL PRECAUTIONS

### S1.1 BURN PREVENTION

**S1.1.1 Wear Protective Clothing** — leather (or asbestos) gauntlet gloves, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

**S1.1.2 Wear Helmet with Safety Goggles or Glasses** with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a MUST for welding or cutting, (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. See S2.1.4.6.

**S1.1.3 Avoid Oily or Greasy Clothing.** A spark may ignite them.

**S1.1.4 Hot Metal** such as electrode welding rod stubs and workpieces should never be handled without gloves.

**S1.1.5 Medical First Aid and Eye Treatment.** First aid facilities and a qualified first aid person should be available for each shift unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns.

**S1.1.6 Ear Plugs** should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.

**S1.1.7 Flammable Hair Preparations** should not be used by persons intending to weld or cut.

### S1.2 TOXIC FUME PREVENTION

**S1.2.1 Adequate Ventilation.** Severe discomfort, illness or death can result from fumes, vapors, heat, or oxygen enrichment or depletion that welding (or cutting) may produce. Prevent them with adequate ventilation as described in ANSI Standard Z49.1 listed 1 in Standards index. NEVER ventilate with oxygen.

**S1.2.2 Lead-, Cadmium-, Zinc-, Mercury-, and Beryllium-bearing** and similar materials, when welded (or cut) may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air-supplied respirator. For beryllium, both must be used.

**S1.2.3 Metals Coated** with or containing materials that emit toxic fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator.

**S1.2.4 Work in a Confined Space** only while it is being ventilated and, if necessary, while wearing an air-supplied respirator.

**S1.2.5 Gas Leaks in a Confined Space** should be avoided. Leaked gas in large quantities can reduce oxygen concentration dangerously. Do not bring gas cylinders into a confined space.

**S1.2.6 Leaving Confined Space,** shut OFF gas supply at source. The space will then be safe to re-enter, if downstream valves have been accidentally opened or left open.

**S1.2.7 Vapors from Chlorinated Solvents** can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and other lung- and eye-irritating products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapors to form phosgene. **DO NOT WELD** or cut where solvent vapors can be drawn into the welding or cutting atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

### S1.3 FIRE AND EXPLOSION PREVENTION

**S1.3.1 Causes of Fire** and explosion are: combustibles reached by the arc, flame, flying sparks, hot slag or heated material; misuse of compressed gases and cylinders; and short circuits.

**BE AWARE THAT:** flying sparks or falling slag can pass through cracks, along pipes, through windows or doors, and through wall or floor openings, out of sight of the goggled operator. Sparks and slag can fly 35 feet.

To prevent fires and explosion:

**S1.3.2 Keep Equipment Clean and Operable,** free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits.

**S1.3.3 If Combustibles Are In Area,** do NOT weld or cut. Move the work if practicable, to an area free of combustibles. Avoid paint spray rooms, dip tanks, storage areas, ventilators. If the work can not be moved, move combustibles at least 35 feet away out of reach of sparks and heat; or protect against ignition with suitable and snug-fitting, fire-resistant covers or shields.

**S1.3.4 Walls Touching Combustibles** on opposite sides should not be welded on (or cut). Walls, ceilings, and floor near work should be protected by heat-resistant covers or shields.

**S1.3.5 Fire Watcher** must be standing by with suitable fire-extinguishing equipment during and for some time after welding or cutting if:

- combustibles (including building construction) are within 35 feet
- combustibles are further than 35 feet but can be ignited by sparks
- openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks
- combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

**S1.3.6 Hot Work Permit** should be obtained before operation to ensure supervisor's approval that adequate precautions have been taken.

**S1.3.7 After Work is Done**, check that area is free of sparks, glowing embers, and flames

**S1.3.8 An Empty Container That Held Combustibles**, or can produce flammable vapors when heated, must never be welded on or cut, unless container has first been cleaned as described in AWS Standard A6.0, listed 3 in Standards index. This includes: a thorough steam or caustic cleaning (or a solvent or water washing, depending on the combustible's solubility) followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment as recommended in A6.0. Waterfilling just below working level may substitute for inerting.

**S1.3.9 A Container With Unknown Contents** should be cleaned (see paragraph above). Do NOT depend on sense of smell or sight to determine if it is safe to weld or cut.

**S1.3.10 Hollow Castings or Containers** must be vented before welding or cutting. They can explode.

**S1.3.11 Explosive Atmospheres**. Never weld or cut where the air may contain flammable dust, gas, or liquid vapors (such as gasoline).

#### **S1.4 COMPRESSED GAS EQUIPMENT**

**S1.4.1 Standard Precautions**. Comply with precautions in this manual, and those detailed in CGA Standard P-1, PRECAUTIONS FOR SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, listed 6 in Standards index.

##### **S1.4.2 Pressure Regulators**

**S1.4.2.1 Regulator Relief Valve** is designed to protect only the regulator from overpressure; it is not intended to protect any downstream equipment. Provide such protection with one or more relief devices.

**S1.4.2.2 Never Connect** a regulator to a cylinder containing gas other than that for which the regulator was designed.

**S1.4.2.3 Remove Faulty Regulator** from service immediately for repair (first close cylinder valve). The following symptoms indicate a faulty regulator:

*Leaks* — if gas leaks externally.

*Excessive Creep* — If delivery pressure continues to rise with downstream valve closed.

*Faulty Gauge* — If gauge pointer does not move off stop pin when pressurized, nor returns to stop pin after pressure release.

**S1.4.2.4 Repair**. Do NOT attempt repair. Send faulty regulators for repair to manufacturer's designated repair center, where special techniques and tools are used by trained personnel.

**S1.4.3 CYLINDERS Must Be Handled Carefully** to prevent leaks and damage to their walls, valves, or safety devices:

**S1.4.3.1 Avoid Electrical Circuit Contact** with cylinders including third rails, electrical wires, or welding circuits. They can produce short circuit arcs that may lead to a serious accident. (See S2.3.4).

**S1.4.3.2 ICC or DOT Marking** must be on each cylinder. It is an assurance of safety when the cylinder is properly handled.

**S1.4.3.4 Identifying Gas Content**. Use only cylinders with name of gas marked on them; do not rely on color to identify gas content. Notify supplier if unmarked. NEVER DEFACE or alter name, number, or other markings on a cylinder. It is illegal and hazardous.

**S1.4.3.4 Empties**: Keep valves closed, replace caps securely, mark MT; keep them separate from FULLS and return promptly.

**S1.4.3.5 Prohibited Use**. Never use a cylinder or its contents for other than its intended use. NEVER as a support or roller.

**S1.4.3.6 Secure from Falling**. Chain or secure cylinders upright when a regulator (and hose) are connected to it.

**S1.4.3.7 Passageways and Work Areas**. Keep cylinders clear of areas where they may be struck.

**S1.4.3.8 Transporting Cylinders**. With a crane, use a secure support such as a platform or cradle. Do NOT lift cylinders off the ground by their valves or caps, or by chains, slings, or magnets.

**S1.4.3.9 Do NOT Expose Cylinders To** excessive heat sparks, slag, and flame, etc. that may cause rupture. Do not allow contents to exceed 130°F. Cool with water spray where such exposure exists

**S1.4.3.10 Protect Cylinders. Particularly Valves** from bumps, falls, falling objects, and weather. Replace caps securely when moving cylinders.

**S1.4.3.11 Stuck Valve**. Do NOT use a hammer or metal wrench to open a cylinder valve that can not be opened by hand. Notify your supplier.

**S1.4.3.12 Mixing Gases**. Never try to mix any gases in a cylinder.

**S1.4.3.13 Never Refill Any Cylinder**.

**S1.4.3.14 Cylinder Fittings** should never be modified or exchanged.

##### **S1.4.4 Hose**

**S1.4.4.1 Prohibited Use**. Never use hose other than that designed for the specified gas. A general hose identification rule is red for fuel gas, green for oxygen, and black for inert gases

**S1.4.4.2 Use Ferrules or Clamps** designed for the hose (not ordinary wire or other substitute) as a binding to connect hoses to fittings.

**S1.4.4.3 No Copper Tubing Splices**. Use only standard brass fittings to splice hose.

**S1.4.4.4 Avoid Long Runs** to prevent kinks and abuse. Suspend hose off ground to keep it from being run over, stepped on, or otherwise damaged.

**S1.4.4.5 Coil Excess Hose** to prevent kinks and tangles

**S1.4.4.6 Protect Hose from Damage** by sharp edges, and by sparks, slag, and open flame.

**S1.4.4.7 Examine Hose Regularly** for leaks, wear, and loose connections. Immerse pressured hose in water; bubbles indicate leaks.

**S1.4.4.8 Repair Leaky or Worn Hose** by cutting area out and splicing (S1.4.4.3). Do NOT use tape

##### **S1.4.5 Proper Connections**

**S1.4.5.1 Clean Cylinder Valve Outlet** of impurities that may clog orifices and damage seats before connecting regulator. Except for hydrogen, crack valve momentarily, pointing outlet away from people and sources of ignition. Wipe with a clean lintless cloth.

**S1.4.5.2 Match Regulator to Cylinder**. Before connecting, check that the regulator label and cylinder marking agree, and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

**S1.4.5.3 Tighten Connections**. When assembling threaded connections, clean and smooth seats where necessary. Tighten. If connection leaks, disassemble, clean, and retighten. For metal-to-metal seating, use correct wrenches, available from your supplier. For O-ring connections, hand-tighten.

**S1.4.5.4 Adapters**. Use a CGA adapter (available from your supplier) between cylinder and regulator, if one is required. Use two wrenches to tighten adapter marked right and LEFT HAND threads.

**S1.4.5.5 Regulator Outlet (or Hose) Connections** may be identified by right hand threads for oxygen and left hand threads (with grooved hex on nut or shank) for fuel gas.

#### **S1.4.6 Pressurizing Steps:**

**S1.4.6.1 Drain Regulator** of residual gas through suitable vent before opening cylinder (or manifold valve) by turning adjusting screw in (clockwise). Draining prevents excessive compression heat at high pressure seat by allowing seat to open on pressurization. Leave adjusting screw engaged.

**S1.4.6.2 Before Opening Cylinder Valve**, check that hoses are connected and that downstream valves are closed.

**S1.4.6.3 Stand to Side of Regulator** before opening cylinder valve.

**S1.4.6.4 Open Cylinder Valve Slowly** so that regulator pressure increases slowly. When gauge is pressurized (gauge reaches regulator maximum) leave cylinder valve in following position: For oxygen, and inert gases, open fully to seal stem against possible leak. For fuel gas, open to less than one turn to permit quick emergency shutoff.

**S1.4.6.5 Use Pressure Charts** (available from your supplier) for safe and efficient, recommended pressure settings on regulators. It will reduce backfiring and change of flashbacks.

**S1.4.6.6 Check for Leaks** on first pressurization and regularly thereafter. Brush with soap solution (capful of Ivory Liquid\* or equivalent per gallon of water). Bubbles indicate leak. Clean off soapy water after test; dried soap is combustible.

**S1.5 USER RESPONSIBILITIES.** Remove leaky or defective equipment from service immediately and repair them only if recommended in equipment instruction manual. Send others for repair to manufacturer's designated repair center where special techniques and tools are used by trained personnel. Refer to User Responsibilities statement in equipment manual.

**S1.6 LEAVING EQUIPMENT UNATTENDED.** Close gas supply at source and drain gas.

**S1.7 ROPE STAGING-SUPPORT** should not be used for welding or cutting operation; rope may burn.

## **S-2 ARC WELDING**

Comply with precautions in S-1 and this section. Arc Welding, properly done, is a safe process, but a careless operator invites trouble. The equipment carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates, weldments are hot, and compressed gases may be used. The wise operator avoids unnecessary risks and protects himself and others from accidents. Precautions are described here and in standards referenced in index.

### **S2.1 BURN PROTECTION**

#### **S2.1.1 Comply With Precautions in S1.1**

**S2.1.2 The Welding Arc** is intense and visibly bright. Its radiation can damage eyes, penetrate lightweight clothing, reflect from light-colored surfaces, and burn the skin and eyes. Skin burns resemble acute sunburn, those from gas-shielded arcs are more severe and painful. **DON'T GET BURNED; COMPLY WITH PRECAUTIONS.**

#### **S2.1.3 Protective Clothing**

**S2.1.3.1 Wear Long-Sleeve Clothing** (particularly for gas-shielded arc) in addition to gloves, hat, and shoes (S1.1.1). As necessary, use additional protective clothing such as leather jacket or sleeves, flame-proof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton.

**S2.1.3.2 Bare Skin Protection.** Wear dark, substantial clothing. Button collar to protect chest and neck and button pockets to prevent entry of sparks.

#### **S2.1.4 Eye and Head Protection**

**S2.1.4.1 Protect Eyes From Exposure to Arc.** NEVER look at an electric arc without protection.

**S2.1.4.2 Welding Helmet or Shield** containing a filter plate shade no. 9 or denser must be used when welding. Place over face before striking arc.

**S2.1.4.3 Protect Filter Plate** with a clear cover plate.

**S2.1.4.4 Cracked or Broken Helmet** or shield should NOT be worn; radiation can pass through to cause burns.

**S2.1.4.5 Cracked, Broken, or Loose Filter Plates** must be replaced IMMEDIATELY. Replace clear cover plate when broken, pitted, or spattered.

**S2.1.4.6 Flash Goggles With Side Shields** MUST be worn under the helmet to give some protection to the eyes should the helmet not be lowered over the face before an arc is struck. Looking at an arc momentarily with unprotected eyes (particularly a high intensity gas-shielded arc) can cause a retinal burn that may leave a permanent dark area in the field of vision.

#### **S2.1.5 Protection of Nearby Personnel**

**S2.1.5.1 Enclosed Welding Area.** For production welding, a separate room or enclosed bay is best. In open areas, surround the operation with low-reflective, non-combustible screens or panels. Allow for free air circulation, particularly at floor level.

**S2.1.5.2 Viewing the Weld.** Provide face shields for all persons who will be looking directly at the weld.

**S2.1.5.3 Others Working in Area.** See that all persons are wearing flash goggles.

**S2.1.5.4 Before Starting to Weld**, make sure that screen flaps or bay doors are closed.

### **S2.2 TOXIC FUME PREVENTION**

#### **S2.2.1 Comply With Precautions in S1.2.**

**S2.2.2 Generator Engine Exhaust** must be vented to the outside air. Carbon monoxide can kill.

### **S2.3 FIRE AND EXPLOSION PREVENTION**

#### **S2.3.1 Comply With Precautions in S1.3**

**S2.3.2 Equipment's Rated Capacity.** Do not overload arc welding equipment. It may overheat cables and cause a fire.

**S2.3.3 Loose Cable Connections** may overheat or flash and cause a fire.

**S2.3.4 Never Strike An Arc On A Cylinder** or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

**S2.4 COMPRESSED GAS EQUIPMENT.** Comply with precautions in S1.4.

### **S2.5 SHOCK PREVENTION**

**Exposed Hot Conductors** or other bare metal in the welding circuit, or in ungrounded, electrically-HOT equipment can fatally shock a person whose body becomes a conductor. **DO NOT STAND, SIT, LIE, LEAN ON, OR TOUCH** a wet surface when welding, without suitable protection.

To protect against shock:

**S2.5.1 Keep Body and Clothing Dry.** Never work in damp area without adequate insulation against electrical shock. Stay on a dry duckboard, or rubber mat when dampness or sweat can not be avoided. Sweat, sea water, or moisture between body and an elec-

trically HOT part — or grounded metal — reduces the body-surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

### **S2.5.2 Grounding The Equipment**

**S2.5.2.1 When Installing**, connect the frames of each unit such as welding machine, control, work table, and water circulator to the building ground. Conductors must be adequate to carry ground currents safely. Equipment made electrically HOT by stray current may shock, possibly fatally. Do NOT GROUND to electrical conduit, or to a pipe carrying ANY gas or a flammable liquid such as oil or fuel.

**S2.5.2.2 Three-Phase Connection**. Check phase requirement of equipment before installing. If only 3-phase power is available, connect single-phase equipment to only two wires of the 3-phase line. Do NOT connect the equipment ground lead to the third (live) wire, or the equipment will become electrically HOT—a dangerous condition that can shock, possibly fatally.

**S2.5.2.3 Before Welding, Check Ground** for continuity. Be sure conductors are touching bare metal of equipment frames at connections.

**S2.5.2.4 If a Line Cord With a Ground Lead** is provided with the equipment for connection to a switchbox, connect the ground lead to the grounded switchbox. If a three-prong plug is added for connection to a grounded mating receptacle, the ground lead must be connected to the ground prong only. If the line cord comes with a three-prong plug, connect to a grounded mating receptacle. Never remove the ground prong from a plug, or use a plug with a broken off ground prong.

**S2.5.3 Fully Insulated Electrode Holders** should be used. Do NOT use holders with protruding screws.

**S2.5.4 Fully Insulated Lock-Type Connectors** should be used to join welding cable lengths.

**S2.5.5 Frequently Inspect Cables** for wear, cracks and damage. IMMEDIATELY REPLACE those with excessively worn or damaged insulation to avoid possibly-lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable.

**S2.5.6 Keep Cable Dry**, free of oil and grease, and protected from hot metal and sparks.

**S2.5.7 Terminals and Other Exposed Parts** of electrical units should have insulating covers secured before operation.

**S2.5.8 Electrode Wire** becomes electrically HOT when the power switch of gas metal-arc welding equipment is ON and welding gun trigger is pressed. Keep hands and body clear of wire and other HOT parts.

**S2.5.9 Safety Devices** such as interlocks and circuit breakers should not be disconnected or shunted out.

**S2.5.10 Before Installation, Inspection or Service**, of equipment, shut OFF all power and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding machine, and pull all 115 volt line-cord plugs.

**S2.5.11 Do Not Open Power Circuit Or Change Polarity While Welding**. If, in an emergency, it must be disconnected, guard against shock, burns, or flash from switch arcing.

**S2.5.12 Leaving Equipment Unattended**. Always shut OFF and disconnect all power to equipment.

**S2.5.13 Power Disconnect Switch** must be available near the welding machine power source.

### **STANDARDS BOOKLET INDEX**

For more information, refer to the following standards or their latest revisions and comply as applicable:

1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 2501 NW 7th St., Miami, Fla. 33125.
2. ANSI Standard Z87.1, PRACTICE FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.
3. American Welding Society Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable same as item 1.
4. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable from the National Fire Protection Association, 60 Batterymarch Street, Boston, Mass. 02110.
5. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable same as item 4.
6. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, N.Y. 10036.
7. OSHA Standard 29 CFR, Part 1910, Subpart O, WELDING, CUTTING AND BRAZING

THREE-PHASE, CONSTANT CURRENT ARC WELDERS

OPERATING AND MAINTENANCE INSTRUCTIONS

GENERAL

The three phase DC Silicon Rectifiers consist of a series of welders ranging from 300 amperes through 500 amperes. The design consists of a static three phase transformer, a saturable reactor control and a Silicon full wave rectifier for conversion to DC welding current.

Two wide ranges of welding heats are provided by the panel selector switch with generous overlap in each position. Adjustment is made continuously in each range by means of the rheostat control knob. A remote control foot or hand rheostat is available as an accessory for remote amperage adjustment.

These machines are equipped with hermetically sealed (Diode) Silicon Rectifiers, the most modern and efficient device known for conversion of AC to DC current. Silicon has an inherent non-aging characteristic which means that the power output of the welder will not drop or vary over a period of many years usage as occurs with other rectifying elements.

All DC models are built to NEMA standards with 60% industrial duty cycle ratings.

Quick acting CAM LOK fittings are furnished for each cable changes.

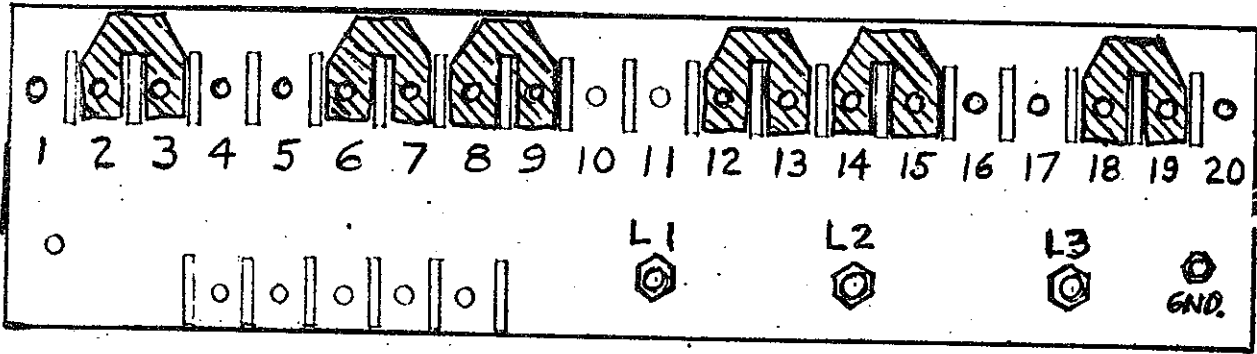
INSTALLATION

This model is skid mounted and may be bolted to the floor if desired. The area at the base of the welder must be kept clear so that cooling air can circulate properly. Fan cooled welders should not be mounted closer than 18" from the wall.

PRIMARY POWER CONNECTIONS

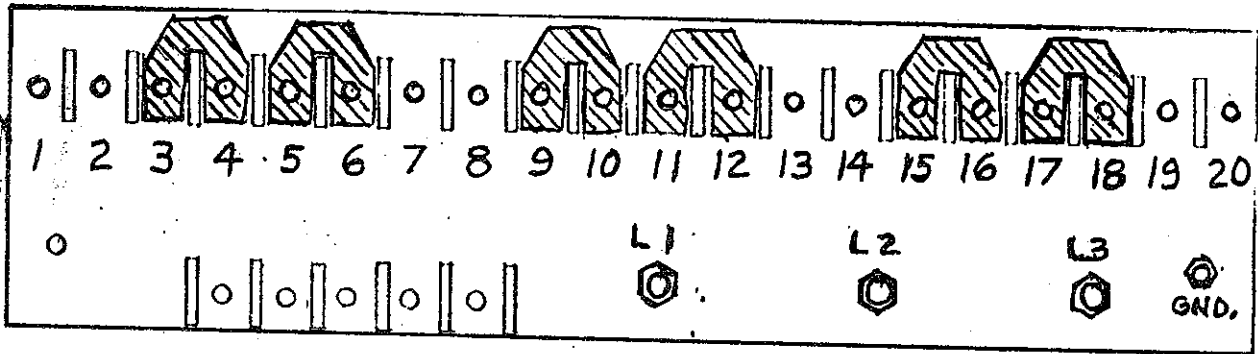
Standard models are provided with dual voltage primary coils for operation on 208, 230 or 460 volt, 3 Phase AC power lines. They are equipped with a voltage change over panel and are normally shipped connected for 460 volts, or in the case of special voltages, are connected for the higher voltage.

In order to re-connect machines for 208 or 230 volts, open rear panel door exposing the primary terminal panel. Remove the copper voltage change bars and re-position them as shown in Fig. 1. Be sure and tighten locking nuts down to avoid any loose connections. After bars have been changed, close access door and fasten with screws.



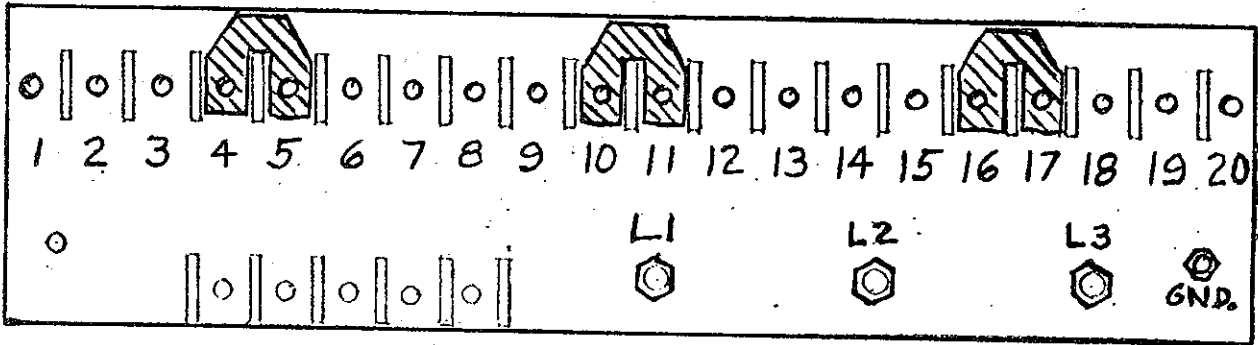
208 V.

3 PHASE



230 V.

3 PHASE

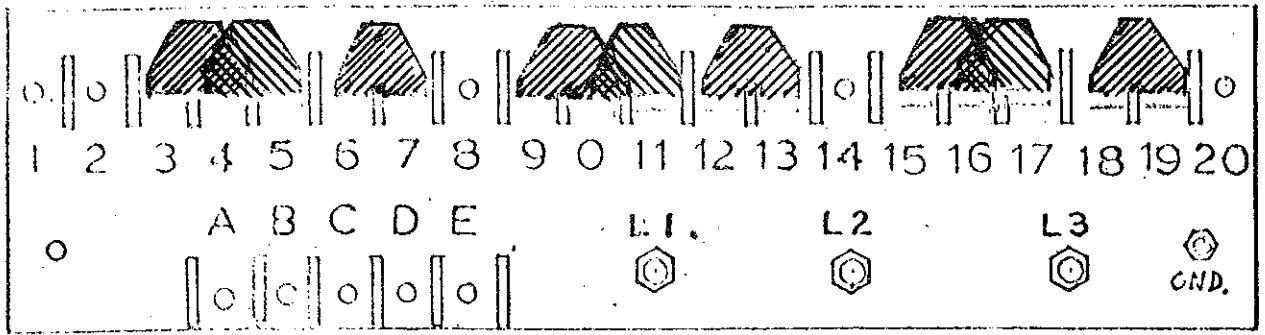


480 V.

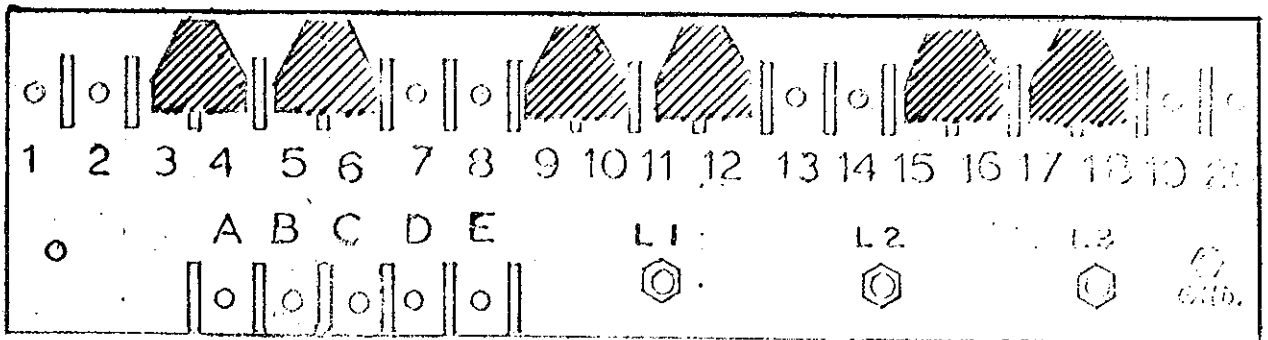
3 PHASE

TRI-VOLTAGE PANEL  
CONNECTIONS

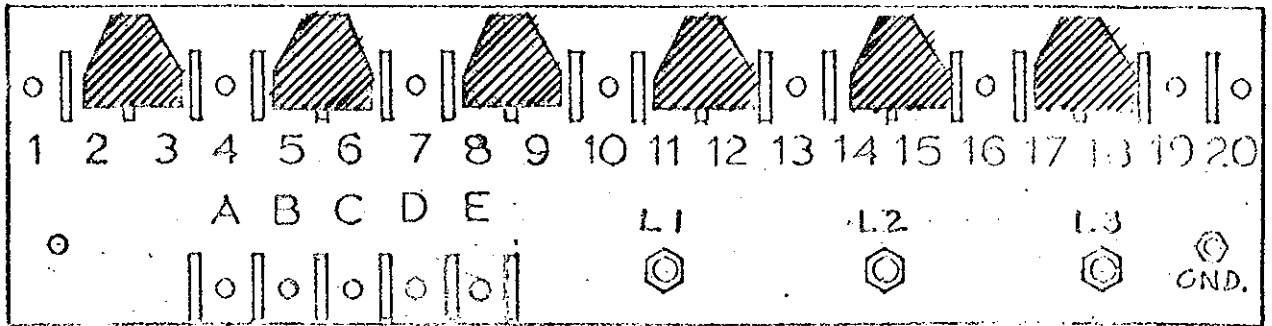
FIG 1



230 V. 3 PHASE



460 V. 3 PHASE



575 V. 3 PHASE

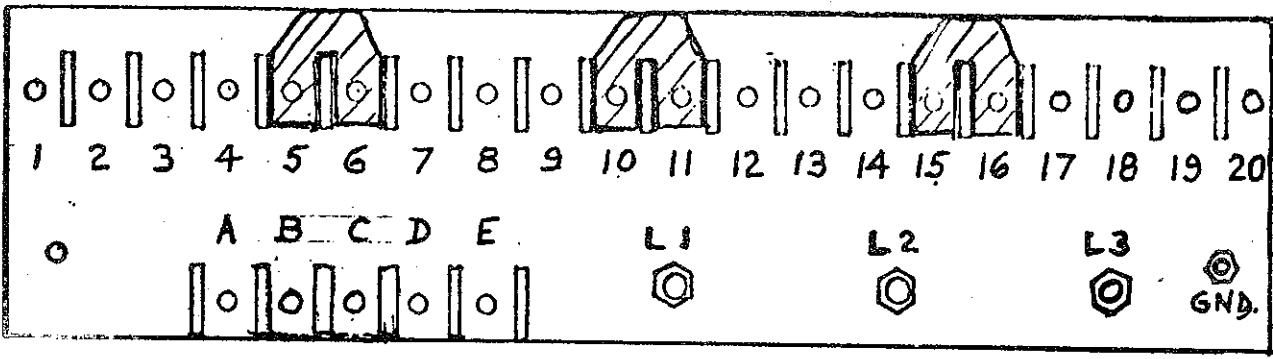
VOLTAGE CHANGE PANEL  
SIL-A-TRAN

230/460/575 V.

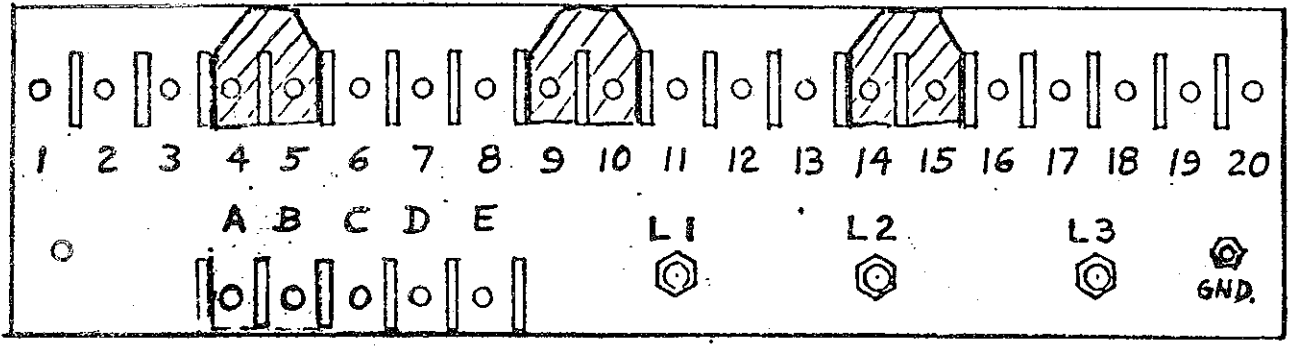
3 PH-WYE

Fig. 1 B





380 VOLTS



220 VOLTS

PRIMARY CONNECTIONS

FOR 220/380V. UNITS

3 PHASE - Δ-Y

SIL-A-TRAN

Bring primary power leads through entrance hole in rear of the cabinet and connect the three "HOT" wires to the line terminals, screws L1, L2, L3, one phase wire to each terminal.

The grounding wire (non-current carrying fourth lead) should be secured to the ground screw on the Terminal Panel. Close rear panel door and replace screws.

TABLE #1 shows the welder specifications and TABLE #2 the recommended wire and fuse sizes.

TABLE I  
SPECIFICATIONS

Rated 60% Duty Cyc. Amps.	Sec. Load Volts	Welding Current Range Medium High	Open Circ. Volts	Rated Primary 3 Phase 60 cycle Volts	Amps	KW	KVA
300	32	30-140	110-380	85	208/230/460	74/66/33	16 26
400	36	50-250	210-525	85	208/230/460	97/88/44	21 35
500	40	80-350	320-625	85	208/230/460	122/110/55	26 44

TABLE II  
RECOMMENDED WIRE AND FUSE SIZE

<u>CAPACITY</u>	<u>AWG WIRE SIZE</u>			<u>FUSE SIZE IN AMPS</u>		
	<u>208V</u>	<u>230V</u>	<u>460V</u>	<u>208V</u>	<u>230V</u>	<u>460V</u>
300	#4	#6	#8	100	90	45
400	#3	#4	#8	125	110	55
500	#1	#2	#6	175	150	80

SECONDARY POWER CONNECTIONS

Two CAM LOK plugs are furnished with welder for attachment to welding cable leads. Insert plugs in jacks provided on lower front panel, electrode holder lead on right hand side and ground lead on left hand side. Plugs lock securely in place by twisting in clockwise direction after inserting.

OPERATION

After line connections and voltage bar changes have been made as described above the welder is ready for operation.

Throwing the line switch on the front panel to the ON position starts the cooling fan and energizes the machine for welding.

A two position range switch is provided and should be set for the range of amperage necessary. Current settings in each range are made by totating rheostat control knob to desired position.

To change Polarity, plug in welding cables for DC straight or reverse. Depending on the electrode type or specific welding requirements.

IMPORTANT when operating range switch handle pointer on indicating arrow labeled on panel. Failure to do so will result in partial connections being made and can lead to burn out of the switch.

Do not move switch handles while operator is welding.

This welder is designed for remote amperage control by either a hand or foot control (available at extra cost).

Simply plug in remote unit in panel receptacle marked "REMOTE CONTROL" (Jack Plug). In this position the welding current can be adjusted by operating the remote control rheostat. However, the setting of the panel rheostat will limit the maximum heat available in any one range. If full amperage is required, be sure to set panel rheostat wide open, thus giving full remote control from maximum down to minimum at the remote control unit.

#### MAINTENANCE

This welder is designed for minimum of maintenance since there are no moving parts excepting the fan, which is totally enclosed with lifetime lubrication.

The hermetically sealed silicon diode rectifiers are specially designed for welder use and will not age or deteriorate in use. The six rectifier cells are mounted on cooling fins. A periodic cleaning of dust and dirt off these fins is necessary to insure proper cooling of the rectifiers. Access is by removal of top cover of welder.

Should any cell accidentally be damaged and need replacement, it can be quickly removed from the cooling plate. The replacement cell should be locked securely to the fin, preferably with a torque wrench set for a maximum of 30 ft. lb s. and a minimum of 25 ft. lbs. Excessive torque will distort the mechanical structure and may break the hermetic seal, whereas too little torque will result in improper electrical connection.

This machine is equipped with a thermostatic overload switch as a means of protecting against overheating.

Should the duty cycle be exceeded causing excessive heating, this thermostat will open the welder control circuit causing the current to fall to a low value. If this occurs the welder must be allowed to cool in order for the thermostat contacts to reclose.

#### GUARANTEE

We hereby guarantee that this equipment has been thoroughly checked and tested before shipment and is free of mechanical and electrical defects.

Should defects due to faulty material or workmanship develop within one year from date of sale, the equipment will be repaired and put in workable condition free of charge, providing it is returned to our factory or authorized service station TRANSPORTATION PREPAID, after issuance of return goods tags have been made by the factory, or authorized Service Station authorizing such a return.

In addition all silicon power rectifiers are warranted to the original purchaser during the life time of the equipment in which they originally were installed, providing the equipment is used for the purpose for which it was designed.

This guarantee does not cover helmet, cables, plugs, receptacles, switches, electrode holder or ground clamp, nor is it valid if the item has been misused, abused or tampered with.

TROUBLE SHOOTINGPOSSIBLE TROUBLEPOSSIBLE REMEDYWELDING ARC NOISY & SPATTERS

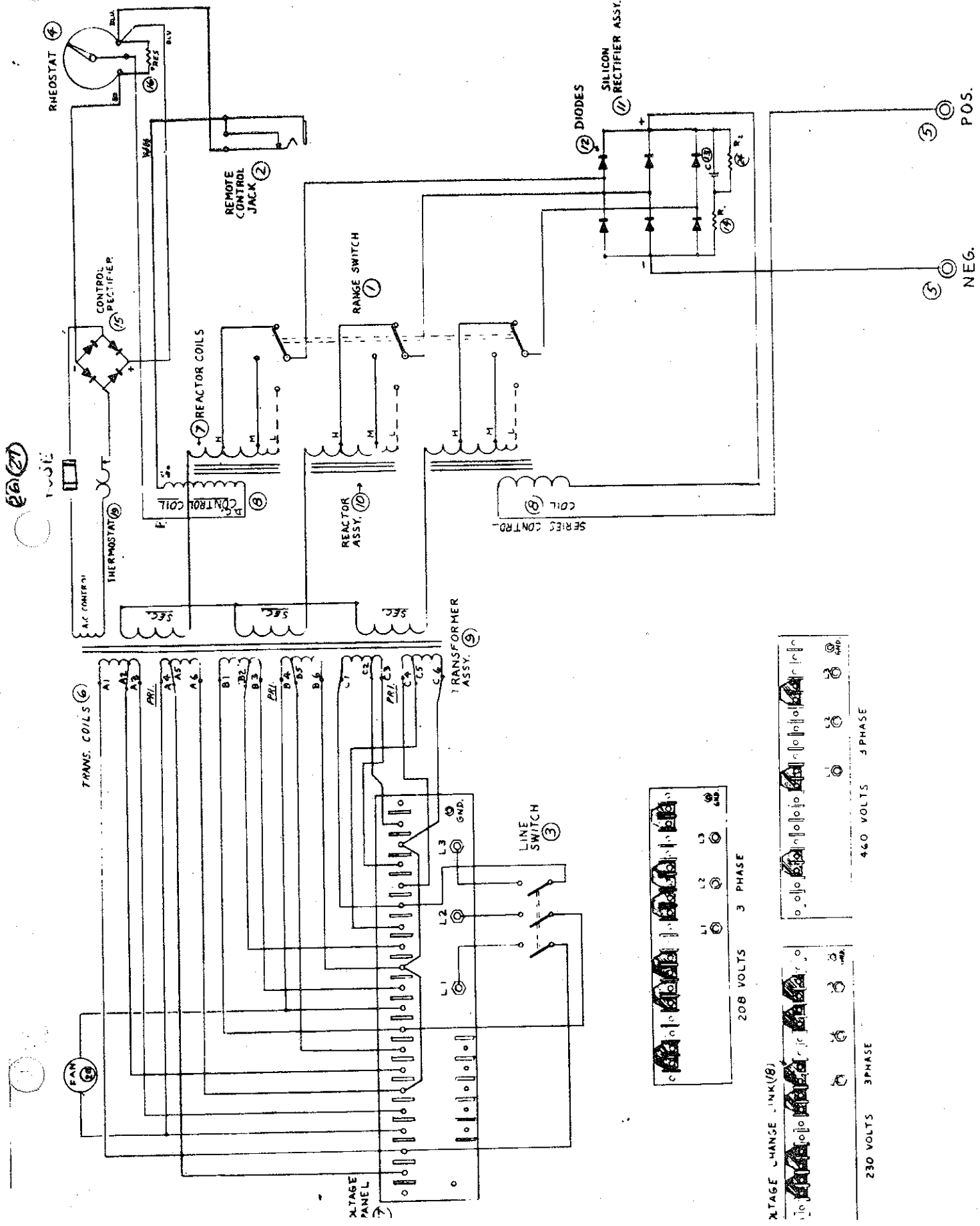
- |                           |  |
|---------------------------|--|
| 1. Output may be too high | 1. Reduce rheostat setting<br>Check current output with<br>Ammeter |
| 2. Using wrong electrode  | 2. Check proper application of<br>electrode type.                  |
| 3. Wrong polarity         | 3. Check polarity against<br>electrode recommendations.            |

WELDING ARC WILL NOT IGNITE  
LOW OUTPUT AND ROUGH ARC

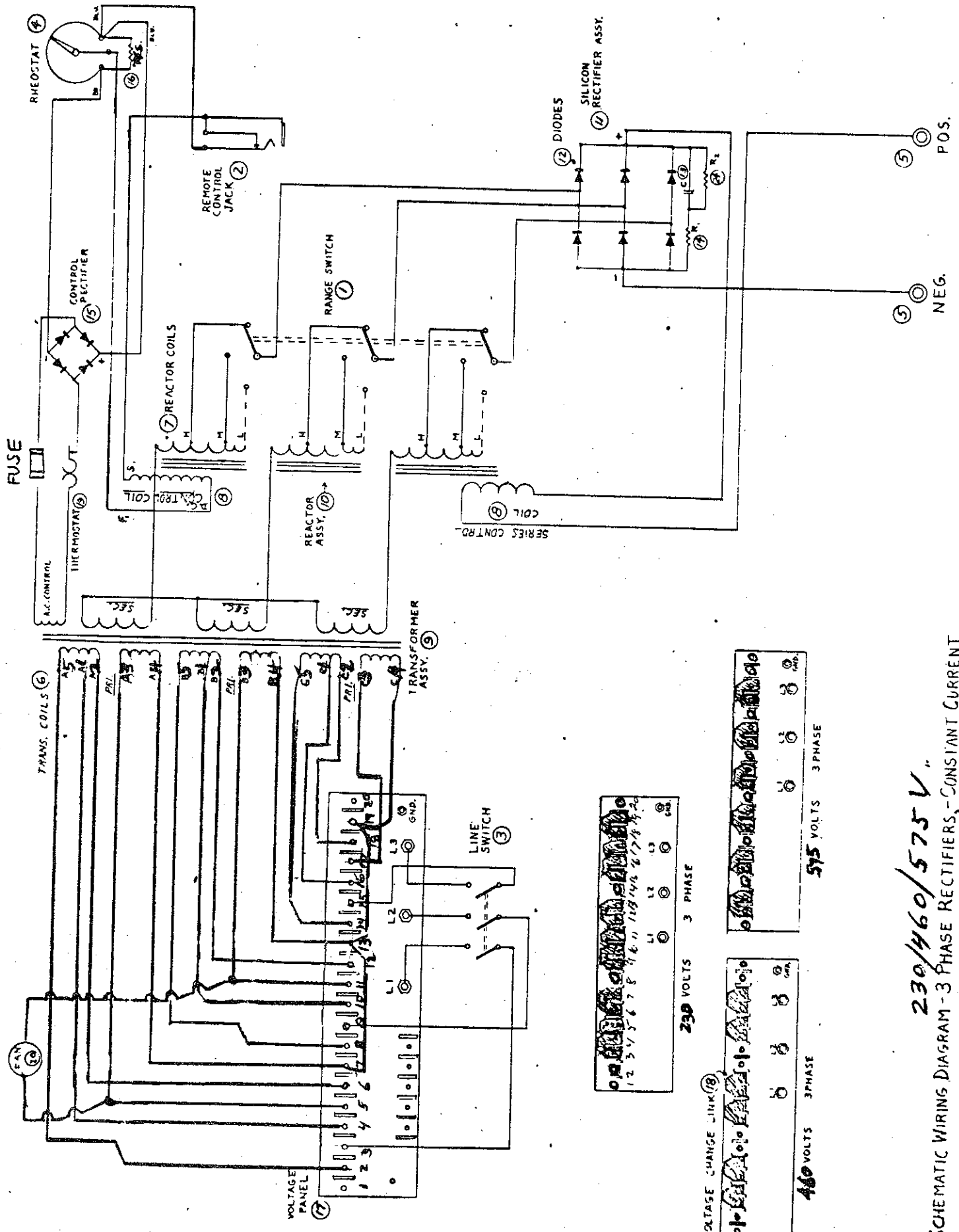
- |                             |  |
|-----------------------------|--|
| 1. Improper line voltage    | 1. Check incoming power  |
| 2. Low open circuit voltage | 2. Check for blown fuse.<br>Single phase operation pro-<br>duces this condition. |
| 3. No open circuit voltage  | 3. Check for shorted power<br>rectifiers with ohmmeter                           |
| 4. Loose connections        | 4. Tighten all electrical junctions  |

SUDDEN LOSS OF POWER  
AND NO CURRENT CONTROL

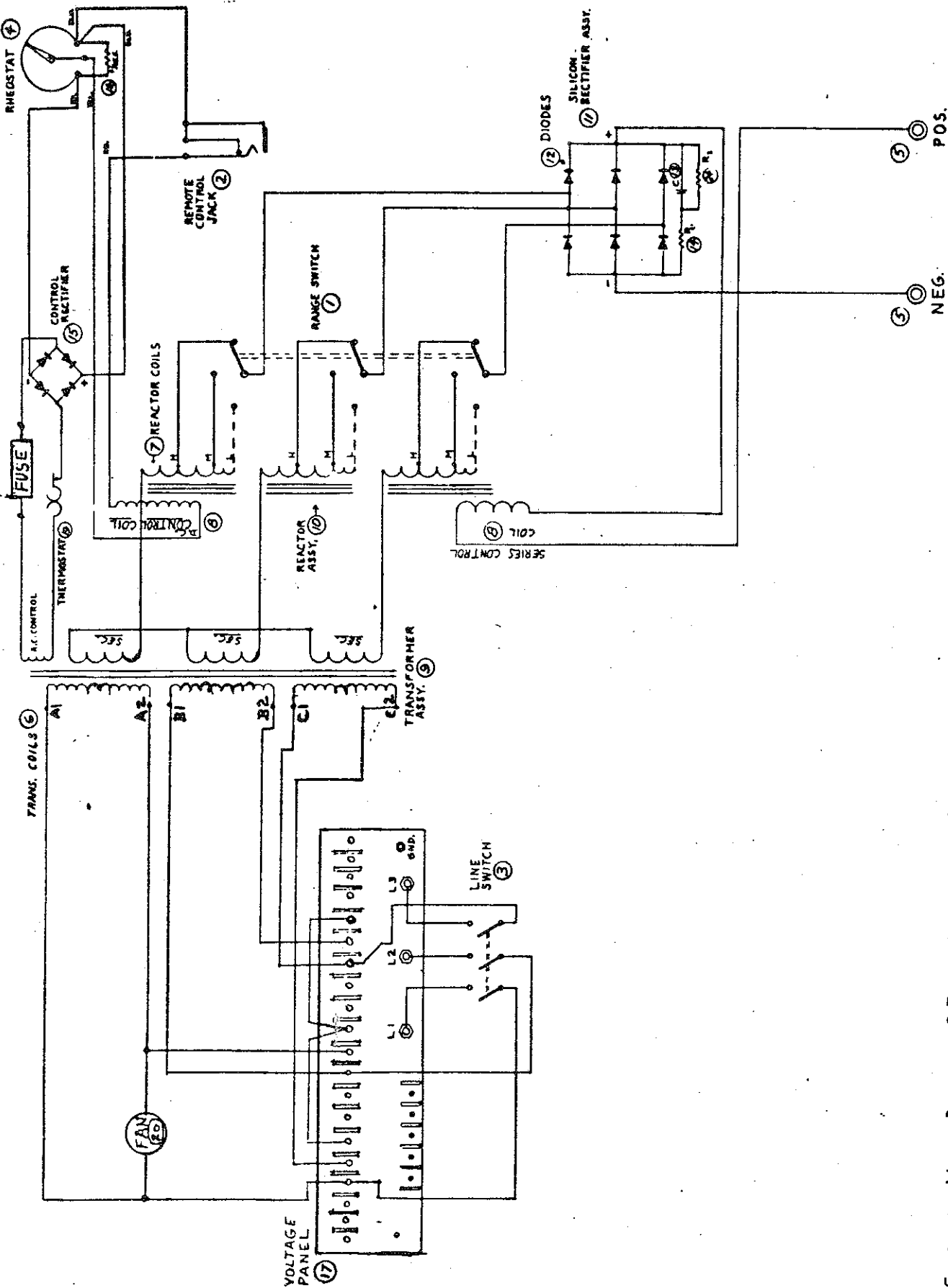
- |                                |  |
|--------------------------------|--|
| 1. Thermostat has opened       | 1. Welder is over loaded and<br>overheating. Check fan<br>operation. Check duty cycle<br>and rating of machine. Let<br>welder cool down, and ther-<br>mostat will reclose. |
| 2. Control circuit inoperative | 2. Check for broken or burned<br>out rheostat. Check control<br>rectifier output - should be<br>approx. 28 volts DC. Check<br>control cord for ground or<br>short.         |



SCHEMATIC WIRING DIAGRAM - 3 PHASE RECTIFIERS - CONSTANT CURRENT



SCHEMATIC WIRING DIAGRAM - 3 PHASE RECTIFIERS, - CONSTANT CURRENT  
 230/460/575 V



SCHMATIC WIRING DIAGRAM - 3 PHASE RECTIFIERS, - CONSTANT CURRENT  
 220/380 VOLTS

3 PHASE D C SILICON RECTIFIER

PARTS LIST 208/230/460 Volts

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>Qty.</u> <u>Req.</u>	<u>300 Amp</u>	<u>400 Amp</u>	<u>500 Amp</u>
1	Switch, Range 3 P 2 Pos	1	24G2017	24G2017	24G2017
2	Remote Control Jack	1	9R1624	9R1624	9R1624
3	Switch, Line 3 1 1	1	24R1004	24R1004	24R1004
4	Rheostat, Panel Control	1	19R1765	19R1765	19R1765
5	Recept., Cam Lok	2	9R1602	9R1602	9R1602
6A	# Pri-Sec. Coil Assen. A.	1	26G2369A	26G2359A	26G2373A
6B	# Pri-Sec. Coil Assen. B&C	2	26G2359	26G2359	26G2373
7	Reactor Coil Lft- rht. Gen	3	26G2370	26G2360	26G2374
8	Control Coil	1	26G2372	26G2362	26G2376
9	# Trans. Assembly	1	27G2273	27G2265	27G2276
10	Reactor Assembly	1	27G2274	27G2266	27G2277
11	Rectifier Assembly	1	17G1601	17G1601	17G1602
12	Silicon Diodes	6	17R1589	17R1589	17R1589
13	Capacitor	1	4R120	4R120	4R120
14	Resistors, 27 (Ohm)	1	19R1772	19R1772	19R1772
15	Rectifier Control	1	17R1618	17R1618	17R1618
16	Resistor (25 ohms)	1	19R1032	19R1032	19R1032
17	Panel, Primary	1	8R2296	8R2296	8R2296
18	Bar, Voltage Change	6	11G2229	11G2229	11G2229
19	Thermostat Switch	1	24G2012	24G2012	24G2012
20	Fan Motor, 230 Volt	1	11R1836	11R1836	11R1836
*21	Fan Blade	1	11R1837	11R1837	11R1837
*22	Rem. Hand Amp. Con. with cable	1	29G2013	29G2013	29G2013
*23	Rem. Foot Amp. Con. with cable	1	29G2014	29G2014	29G2014
24	Resistor (1000 Ohm)	1	19R1590	19R1590	19R1590
*25	Plug, Cam Lok	2	9R1132	9R1132	9R1132
26	Fuse, 20 Amp	1	11G2208	11G2208	11G2208
27	Fuse Holder	1	11G2207	11G2207	11G2207
*	NOT SHOWN ON DIAGRAM				

# For part numbers of Pri-Sec. Coil Assemblies and Transformer Assemblies for voltages other than 208/230/460 volts, refer to addendum sheet.



ADDENDUM SHEET

FOR

VOLTAGES OTHER THAN 208/230/460 VOLTS

230/460/575 VOLTS			
PRI-SEC COIL ASSY. A	ST-301R 26G2369-1A	ST-401R 26G2359-1A	ST-501R 26G2373-1A
PRI-SEC COIL ASSY. B&C	26G2369-1	26G2359-1	26G2373-1
TRANSFORMER ASSEMBLY	27G2273-1	27G2265-1	27G2276-1
WIRING DIAGRAM	12G107	12G107	12G107

220/380 VOLTS			
PRI-SEC COIL ASSY. A	ST-301R 26G2369-2A	ST-401R 26G2359-2A	ST-501R
PRI-SEC COIL ASSY. B&C	26G2369-2	26G2359-2	
TRANSFORMER ASSEMBLY	27G2273-2	27G2265-2	
WIRING DIAGRAM	12G123	12G123	

RECOMMENDED WIRE SIZES AND FUSE SIZES

VOLTS		ST 301R	ST 401R	ST 501R
208	INPUT AMPS	74	97	122
	FUSE SIZE	100	125	175
	PRIMARY WIRE(AWG)	#4	#3	#1
220	INPUT AMPS	70	92	115
	FUSE SIZE	100	125	175
	PRIMARY WIRE(AWG)	#4	#3	#1
230	INPUT AMPS	66	88	110
	FUSE SIZE	90	110	150
	PRIMARY WIRE(AWG)	#6	#4	#2
380	INPUT AMPS	40	54	67
	FUSE SIZE	55	80	90
	PRIMARY WIRE(AWG)	#8	#6	#6
460	INPUT AMPS	33	44	55
	FUSE SIZE	45	55	80
	PRIMARY WIRE(AWG)	#8	#8	#6
575	INPUT AMPS	27	35	44
	FUSE SIZE	50	55	55
	PRIMARY WIRE(AWG)	#10	#8	#8