

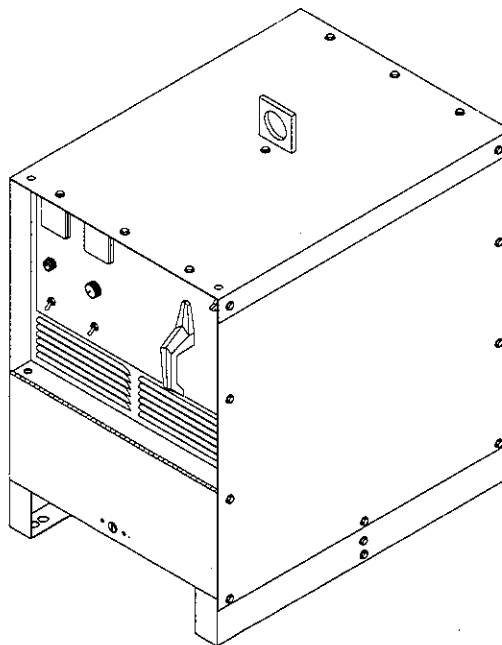


August 1990

FORM: OM-318A

Effective With Serial No. JK721125

MODEL: SHOPMASTER™ 300 AC/DC



OWNER'S MANUAL

IMPORTANT: Read and understand the entire contents of this manual, with special emphasis on the safety material throughout the manual, before installing, operating, or maintaining this equipment. This unit and these instructions are for use only by persons trained and experienced in the safe operation of welding equipment. Do not allow untrained persons to install, operate, or maintain this unit. Contact your distributor if you do not fully understand these instructions.

MILLER ELECTRIC Mfg. Co.
A Miller Group Ltd., Company

P.O. Box 1079
Appleton, WI 54912 USA
Tel. 414-734-9821

LIMITED WARRANTY

EFFECTIVE: AUGUST 6, 1990

This warranty supersedes all previous MILLER warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY - Subject to the terms and conditions hereof, MILLER Electric Mfg. Co., Appleton, Wisconsin warrants to its Distributor/Dealer that all new and unused Equipment furnished by MILLER is free from defect in workmanship and material as of the time and place of delivery by MILLER. No warranty is made by MILLER with respect to engines, trade accessories or other items manufactured by others. Such engines, trade accessories and other items are sold subject to the warranties of their respective manufacturers, if any. All engines are warranted by their manufacturer for two years from date of original purchase, except Deutz engines which have a one year, 2000 hour warranty.

Except as specified below, MILLER's warranty does not apply to components having normal useful life of less than one (1) year, such as spot welder tips, relay and contactor points, MILLERMATIC parts that come in contact with the welding wire including nozzles and nozzle insulators where failure does not result from defect in workmanship or material.

MILLER shall be required to honor warranty claims on warranted Equipment in the event of failure resulting from a defect within the following periods from the date of delivery of Equipment to the original user:

1. Arc welders, power sources, robots, and 1 year components
2. Load banks 1 year
3. Original main power rectifiers 3 years (labor - 1 year only)
4. All welding guns, feeder/guns and torches 90 days
5. All other MILLERMATIC Feeders 1 year
6. Replacement or repair parts, exclusive of labor 60 days
7. Batteries 6 months

provided that MILLER is notified in writing within thirty (30) days of the date of such failure.

As a matter of general policy only, MILLER may honor claims submitted by the original user within the foregoing periods.

In the case of MILLER's breach of warranty or any other duty with respect to the quality of any goods, the exclusive remedies therefore shall be, at MILLER's option (1) repair or (2) replacement or, where authorized in writing by MILLER in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized MILLER service station or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at Customer's risk and expense. MILLER's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a MILLER authorized service facility, therefore, no compensation for transportation costs of any kind will be allowed. Upon receipt of notice of apparent defect or failure, MILLER shall instruct the claimant on the warranty claim procedures to be followed.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

EXCEPT AS EXPRESSLY PROVIDED BY MILLER IN WRITING, MILLER PRODUCTS ARE INTENDED FOR ULTIMATE PURCHASE BY COMMERCIAL/INDUSTRIAL USERS AND FOR OPERATION BY PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT AND NOT FOR CONSUMERS OR CONSUMER USE. MILLER'S WARRANTIES DO NOT EXTEND TO, AND NO RESELLER IS AUTHORIZED TO EXTEND MILLER'S WARRANTIES TO, ANY CONSUMER.

ERRATA SHEET

For SHOPMASTER™ 300 AC/DC

After this manual was printed, refinements in equipment design occurred. This sheet lists exceptions to data appearing later in this manual.

AMENDMENT TO SECTION 4 – INSTALLATION OR RELOCATION

Amend Section 4-3C. Subsection 3. LOWER FRONT PANEL CONNECTIONS. Weld Output Connections. Weld Cable Connections.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

IMPORTANT: Weld output (AC, DC/CC or DC/CV) is determined by the position of the OUTPUT SELECTOR switch (see Section 5-2).

Two CC/AC weld output terminals and two CV weld output terminals are provided on the lower front panel for making weld output connections. To make connections, proceed as follows:

- a. For Gas Metal Arc Welding (GMAW) And Flux Cored Arc Welding (FCAW) (Electrode Positive/Reverse Polarity) (Figure 4-1)
 1. Connect one weld cable to RED (Positive) CV weld output terminal and remaining end to terminal on drive housing of wire feeder (see wire feeder Owner's Manual for location).
 2. Connect one end of work cable to BLACK (Negative) CV weld output terminal.

IMPORTANT: For Electrode Negative/Straight Polarity connections, reverse cable connections to weld output terminals; electrode becomes negative.

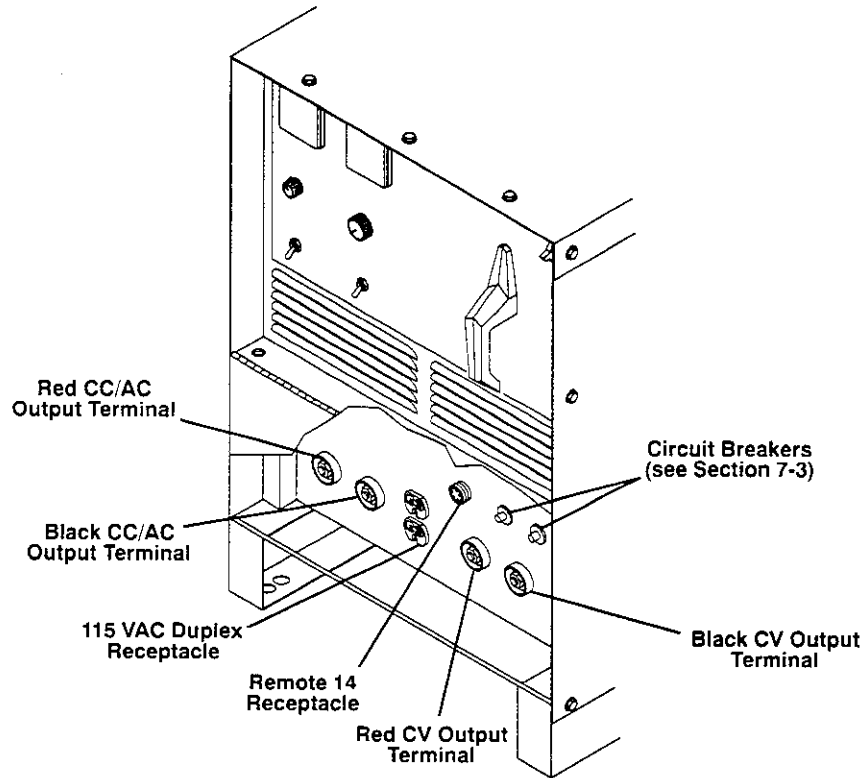
- b. For Shielded Metal Arc Welding (SMAW) (Electrode Positive/Reverse Polarity) (Figure 4-1)
 1. Connect end of electrode holder cable to RED (Positive) CC/AC weld output terminal.
 2. Connect end of work cable to BLACK (Negative) CC/AC weld output terminal.

IMPORTANT: For DC Electrode Negative/Straight Polarity connections, reverse cable connections to weld output terminals; electrode becomes negative.

- c. For Gas Tungsten Arc Welding (GTAW) (Electrode Negative/Straight Polarity) (Figure 4-1)
 1. Connect torch cable or connector to BLACK(Negative) CC/AC weld output terminal. Be sure that the torch connector does not touch the access door when closed.
 2. Connect work cable to RED (Positive) CC/AC weld output terminal.

IMPORTANT: For DC Electrode Positive/Reverse Polarity connections, reverse cable connections to weld output terminals; electrode becomes positive.

Amend Figure 4-1. Lower Panel View With Access Door Open



Ref. SC-130 173-A

Figure 4-1. Lower Panel View With Access Door Open

AMENDMENT TO SECTION 8 – ELECTRICAL DIAGRAMS

Amend Diagram 8-1. Circuit Diagram For Welding Power Source (see Page 3 on this Errata Sheet)

Amend Diagram 8-3. Wiring Diagram For Welding Power Source (see Pages 4 and 5 on this Errata Sheet)

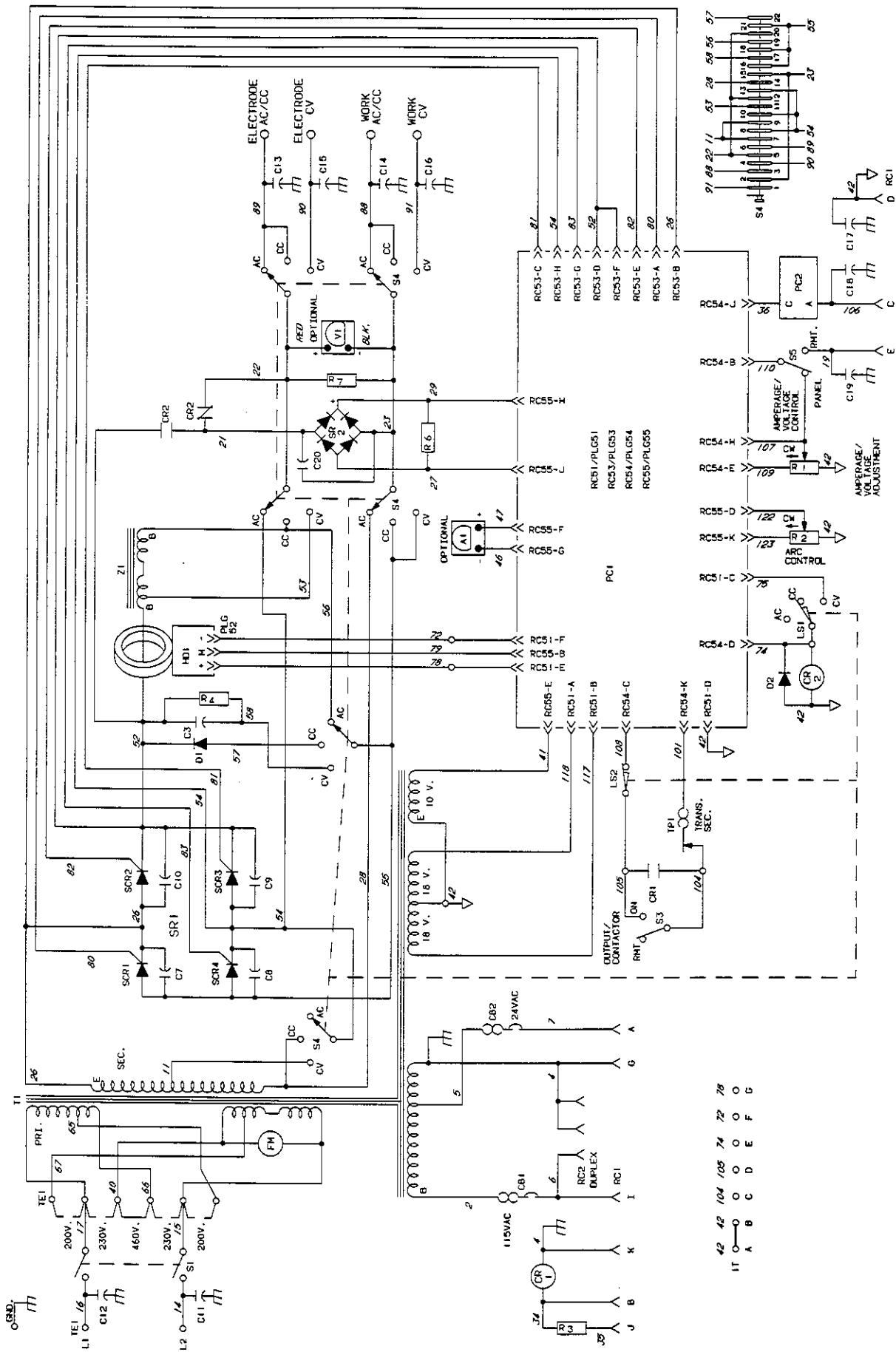
AMENDMENT TO SECTION 9 – PARTS LIST

Amend Parts list as follows:

**	Dia. Mkgs.	Part No.	Replaced With	Description	Quantity
31-3	HD1	129 836	124 684	TRANSDUCER, current 300A	1
31-7		031 670	031 670	CAPACITOR, (dia mkg chg C20)	1
31-14		126 420	144 798	FRAME, lifting (Eff w/KB051910 thru KB076549)	1
31-14		144 798	146 350	FRAME, lifting (Eff w/KB076550)	1
31-21	S4	133 144	144 210	SWITCH, changeover (Eff w/KB051910) (consisting of)	1
	LS1,2		133 145	SWITCH, limit	2
33-3		126 208	146 353	PANEL, front (Eff w/KB076550)	1
33-8		126 203	142 364	EXTENSION, handle switch (Eff w/KB051910)	1
33-10	R7	115 228	140 756	RESISTOR, WW fxd 180W 25 ohm	1
33-16		126 428	144 645	PANEL, front lower (Eff w/KB051910)	1
33-17	C13,14	126 722	144 141	CAPACITOR ASSEMBLY, (Eff w/KB051910)	2
33-18		039 046	039 046	TERMINAL, (qty chg)	2
33-19		039 047	039 047	TERMINAL, (qty chg)	2
33-25	C15,16	126 721	144 140	CAPACITOR ASSEMBLY, (Eff w/KB051910)	2
33-29		123 154	134 327	LABEL, warning general precautionary	1
33-		Added	138 106	LABEL, caution incorrect use	1
33-		138 106	Deleted	Eff w/KB051910	
34-2	SCR1-4	109 091	132 147	THYRISTOR, SCR 865A 300V (Eff w/JK730117)	4

**First digit represents page no – digits following dash represent item no.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



Circuit Diagram No. SC-143 681-A

Diagram 8-1. Circuit Diagram For Welding Power Source Effective With Serial No. KB051910

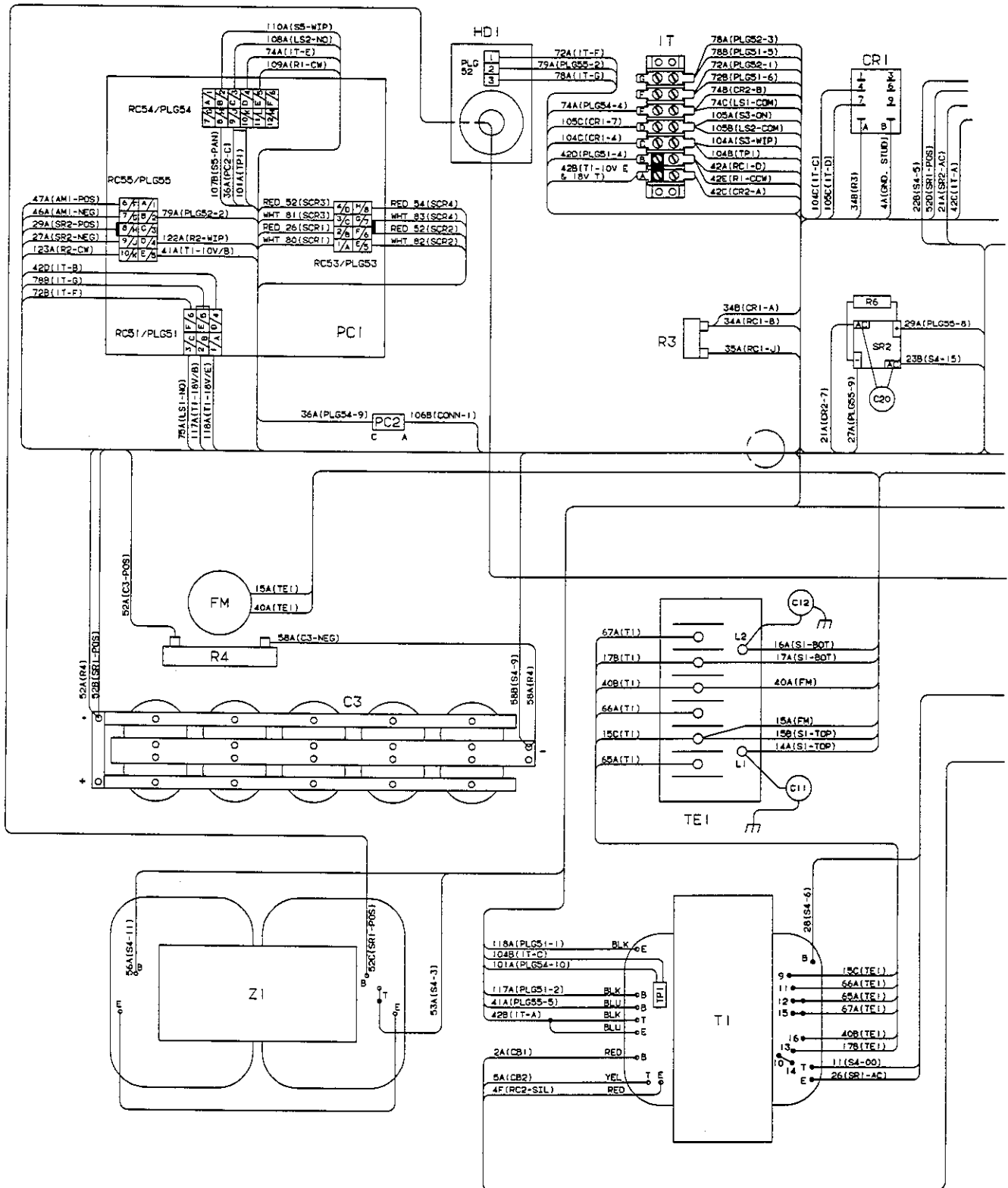
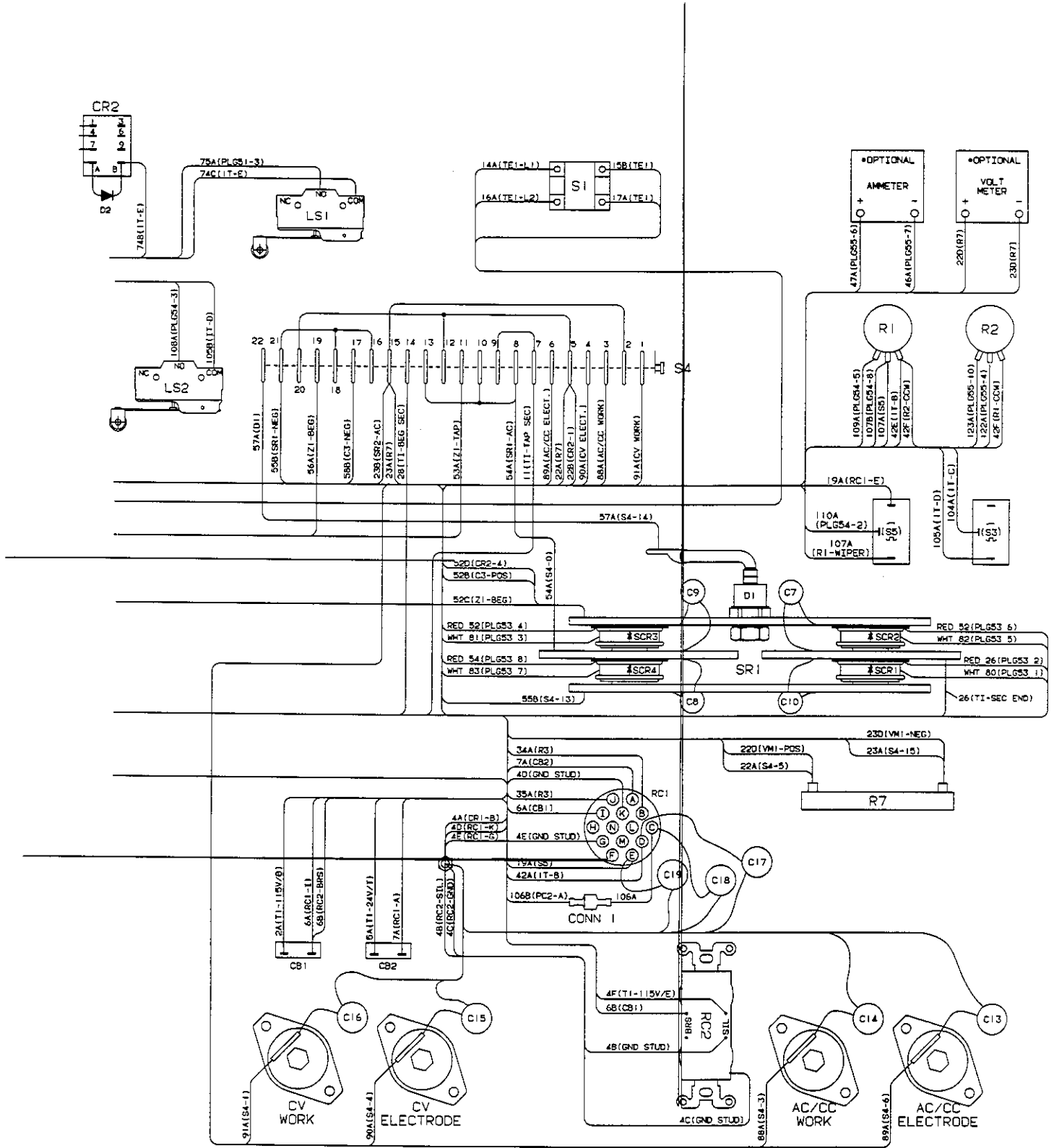


Diagram 8-3. Wiring Diagram For Welding Power Source Effective With Serial No. KB051910



Wiring Diagram No. SD-144 250-A

RECEIVING-HANDLING

Before unpacking equipment, check carton for any damage that may have occurred during shipment. File any claims for loss or damage **with the delivering carrier**. Assistance for filing or settling claims may be obtained from the distributor and/or the equipment manufacturer's Transportation Department.

When requesting information about this equipment, always provide the Model Description and Serial or Style Number.

Use the following spaces to record the Model Designation and Serial or Style Number of your unit. The information is located on the data card or the nameplate.

Model _____

Serial or Style No. _____

Date of Purchase _____

TABLE OF CONTENTS

Section No.	Page No.
SECTION 1 – SAFETY RULES FOR OPERATION OF ARC WELDING POWER SOURCE	
1-1. Introduction	1
1-2. General Precautions	1
1-3. Arc Welding	3
1-4. Standards Booklet Index	5
SECTION 2 – SAFETY PRECAUTIONS AND SIGNAL WORDS	
2-1. General Information And Safety	6
2-2. Safety Alert Symbol And Signal Words	6
SECTION 3 – SPECIFICATIONS	
3-1. Volt-Ampere Curves	8
3-2. Duty Cycle	8
3-3. Description	9
SECTION 4 – INSTALLATION OR RELOCATION	
4-1. Site Selection	9
4-2. Transporting Methods	9
4-3. Lower Front Panel Connections	9
4-4. Electrical Input Connections	12
SECTION 5 – OPERATOR CONTROLS	
5-1. Power Switch	14
5-2. Output Selector Switch	14
5-3. Amperage/Voltage Adjustment Control	14
5-4. Amperage/Voltage Switch	14
5-5. Output/Contactor Switch	15
5-6. Arc Control	15
5-7. Meters (Optional)	15

SECTION 6 – SEQUENCE OF OPERATION

6-1. Gas Tungsten Arc Welding (GTAW)	16
6-2. Shielded Metal Arc Welding (SMAW)	16
6-3. Gas Metal Arc (GMAW) And Flux Cored Arc Welding (FCAW)	17
6-4. Shutting Down	17

SECTION 7 – MAINTENANCE & TROUBLESHOOTING

7-1. Routine Maintenance	17
7-2. Tungsten Electrode	18
7-3. Overload Protection	19
7-4. Thermal Overload Protection	20
7-5. Circuit Board Handling Precautions	20
7-6. Troubleshooting	20

SECTION 8 – ELECTRICAL DIAGRAMS

Diagram 8-1. Circuit Diagram For Welding Power Source	23
Diagram 8-2A. Circuit Diagram For Control Board PC1 (1 of 2)	24
Diagram 8-2B. Circuit Diagram For Control Board PC1 (2 of 2)	25
Diagram 8-3. Wiring Diagram For Welding Power Source	26
Diagram 8-4. Circuit Diagram For Snubber Board PC2	28

SECTION 9 – PARTS LIST

Figure 9-1. Main Assembly	30
Figure 9-2. Panel, Front w/Components	32
Figure 9-3. Terminal Assembly, Pri	34
Figure 9-4. Rectifier, Si Diode	34
Figure 9-5. Panel, Rear w/Components	35
Figure 9-6. Circuit Card, Control PC1	37

LIST OF CHARTS AND TABLES

Table 3-1. Specifications	7
Chart 3-1. Volt-Ampere Curves	8
Chart 3-2. Duty Cycle	8
Table 4-1. Weld Cable Size	11
Table 4-2. Connections For Welding Processes	12
Table 4-3. Input Conductor And Fuse Size	13
Table 7-1. Maintenance Schedule	17
Table 7-2. Tungsten Size	19
Table 7-3. Troubleshooting	21

SECTION 1 – SAFETY RULES FOR OPERATION OF ARC WELDING POWER SOURCE

1-1. 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.

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.

1-2. GENERAL PRECAUTIONS

Different arc welding processes, electrode alloys, and fluxes can produce different fumes, gases, and radiation levels. In addition to the information in this manual, be sure to consult flux and electrode manufacturers Material Safety Data Sheets (MSDSs) for specific technical data and precautionary measures concerning their material.

A. Burn Prevention

Wear protective clothing-gauntlet gloves designed for use in welding, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

Wear helmet with safety goggles and 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 1-3A.2.

Avoid oily or greasy clothing. A spark may ignite them.

Hot metal such as electrode stubs and workpieces should never be handled without gloves.

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.

Ear plugs should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.

Flammable hair preparations should not be used by persons intending to weld or cut.

B. Toxic Fume Prevention

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 in Standards Index. NEVER ventilate with oxygen.

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.

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 and, if necessary, while wearing an air-supplied respirator.

Work in a confined space only while it is being ventilated and, if necessary, while wearing an air-supplied respirator.

Gas leaks in a confined space should be avoided. Leaked gas in large quantities can change oxygen concentration dangerously. Do not bring gas cylinders into a confined space.

Leaving confined space, shut OFF gas supply at source to prevent possible accumulation of gases in the space if downstream valves have been accidentally opened or left open. Check to be sure that the space is safe before re-entering it.

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.

C. Fire and Explosion Prevention

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:

Keep equipment clean and operable, free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits.

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 cannot 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.

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.

Fire watcher must be standing by with suitable fire extinguishing equipment during and for some time after welding or cutting if:

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

Hot work permit should be obtained before operation to ensure supervisor's approval that adequate precautions have been taken.

After work is done, check that area is free of sparks, glowing embers, and flames.

An empty container that held combustibles, or that can produce flammable or toxic vapors when heated, must never be welded on or cut, unless container has first been cleaned as described in AWS Standard A6.0, listed 7 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 equip-

ment as recommended in A6.0. Waterfilling just below working level may substitute for inerting.

A container with unknown contents should be cleaned (see preceding paragraph). Do NOT depend on sense of smell or sight to determine if it is safe to weld or cut.

Hollow castings or containers must be vented before welding or cutting. They can explode.

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

D. Compressed Gas Equipment

Standard precautions. Comply with precautions in this manual, and those detailed in CGA Standard P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, listed 11 in Standards Index.

1. Pressure Regulators

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.

Never connect a regulator to a cylinder containing gas other than that for which the regulator was designed.

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.

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

2. Cylinders

Cylinders must be handled carefully to prevent leaks and damage to their walls, valves, or safety devices:

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 1-3C.)

ICC or DOT marking must be on each cylinder. It is an assurance of safety when the cylinder is properly handled.

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.

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

Prohibited use. Never use a cylinder or its contents for other than its intended use, NEVER as a support or roller.

Locate or secure cylinders so they cannot be knocked over.

Passageways and work areas. Keep cylinders clear of areas where they may be struck.

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.

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.

Protect cylinders particularly valves from bumps, falls, falling objects, and weather. Replace caps securely when moving cylinders.

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

Mixing gases. Never try to mix any gases in a cylinder.

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

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.

Use ferrules or clamps designed for the hose (not ordinary wire or other substitute) as a binding to connect hoses to fittings.

No copper tubing splices. Use only standard brass fittings to splice hose.

Avoid long runs to prevent kinks and abuse. Suspend hose off ground to keep it from being run over, stepped on, or otherwise damaged.

Coil excess hose to prevent kinks and tangles.

Protect hose from damage by sharp edges, and by sparks, slag, and open flame.

Examine hose regularly for leaks, wear, and loose connections. Immerse pressured hose in water; bubbles indicate leaks.

Repair leaky or worn hose by cutting area out and splicing (1-2D3). Do NOT tape.

4. Proper Connections

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.

Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking area, 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.

Tighten connections. When assembling threaded connections, clean and smooth seats where necessary. Tighten. If connection leaks, disassemble, clean, and retighten using properly fitting wrench.

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.

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.

5. Pressurizing Steps:

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 slightly on single-stage regulators.

Stand to side of regulator while opening cylinder valve.

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.

Use pressure charts (available from your supplier) for safe and efficient, recommended pressure settings on regulators.

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

E. User Responsibilities

Remove leaky or defective equipment from service immediately for repair. See User Responsibility statement in equipment manual.

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

Rope staging-support should not be used for welding or cutting operation; rope may burn.

*Trademark of Proctor & Gamble.

1-3. ARC WELDING

Comply with precautions in 1-1, 1-2, 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.

A. Burn Protection

Comply with precautions in 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.**

1. Protective Clothing

Wear long-sleeve clothing (particularly for gas-shielded arc) in addition to gloves, hat, and shoes (1-2A). 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.

Bare skin protection. Wear dark, substantial clothing. Button collar to protect chest and neck and button pockets to prevent entry of sparks.

2. Eye and Head Protection

Protect eyes from exposure to arc. **NEVER** look at an electric arc without protection.

Welding helmet or shield containing a filter plate shade no. 12 or denser must be used when welding. Place over face before striking arc.

Protect filter plate with a clear cover plate.

Cracked or broken helmet or shield should **NOT** be worn; radiation can pass through to cause burns.

Cracked, broken, or loose filter plates must be replaced **IMMEDIATELY**. Replace clear cover plate when broken, pitted, or spattered.

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.

3. Protection of Nearby Personnel

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.

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

Others working in area. See that all persons are wearing flash goggles.

Before starting to weld, make sure that screen flaps or bay doors are closed.

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

Generator engine exhaust must be vented to the outside air. Carbon monoxide can kill.

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

Equipment's rated capacity. Do not overload arc welding equipment. It may overheat cables and cause a fire.

Loose cable connections may overheat or flash and cause a fire.

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 under rough handling.

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. 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:

Wear dry insulating gloves and body protection. 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 electrically HOT part or grounded metal reduces the electrical resistance, and could enable dangerous and possibly lethal currents to flow through the body.

A voltage will exist between the electrode and any conducting object in the work circuit. Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, welding power source cases, workpieces, etc. **Never touch the electrode and any metal object unless the welding power source is off.**

1. Grounding the Equipment

Arc welding equipment must be grounded according to the National Electrical Code, and the work must be grounded according to ANSI Z49.1 "Safety In Welding And Cutting."

When installing, connect the frames of each unit such as welding power source, 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 flammable liquid such as oil or fuel.

Three-phase connection. Check phase requirements 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.

Before welding, check ground for continuity. Be sure conductors are touching bare metal of equipment frames at connections.

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.

2. Electrode Holders

Fully insulated electrode holders should be used. Do NOT use holders with protruding screws.

3. Connectors

Fully insulated lock-type connectors should be used to join welding cable lengths.

4. Cables

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.

Keep cable dry, free of oil and grease, and protected from hot metal and sparks.

5. Terminals And Other Exposed Parts

Terminals and other exposed parts of electrical units should have insulating covers secured before operation.

6. Electrode

a. Equipment with output on/off control (contactor)

Welding power sources for use with the gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) and similar processes normally are equipped with devices that permit on-off control of the welding power output. When so equipped the electrode wire becomes electrically HOT when the power source switch is ON and the welding gun switch is closed. Never touch the electrode wire or any conducting object in contact with the electrode circuit unless the welding power source is off.

b. Equipment without output on/off control (no contactor)

Welding power sources used with shielded metal arc welding (SMAW) and similar processes may not be equipped with welding power output on-off control devices. With such equipment the electrode is electrically HOT when the power switch is turned ON. Never touch the electrode unless the welding power source is off.

7. Safety Devices

Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out.

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 power source, and pull all 115 volts line-cord plugs.

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.

Leaving equipment unattended. Always shut OFF and disconnect all power to equipment.

Power disconnect switch must be available near the welding power source.

F. Protection For Wearers of Electronic Life Support Devices (Pacemakers)

Magnetic fields from high currents can affect pacemaker operation. Persons wearing electronic life support equipment (pacemaker) should consult with their doctor before going near arc welding, gouging, or spot welding operations.

1-4. 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, 550 N.W. LeJeune Rd, Miami, FL 33126.
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES

obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126.
8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING, AND ALLIED PROCESSES obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
9. NFPA Standard 70, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS obtainable

from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.
14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126.
15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

SECTION 2 – SAFETY PRECAUTIONS AND SIGNAL WORDS

2-1. GENERAL INFORMATION AND SAFETY

A. General

Information presented in this manual and on various labels, tags, and plates on the unit pertains to equipment design, installation, operation, maintenance, and troubleshooting which should be read, understood, and followed for the safe and effective use of this equipment.

The nameplate of this unit uses international symbols for labeling the front panel controls. The symbols also appear at the appropriate section in the text.

B. Safety

The installation, operation, maintenance, and troubleshooting of arc welding equipment requires practices and procedures which ensure personal safety and the safety of others. Therefore, this equipment is to be installed, operated, and maintained only by qualified persons in accordance with this manual and all applicable codes such as, but not limited to, those listed at the end of Section 1 – Safety Rules For Operation Of Arc Welding Power Source.

2-2. SAFETY ALERT SYMBOL AND SIGNAL WORDS

The following safety alert symbol and signal words are used throughout this manual to call attention to and identify different levels of hazard and special instructions.



This safety alert symbol is used with the signal words **WARNING** and **CAUTION** to call attention to the safety statements.



WARNING statements identify procedures or practices which must be followed to avoid serious personal injury or loss of life.



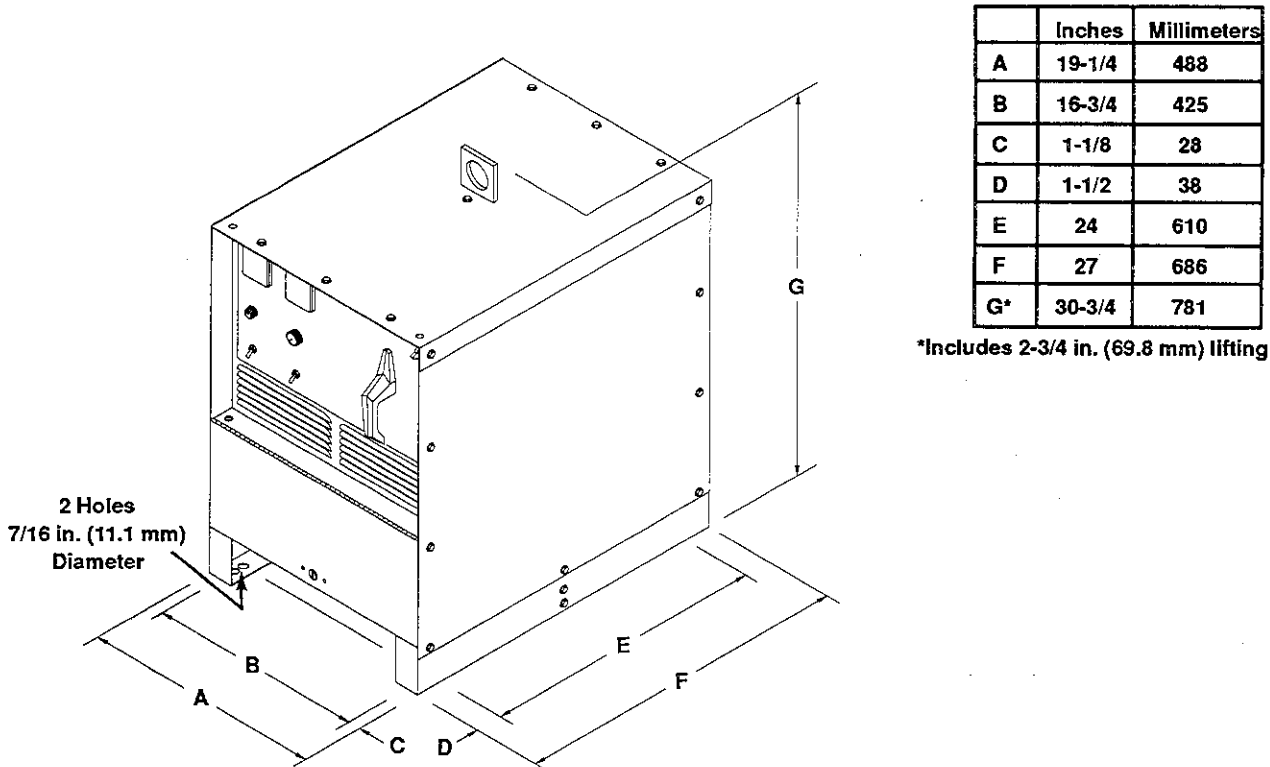
CAUTION statements identify procedures or practices which must be followed to avoid minor personal injury or damage to this equipment.

IMPORTANT statements identify special instructions necessary for the most efficient operation of this equipment.

SECTION 3 – SPECIFICATIONS

Table 3-1. Specifications

Model	Rated Welding Amperes	Weld Output Mode*	Welding Range	Max. Open-Circuit Voltage (ocv)	Input at Rated Load Output 50/60 Hz Single-Phase							kva	kw	Weight				
					Amperes At									Net	Ship			
					200V	220V	230V	380V	415V	460V	575V							
60Hz	NEMA Class II (40) 200 At 28 Volts AC 40% Duty Cycle	AC	20-330 Amperes	80VAC	85		74				37	29	16.8	8.2	370 lbs. (168 kg)	380 lbs (172 kg)		
	NEMA Class II (50) 300 At 32Volts DC 50% Duty Cycle	CC	20-330 Amperes	68VDC	105		91				46	36	20.9	13.7				
		CV	12-32 Volts	40VDC	103		90				45	36	20.7	13.6				
50Hz	NEMA Class II (40) 200 at 28 Volts AC 40% Duty Cycle	AC	20-330 Amperes	80VAC		69		40	36				15.1	7.8			370 lbs. (168 kg)	380 lbs (172 kg)
	NEMA Class II (50) 300 At 32 Volts DC 50% Duty Cycle	CC	20-330 Amperes	57VDC		88		51	47				19.3	13.1				
		CV	12-32 Volts	40VDC		72		42	38				15.8	12.7				



TC-130 172

Figure 3-1. Dimensional Drawing

3-1. VOLT-AMPERE CURVES (Chart 3-1)

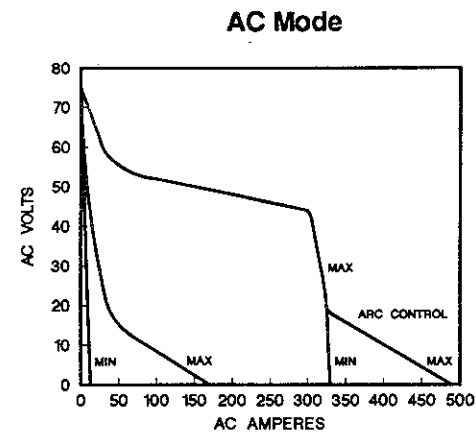


RATED OUTPUT

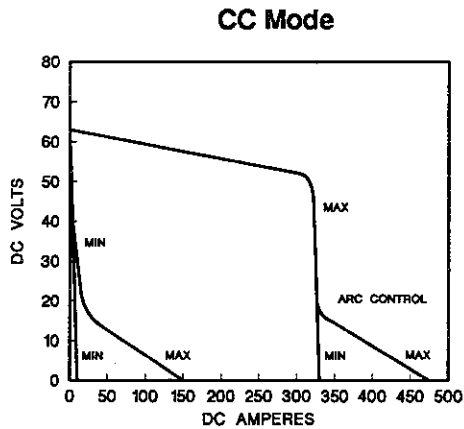
The volt-ampere curves show the voltage and amperage output capabilities of the welding power source. Voltage and amperage adjustment is provided by the AMPERAGE/VOLTAGE ADJUSTMENT Control. Curves of other settings fall between the curves shown.

With the use of the volt-ampere curves, it is possible to determine the weld amperage at any particular load voltage.

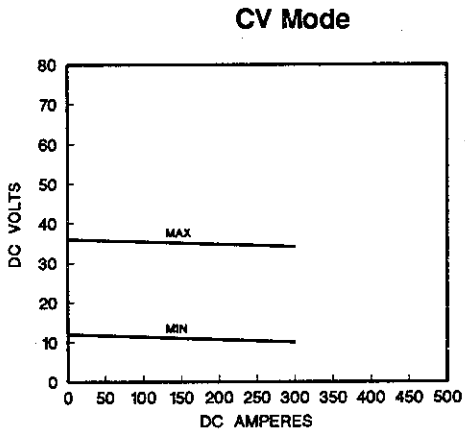
Chart 3-1. Volt-Ampere Curves



B-127 201



B-127 198



B-127 197

3-2. DUTY CYCLE (Chart 3-2)

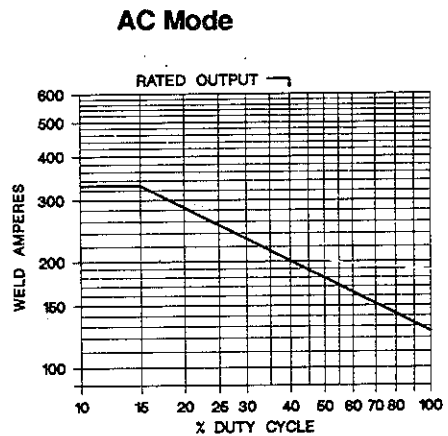
The duty cycle is the percentage of a ten minute period that a welding power source can be operated at a given output without overheating and damaging the unit. This welding power source has dual duty cycle ratings, each for a specific amperage output range. See Chart 3-2 for various amperage output ranges and associated duty cycles. If the unit is operated in the 200 amperage AC output range, this unit is rated at 40 percent duty cycle; therefore, the unit can be operated at 200 amperes for four consecutive minutes, but it must operate at no load for the remaining six minutes to allow proper cooling. If the welding amperes decrease, the duty cycle increases. When the welding power source is operated in the 300 ampere DC output range (CC or CV), the unit is rated at 50 percent duty cycle; therefore, the unit can be operated at 300 amperes for five consecutive minutes, but it must operate at no load for the remaining five minutes.



CAUTION: EXCEEDING DUTY CYCLE RATINGS will damage the welding power source.

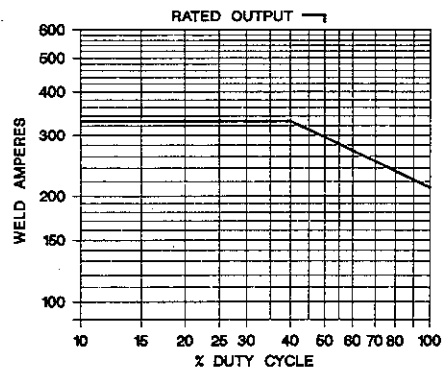
- Do not exceed indicated duty cycles.

Chart 3-2. Duty Cycle



B-127 200-A

DC Mode (CC or CV)



B-127 199-A

3-3. DESCRIPTION

This unit is a single-phase AC/DC arc welding power source having constant voltage (DC/CV), and constant current (AC/CC or DC/CC) characteristics for multi-process capability. The unit is designed for use with Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), and Flux Cored Arc Welding (FCAW) processes.

The number 300 in the model designation means 300 amperes of rated DC weld output. See Table 3-1 for complete unit specifications. This unit compensates for line fluctuations of $\pm 10\%$.

A complete line of remote controls are available as listed elsewhere in this manual. Optional digital voltage controls are available for presetability in the Gas Metal Arc Welding (GMAW) process.

SECTION 4 – INSTALLATION OR RELOCATION

4-1. SITE SELECTION

Select an installation site which provides the following:

1. Correct input power supply (see unit nameplate)
2. Shielding gas supply (if applicable)
3. Water supply (if applicable)
4. Adequate ventilation and fresh air supply
5. No flammables
6. A clean and dry area
7. Proper temperature that avoids extremes of heat or cold
8. Proper airflow around unit
9. Adequate space for removing top cover and outer panels for installation, maintenance, and repair functions.

Base mounting holes provide the capability to install and secure the unit on a running gear or in a permanent location. Figure 3-1 gives overall dimensions and base mounting hole layout. A permanent installation site for securing the unit should allow sufficient space on all sides and above the unit to open access door(s), or remove top cover and outer enclosure panels for maintenance and repair functions.



WARNING: FIRE OR EXPLOSION can result from placing unit on or over combustible surfaces; RESTRICTED AIRFLOW can cause overheating and possible damage to internal parts.

- Do not locate unit over combustible surfaces.
- Maintain at least 18 inches (457 mm) of unrestricted space on all sides of unit, and keep underside free of obstructions.
- Do not place any filtering device over the intake air passages that provide airflow for cooling this unit.

Warranty is void if any type of filtering device is used at intake air passages.

4-2. TRANSPORTING METHODS

This welding power source is equipped with a lifting eye for moving the unit during installation. Weight capacity of the lifting eye only allows for supporting the welding power source.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Disconnect input power conductors from deenergized supply line BEFORE moving welding power source.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other heavy accessories or devices.
- Use equipment of adequate capacity to lift the unit.
- If lifting or moving this unit with lift forks under the base, be sure that lift forks are long enough to extend beyond opposite side of the base.

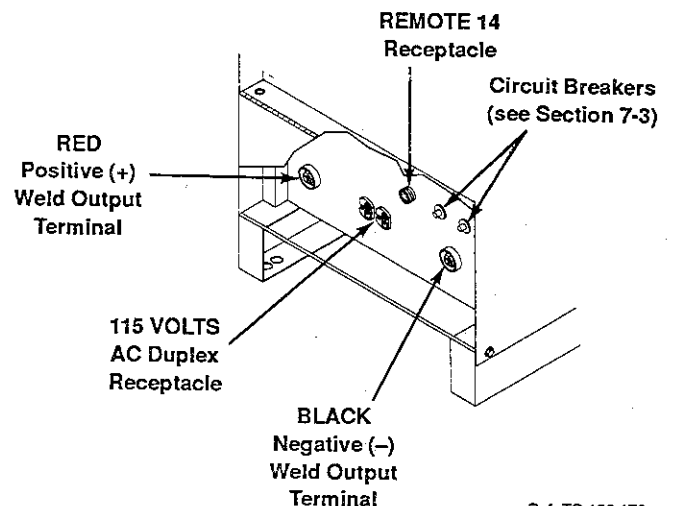
Using lift forks too short can damage internal parts if tips of the lift forks penetrate the unit base, or may cause personal injury and/or equipment damage if unit falls off the lift forks.

4-3. LOWER FRONT PANEL CONNECTIONS (Figure 4-1)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn off welding power source before making connections.



Ref. TC-130 173

Figure 4-1. Lower Panel View With Access Door Open

To gain access to the 115 VOLTS AC receptacle and circuit breakers, REMOTE 14 receptacle, and weld output terminals, it is necessary to open and secure the lower front access door.

Route all cables under the horizontal bar on the front of the base.

A. REMOTE 14 RECEPTACLE INFORMATION AND CONNECTIONS (Figure 4-1 And Figure 4-2)



REMOTE 14



WARNING: Read precautionary information at beginning of entire Section 4-3 before proceeding.

REMOTE 14 receptacle RC1 is used to connect any of the following equipment to the welding power source circuitry:

- a. Remote Contactor
- b. Remote Amperage or Voltage control
- c. Wire feeder which provides contactor control to the welding power source
- d. Combination of the above.

To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

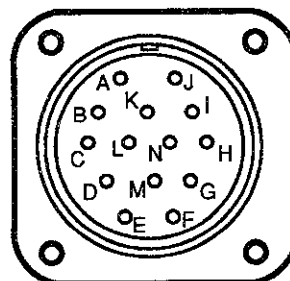
The following socket information is included in case the supplied cord is not suitable, and it is necessary to wire a plug or cord to interface with REMOTE 14 receptacle RC1.

- Socket A: Up to 10 amperes of 24 volts ac, 60 Hz, with respect to socket G (circuit common); protected by circuit breaker CB2.
- Socket B: Input control to energize weld contactor for 24 volts ac wire feeder. A contact closure from socket A to socket B completes the 24 volt circuit.
- Socket C: +10 volts dc with respect to socket D.
- Socket D: Control circuit common for remote control device.
- Socket E: Input command signal from wiper of remote control potentiometer; 0 volts equals machine minimum; +10 volts equals machine maximum.
- Socket G: 24 and 115 volts ac circuit common; also connected to welding power source chassis.
- Socket I: Up to 15 amperes of 115 volts ac, 60 Hz, with respect to socket G (circuit common); protected by circuit breaker CB1.

Socket J: Input control to energize weld contactor for 115 volts ac wire feeder. A contact closure from socket I to socket J completes the 115 volt circuit.

Socket K: Machine chassis (circuit common).

IMPORTANT: The remaining sockets in the receptacle are not used.



S-0004

Figure 4-2. Front View Of REMOTE 14 Receptacle With Socket Locations

B. 115 VOLTS AC Duplex Receptacle (Figure 4-1)

115V  15A



WARNING: Read precautionary information at beginning of entire Section 4-3 before proceeding.

The duplex receptacle provides up to 15 amperes of 115 volts ac for operating accessory equipment. The unit must be energized before output is available at this receptacle.

C. WELD OUTPUT CONNECTIONS (Figure 4-1)



WARNING: Read precautionary information at beginning of entire Section 4-3 before proceeding.

To obtain full rated output from this unit, it is necessary to select, prepare, and install proper weld cables. Failure to comply in any of these areas may result in unsatisfactory welding performance.

1. Weld Cable Selection

Use the following guidelines to select weld cables:

- a. Use the shortest possible cables, and place cables close together. Excessive cable lengths may reduce output or cause unit overload due to added resistance.
- b. Use weld cable with an insulation voltage rating equal to or greater than the maximum open-circuit voltage (ocv) of the welding power source (see Table 3-1 for unit maximum ocv rating).

Table 4-1. Weld Cable Size

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding*							
	100 ft. Or Less (30 m)		150 ft. (45 m)	200 ft. (60 m)	250 ft. (70 m)	300 ft. (90 m)	350 ft. (105 m)	400 ft. (120 m)
	10 To 60% Duty Cycle	60 Thru 100% Duty Cycle	10 Thru 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0

*Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of more than 300 circular mils per ampere.

S-0007/8-88

- c. Select adequate size weld cable for the anticipated maximum weld amperage. Use total length of weld cable in the circuit to determine cable size. For example, if the cable to the wire feeder, or electrode holder (torch) cable if applicable, is 25 feet (7.5 m) long and the work cable is 25 feet (7.5 m) long, select the size cable recommended in Table 4-1 for 50 feet (15 m).

- d. Do not use damaged or frayed cables.

2. Weld Cable Preparation

- a. Install terminal lugs of adequate amperage capacity and correct stud size onto cables that connect to the work clamp, wire feeder, or electrode holder, and weld output terminals.
- b. If installing an electrode holder, follow manufacturer's installation instructions. Always use an insulated electrode holder to ensure operator safety.
- c. Install work clamp onto cable.

3. Weld Cable Connections (Table 4-2)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

IMPORTANT: Weld output (AC, CC or CV) is determined by the position of the OUTPUT SELECTOR switch (see Section 5-2).

- a. For Gas Metal Arc Welding (GMAW) And Flux Cored Arc Welding (FCAW) (Electrode Positive/Reverse Polarity) (Figure 4-1)

1. Connect one weld cable to RED (Positive) weld output terminal and remaining end to terminal on drive housing of wire feeder (see wire feeder Owner's Manual for location).
2. Connect one end of work cable to BLACK (Negative) weld output terminal.

IMPORTANT: For Electrode Negative/Straight Polarity connections, reverse cable connections to weld output terminals; electrode becomes negative.

- b. For Shielded Metal Arc Welding (SMAW) (Electrode Positive /Reverse Polarity) (Figure 4-1)

1. Connect end of electrode holder cable to RED (Positive) weld output terminal.
2. Connect end of work cable to BLACK (Negative) weld output terminal.


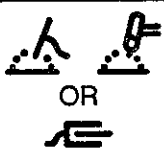

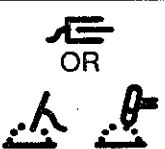











IMPORTANT: For Electrode Negative/Straight Polarity connections, reverse cable connections to weld output terminals; electrode becomes negative.

- c. For Gas Tungsten Arc Welding (GTAW) (Electrode Negative/Straight Polarity) (Figure 4-1)

1. Connect torch cable or connector to BLACK (Negative) weld output terminal. Be sure that the torch connector does not touch the access door when closed.
2. Connect work cable to RED (Positive) weld output terminal.

IMPORTANT: For Electrode Positive/Reverse Polarity connections, reverse cable connections to weld output terminals; electrode becomes positive.

Table 4-2. Connections For Welding Processes

MODE	POLARITY	RED TERMINAL	BLACK TERMINAL	PROCESS
AC 	NOT APPLICABLE	 OR 	 OR 	SMAW GTAW
CC 	DCRP/DCEP			SMAW
	DCSP/DCEN			GTAW SMAW
CV 	DCRP/DCEP			GMAW FCAW
	DCSP/DCEN			GMAW FCAW (THIN MATERIAL)

S-126 176

4-4. ELECTRICAL INPUT CONNECTIONS



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Electrical Input Requirements

Operate the welding power source from a single-phase, 50 or 60 Hertz, ac power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required.

B. Jumper Link Installation (Figure 4-3)



WARNING: Read precautionary information at beginning of entire Section 4-4 before proceeding with this installation.

Jumper links are used to allow the equipment to operate from different line voltages.

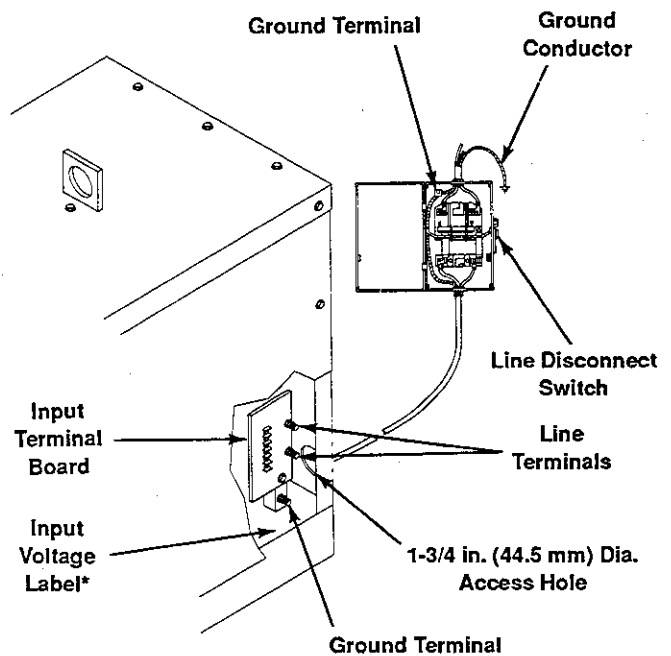
1. Remove right side panel.
2. Compare position of jumper links on the input terminal board to the voltage link arrangement shown on input voltage label.



CAUTION: INCORRECT INPUT VOLTAGE JUMPER LINK PLACEMENT can damage unit.

- Position jumper links as shown on the input voltage label (see Figure 4-3).
- Store unused jumper links across linked terminals.

3. Install jumper links onto the input terminal board to match the available input line voltage.



*Input voltage label is on the center upright next to the input terminal board.

Ref. TB-114 119
Ref. TC-130 173

Figure 4-3. Input Conductor Connections

Table 4-3. Input Conductor And Fuse Size

Input Voltage	200	220	230	380	415	460	575
Input Conductor Size (AWG)	4	6	6	8	10	10	10
Ground Conductor Size (AWG)	6	6	6	8	10	10	10
Fuse Size In Amperes	150	125	125	80	70	70	50

*Conductor size is based on the 1987 Edition of the National Electrical Code (NEC) specifications for allowable ampacities of insulated copper conductors, having a temperature rating of 167°F (75°C), with not more than three single current-carrying conductors in a raceway (Article 310 of NEC). (The ground conductor is not counted as a current-carrying conductor.)

*Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Article 630 of NEC).

S-0092/4-89

C. Welding Power Source Input Power Connections (Figure 4-3)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Install a fusible line disconnect switch in the input circuit to the welding power source.
- Connect input conductors to the welding power source before connecting to the single-phase input power.
- Read and follow safety information at beginning of entire Section 4-4.

The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power source whenever it is necessary to inspect or service the unit.

1. Use Table 4-3 as a guide to select input conductors for the installation. The input conductors should be covered with an insulating material that complies with national, state, and local electrical codes.
2. Install terminal lugs of adequate amperage capacity and correct stud size onto the input and ground conductors.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Do not connect an input conductor to the ground terminal in the unit.

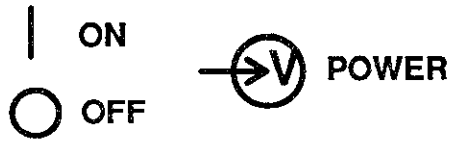
- Do not connect the ground conductor to an input line terminal.

Incorrect input connections can result in an electrically energized welding power source chassis. The ground terminal is connected to the welding power source chassis and is for grounding purposes only.

3. Obtain and install a standard conduit strain relief connector into the rear panel access hole.
4. Insert conductors through strain relief installed in Step 3. Route conductors to the input terminal board.
5. Connect input conductors to line terminals on the input terminal board (see Figure 4-3).
6. Connect the ground conductor to the ground terminal (see Figure 4-3).
7. Connect remaining end of ground conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
8. Connect remaining ends of input conductors to a deenergized line disconnect switch.
9. Secure the input cable in the strain relief.
10. Reinstall right side panel.
11. Use Table 4-2 as a guide to select line fuses for the disconnect switch. Obtain and install proper fuses.

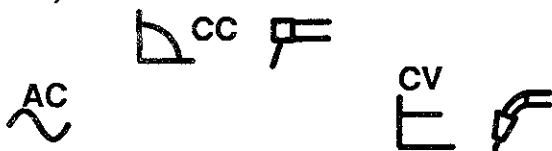
SECTION 5 – OPERATOR CONTROLS

5-1. POWER SWITCH (Figure 5-1)



Placing the POWER switch in the ON position energizes the welding power source and fan. The fan runs whenever the POWER switch is in the ON position. Placing the POWER switch in the OFF position shuts down the welding power source and fan.

5-2. OUTPUT SELECTOR SWITCH (Figure 5-1 And Table 4-2)



- WARNING: ELECTRIC SHOCK can kill.**
- Use AC output *ONLY* if required for the welding process.
 - If AC output is required, use remote output control.
 - Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.

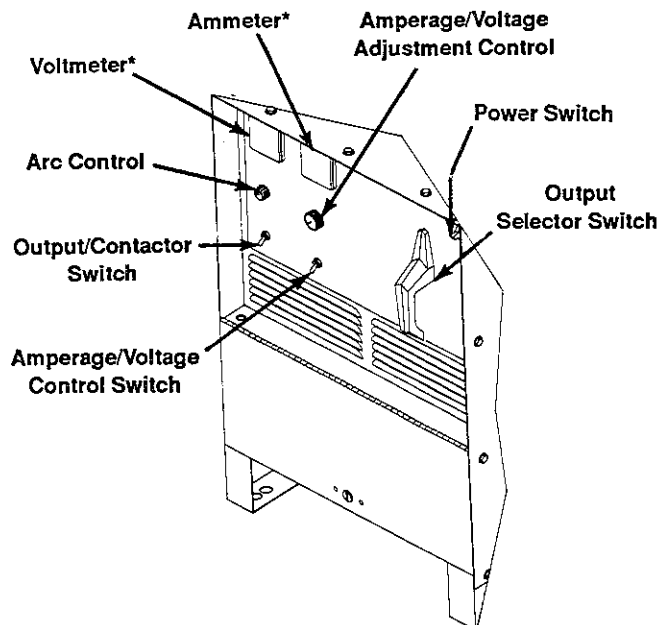


Figure 5-1. Front Panel View

The OUTPUT SELECTOR switch provides selection of weld output characteristics for the desired process. The AC (Alternating Current) and CC (DC, Constant Current) positions are specifically designed for the Shielded Metal Arc Welding (SMAW) and Gas Tungsten Arc

Welding (GTAW) processes. The CV (DC, Constant Voltage) position is specifically designed for the Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) processes.



CAUTION: ARCING can damage switch contacts.

- Do not change the position of the OUTPUT SELECTOR switch while welding or under load. Arcing causes the contacts to become pitted and eventually inoperative.

5-3. AMPERAGE/VOLTAGE ADJUSTMENT CONTROL (Figure 5-1)

AMPERAGE/VOLTAGE ADJUSTMENT

The AMPERAGE/VOLTAGE ADJUSTMENT control provides a means of selecting the desired output within the entire range of the welding power source. Rotating this control in a clockwise direction increases the weld output.

The scale surrounding the AMPERAGE/VOLTAGE ADJUSTMENT control is calibrated in actual amperage and voltage values and is to be read according to the selected mode (either AC, CC, or CV). This control provides voltage adjustment in the CV mode and amperage adjustment in the AC and CC modes.

IMPORTANT: The AMPERAGE/VOLTAGE ADJUSTMENT control may be adjusted while welding.

5-4. AMPERAGE/VOLTAGE SWITCH (Figure 5-1) PANEL



REMOTE

AMPERAGE/VOLTAGE ADJUSTMENT

If remote amperage or voltage control is desired, make connections to the REMOTE 14 receptacle as instructed in Section 4-3A, and place the AMPERAGE/VOLTAGE switch in the REMOTE position.

When a remote amperage or voltage control is used, the Remote Amperage/Voltage control functions as a fine amperage/voltage adjustment for the AMPERAGE/VOLTAGE ADJUSTMENT control setting on the welding power source. For example, if the AMPERAGE/VOLTAGE ADJUSTMENT control is set at the mid-range position, the Remote Amperage/Voltage control will provide (from its minimum to maximum positions) fine amperage/voltage adjustment of one half the welding power source output. If full adjustment through use of a Remote Amperage/Voltage control is desired, the AMPERAGE/VOLTAGE ADJUSTMENT control must be set at the maximum position.

If remote amperage or voltage control is not desired, place the AMPERAGE/VOLTAGE switch in the PANEL position. Only the AMPERAGE/VOLTAGE ADJUSTMENT control then regulates output.

5-5. OUTPUT/CONTACTOR SWITCH (Figure 5-1)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Do not touch the weld output terminals when the contactor is energized.
- Do not touch stick electrode, tungsten electrode, or welding wire and work clamp at the same time.

If the OUTPUT/CONTACTOR switch is ON, open-circuit voltage is present at the weld output terminals as long as the welding power source is energized.

IMPORTANT: Although the term CONTACTOR is used on the nameplate and throughout this manual, the output is not switched on or off by a physical contactor; rather, the output is controlled by relay action and solid-state components on circuit boards.

If remote contactor control by means of a wire feeder or remote device is desired, make connections to the REMOTE 14 receptacle as instructed in Section 4-3A, and place the OUTPUT/CONTACTOR switch in the REMOTE position. Open-circuit voltage is present at the weld output terminals whenever the gun switch or remote device is closed.

The OUTPUT/CONTACTOR switch REMOTE position is normally used with all wire feeding processes (GMAW and FCAW) and the Gas Tungsten Arc Welding (GTAW) process. The ON position is normally used with the Shielded Metal Arc Welding (SMAW).

If remote contactor control is not desired, place the OUTPUT/CONTACTOR switch in the ON position. Open-circuit voltage is present at the weld output terminals whenever the POWER switch is in the ON position.

5-6. ARC CONTROL (Figure 5-1)

IMPORTANT: The ARC CONTROL is not operational when the OUTPUT SELECTOR switch is in the CV (Constant Voltage) mode.

The ARC CONTROL provides variable selection of short-circuit amperage to suit individual welding conditions. Rotating this control clockwise causes the amperage to increase as the short-circuit condition is approached. When this control is set at some value above 0, the amperage begins to increase when arc voltage drops below 18 volts.

When the control is set at 100, the short-circuit amperage is considerably higher than normal welding amperage (see Chart 3-1, Volt-Ampere Curves for CC mode). This provides extra amperage for arc starting in out-of-position welds as well as the momentary overcurrents necessary for certain types of electrodes.

When the control is set at 0, short-circuit amperage is the same as normal welding amperage.

IMPORTANT: Set ARC CONTROL at 0 for Gas Tungsten Arc Welding (GTAW).

When the control is set at 50, short-circuit amperage is approximately half that of the 100 position but still higher than normal welding amperage. The 50 position provides a moderate amperage increase for arc starting necessary for certain types of electrodes and applications.

IMPORTANT: The ARC CONTROL may be adjusted while welding.

5-7. METERS (Optional) (Figure 5-1)

This unit may be equipped with optional meters to monitor the welding operation and serve as an indication of the welding process. They are not intended for exact amperage or voltage measurements. The voltmeter is internally connected to the welding power source output terminals. The voltmeter will indicate the voltage at the weld output terminals, but will not necessarily indicate the actual voltage at the welding arc (due to cable resistance, poor connections, etc.). The ammeter indicates the weld amperage output of the welding power source.

SECTION 6 – SEQUENCE OF OPERATION



WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury; IMPROPER AIRFLOW AND EXPOSURE TO ENVIRONMENT can damage internal parts.

- Do not touch live electrical parts.
- Keep all covers and panels in place while operating.

Warranty is void if the welding power source is operated with any portion of the outer enclosure removed.

ARC RAYS, SPARKS, AND HOT SURFACES can burn eyes and skin; NOISE can damage hearing.

- Wear correct eye, ear, and body protection.

FUMES AND GASES can seriously harm your health.

- Keep your head out of the fumes.
- Ventilate to keep from breathing fumes and gases.
- If ventilation is inadequate, use approved breathing device.

WELDING WIRE can cause puncture wounds.

- *Do not point gun toward any part of the body, any conductive surface, or other personnel.*

HOT METAL, SPATTER, AND SLAG can cause fire and burns.

- *Watch for fire.*
- *Keep a fire extinguisher nearby, and know how to use it.*
- *Do not use near flammable material.*
- *Allow work and equipment to cool before handling.*

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- *Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.*

See Section 1 - Safety Rules For Operation Of Arc Welding Power Source for basic welding safety information.

6-1. GAS TUNGSTEN ARC WELDING (GTAW)



WARNING: Read and follow safety information at beginning of entire Section 6 before proceeding.

1. Install and connect unit according to Section 4.



WARNING: ELECTRIC SHOCK can kill.

- *Use AC output ONLY if required for the welding process.*
- *If AC output is required, use remote output control.*
- *Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.*

2. Place OUTPUT SELECTOR switch in desired position (see Section 5-2).
3. If remote amperage/voltage control is desired, make connections to the REMOTE 14 receptacle (see Section 4-3A), and place the AMPERAGE/VOLTAGE switch in the REMOTE position.
4. If remote amperage/voltage control is not desired, place the AMPERAGE/VOLTAGE switch in the PANEL position.
5. Rotate the AMPERAGE/VOLTAGE ADJUSTMENT control or Remote Amperage/Voltage control (if applicable) to the desired position (see Section 5-3).
6. Place the OUTPUT/CONTACTOR switch in the desired position (see Section 5-5).
7. Rotate the ARC CONTROL to the 0 (Zero) position.
8. Make adjustments to remote control(s) as necessary.
9. Wear dry insulating gloves and clothing, and wear welding helmet with proper filter lens according to ANSI Z49.1.

10. Prepare for welding as follows:

- a. Connect work clamp to clean, bare metal at workpiece.
- b. Select and obtain proper tungsten electrode (see Table 7-2).
- c. Prepare tungsten electrode according to Section 7-2, and insert into torch.

11. Turn on shielding gas and coolant supplies, if applicable.
12. Place the POWER switch in the ON position.
13. Begin welding.

6-2. SHIELDED METAL ARC WELDING (SMAW)



WARNING: Read and follow safety information at beginning of entire Section 6 before proceeding.

1. Install and connect unit according to Section 4.



WARNING: ELECTRIC SHOCK can kill.

- *Use AC output ONLY if required for the welding process.*
- *If AC output is required, use remote output control.*
- *Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.*

2. Place OUTPUT SELECTOR switch in desired position (see Section 5-2).
3. If remote amperage/voltage control is desired, make connections to the REMOTE 14 receptacle (see Section 4-3A), and place the AMPERAGE/VOLTAGE switch in the REMOTE position.
4. If remote amperage/voltage control is not desired, place the AMPERAGE/VOLTAGE switch in the PANEL position.
5. Rotate the AMPERAGE/VOLTAGE ADJUSTMENT control or Remote Amperage/Voltage control (if applicable) to the desired position (see Section 5-3).
6. Place the OUTPUT/CONTACTOR switch in the ON position.
7. Rotate the ARC CONTROL to the desired position (see Section 5-6).
8. Make adjustments to remote control(s) as necessary.
9. Wear dry insulating gloves and clothing, and wear welding helmet with proper filter lens according to ANSI Z49.1.
10. Prepare for welding as follows:
 - a. Connect work clamp to clean, bare metal at workpiece.
 - b. Select and obtain proper electrode, and insert into electrode holder.
11. Place the POWER switch in the ON position.
12. Begin welding.

6-3. GAS METAL ARC (GMAW) AND FLUX CORED ARC WELDING (FCAW)



WARNING: Read and follow safety information at beginning of entire Section 6 before proceeding.

1. Install and connect unit according to Section 4.



WARNING: ELECTRIC SHOCK can kill.

- Use AC output **ONLY** if required for the welding process.
- If AC output is required, use remote output control.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.

2. Install and prepare wire feeder and gun according to their Owner's Manuals.
3. Place the OUTPUT SELECTOR switch in the CV position.
4. Place the OUTPUT/CONTACTOR switch in the REMOTE position.
5. If remote amperage/voltage control is desired, make connections to the REMOTE 14 receptacle (see Section 4-3A), and place the AMPERAGE/VOLTAGE switch in the REMOTE position.
6. If remote amperage/voltage control is not desired, place the AMPERAGE/VOLTAGE switch in the PANEL position.

7. Rotate the AMPERAGE/VOLTAGE ADJUSTMENT control or Remote Amperage/Voltage control (if applicable) to the desired position (see Section 5-3).
8. Wear dry insulating gloves and clothing, and wear welding helmet with proper filter lens according to ANSI Z49.1.
9. Prepare for welding as follows:
 - a. Connect work clamp to clean, bare metal at workpiece.
 - b. Select and obtain proper welding wire, and thread as instructed in wire feeder Owner's Manual.
10. Turn on shielding gas and water supplies, if applicable.
11. Energize the wire feeder.
12. Place the POWER switch in the ON position.
13. Begin welding.

6-4. SHUTTING DOWN

1. Stop welding.
2. Shut down the wire feeder, if applicable.
3. Place the POWER switch in the OFF position.
4. Turn off shielding gas and water supplies, if applicable.



WARNING: HIGH CONCENTRATION OF SHIELDING GAS can harm health or kill.

- Shut off gas supply when not in use.

5. Turn off flux supply, if applicable.

SECTION 7 – MAINTENANCE & TROUBLESHOOTING

7-1. ROUTINE MAINTENANCE

IMPORTANT: Every six months inspect the labels on this unit for legibility. All precautionary labels must be maintained in a clearly readable state and replaced when necessary. See Parts List for part number of precautionary labels.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

MOVING PARTS can cause serious injury.

- Keep away from moving parts.

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

Maintenance to be performed only by qualified persons.

Table 7-1. Maintenance Schedule

FREQUENCY	MAINTENANCE
Every Month	Units in heavy service environments: Check labels, weld cables, clean internal parts.
Every 3 Months	Check weld cables (see Section 7-1B).
Every 6 Months	Check all labels (see IMPORTANT block, Section 7-1). Clean internal parts (see Section 7-1C).
*Frequency of service is based on units operated 40 hours per week. Increase frequency of maintenance if usage exceeds 40 hours per week.	

A. Fan Motor

This unit is equipped with an exhaust fan and relies on forced draft for adequate cooling. The fan motor is manufactured with lifetime sealed bearings and requires no maintenance.

B. Weld Cables

WARNING: Read and follow safety information at beginning of entire Section 7-1 before proceeding.

Every three months inspect cables for breaks in insulation. Repair or replace cables if insulation breaks are present. Clean and tighten connections at each inspection.

C. Internal Cleaning

WARNING: Read and follow safety information at beginning of entire Section 7-1 before proceeding.

Every six months blow out or vacuum dust and dirt from the inside of the welding power source. Remove the outer enclosure, and use a clean, dry airstream or vacuum suction for the cleaning operation. If dusty or dirty conditions are present, clean the unit monthly.

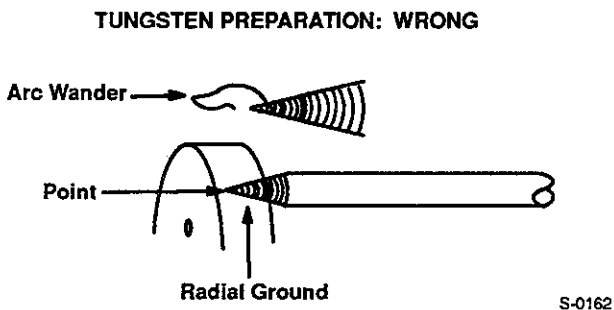
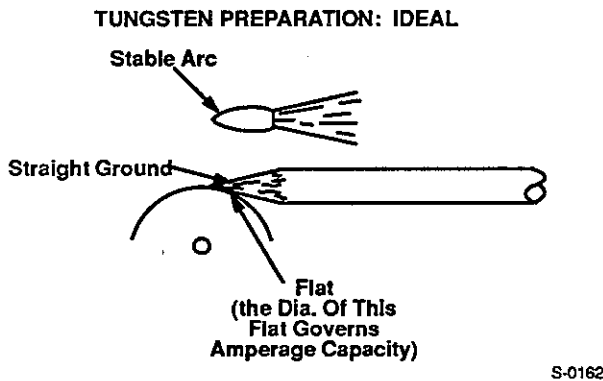


Figure 7-1. Tungsten Preparation

7-2. TUNGSTEN ELECTRODE (Table 7-2, Figure 7-1, And Figure 7-2)

Use Table 7-2 to select the correct size and type tungsten electrode. Prepare the tungsten electrode using the following guidelines. A properly prepared tungsten electrode is essential in obtaining a satisfactory weld.

A. For AC Or DC Electrode Positive Welding (Figure 7-2)

Ball the end of tungsten electrodes used for ac or dc electrode positive welding before beginning the welding operation. Weld amperage causes the tungsten electrode to form the balled end. The diameter of the end should not exceed the diameter of the tungsten electrode by more than 1-1/2 times. For example, the end of a 1/8 in. (3.2 mm) diameter tungsten electrode should not exceed 3/16 in. (4.8 mm) diameter.

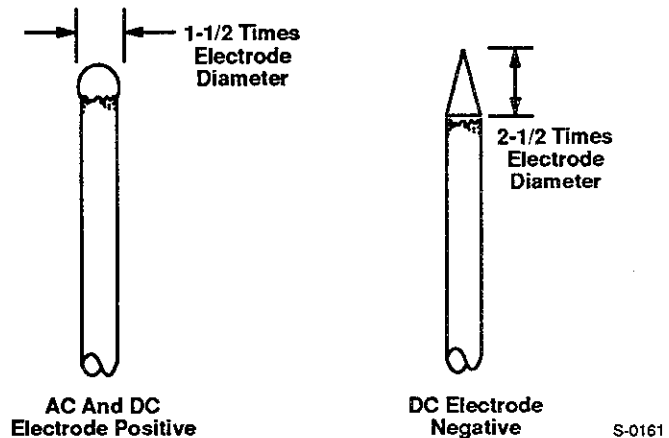


Figure 7-2. Properly Prepared Tungsten Electrodes

B. For DC Electrode Negative Welding (Figure 7-1 And Figure 7-2)

CAUTION: HOT FLYING METAL PARTICLES can injure personnel, start fires, and damage equipment; TUNGSTEN CONTAMINATION can lower weld quality.

- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Do not use same wheel for any other job or the tungsten will become contaminated.
- Shape tungsten electrodes on a fine grit, hard abrasive wheel used only for tungsten shaping.

Grind tungsten electrodes so that grinding marks run lengthwise with the electrode. These procedures reduce the possibility of the tungsten electrode transferring foreign matter into the weld and help reduce arc wander.

Grind the end of the tungsten electrode to a taper for a distance of 2 to 2-1/2 electrode diameters in length. For example, the ground surface for a 1/8 in. (3.2 mm) diameter tungsten electrode should be 1/4 to 5/16 in. (6.4 to 8.0 mm) long.

For additional information, see your distributor for a handbook on the Gas Tungsten Arc Welding (GTAW) process.

Table 7-2. Tungsten Size

Electrode Diameter	Amperage Range - Polarity - Gas Type			
	DC-Argon Electrode Negative/Straight Polarity	DC-Argon Electrode Positive/Reverse Polarity	AC-Argon Using High Frequency	AC-Argon Balanced Wave Using High Freq.
Pure Tungsten (Green Band)				
.010"	Up to 15	*	Up to 15	Up to 10
.020"	5-20	*	5-20	10-20
.040"	15-80	*	10-60	20-30
1/16"	70-150	10-20	50-100	30-80
3/32"	125-225	15-30	100-160	60-130
1/8"	225-360	25-40	150-210	100-180
5/32"	360-450	40-55	200-275	160-240
3/16"	450-720	55-80	250-350	190-300
1/4"	720-950	80-125	325-450	250-400
2% Thorium Alloyed Tungsten (Red Band)				
.010"	Up to 25	*	Up to 20	Up to 15
.020"	15-40	*	15-35	5-20
.040"	25-85	*	20-80	20-60
1/16"	50-160	10-20	50-150	60-120
3/32"	135-235	15-30	130-250	100-180
1/8"	250-400	25-40	225-360	160-250
5/32"	400-500	40-55	300-450	200-320
3/16"	500-750	55-80	400-500	290-390
1/4"	750-1000	80-125	600-800	340-525
Zirconium Alloyed Tungsten (Brown Band)				
.010"	*	*	Up to 20	Up to 15
.020"	*	*	15-35	5-20
.040"	*	*	20-80	20-60
1/16"	*	*	50-150	60-120
3/32"	*	*	130-250	100-180
1/8"	*	*	225-360	160-250
5/32"	*	*	300-450	200-320
3/16"	*	*	400-550	290-390
1/4"	*	*	600-800	340-525

***NOT RECOMMENDED**

The figures listed are intended as a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

S-0009/8-88

7-3. OVERLOAD PROTECTION



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Circuit Breaker CB1 (Figure 4-1)



WARNING: Read and follow safety information at beginning of entire Section 7-3 before proceeding.

Circuit Breaker CB1 protects the 115 volts ac winding of transformer T1 from overload. Should an overload occur, CB1 would open and stop the 115 volts ac output to REMOTE 14 receptacle RC1 and 115 VOLTS AC duplex receptacle RC2. If CB1 opens, correct the problem, and manually reset CB1.

B. Circuit Breaker CB2 (Figure 4-1)



WARNING: Read and follow safety information at beginning of entire Section 7-3 before proceeding.

Circuit Breaker CB2 protects the 24 volts ac winding of transformer T1 from overload. Should an overload occur, CB2 would open and stop the 24 volts ac output to REMOTE 14 receptacle RC1. If CB2 opens, correct the problem, and manually reset CB2.

7-4. THERMAL OVERLOAD PROTECTION

The main transformer is protected against overload by normally-closed thermostat TP1. If overheating occurs, TP1 opens and output ceases. Allow a cooling period with the unit on (fan running) before resuming operation.

7-5. CIRCUIT BOARD HANDLING PRECAUTIONS



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.



CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.

- Put on properly grounded wrist strap BEFORE handling circuit boards.
- Transport circuit boards in proper static-shielding carriers or packages.
- Perform work only at a static-safe work area.

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- Be sure that plugs are properly installed and aligned.

EXCESSIVE PRESSURE can break circuit board.

- Use only minimal pressure and gentle movement when disconnecting or connecting board plugs and removing or installing board.

7-6. TROUBLESHOOTING (Table 7-3)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

Troubleshooting to be performed only by qualified persons.

MOVING PARTS can cause serious injury.

- Keep away from moving parts.

It is assumed that the unit was properly installed according to Section 4 of this manual, the operator is familiar with the function of controls, the welding power source was working properly, and the trouble is not related to the welding process. The following table is designed to diagnose and provide remedies for some of the troubles that may develop in this welding power source.

Use this table in conjunction with the circuit diagram while performing troubleshooting procedures. If the trouble is not remedied after performing these procedures, the nearest Factory Authorized Service Station should be contacted. In all cases of equipment malfunction, the manufacturer's recommendations should be strictly followed.

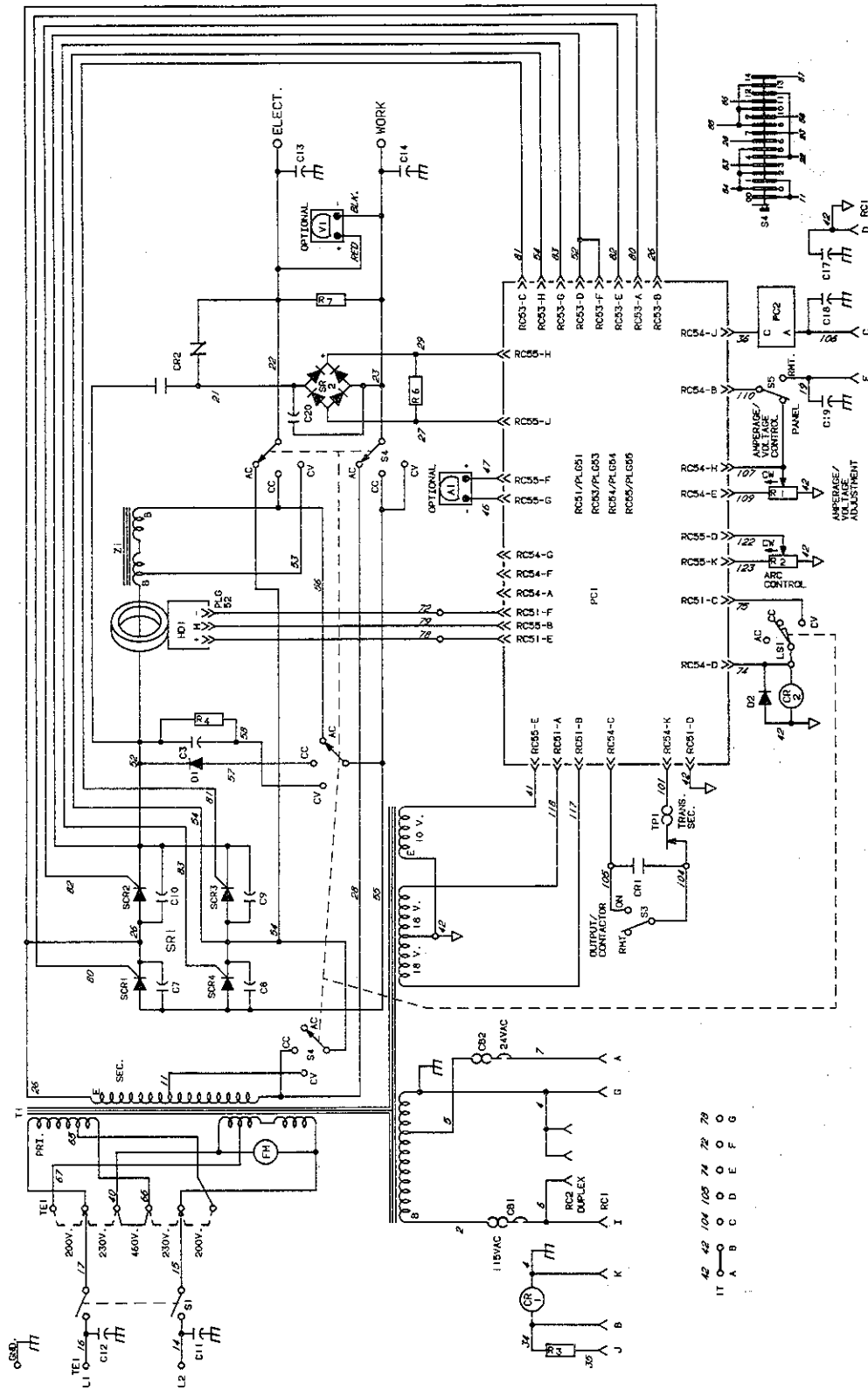
Table 7-3. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
No weld output; unit completely inoperative.	Line disconnect switch in OFF position.	Place line disconnect in the ON position.
	Line fuse(s) open.	Check and replace line fuse(s).
	Improper electrical input connections.	See Section 4-4 for proper input connections.
	Input voltage jumper links not in proper position.	See Section 4-4 for proper jumper link position.
	POWER switch S1.	Replace S1.
No weld output; fan on.	OUTPUT/CONTACTOR switch S3 position.	Place S3 in ON position if no remote control is used. Place S3 in REMOTE position, and be sure Remote Control is connected to REMOTE 14 receptacle RC1 (see Section 4-3).
	Remote control device.	Check, repair, or replace remote control device.
	Thermostat TP1 (thermal shut-down).	Allow unit to cool with fan ON (see Section 7-4).
	Control relay CR1.	Check and replace CR1, if necessary.
	Control board PC1.	Replace PC1 (see Section 7-5).
No control of weld output.	AMPERAGE/VOLTAGE ADJUSTMENT control switch S5 position.	Place S5 in PANEL position if no remote control is being used. Place S5 in REMOTE position, and be sure remote control is connected to REMOTE 14 receptacle RC1 (see Section 4-3).
	AMPERAGE/VOLTAGE ADJUSTMENT control R1.	Check and replace R1, if necessary.
	Control board PC1.	Replace PC1 (see Section 7-5).
Unit provides only maximum or minimum weld output.	Control board PC1.	Replace PC1 (see Section 7-5).
	Hall Device HD1.	Check and replace HD1, if necessary.
Erratic or improper weld output.	Incorrect weld cable size.	Use proper size and type of cable (see Section 4-3).
	Loose or dirty weld cable connections.	Clean and tighten all welding connections.
	Improper wire feeder installation.	See Installation section in wire feeder's Owner's Manual.
	OUTPUT SELECTOR switch S4.	Place S4 in proper position for welding process (see Section 5-2).
	Control relay CR2.	Check and replace CR2, if necessary.
	SCR in main rectifier SR1.	Contact nearest factory authorized service station.
	Control board PC1.	Replace PC1 (see Section 7-5).
	Hall device HD1.	Check and replace HD1, if necessary.

Table 7-3. Troubleshooting (Continued)

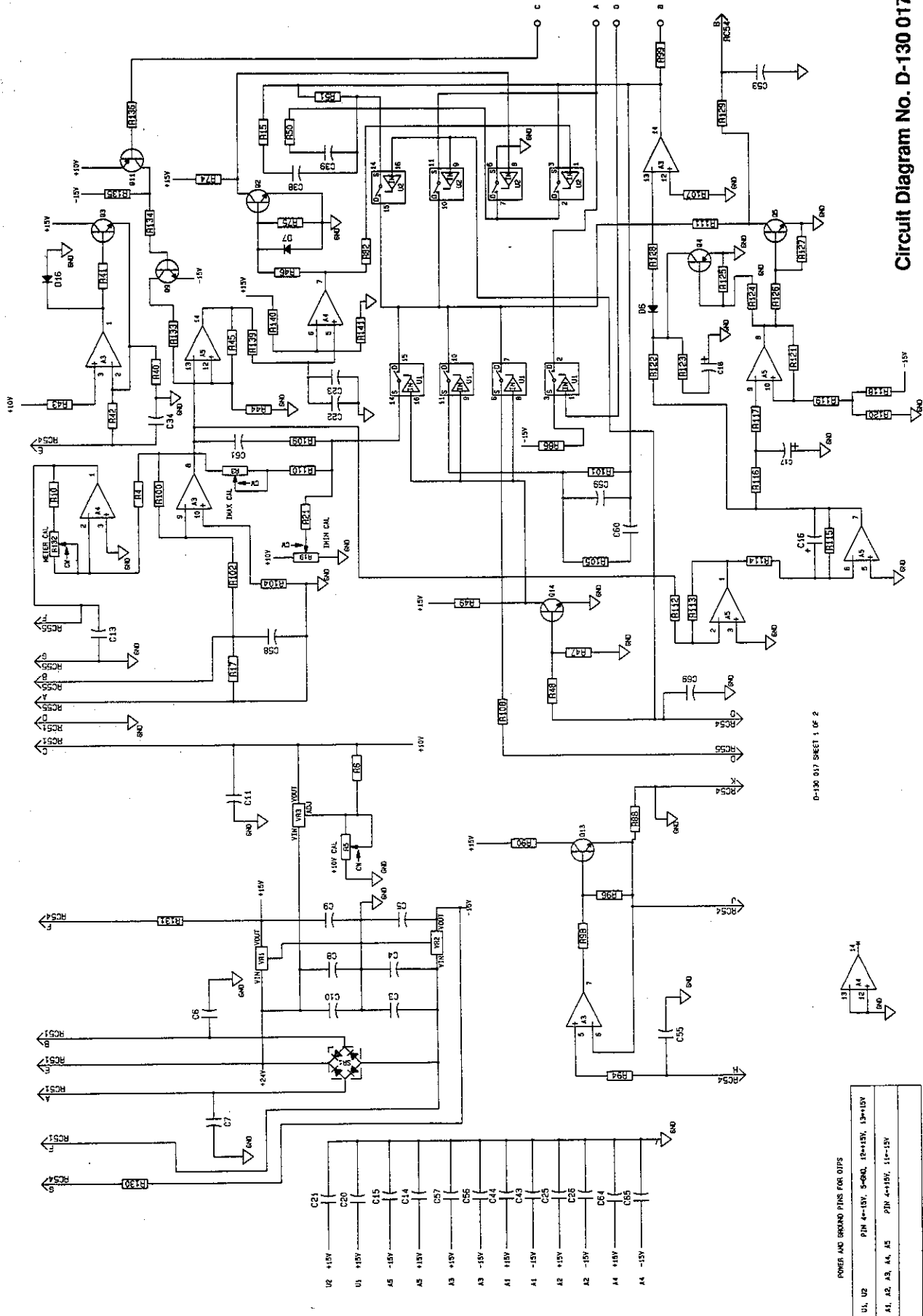
TROUBLE	PROBABLE CAUSE	REMEDY
No 115 volts AC output at 115 VOLTS AC duplex receptacle or REMOTE 14 receptacle RC1.	Circuit breaker CB1 open.	Reset CB1 (see Section 7-3).
No 24 volts AC output at REMOTE 14 receptacle RC1.	Circuit breaker CB2 open.	Reset CB2 (see Section 7-3).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Loose gas fittings on regulator or gas line. This will siphon oxygen into the weld zone.	Check and tighten all gas fittings.
	Insufficient gas flow.	Increase gas flow setting.
	Drafts blowing gas shield away from tungsten.	Shield weld zone from drafts.
	Contaminated tungsten.	Prepare tungsten as instructed in Section 7-2.
Wandering arc – poor control of direction of arc.	Use of tungsten considerably larger than recommended.	Use proper size tungsten (see Table 7-2).
	Improperly prepared tungsten.	Prepare tungsten as instructed in Section 7-2.
Fan inoperative.	Fan blade obstructions.	Check for and remove fan blade obstructions.
	Fan motor (FM) leads open or shorted.	Check for and correct open or shorted FM leads.
	Fan motor (FM).	Check and replace FM.

SECTION 8 - ELECTRICAL DIAGRAMS



Circuit Diagram No. C-132 832-A

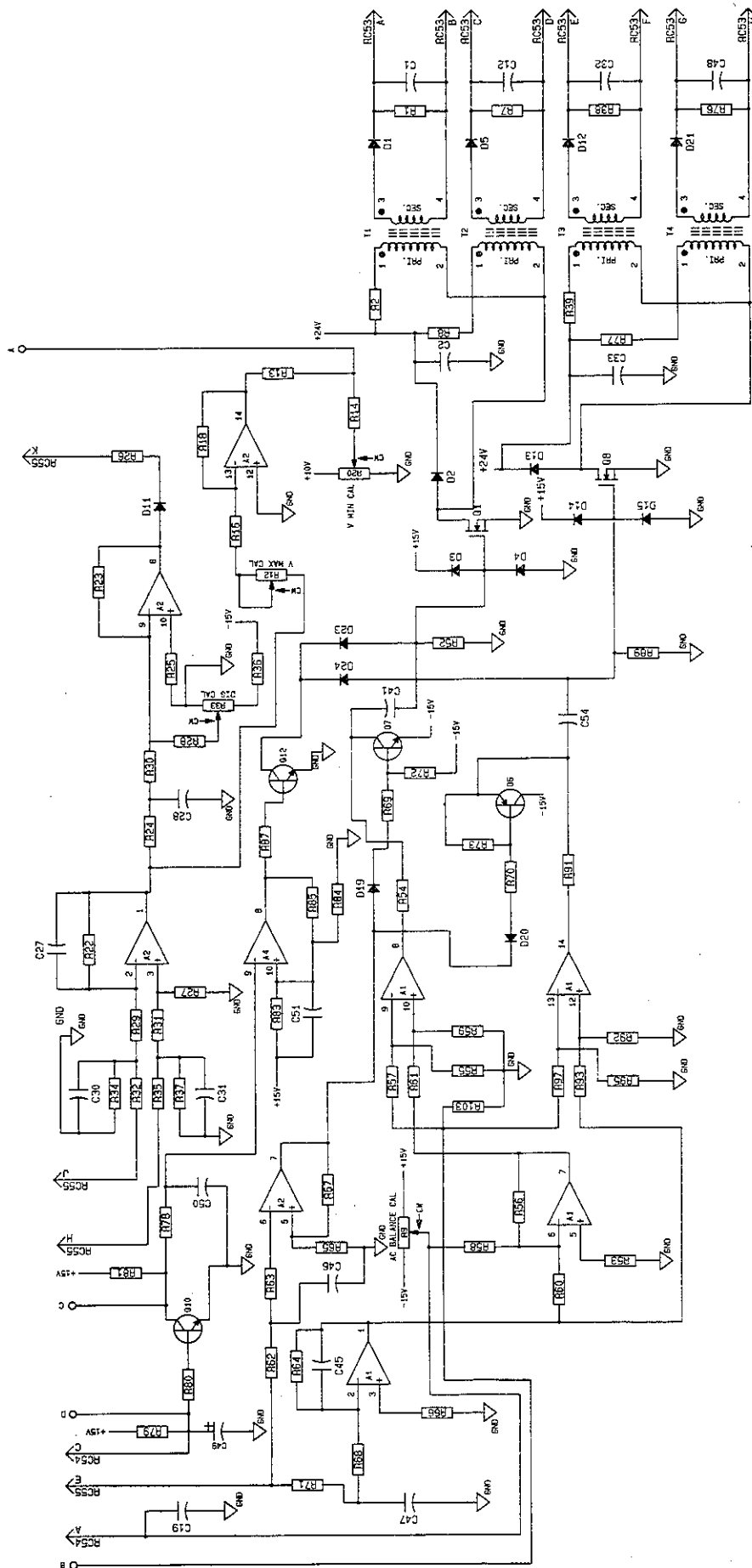
Diagram 8-1. Circuit Diagram For Welding Power Source



Circuit Diagram No. D-130 017-A

Diagram 8-2A. Circuit Diagram For Control Board PC1 (1 of 2)

D-130 017 SHEET 1 OF 2



Circuit Diagram No. D-130 017-A

Diagram 8-2B. Circuit Diagram For Control Board PC1 (2 of 2)

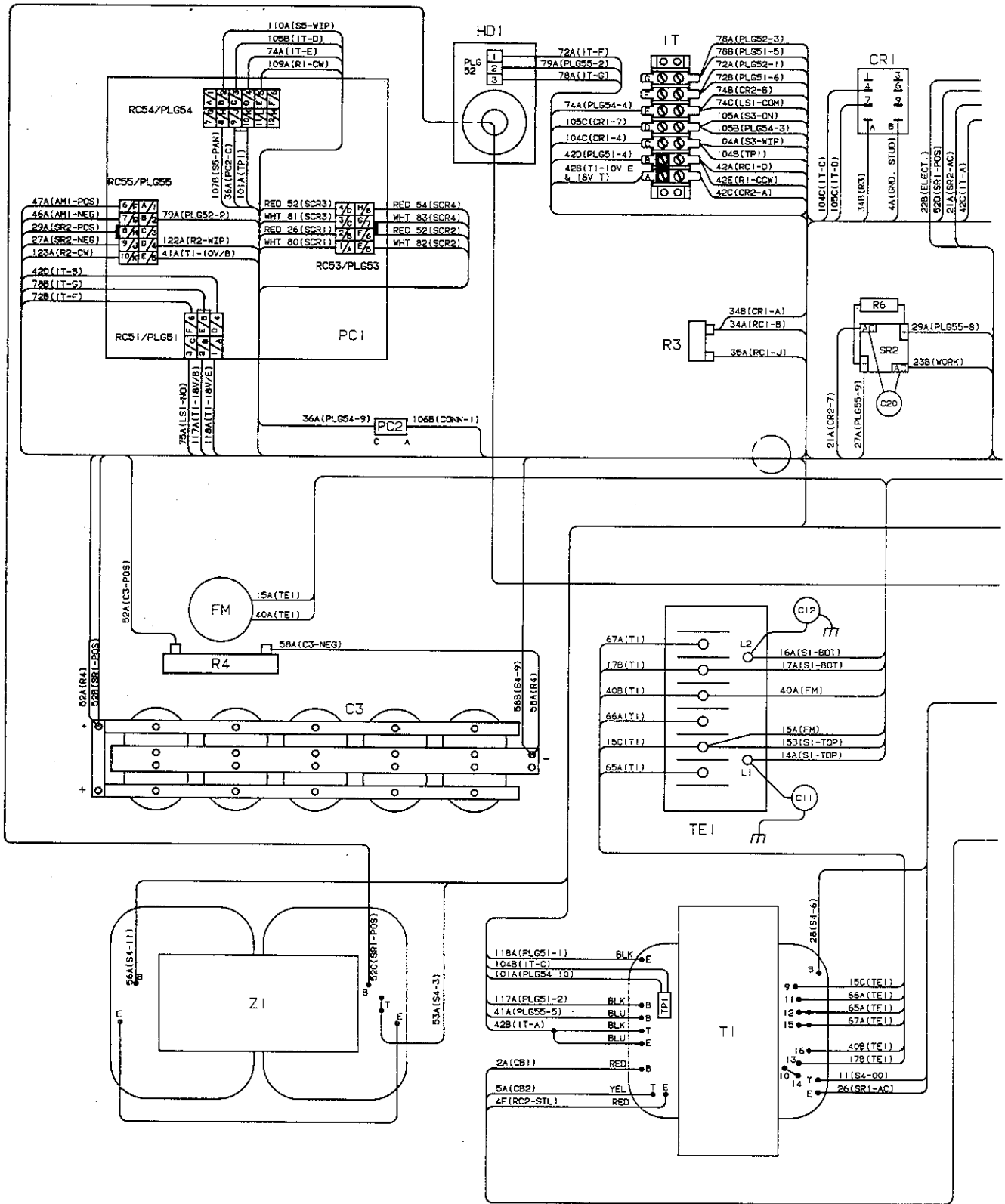
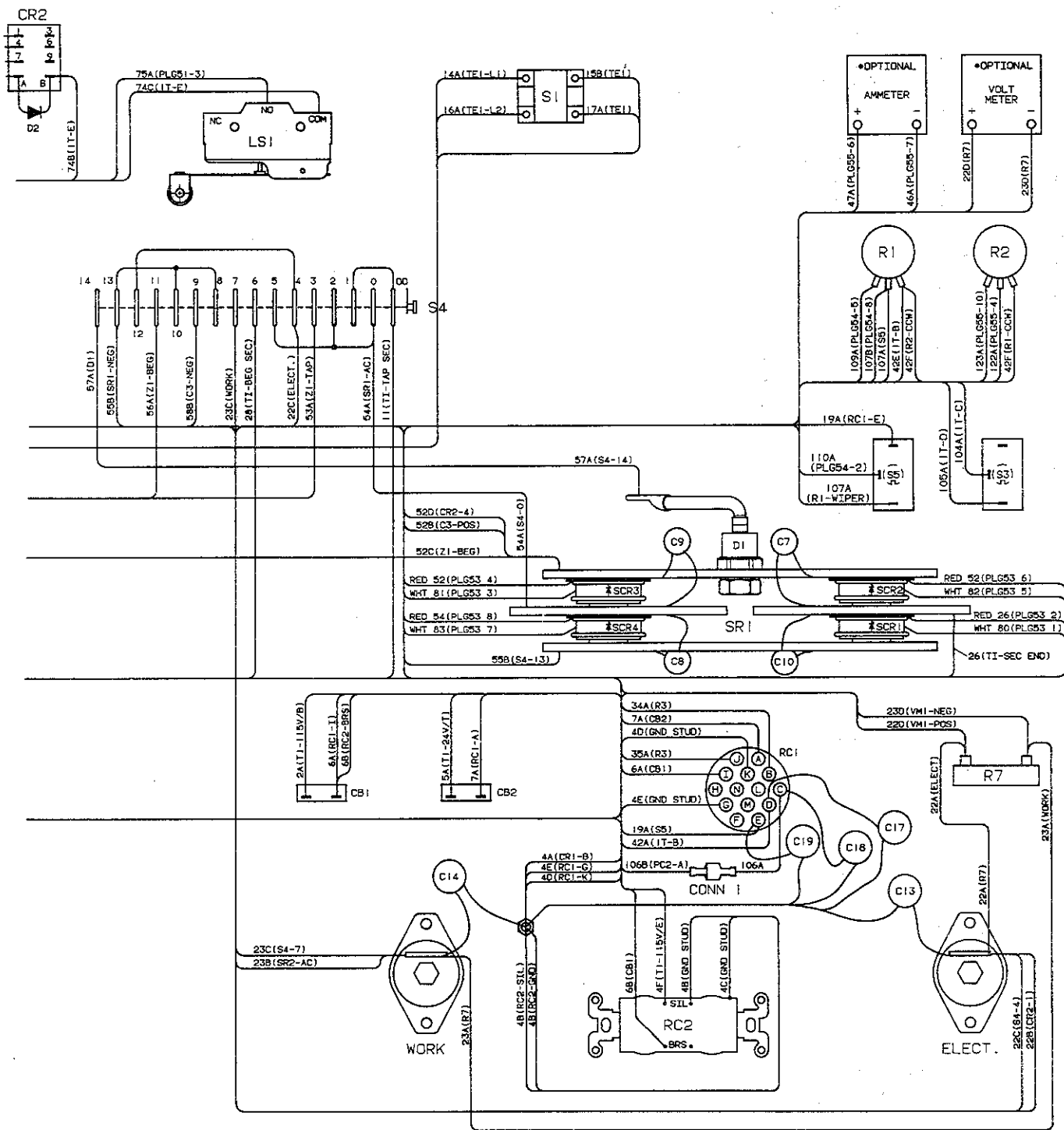


Diagram 8-3. Wiring Diagram For Welding Power Source



Wiring Diagram No. D-132 833-A



Circuit Diagram No. A-121 282

Diagram 8-4. Circuit Diagram For Snubber Board PC2

SECTION 9 – PARTS LIST

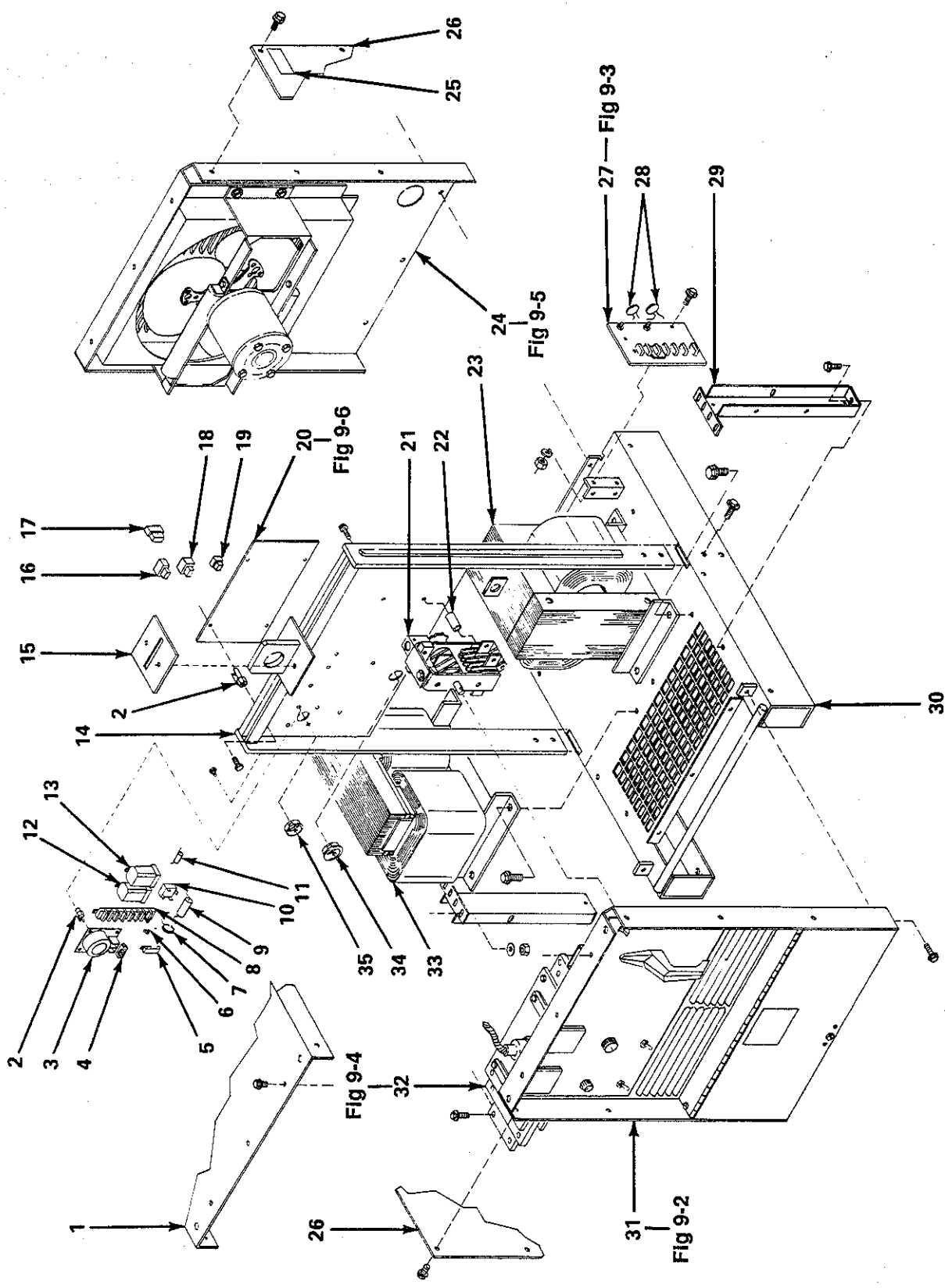
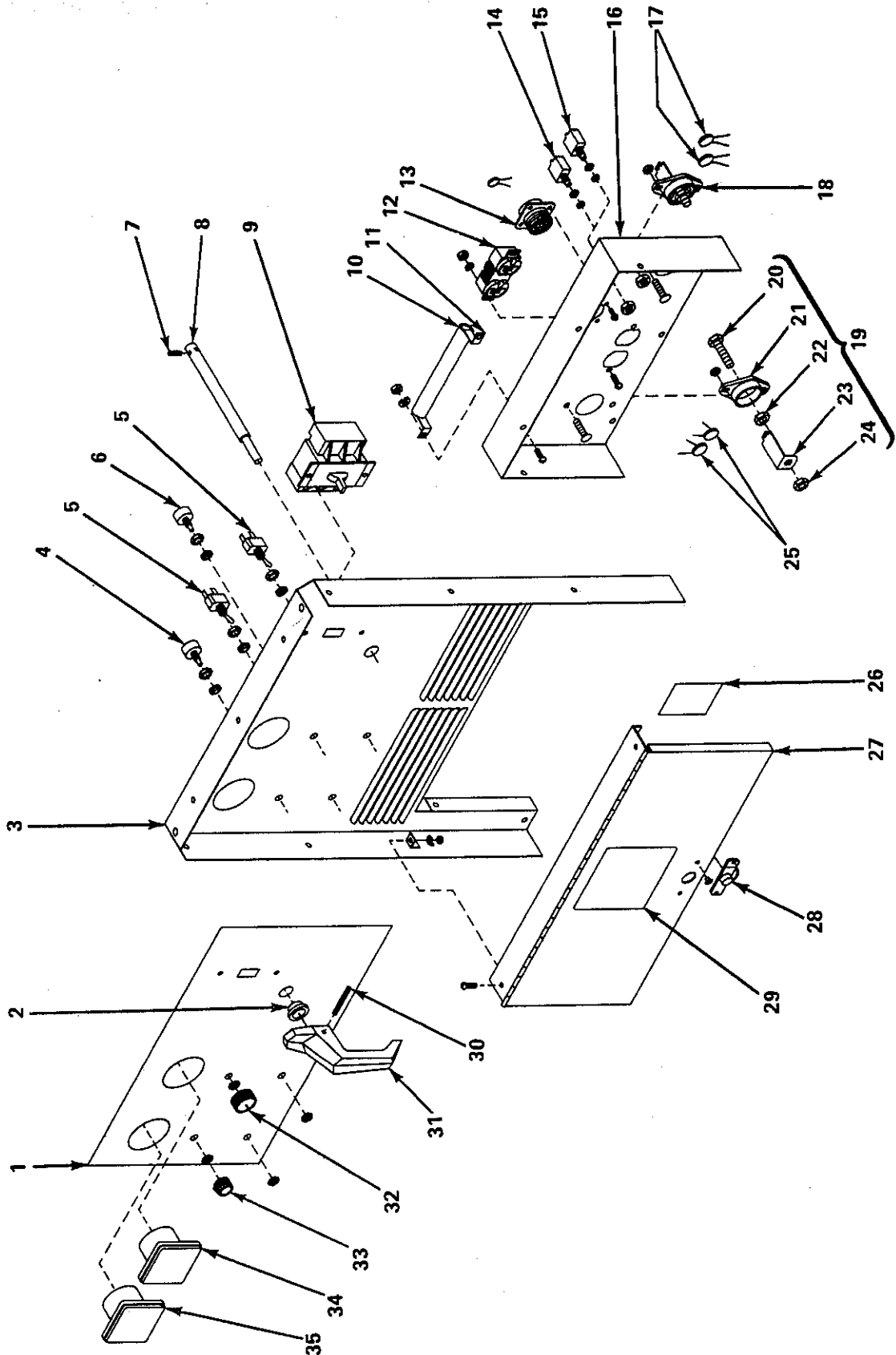


Figure 9-1. Main Assembly

Replace Coils At Factory Or Factory Authorized Service Station

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 9-1. Main Assembly				
1		114 741	COVER, top	1
2		110 375	STAND-OFF SUPPORT, PC card	9
3	HD1	137 156	TRANSDUCER, current 300A	1
4	PLG52	130 204	HOUSING PLUG & SOCKETS, (consisting of)	1
		114 066	· TERMINAL, female	3
5	R3	114 050	RESISTOR, WW fxd 10W 1K ohm	1
6		108 023	LINK, jumper term blk 10A	1
7	C20	119 834	CAPACITOR	1
8	1T	116 005	BLOCK, term 10A 7P	1
9	R6	117 803	RESISTOR, WW fxd 10W 1K ohm	1
10	SR2	035 704	RECTIFIER, integ 30A 600V	1
11	D2	026 202	DIODE, rect 1A 400V SP	1
12	CR1	006 393	RELAY, encl 24VAC DPDT	1
13	CR2	059 267	RELAY, encl 12VDC DPDT	1
14		126 420	FRAME, lifting	1
15		026 627	GASKET, lifting eye cover	1
16	PLG53	115 092	HOUSING PLUG & SOCKETS, (part of rectifier) (consisting of)	1
		113 746	· TERMINAL, female	8
17	PLG54	130 203	HOUSING PLUG & SOCKETS, (consisting of)	1
		113 746	· TERMINAL, female	12
18	PLG55	115 091	HOUSING PLUG & SOCKETS, (consisting of)	1
		113 746	· TERMINAL, female	10
19	PLG51	115 093	HOUSING PLUG & SOCKETS, (consisting of)	1
		113 746	· TERMINAL, female	6
20	PC1	132 281	CIRCUIT CARD, control 50Hz (Fig 9-6)	1
20	PC1	130 377	CIRCUIT CARD, control 60Hz (Fig 9-6)	1
		128 063	COVER, circuit card	1
21	S4	133 144	SWITCH, changeover (consisting of)	1
	LS1	133 145	· SWITCH, limit	1
22		010 199	TUBING, stl .275 ID x .048 wall x 1 in	2
23	T1	126 205	TRANSFORMER, power main 200/230/460 (consisting of)	1
23	T1	129 208	TRANSFORMER, power main 220/380/415 (consisting of)	1
23	T1	129 207	TRANSFORMER, power main 230/460/575 (consisting of)	1
		125 976	· COIL, pri/sec 200/230/460	1
		129 172	· COIL, pri/sec 220/380/415	1
		129 171	· COIL, pri/sec 230/460/575	1
	TP1	020 520	· THERMOSTAT, NC	1
24		Fig 9-5	PANEL, rear w/components	1
25		109 035	LABEL, warning electric shock	1
26		+114 751	PANEL, side	2
27	TE1	034 587	TERMINAL ASSEMBLY, pri 1ph 3V (Fig 9-3)	1
28	C11,12	111 634	CAPACITOR ASSEMBLY	1
29		114 722	BRACKET, mtg rectifier	2
30		126 210	BASE	1
31		Fig 9-2	PANEL, front w/components	1
32	SR1	126 209	RECTIFIER, si diode (Fig 9-4)	1
33	Z1	126 211	REACTOR, (consisting of)	1
		126 057	· COIL, reactor front	1
		126 058	· COIL, reactor back	1
34		010 494	BUSHING, snap-in nyl 1.375 ID	1
35		057 358	BUSHING, snap-in nyl 1.000 ID	1
	PC2	131 527	CIRCUIT CARD, snubber	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



TC-130 187-A

Figure 9-2. Part Front W/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
----------	------------	----------	-------------	----------

Figure 9-2. Panel, Front w/Components (Fig 9-1 Item 31)

1		+	NAMEPLATE, (order by model & serial number)	1
		138 106	LABEL, caution incorrect use	1
2		109 013	BUSHING, snap-in nyl .375 ID	1
3		126 208	PANEL, front	1
4	R2	035 897	POTENTIOMETER, C sltd sft 1/T 2W 1000 ohm	1
5	S3,5	011 609	SWITCH, tgl SPDT 15A 125V	2
6	R1	072 623	POTENTIOMETER, C std sft 1/T 2W 1000 ohm	1
		072 590	LOCK, shaft pot .375-32 x .25	1
7		106 398	PIN, spring CS .156 x .625	1
8		126 203	EXTENSION, handle switch	1
9	S1	045 834	SWITCH, tgl DPST 60A 600VAC	1
10	R7	115 228	RESISTOR, WW fxd 100W 50 ohm	1
11		605 742	CLIP, mtg resistor .500 ID	2
12	RC2	604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1
		073 690	PLUG, str grd armd 2P3W 15A 125V	1
13	RC1/C17-19	132 822	RECEPTACLE/CAPACITOR, w/leads	1
14	CB2	083 432	CIRCUIT BREAKER, man reset 1P 10A 250V	1
15	CB1	093 995	CIRCUIT BREAKER, man reset 1P 15A 250V	1
16		126 428	PANEL, front lower	1
17	C13	126 722	CAPACITOR ASSEMBLY	1
18	Work	039 046	TERMINAL, pwr output black (consisting of)	1
19	Electrode	039 047	TERMINAL, pwr output red (consisting of)	1
20		601 976	· SCREW, cap stl hexhd .500-13	1
21		039 045	· TERMINAL BOARD, black	1
21		039 049	· TERMINAL BOARD, red	1
22		601 880	NUT, stl hex jam .500-13	1
23		039 044	BUS BAR, term bd	1
24		601 879	NUT, stl hex full fnsh .500-13	1
25	C14	126 721	CAPACITOR ASSEMBLY	1
26		127 363	LABEL, warning electrical shock	1
27		+114 759	DOOR, access front	1
28		605 583	CATCH, spr loaded door	1
29		123 154	LABEL, warning general precautionary	1
30		010 647	PIN, spring CS .156 x 1.250	1
31		098 279	HANDLE, switch selector mode	1
32		097 924	KNOB, pointer	1
33		097 922	KNOB, pointer	1
34	A	◆126 184	METER, amp AC/DC 50MV 0-400 scale	1
35	V	◆126 183	METER, volt AC/DC 0-100/0-90 scale	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

◆Optional Parts.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity
Figure 9-3	034 587	Terminal Assembly, Pri (Fig 9-1 Item 27)	
1	601 836	NUT, brs hex .250-20 jam hvy	4
2	010 915	WASHER, flat brs .250 ID	4
3	601 835	NUT, brs hex 10-32 reg	12
4	038 618	LINK, jumper term bd pri	2
5	083 426	TERMINAL BOARD, pri	1
6	038 887	STUD, pri board brs 10-32	6
7	010 913	WASHER, flat brs .187 ID	6
8	038 888	STUD, pri board brs .250-2	2

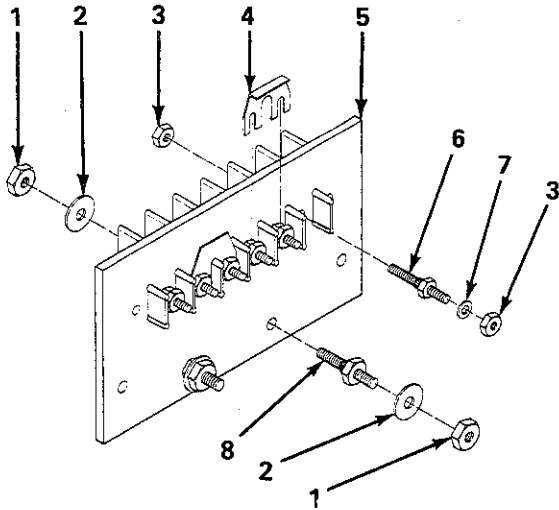


Figure 9-3. Terminal Assembly, Pri

TB-085 126

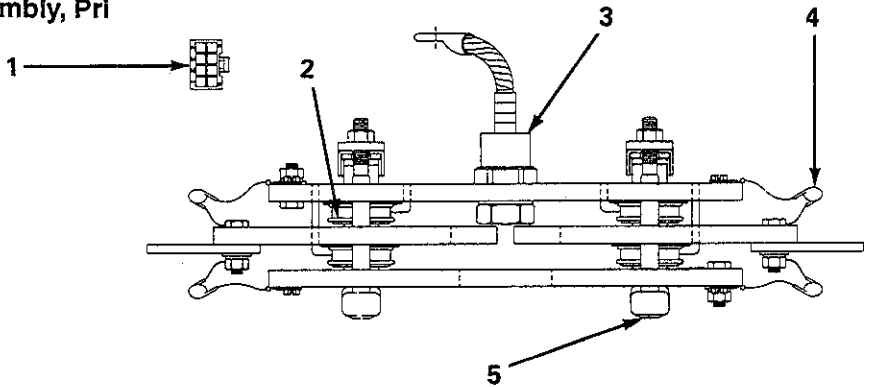


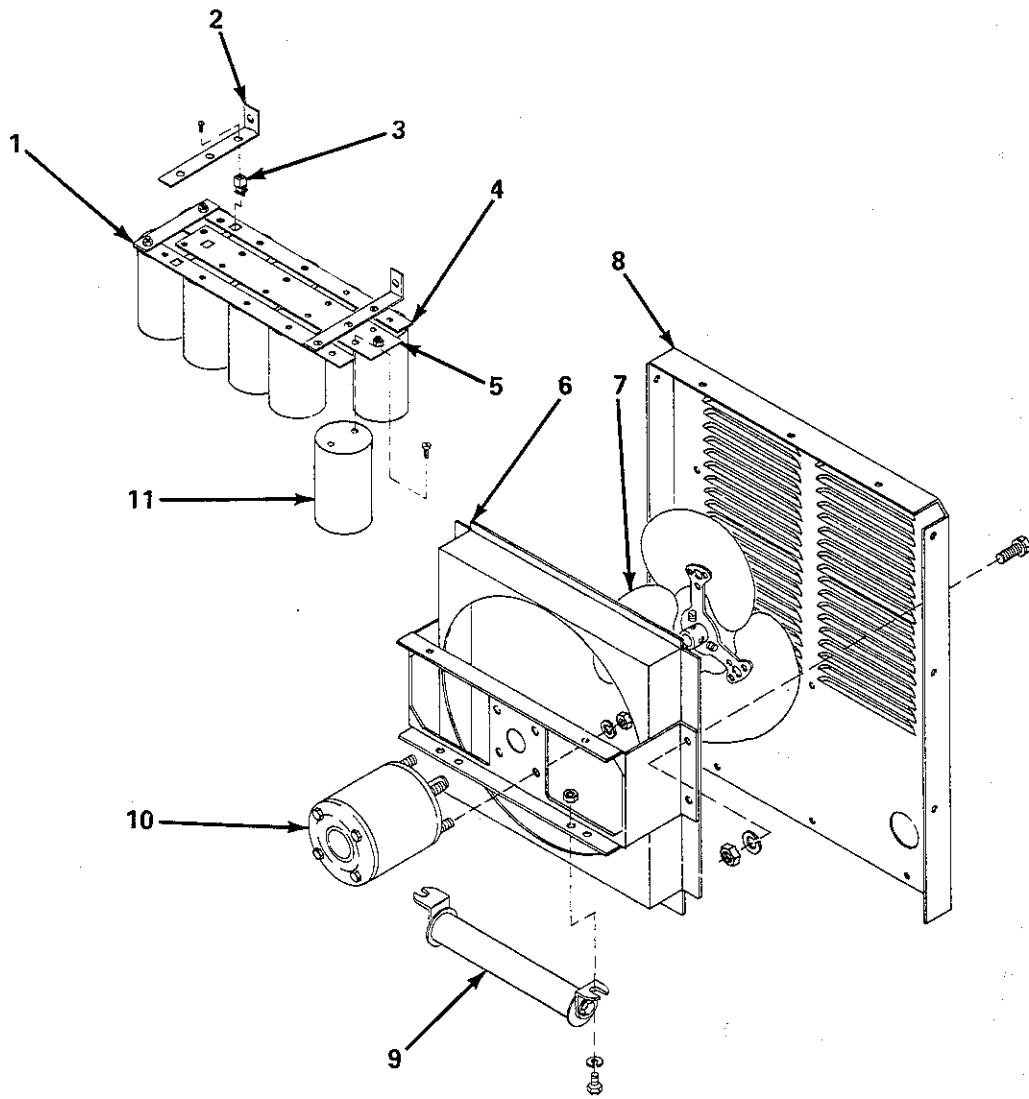
Figure 9-4. Rectifier, Si Diode

TB-130 174

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		126 209	Figure 9-4. Rectifier, Si Diode (Fig 9-1 Item 32)	
1	PLG53	115 092	HOUSING, term header 8skt (consisting of)	1
		113 746	TERMINAL, female	8
2	SCR1-4	109 091	THYRISTOR, SCR 865A 300V	4
3	D1	037 956	DIODE, rect 275A 300V SP	1
		028 516	PIN, spring CS .125 x .250	8
4	C7-10	031 689	CAPACITOR, cer disc .01uf 1000VDC	4
5		083 884	CLAMP, thyristor rectifier	2

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 9-5. Panel, Rear w/Components (Fig 9-1 Item 24)				
1		128 648	BUS BAR, capacitors	1
2		126 206	BRACKET, mtg capacitors	2
3		080 509	GROMMET, scr No. 8/10	6
4		126 207	BUS BAR, capacitors	2
5		128 647	BUS BAR, capacitors	1
6		124 275	CHAMBER, plenum 14 in	1
7		032 604	BLADE, fan 14 in 3wg 19 deg	1
8		114 752	PANEL, rear	1
9	R4	119 998	RESISTOR, WW fxd 300W 5 ohm	1
10	FM	116 190	MOTOR, 1/12HP 230V 1550RPM	1
11	C3	109 833	CAPACITOR, elctlt 30000uf 50VDC	10



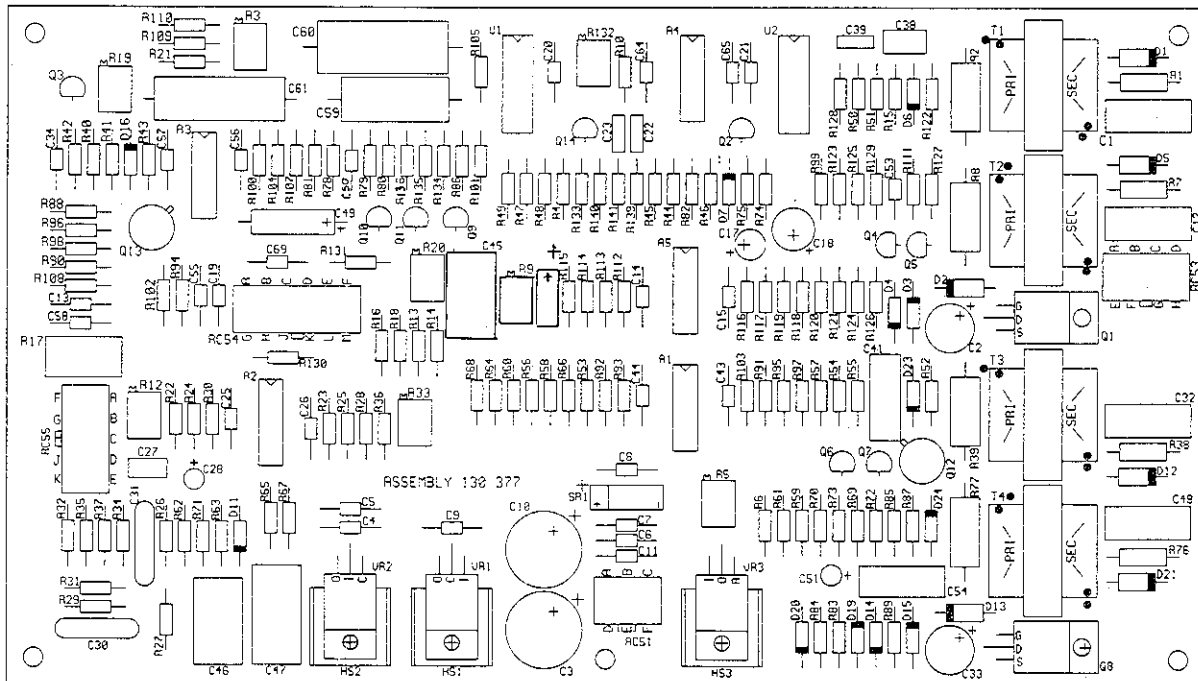
TC-190 168-A

Figure 9-5. Panel, Rear w/Components

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Dia. Mkgs.	Part No.	Description	Quantity
PC1	132 281 130 377	Figure 9-6. Circuit Card, Control (Fig 9-1 Item 20)	
A1-5	093 065	IC, linear 347	5
C1,12,32,48	035 833	CAPACITOR, polye film .033uf 100VDC	4
C2,33	039 482	CAPACITOR, elctlt 100uf 35VDC	2
C3,10	083 973	CAPACITOR, elctlt 1000uf 35VDC	2
Note 1	122 723	CAPACITOR, cer mono .1uf 50VDC	27
C16	031 677	CAPACITOR, tantlm 5.6MF 35VDC	1
C17	091 791	CAPACITOR, tantlm 15uf 35VDC	1
C18	091 378	CAPACITOR, tantlm 33uf 35VDC	1
C22,23,39	003 530	CAPACITOR, cer mono 1uf 50VDC	3
C27	031 646	CAPACITOR, cer disc .001uf 1000VDC	1
C28,51	072 130	CAPACITOR, tantlm 1uf 35VDC	2
C30,31	059 122	CAPACITOR, cer disc .01uf 500VDC	2
C38	121 684	CAPACITOR, polye met film .47uf 100V	1
C41,54	035 522	CAPACITOR, polye film .047uf 100V	2
C45,46	034 286	CAPACITOR, polye film .1uf 100VDC	2
C47	003 065	CAPACITOR, polye film .15uf 100VDC	1
C49	032 820	CAPACITOR, tantlm 2.2uf 35VDC	1
C59	038 585	CAPACITOR, polye film .22uf 50V	1
C60	031 714	CAPACITOR, polye met film .68uf 200VDC	1
C61	028 294	CAPACITOR, polye met film 1uf 250VDC	1
D1,2,5,12,13,21	026 202	DIODE, rect 1A 400V SP	6
D3,4,6,7,11,14-16, 19,20,23,24	028 351	DIODE, sig .020A 75V SP	12
Q1,8	109 156	TRANSISTOR, chan N 9A 50V	2
Q2,3,5,7,9,10,14	037 200	TRANSISTOR, NPN 200MA 40V	7
Q4,6,11	037 201	TRANSISTOR, PNP 200MA 40V	3
Q12,13	000 088	TRANSISTOR, NPN 800MA 40V	2
R1,7,38,76	030 090	RESISTOR, C .5W 47 ohm	4
R2,8,39,77	030 761	RESISTOR, C 1W 10 ohm	4
R3,5,9,33	039 359	POTENTIOMETER, cermet trmr 25/T .5W 5000 ohm	4
R4,23,29,31,32, 35,112,113,121	044 789	RESISTOR, CF .25W 100K ohm	9
R6	039 327	RESISTOR, CF .25W 220 ohm	1
R10,90	035 823	RESISTOR, CF .25W 100 ohm	2
R12	039 360	POTENTIOMETER, cermet trmr 20/T .5W 25K ohm	1
R13,21,24,25,34, 37,48,72,73,98	108 437	RESISTOR, CF .25W 4.7K ohm	10
R14,63,68	039 332	RESISTOR, CF .25W 15K ohm	3
R15	035 830	RESISTOR, CF .25W 6.8K ohm	1
R16,78	039 335	RESISTOR, CF .25W 47K ohm	2
R17	124 009	RESISTOR, WW fxd 5W 33 ohm	1
R18	093 041	RESISTOR, CF .25W 150K ohm	1
R19,132	004 596	POTENTIOMETER, cermet trmr 25/T .5W 2K ohm	2
R20	039 352	POTENTIOMETER, cermet trmr 25/T .5W 100K ohm	1
R22,27	039 336	RESISTOR, CF .25W 220K ohm	2
R26,111	092 525	RESISTOR, CF .25W 2K ohm	2
Note 2	035 827	RESISTOR, CF .25W 10K ohm	27
R30	052 137	RESISTOR, CF .25W 5.1K ohm	1
R36,50	053 572	RESISTOR, CF .25W 12K ohm	2
R41,81,99, 109,118,122	072 560	RESISTOR, CF .25W 1K ohm	6
R42	035 822	RESISTOR, CF .25W 10 ohm	1
R44	108 440	RESISTOR, CF .25W 13K ohm	1
R45,139	005 653	RESISTOR, CF .25W 180K ohm	2
R46,47,103, 124,126,134	035 826	RESISTOR, CF .25W 6.8K ohm	6
R51	039 325	RESISTOR, CF .25W 82K ohm	1
R52,89	108 434	RESISTOR, CF .25W 3K ohm	2
R54,91,116	035 887	RESISTOR, CF .25W 3.3K ohm	3

Dia. Mkgs.	Part No.	Description	Quantity
PC1	132 281 130 377	Figure 9-6. Circuit Card, Control (Fig 9-1 Item 20) (Continued)	
R55,59,92,95	035 824	RESISTOR, CF .25W 270 ohm	4
R56,60,62, 71,87,136	108 441	RESISTOR, CF .25W 18K ohm	6
R57,58,61, 93,97,105	035 896	RESISTOR, CF .25W 33K ohm	6
R64	039 337	RESISTOR, CF .25W 330K ohm	1
67,104,107	038 584	RESISTOR, CF .25W 470K ohm	3
R100,117	093 032	RESISTOR, CF .25W 27K ohm	2
R101	003 272	RESISTOR, CF .25W 1 meg ohm	1
R102	072 559	RESISTOR, CF .25W 2K ohm	1
R108	091 799	RESISTOR, CF .25W 8.2K ohm	1
R110,131	108 432	RESISTOR, CF .25W 2.2K ohm	2
R114	052 138	RESISTOR, CF .25W 20K ohm	1
R119	117 134	RESISTOR, CF .25W 24K ohm	1
R120,123	044 634	RESISTOR, CF .25W 330 ohm	2
R128	044 635	RESISTOR, CF .25W 680 ohm	1
R129	108 439	RESISTOR, CF .25W 6.2K ohm	1
R140,141	000 885	RESISTOR, CF .25W 10K ohm	2
RC51	114 654	TERMINAL, header 6 pin	1
RC53	113 749	TERMINAL, header 8 pin	1
RC54	116 512	TERMINAL, header 12 pin	1
RC55	113 747	TERMINAL, header 10 pin	1
SR1	035 841	RECTIFIER, integ 1.5A 200V	1
T1-4	000 096	TRANSFORMER, pulse	4
U1,2	112 058	IC, linear 212	2
VR1	083 772	IC, linear 7815	1
VR2	046 932	IC, linear 7915	1
VR3	095 269	IC, linear 3171	1



D-130 378

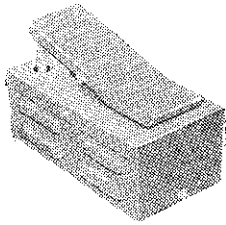
Figure 9-6. Circuit Card, Control PC1

Note 1: C4-9,11,13-15,19-21,25,26,34,43,44,50,53,55-58,64,65,69

Note 2: R28,40,43,49,53,65,66,69,70,74,75,79,80,82-86,88,94,96,115,125,127,130,133,135

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

OPTIONS AND ACCESSORIES



RFC-14 FOOT CONTROL (#129 339)

Foot current and contactor control.
20 ft. (6 m) cord and 14-pin
Amphenol plug.

RHC-14 HAND CONTROL (#129 340)

Miniature hand control for remote
current and contactor control
Dimensions: 4 in. (102 mm) x 4 in.
(102 mm) x 3-1/4 in. (82 mm).
Includes 20 ft. (6 m) cord and 14-pin
Amphenol plug.

FTC-14 REMOTE CONTACTOR AND CURRENT CONTROL (#129 338)

Fastens to TIG torch handle. Includes
28 ft. (8.5 m) cord and 14-pin
Amphenol plug.

EXTENSION CORDS FOR 14-PIN AMPHENOL

10 ft. (3 m) (#122 972)
25 ft. (7.6 m) (#122 973)
50 ft. (15.2 m) (#122 974)
75 ft. (22.9 m) (#122 975)

ADAPTER CORD (#041 947)

1 ft. (305 mm) cord with 14-pin
Amphenol plug and 5-pin socket.
Connects power source to 5-pin
remote controls.

EXTENSION CORDS FOR 5-PIN AMPHENOL

25 ft. (7.6 m) (#041 294)
50 ft. (15.2 m) (#041 293)

RMLS-14 SWITCH (#129 337)

Momentary-and maintained-contact
rocker switch for contactor control.
Push forward for maintained
contact and back for momentary
contact. Includes 20 ft. (6 m) cord
and 14-pin Amphenol plug.

ADAPTER CORD (#041 948)

1 ft. (305 mm) cord with 14-pin
Amphenol plug and 2-pin and 3-pin
Hubbell connections. Connects
power source to Miller wire feeder
interconnecting cord.

HF-251D-1 HIGH FREQUENCY ARC STARTER/STABILIZER (#042 388)

See Literature Index No. AY/5.1.

No. 22 RUNNING GEAR (#042 258)

Includes two 8 in. (203 mm) wheels
and two 4 in. (102 mm) casters and
a two-compartment rack for gas
cylinder(s) or Watermate™ coolant
system.

VOLTMETER AND AMMETER (#042 314 Factory)

(#042 315 Field)
Analog AC/DC combination.