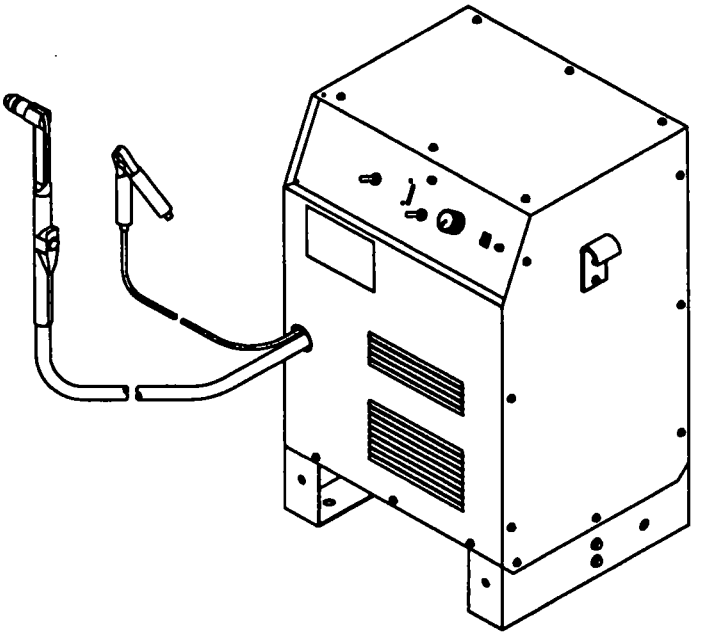
Miller®

February 1990 FORM: OM-2201A

Effective With Serial No. KA780044

MODEL: Spectrum™ 750



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

SB-134 696

PRINTED IN U.S.A

LIMITED WARRANTY

EFFECTIVE: FEBRUARY 1, 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 warrantied 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 components ..... 1 year
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.

June 3, 1991 FORM: OM-2201A

ERRATA SHEET

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

AMENDMENT TO SECTION 5 – OPERATOR CONTROLS

Amend Section 5-4. TEST/RUN SWITCH

The TEST/GOUGE/RUN switch provides a means for adjusting the air filter/regulator without energizing the cutting circuit. Placing the TEST/GOUGE/RUN switch in the TEST position energizes the air solenoids allowing the air filter/regulator to be properly set to 64 psi (4.3 bars). Placing the TEST/GOUGE/RUN switch in the GOUGE position provides gas/air to the torch for normal gouging operations when the torch switch is pressed. Placing the TEST/GOUGE/RUN switch in the RUN position provides gas/air to the torch for normal cutting operations when the torch switch is pressed.

CAUTION: CUTTING WHEN THE GAS/AIR SWITCH IS IN GOUGE POSITION will damage torch.

- *Do not cut when in GOUGE position.*
- *Use GOUGE position for gouging only. The GOUGE position provides an inadequate supply of airflow for cooling during cutting.*

IMPORTANT: *For gouging operations, install a "G" style gouging tip in the torch. Follow the instructions in the torch Owner's Manual.*

AMENDMENT TO SECTION 6 – SEQUENCE OF OPERATION

Add Section 6-4. PLASMA ARC GOUGING (PAG)

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

1. Install and connect unit according to Section 4.

CAUTION: TIP AND ELECTRODE WEAR BEYOND RECOMMENDED VALUES or OPERATION WITHOUT TIP OR ELECTRODE in place can damage torch.

- *Inspect shield cup, tip, and electrode before each use, hourly during operation, or whenever cutting speed has been significantly reduced (see Torch Owner's Manual).*
- *Do not operate torch without a tip or electrode in place.*

IMPORTANT: *For gouging operations, install a "G" style gouging tip in the torch. Follow the instructions in the torch Owner's Manual.*

2. Wear dry insulating gloves and clothing.
3. Connect work clamp to clean, bare metal at workpiece.
4. Place the TEST/GOUGE/RUN switch in the TEST position.
5. Place the POWER switch in the ON position. The POWER light will come on.

CAUTION: INCORRECT PLASMA GAS can cause torch and power source damage.

- *Use only air or nitrogen for the plasma gas supply.*
- *Do not use any other gas or combination of gases.*

6. Turn on gas/air supply at the source, and adjust air filter/regulator to 64 psi (4.3 bars) while observing air pressure gauge on rear of unit. For proper regulation, the recommended output from the gas/air supply should provide a minimum of 80 psi (5.5 bars) and a maximum of 150 psi (10.3 bars). Make pressure adjustment according to Figure 4-4 as follows:
   a. Loosen locking screw in center of air filter/regulator adjustment knob.
   b. Turn air filter/regulator adjustment knob clockwise to increase pressure setting and counterclockwise to decrease pressure setting.
   c. Tighten locking screw.
7. Place the THICKNESS OUTPUT CONTROL in the desired position (see Section 5-3).
8. Place the TEST/GOUGE/RUN switch in the GOUGE position. The READY light will come on indicating that the unit is ready for operation.

CAUTION: CUTTING WHEN THE GAS/AIR SWITCH IS IN GOUGE POSITION will damage torch.

- *Do not cut when in GOUGE position.*
- *Use GOUGE position for gouging only. The GOUGE position provides an inadequate supply of airflow for cooling during cutting.*

9. Wear safety goggles with correct filter shade according to ANSI Z49.1.
10. Place tip of torch on metal to be gouged at approximately a 40° angle to the line of travel and press torch switch. There will be approximately 2 seconds of preflow air followed by approximately 2-1/2 seconds of pilot arc. If the gouge arc is not started within the 2-1/2 seconds of pilot arc, the pilot arc will stop. The torch switch will have to be released, and the startup procedure repeated.
11. Once gouging arc starts, establish an arc length of approximately 1 to 1-1/2 in. (25 mm to 38 mm), and slowly and smoothly begin moving torch across material.
12. Adjust torch speed and angle for desired depth of groove and so that sparks are directed away from the operator. Do not attempt to remove too much metal in one pass. Additional passes can be made to achieve the desired depth.
13. Pause briefly at end of gouge, and then release torch switch. Postflow gas/air will flow for approximately 20 seconds to cool the torch. If another gouge is started before postflow ends, the arc will start immediately.

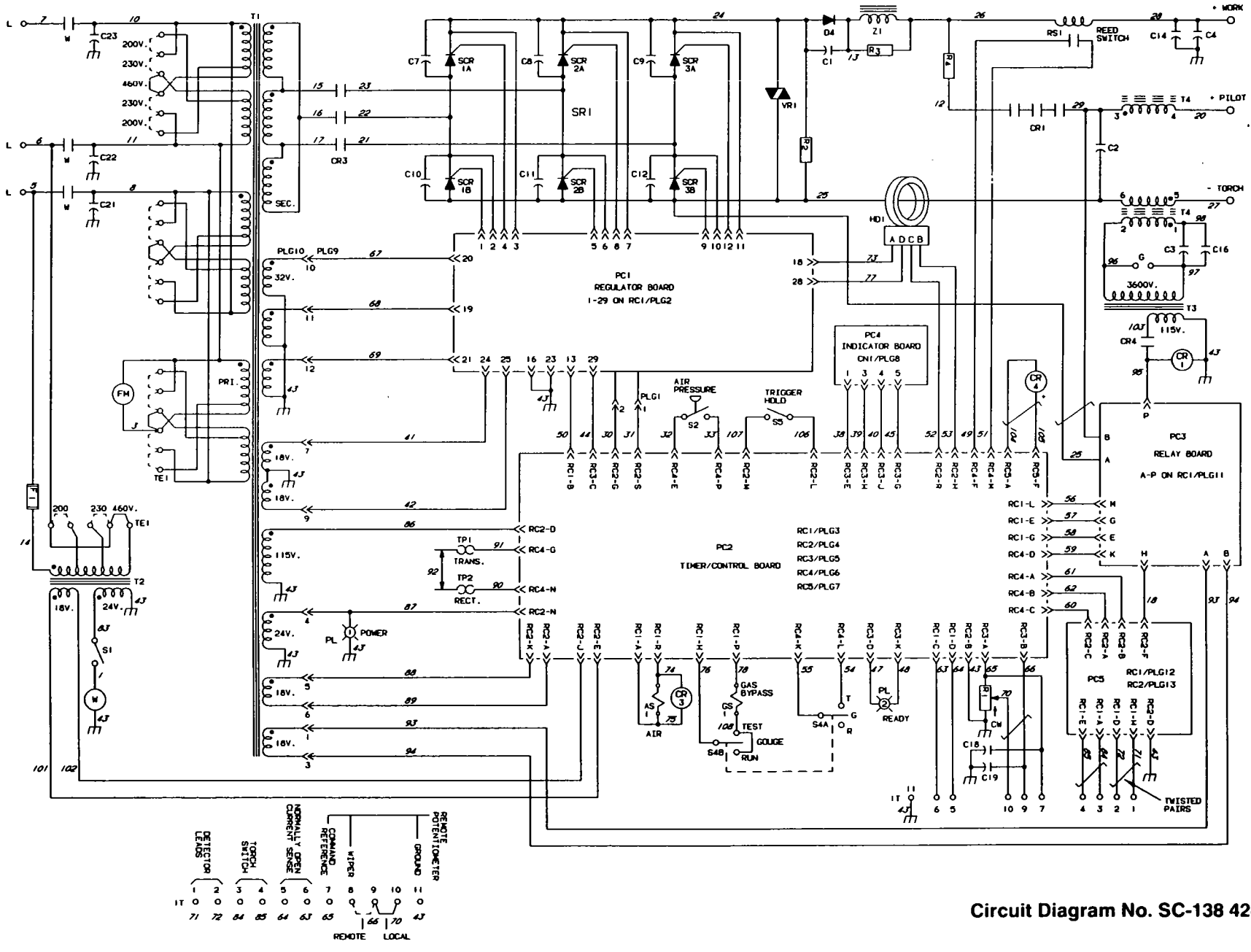
AMENDMENT TO SECTION 8 – ELECTRICAL DIAGRAMS

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

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

Add Diagram 8-8A. Circuit Diagram For Trouble Light Board PC4 (see Page 6 on this Errata Sheet)

Amend Diagram 8-8B on this Errata Sheet. Circuit Diagram For Trouble Light Board PC4 (see Page 6 on this Errata Sheet)



Circuit Diagram No. SC-138 424-A

Diagram 8-1. Circuit Diagram For Power Source Effective With Serial No. KA880002

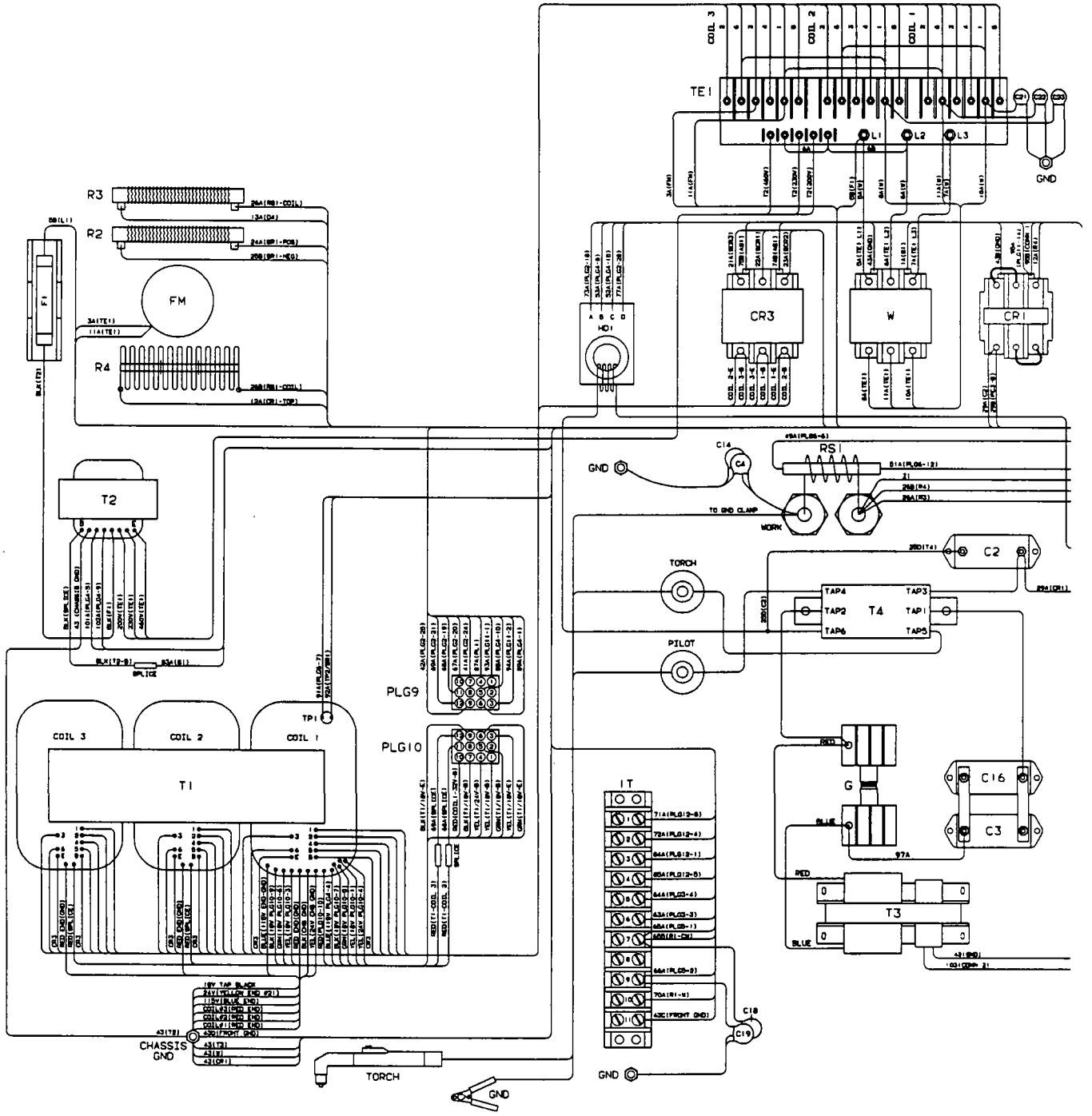
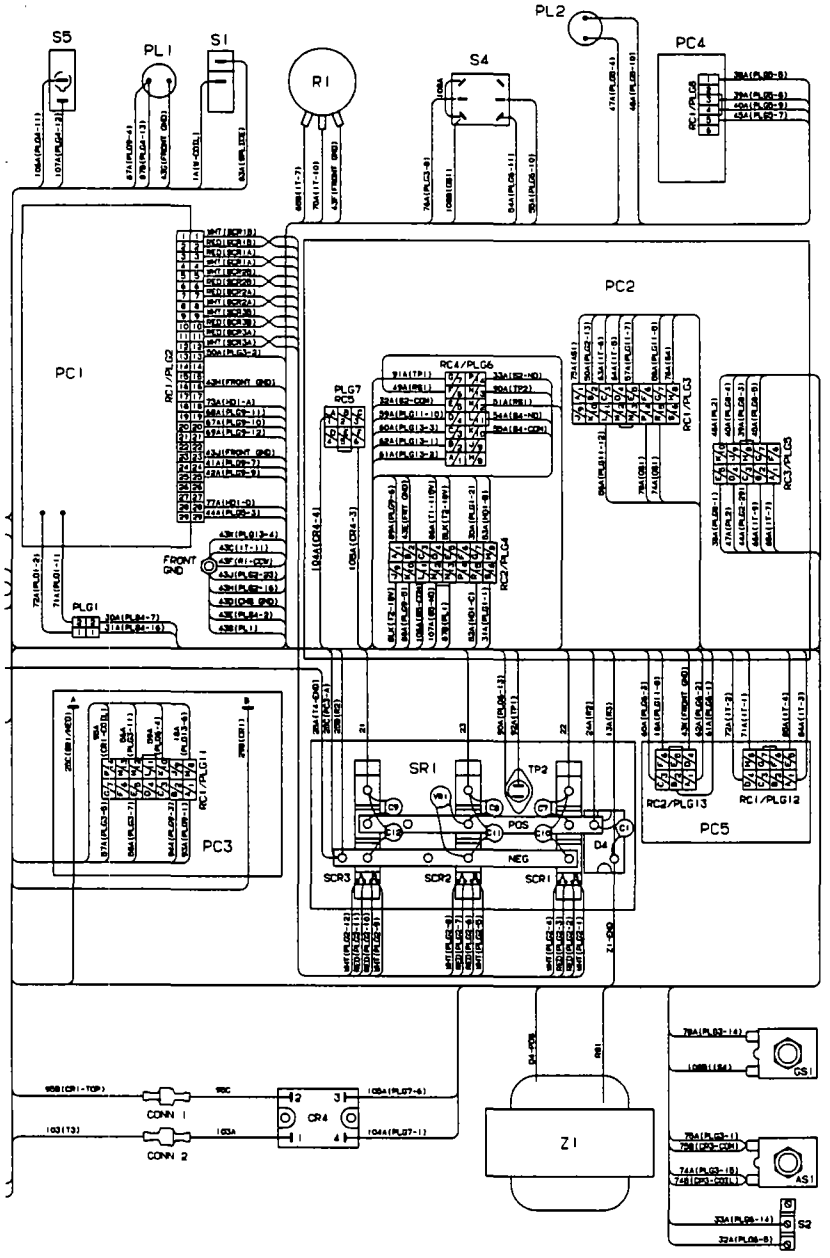
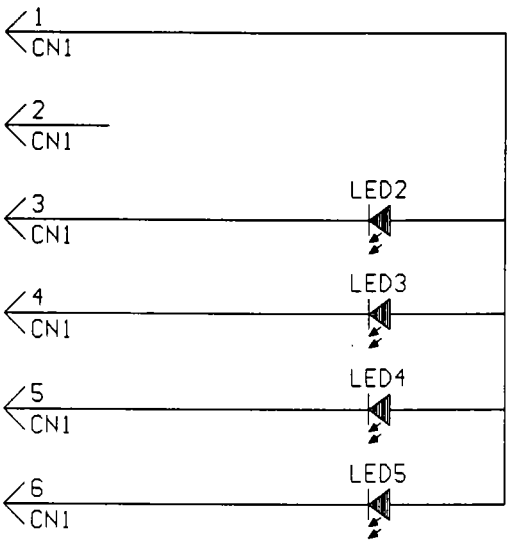


Diagram 8-3. Wiring Diagram For Power Source Effective With Serial No. KA880002

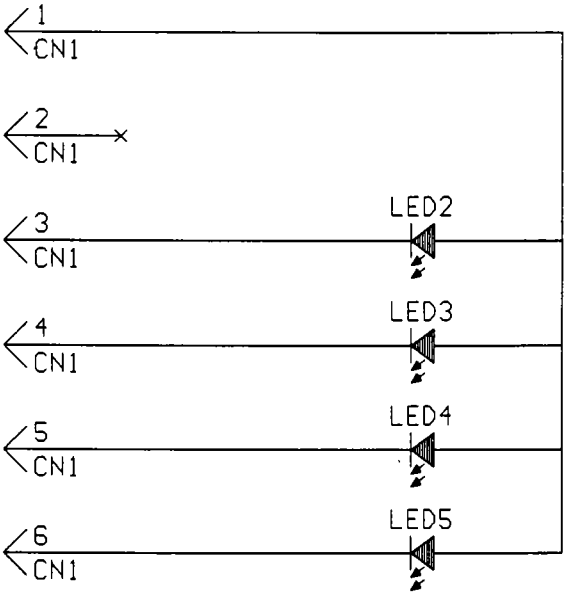


Wiring Diagram No. SD-138 375-A



Circuit Diagram No. SA-135 750

Diagram 8-8A. Circuit Diagram For Trouble Light Board PC4



Circuit Diagram No. SA143 674

Diagram 8-8B. Circuit Diagram For Trouble Light Board PC4 Effective With Serial No. KB058453

AMENDMENT TO SECTION 10 – PARTS LIST

Amend Parts List as follows:

**	Dia. Mkgs.	Part No.	Replaced With	Description	Quantity
39-12	T2	Added	130 534	TRANSFORMER, kVA 1/3 24-18-230/460/575	1
39-16	T1	132 879	140 276	TRANSFORMER, pwr main 200/230/460 (Eff w/KA885936) (consisting of)	1
			140 084	· COIL, pri/sec 200/230/460 center & RH	2
			140 083	· COIL, pri/sec 200/230/460 LH	1
39-16	T1	Added	136 200	TRANSFORMER, pwr main 230/460/575 (consisting of)	1
39-17			135 984	· COIL, pri/sec 230/460/575 center & RH	2
39-18			135 983	· COIL, pri/sec 230/460/575 LH	1
39-37	Z1	132 943	135 860	STABILIZER, (Prior to KA834898)	1
39-37	Z1	135 860	137 762	STABILIZER, (Eff w/KA834898 thru KA873919)	1
39-37	Z1	137 762	139 709	STABILIZER, (Eff w/KA873920 thru KA885935))	1
39-37		139 709	140 118	STABILIZER, (Eff w/KA885936)	1
39-		132 463	132 463	SLEEVE, (APT 7000)	1
39-		132 657	132 657	GUIDE, (APT 7000)	2
39-		Added	132 658	GUIDE, stand-off (APT 5000)	2
39-		Added	138 755	TIP, gouge GH (Eff w/KA880002 thru KB079750)	5
39-		138 755	143 983	TIP, gouge 70A (Eff w/KB079751)	5
41-3		089 085	089 085	SWITCH, (qty chg deleted S4) (Eff w/KA880002)	1
41-4		098 691	115 443	STAND-OFF, No. 6-32 x .750 (Eff w/KB058453)	2
41-6	PC4	125 057	135 748	CIRCUIT CARD, display (Prior to KB058453)	1
41-6	PC4	135 748	143 514	CIRCUIT CARD, display (Eff w/KB058453)	1
41-17	PC1	127 184	136 687	CIRCUIT CARD ASSEMBLY, regulator	1
41-22		126 696	138 377	PANEL, front (Eff w/KA880002)	1
41-	S4	Added	088 409	SWITCH, tgl DPDT 15A 125VAC (Eff w/KA880002)	1
41-26		124 729	136 156	LABEL, precautionary plasma cutting	1
42-	R65		108 442	RESISTOR, MF .25W 392 ohm	1
45-	VR50	081 832	083 772	IC, linear 7815	1
47-			024 103	BLANK, snap in nyl .750 mtg hole	1
48-2	C4,14	128 256	142 133	CAPACITOR	2

**First digit represents page no – digits following dash represent item no.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

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 7 – MAINTENANCE & TROUBLESHOOTING

SECTION 8 – ELECTRICAL DIAGRAMS

SECTION 9 – PLASMA ARC CUTTING (PAC) INSTALLATION GUIDELINES

SECTION 10 – PARTS LIST

LIST OF CHARTS AND TABLES

SECTION 1 – SAFETY RULES FOR PLASMA ARC CUTTING (PAC)

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. From 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-Plasma Arc Cutting (PAC).

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 metals and metal coatings can produce different fumes, gases, and radiation levels. In addition to the information in this manual, be sure to consult the manufacturers' Material Safety Data Sheets (MSDSs) for specific technical data and precautionary measures concerning any materials or coatings on materials cut with this equipment.

A. Burn Prevention

Wear protective clothing–gauntlet gloves designed for use in welding or cutting, 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 or glasses with side shields underneath and appropriate filter lenses or plates (protected by clear cover glass). This is a MUST for welding or cutting (and chipping or grinding) to protect the eyes from radiant energy or 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 the workpiece, 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 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 this 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 methods must be used.

Metals coated with or containing materials that emit toxic fumes should not be heated or cut unless coating is removed from the work surface, the area is well ventilated or, 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.

When leaving a 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 reentering it.

Vapors from chlorinated solvents can be decomposed by the heat of the arc 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 va-

pors 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 as follows: 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 travel great distances.

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 the 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, and 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 F4.1, 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 with nitrogen or carbon dioxide, and using protective equipment as recommended in F4.1.

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:

External gas leaks.

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, and welding or cutting 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. Never cut on a cylinder.

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 arcs, excessive heat, sparks, slag, 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 cannot 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 as follows: 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 pressurized 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. PLASMA ARC CUTTING (PAC)

Comply with precautions in 1-1, 1-2, and this section. Plasma Arc Cutting, 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, workpieces 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 electric arc used in cutting 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 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.

A proper welding helmet or shield containing a filter plate shade according to ANSI Z49.1 and ANSI Z87.1 must be used when cutting. Place over face before beginning to cut.

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 cutting is started. 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 cutting area. For production cutting, 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 cut. Provide proper face shields for all persons who will be looking directly at the cut.

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

Before starting to cut, 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 cutting equipment. It may overheat cables and cause a fire.

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

Never cut on a cylinder or other pressure vessel. It 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 cutting 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 cutting without suitable protection.

To protect against shock:

Wear dry insulating gloves and body protection. Keep body and clothing dry. Never work in a damp area without adequate insulation against electrical shock. Stay on a dry duckboard or rubber mat when dampness or sweat cannot be avoided. Sweat, sea water, or moisture between the 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 cutting torch electrode and any conducting object in the work circuit. Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, power source cases, workpieces, etc. **Never touch the cutting torch electrode and any metal object unless the power source is OFF.**

1. Grounding the Equipment

Plasma arc cutting 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." Locate grounding terminal or grounding lead (green or green with yellow stripe). This is the first connection that should be made.

When installing, connect the frames of each unit, such as power source, control, worktable, 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 to the third (live) wire, or the equipment will become electrically HOT–a dangerous condition that can shock, possibly fatally.

Before cutting, 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. Plasma Cutting Torches

Fully insulated torches should be used. Do NOT use torches with protruding screws. Do NOT use torches with cracks on pieces missing or with loose or missing screws.

3. 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.

4. Terminals And Other Exposed Parts

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

5. Cutting Torch Disassembly

Even though there are several safety shutdown devices provided as standard equipment on the cutting torch, it is still a recommended safe practice to turn off the power source before touching any torch parts.

Power sources used for the Plasma Arc Cutting (PAC) process normally are equipped with devices that permit on-off control of the cutting power output. As a result, the cutting torch electrode and tip become electrically HOT whenever the power source is ON and the cutting torch switch is closed (pressed).

Never touch the torch tip or electrode and any conducting object in contact with the cutting circuit unless the power source is OFF.

6. 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 power source, and remove all 115 volts line-cord plugs from receptacles.

Do not open power circuit while cutting. If, in an emergency, it must be disconnected, guard against shock, burns, or flash from switch arcing.

Never leave equipment unattended. Always shut OFF and disconnect all power to equipment before leaving.

Power disconnect switch must be available near the plasma cutting power source.

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, 29 CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, PRACTICE FOR OCCUPATIONAL 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. American Welding Society Standard AWS F4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS THAT HAVE HELD HAZARDOUS SUBSTANCES, 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 AWS C5.2, RECOMMENDED PRACTICES FOR PLASMA ARC CUTTING, 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.

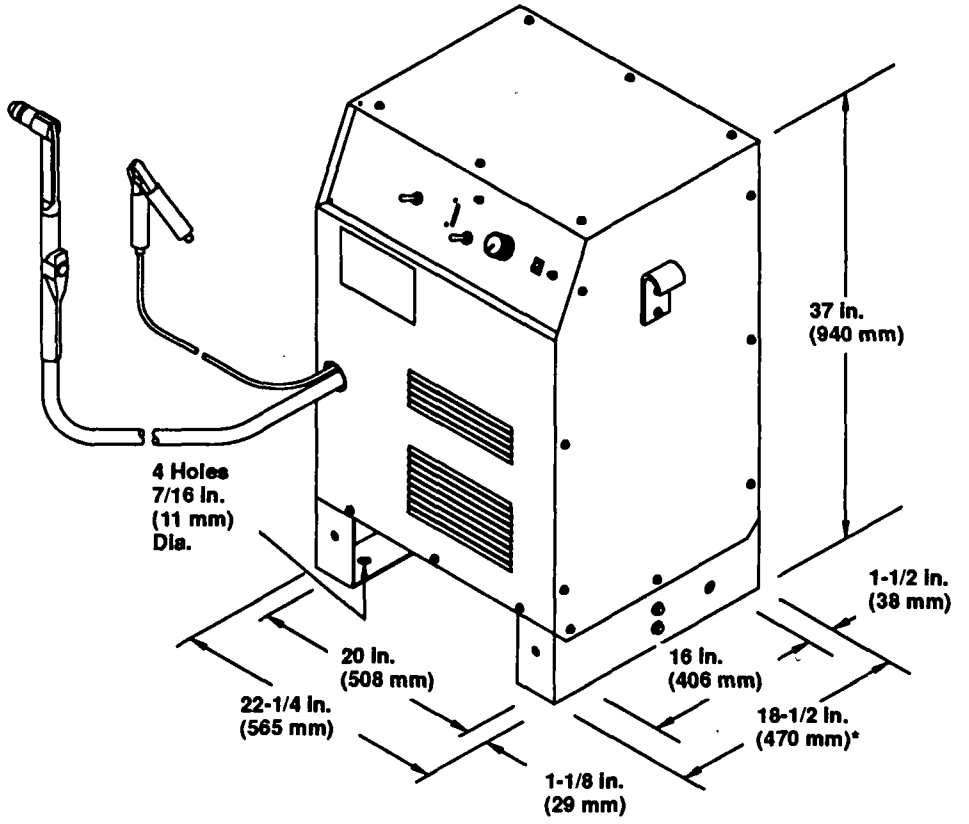
CAUTION statements identify procedures or practices which must be followed to avoid minor personal injury or damage to this equipment.

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

SECTION 3 – SPECIFICATIONS

Table 3-1. Specifications

Rated Output At 60% Duty Cycle	Maximum Open-Circuit Voltage	Input At Rated Load Output 60 Hz Three-Phase						Plasma Gas Nitrogen/Air Only	Weight	
		Amperes At				KVA	KW	Flow/Pressure	Net	Ship
		200V	230V	460V	575V					
70 Amperes At 120 Volts DC	270 Volts DC	62	54	27	22	21	10	5.9 CFM (170 L/min) At 64 PSI (442 kPa)	405 lbs. (184 kg)	465 lbs. (211 kg)



** Add 3-3/4 in. (95 mm) for air filter/regulator.

SB-134 696

Figure 3-1. Overall Dimensions And Base Mounting Hole Locations

3-1. DUTY CYCLE

The duty cycle is the percentage of a ten minute period that the power source and torch can be operated at a given output without overheating and damaging the power source and torch. This power source and torch are rated at 60 percent duty cycle when operated at 70 amperes. The unit can be operated at 70 amperes for six consecutive minutes, but it must operate at no load for the remaining four minutes to allow proper cooling. If the cutting amperes decrease, the duty cycle increases.

CAUTION: EXCEEDING THE DUTY CYCLE RATINGS will damage the power source and torch.

- *Do not exceed indicated duty cycles.*

3-2. DESCRIPTION

CAUTION: INCORRECT PLASMA GAS can cause torch and power source damage.

- *Use only air or nitrogen for the plasma gas supply.*
- *Do not use any other gas or combination of gases.*

This unit is a direct current, straight polarity (electrode negative), Plasma Arc Cutting (PAC) power source requiring 60 Hz three-phase electrical input. The unit can cut through all metals with the capacity to cut 3/4 in. (19 mm) mild steel, stainless steel, and aluminum using the Plasma Arc Cutting (PAC) process.

This unit is designed to be used with any of the following torches:

* APT - 7000H 93° Torch
* APT - 5000H 110° Torch
* APT - 5000MH 180° (Straight) Torch

This unit has capabilities for making connections for remote operation.

Rated output is 70 amperes at 120 volts dc, 60 percent duty cycle.

Plasma is gas/air which has been heated to an extremely high temperature and ionized so that the gas/air becomes electrically conductive. The electrode is located inside the tip of the torch. The torch tip has a small opening (orifice) which constricts the arc. The compressed gas/air flows through the arc where it is heated to the plasma temperature range. Since the gas/air cannot expand due to the constriction of the tip, the gas/air is forced through the orifice and emerges in the form of a highly compressed airstream. The heat formed by the arc and the plasma melts the metal, and the airstream forces the molten metal from the cut.

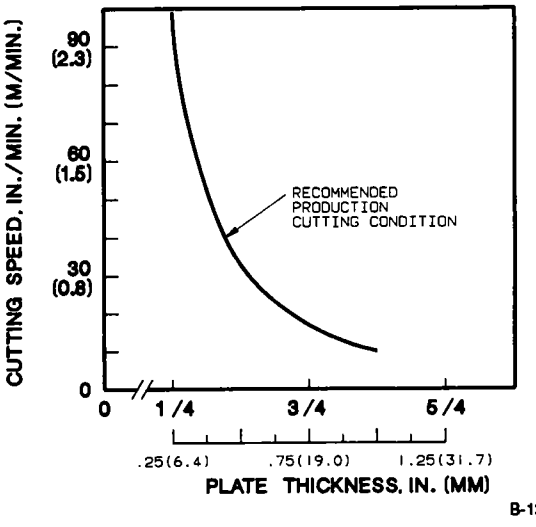
3-3. Cutting Speed (Chart 3-1)

The Cutting speed chart enables the operator to determine the maximum cutting speed for various thickness of mild steel within the capabilities of the power source. The curve indicates the proper speeds at which cutting may be done, although the speeds indicated may not be achieved instantaneously. Cutting may have to begin at a slower speed, with an increase in speed until the optimum speed is reached. Cutting at speeds above the proper speeds shown by the curve will cause rapid erosion of the tip and electrode and should be avoided.

CAUTION: EXCEEDING RECOMMENDED CUTTING SPEEDS will cause rapid erosion of the tip and electrode.

- *Do not exceed indicated cutting speeds.*

Chart 3-1. Cutting Speed



B-135 587

SECTION 4 – INSTALLATION OR RELOCATION

IMPORTANT: *Read entire Section 9 regarding plasma arc cutting equipment installation guidelines before installing this unit.*

4-1. SITE SELECTION (Figure 3-1)

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 in a permanent location. Figure 3-1 gives overall dimensions and base mounting hole locations. Holes are also provided in the base for installing an optional running gear.

WARNING: FIRE OR EXPLOSION can result from placing unit on or over combustible surfaces; RESTRICTED AIR FLOW causes 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 of this power source.*

Warranty is void if any type of filtering device is used.

4-2. TRANSPORTING METHODS (Figure 4-1)

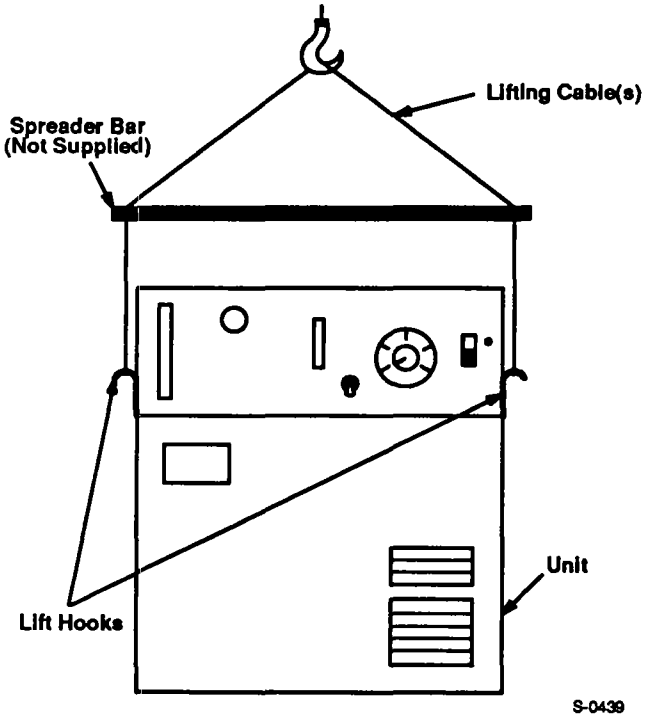


Figure 4-1. Lifting Unit Using Lift Hooks

WARNING: ELECTRIC SHOCK can kill.

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

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- *Use equipment of adequate capacity to lift the unit.*
- *If using lift forks to handle this unit, be sure the 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.

TRANSPORTING UNIT BY LIFTING HOOKS can cause serious personal injury and equipment damage.

- *Use spreader bar (not supplied) when transporting this unit using the supplied lifting hooks (see Figure 4-1).*
- *Use cable(s) of adequate capacity to lift and support unit.*

Installation And Use Of Lifting Hooks (Figure 4-1)

Install and use the supplied Lifting hooks as follows:

1. Locate the mounting holes for the lifting hooks on the left and right side of the unit.
2. Using the supplied bolts, mount the lifting hooks on the left and right side of unit. Tighten bolts to 25 ft/lbs. (34 N·m).
3. When lifting unit by lifting hooks, be sure to use a spreader bar (not supplied) of adequate size to prevent the lifting cable(s) from putting pressure on the sides of the unit causing the cover to bend (see Figure 4-1).

4-3. WORK CLAMP INSTALLATION (Figure 4-2)

Install the work clamp onto the free end of the work cable as follows:

1. Insert free end of work cable through one of the two supplied insulating sleeves.
2. Lay the work cable inside the half of the work clamp which has the flattest inner surface.
3. Align the smaller hole in the work clamp with the hole in the work cable terminal lug. Secure the terminal lug to the work clamp with the supplied nut and bolt.
4. Bend the tabs on the end of the work clamp around the work cable.
5. Slide the insulating sleeve on the work cable over the work clamp handle.
6. Slide the remaining insulating sleeve over the other work clamp handle.

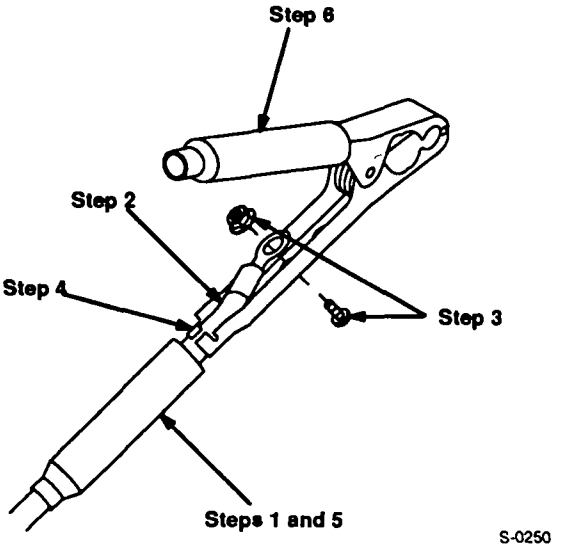


Figure 4-2. Work Clamp Installation

4-4. CONNECTIONS FOR REMOTE OPERATION (Optional) (Figure 4-3)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down 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.

Terminal strip 1T located behind the left side panel provides a junction point for making remote connections to the control circuitry of the power source. Terminal strip 1T connections for torch and remote operation are as follows:

Terminal 1: Shield cup detector circuit lead 1 connection.

Terminal 2: Shield cup detector circuit lead 2 connection.

Terminal 3: Torch switch lead 3 connection.

Terminal 4: Torch switch lead 4 connection.

Terminal 5: Output sensor connection; normally open with respect to terminal 6 when cutting current is not present; contact closure when cutting current is present.

Terminal 6: Output sensor connection; normally open with respect to terminal 5 when cutting current is not present; contact closure when cutting current is present.

Terminal 7: Thickness potentiometer connection (maximum side); command reference.

Terminal 8: Jumper link connection with respect to terminal 9 when remote operation is used.

Terminal 9: Thickness potentiometer connection (wiper contact); jumper link connection with respect to terminal 8 when remote operation is used; jumper link connection with respect to terminal 10 when remote operation is not used.

Terminal 10: Jumper link connection with respect to terminal 9 when remote operation is not used.

Terminal 11: Thickness potentiometer connection (minimum side); ground.

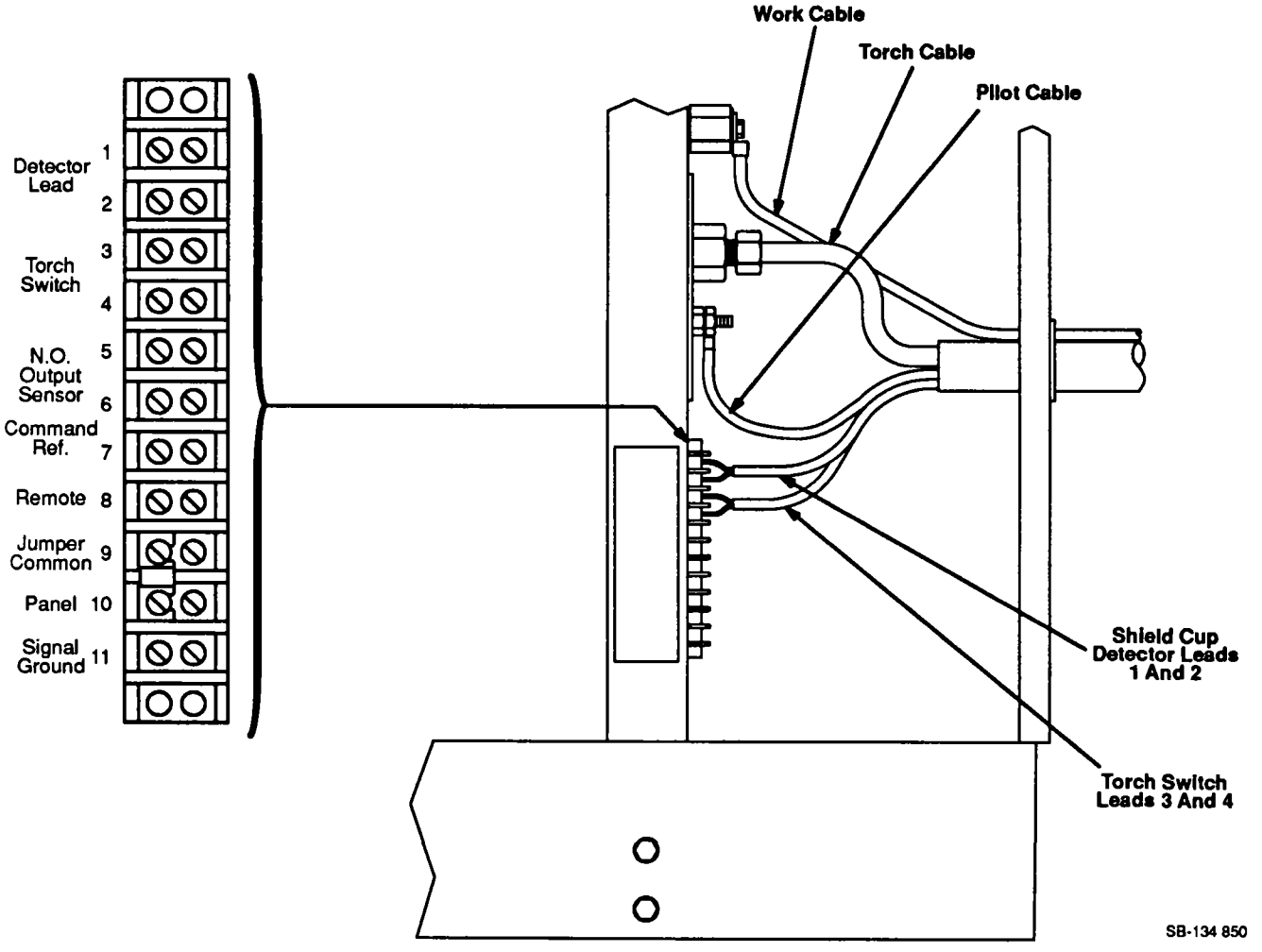


Figure 4-3. Remote Connections And Information

To make connections for remote operation, proceed as follows:

1. Shut down power source.
2. Remove left side panel.
3. Disconnect jumper link connected between terminals 9 and 10, and reconnect jumper link between terminals 8 and 9 on 1T.
4. Connect one current sense lead from remote to terminal 5 on 1T.
5. Connect remaining current sense lead from remote to terminal 6 on 1T.
6. Connect the maximum side lead of thickness potentiometer from remote to terminal 7 on 1T.
7. Connect the wiper contact lead of thickness potentiometer from remote to terminal 9 on 1T.
8. Connect the ground side lead of thickness potentiometer from remote to terminal 11 on 1T.
9. Reinstall and secure left side panel onto unit.

4-5. GAS/AIR INPUT CONNECTION (Figure 4-4)

CAUTION: INCORRECT PLASMA GAS can cause torch and power source damage.

- *Use only air or nitrogen for the plasma gas supply.*
- *Do not use any other gas or combination of gases.*

IMPORTANT: *Be sure that this unit is supplied by a clean, dry gas/air supply (see Table 3-1. Specifications for pressure requirements). For proper regulation, the recommended output from the gas/air supply should provide a minimum of 80 psi (5.5 bars) and a maximum of 150 psi (10.3 bars).*

To make connection, connect air hose from gas/air supply to In Port of air filter/regulator (see Figure 4-4).

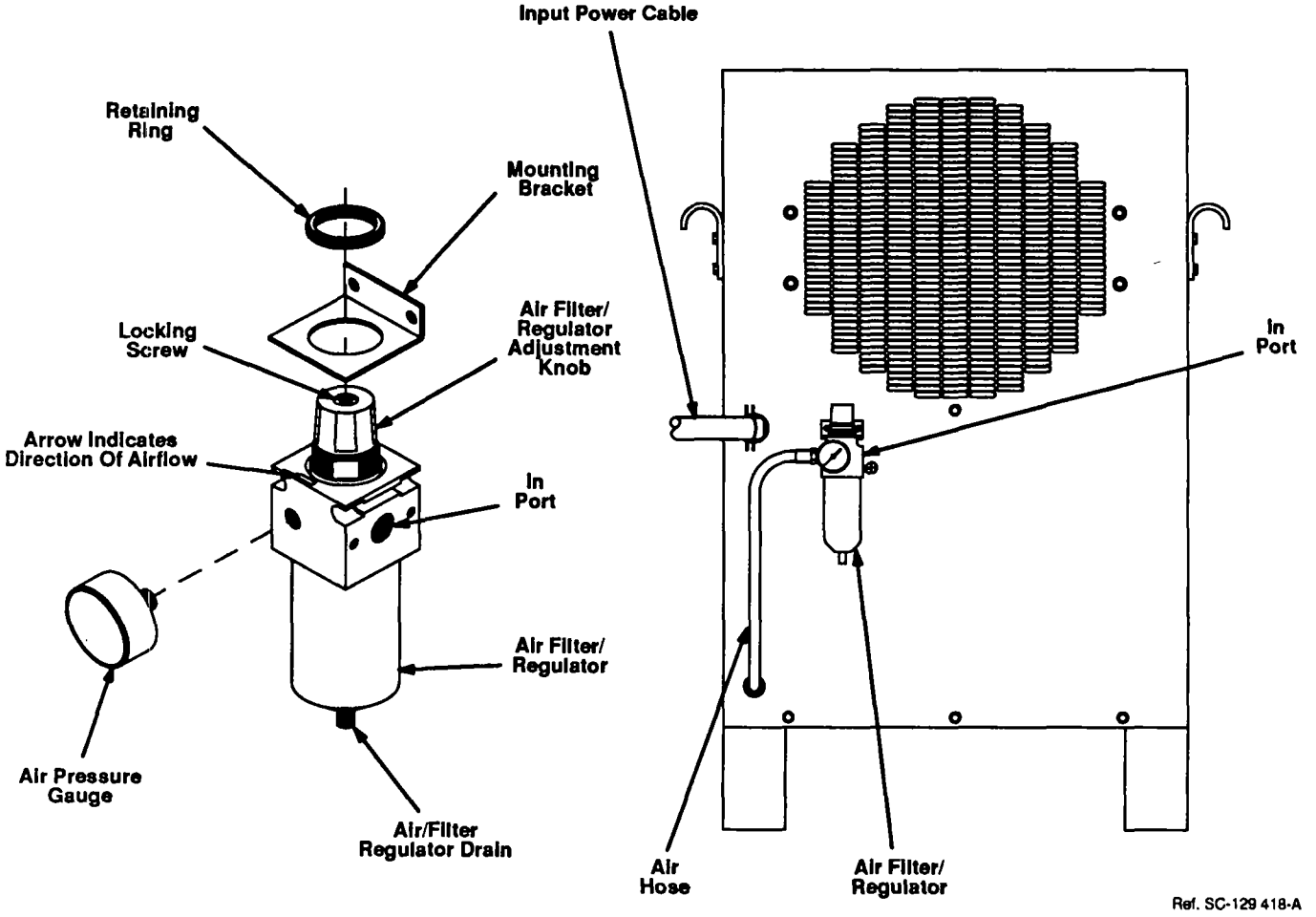


Figure 4-4. Rear Panel View And Component Locations

4-6. ELECTRICAL INPUT CONNECTIONS (Table 4-1 And Figure 4-5)

IMPORTANT: *Read entire Section 9 regarding plasma arc cutting equipment installation guidelines before making electrical input connections.*

INPUT

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down 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 power source from a three-phase, 60 Hz, 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 electric service available, how proper connections should be made, and inspection required.

B. Jumper Link Installation (Figure 4-5)

WARNING: Read and follow safety information at beginning of entire Section 4-7 before proceeding.

Jumper links are used to allow the equipment to operate from different line voltages. The jumper links may be in a bag attached to the input terminal board or installed on the input terminal board for the highest voltage shown on the input voltage label.

1. Remove top cover and right side panel.
2. Compare position of jumper links on the input terminal board to the voltage link arrangement shown on the 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 4-5).*
- *Store unused jumper links across linked terminals.*

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

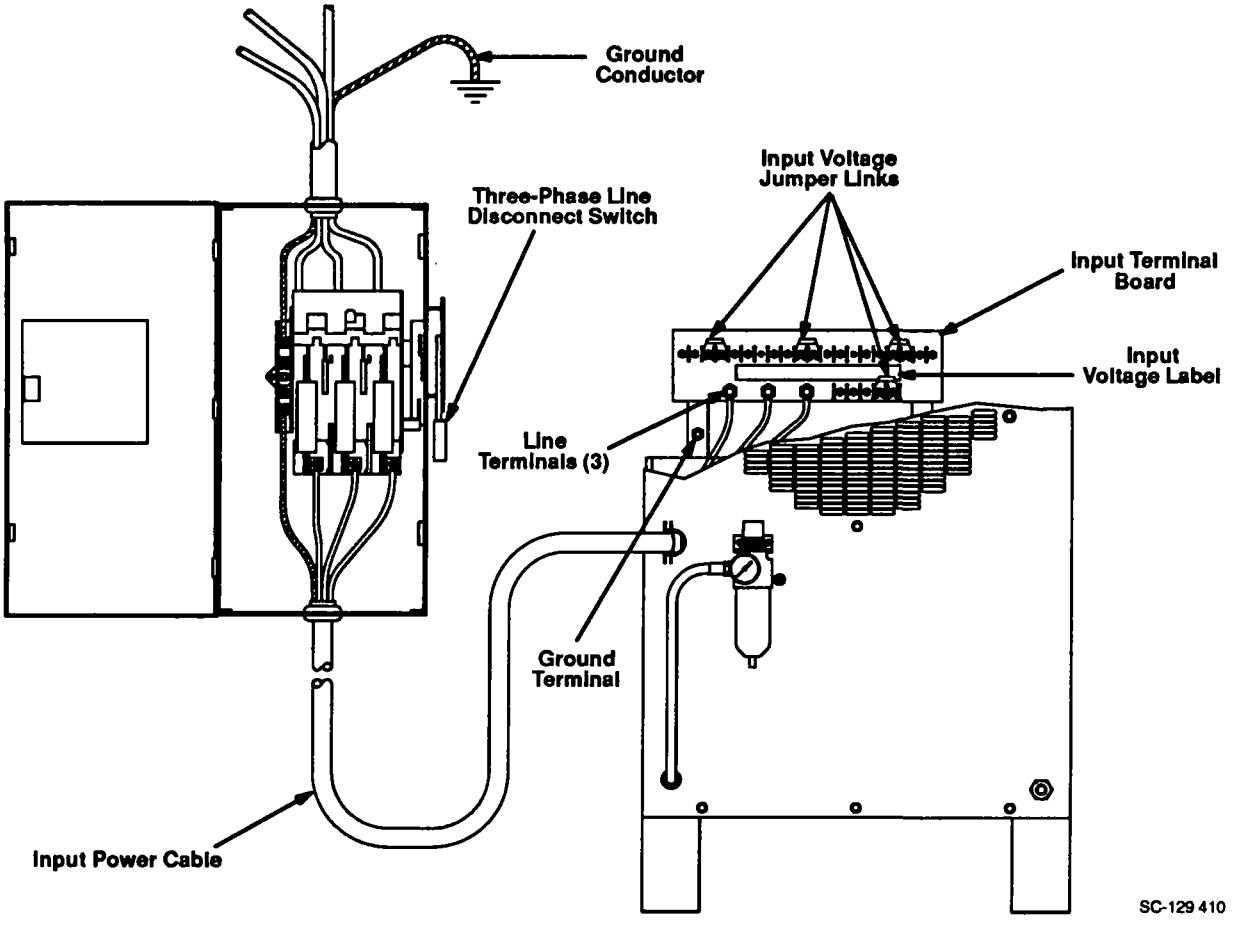


Figure 4-5. Location Of Electrical Input Connections And Components

C. Power Source Input Power Connections (Figure 4-5)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Install a fusible line disconnect switch in the input circuit to the power source.*
- *Connect input conductors to the power source before connecting to three-phase input power.*

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

- *Employ lockout/tagging procedures on input line before making input connections to the power source.*

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.

1. Use Table 4-1 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 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 power source chassis. The ground terminal is connected to the power source chassis and is for grounding purposes only.

3. If necessary, obtain and install a standard 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 4-5).
6. Connect the ground conductor to the ground terminal (see Figure 4-5).
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 and secure right side panel and top cover onto unit.
11. Use Table 4-1 as a guide to select line fuses for the disconnect switch. Obtain and install proper fuses.

Table 4-1. Input Conductor And Fuse Size*

Input Voltage	200	230	460	575
Input Conductor Size (AWG)	6	6	10	12
Ground Conductor Size (AWG)	8	8	10	10
Fuse Size In Amperes	90	80	40	30

*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 power source (Article 630 of NEC).

Ref. S-0092/4-89

4-7. STAND-OFF GUIDE INSTALLATION (Figure 4-6)

CAUTION: FAILURE TO INSTALL STOP GUIDE SLEEVE when using Stand-Off Guide can damage torch.

- *Always install Stop Guide Sleeve when using Stand-Off Guide on APT 7000 Torch.*

When cutting material thicker than 3/8 in. (9.5 mm), it is necessary to use the Stand-Off Guide to maintain the recommended stand off distance of 1/8 in. (3 mm). Install the Stop Guide Sleeve if applicable and Stand-Off Guide according to Figure 4-6.

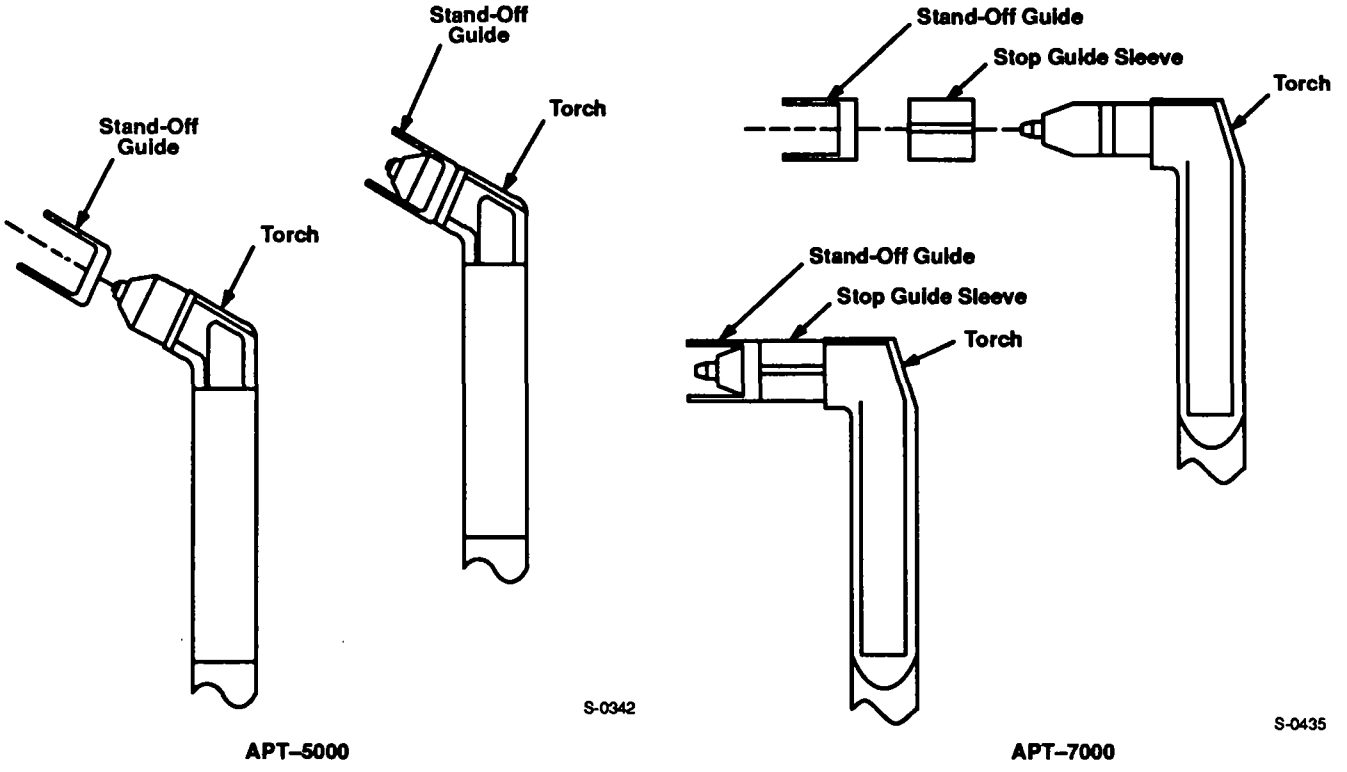


Figure 4-6. Installation Of The Stand-Off Guide

SECTION 5 – OPERATOR CONTROLS

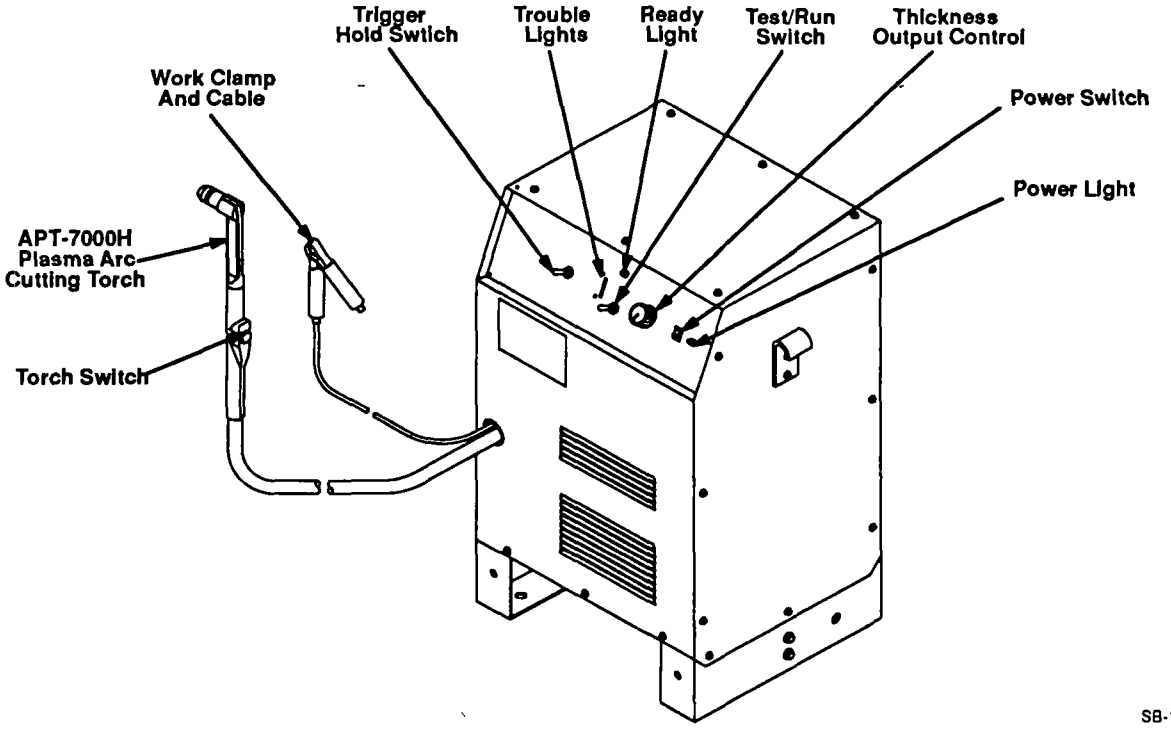


Figure 5-1. Operator Controls

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

POWER

Placing the POWER switch in the ON position energizes the power source. The POWER light and fan motor come on whenever the POWER switch is placed in the ON position and indicate that the unit is receiving input power. Placing the POWER switch in the OFF position turns off the power source, POWER light, and fan motor.

5-2. READY LIGHT (Figure 5-1)

When the READY light comes on, all of the safety shutdown devices within the control circuitry have been monitored, and the unit is ready for operation. If the READY light does not come on when the POWER switch is placed in the ON position, check the TROUBLE LIGHTS (see Section 7-5).

5-3. THICKNESS OUTPUT CONTROL (Figure 5-1)

The THICKNESS OUTPUT CONTROL provides a means for selecting the cutting capacity of the power source for the metal being cut. Rotating the control clockwise increases the cutting capacity of the power source. The scale surrounding the control is calibrated in inches for mild steel.

CAUTION: INCORRECT STANDOFF DISTANCE can damage torch.

- *When THICKNESS OUTPUT CONTROL is set above 3/8 in. (9.5 mm), always use 1/8 in. (3 mm) standoff distance between torch tip and workpiece (see Section 4-7).*

5-4. TEST/RUN SWITCH (Figure 5-1)

The TEST/RUN switch provides a means for adjusting the air filter/regulator without energizing the cutting circuit. Placing the TEST/RUN switch in the TEST position energizes the air solenoids thereby allowing the air filter/regulator to be properly set to 64 psi (4.3 bars). Placing the TEST/RUN switch in the RUN position provides gas/air to the cutting torch when the torch switch is pressed.

5-5. TRIGGER HOLD SWITCH (Figure 5-1)

The TRIGGER HOLD switch provides the capability of torch switch self-hold for long cutting operations. When the TRIGGER HOLD switch is placed in the ON position, the torch switch can be released while cutting, and the cutting circuit will continue to operate until the torch is moved away from the workpiece. When the TRIGGER HOLD switch is in the OFF position, the torch switch must be held closed while cutting and released at the end of the cutting operation. The TRIGGER HOLD switch should be placed in the OFF position for short cutting operations and placed in the ON position for long cutting operations.

SECTION 6 – SEQUENCE OF OPERATION

WARNING: PLASMA ARC CUTTING can be hazardous; FIRE OR EXPLOSION can result from placing unit on or near combustible surfaces.

- *Only qualified persons are to operate this equipment according to all codes and employer's safety practices.*
- *Do not locate unit over combustible surfaces.*
- *Use torch(es) specified in Owner's Manual.*
- *Keep children away.*

CUTTING CONTAINERS, such as barrels, tanks, and pipes, can result in explosions, fire, or poisonous fumes.

- *Cut containers only after they have been properly cleaned and prepared.*
- *Never cut pressurized lines, pipes, or containers.*

ELECTRIC SHOCK can kill; IMPROPER AIRFLOW AND EXPOSURE TO ENVIRONMENT can damage internal parts.

- *Do not touch live electrical parts.*
- *Keep all covers, panels, and guards securely in place.*
- *Wear dry insulating gloves and body protection.*
- *Do not use cables or torch with damaged insulation.*
- *Turn off power source before cleaning slag from torch tip or replacing any torch parts.*
- *Maintain at least 18 inches (457 mm) of unrestricted space on all sides of power source, and keep underside free of obstructions.*
- *Do not place any filtering device over the intake air passages of this power source.*

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

FUMES AND GASES can seriously harm your health.

- *Keep your head out of any fumes.*
- *Ventilate area, or use approved breathing device.*
- *Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for any materials used.*
- *When possible cut over a water table or work table designed to minimize fumes, gases, and sparks, except aluminum – see next statement.*
- *Cutting aluminum on a water table may cause hydrogen detonation beneath the workpiece.*

Contact equipment manufacturer for recommended practices for cutting aluminum.

FLYING SPARKS AND HOT METAL can cause fire and burns.

- *Do not cut where flying sparks can strike flammable material.*
- *Protect yourself and others from flying sparks and hot metal.*
- *Allow work and equipment to cool before handling.*
- *Watch for fire, and keep a fire extinguisher nearby.*

ARC RAYS can burn eyes and skin; NOISE can damage hearing.

- *Wear safety goggles with correct filter shade.*
- *Wear a face shield.*
- *Cover skin.*
- *Protect ears.*

PILOT ARC can cause burns.

- *Keep torch tip away from personnel when switch is pressed.*

CUTTING WORKPIECE ON CONCRETE FLOOR can cause concrete to explode.

- *Do not place workpiece directly on concrete floor.*

HOT METAL SPARKS will mark glass and burn trim.

- *Remove, cover, or protect any glass or trim.*

CUTTING CURRENT can damage vehicle computer(s) and other electronic components.

- *Disconnect both battery cables before cutting on a vehicle.*
- *Place work clamp as close to the cut as possible to avoid long electrical paths.*
- *Be sure torch to power source as well as cable connections to work clamp are clean and tight.*
- *To minimize risk, disconnect the computer(s) from the vehicle.*

See Section 1 – Safety Rules For Plasma Arc Cutting (PAC) for basic safety information.

6-1. PLASMA ARC CUTTING (PAC)

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

1. Install and connect unit according to Section 4.

CAUTION: TIP AND ELECTRODE WEAR BEYOND RECOMMENDED VALUES or OPERATION WITHOUT TIP OR ELECTRODE can damage torch.

- *Inspect shield cup, tip, and electrode before cutting or whenever cutting speed has been significantly reduced (see Torch Owner's Manual).*
- *Do not operate torch without a tip or electrode in place.*

2. Place the TEST/RUN switch in the TEST position.

3. Place the POWER switch in the ON position. The POWER light will come on.

CAUTION: INCORRECT PLASMA GAS can cause torch and power source damage.

- *Use only air or nitrogen for the plasma gas supply.*
- *Do not use any other gas or combination of gases.*

4. Turn on gas/air supply at the source, and adjust air filter/regulator to 64 psi (4.4 bars) while observing air pressure gauge on rear of unit. For proper regulation, the recommended output from the gas/air supply should provide a minimum of 80 psi (5.5 bars) and a maximum of 150 psi (10.3 bars). Make pressure adjustment according to Figure 4-4 as follows:

   a. Loosen locking screw in center of air filter/regulator adjustment knob.

   b. Turn air filter/regulator adjustment knob clockwise to increase pressure setting or counterclockwise to decrease pressure setting.

   c. Tighten locking screw.

5. Place the THICKNESS OUTPUT CONTROL in the desired position (see Section 5-3).

6. Place the TEST/RUN switch in the RUN position. The READY light will come on indicating that the unit is ready for operation.

7. Wear dry insulating gloves and clothing, and wear safety goggles with correct filter shade according to ANSI Z49.1.

8. Connect work clamp to clean, bare metal at workpiece.

9. Place tip of torch at edge of metal to be cut with hole in tip just over metal edge.

10. Press torch switch. There will be approximately 2 seconds of preflow air before arc starts.

11. Once arc starts, move tip slowly and smoothly across material.

IMPORTANT: *If THICKNESS OUTPUT CONTROL is set above 3/8 in. (9.5 mm), dragging the torch tip directly on the material will cause excessive tip and electrode wear and produce cuts of reduced quality. Maintain a 1/8 in. (3 mm) standoff distance between tip and material whenever THICKNESS OUTPUT CONTROL is set above 3/8 in. (9.5 mm) by attaching the supplied Stop Guide Sleeve if applicable and Stand-Off Guide (see Section 4-7).*

12. Adjust torch speed so that sparks are directed through material away from torch tip. Proper cutting speed is being used when sparks go out bottom of cut.

13. Pause briefly at end of cut to allow metal bridge to be cut, and then release torch switch. Postflow air will flow for approximately 20 seconds. If another cut is started before postflow ends, the arc will start immediately.

IMPORTANT: *This unit can also be used to pierce material up to 5/8 in. (16 mm) maximum thickness to start a cut away from the metal edge. Optimum piercing thickness is 1/2 in. (12.7 mm). On light gauge material, there will be little or no additional wear on torch parts, but as the material becomes thicker, the wear will increase accordingly. Always pierce using a slight standoff or 10° angle to the material so that molten metal will be blown away from the torch tip. Molten metal blowing back onto the torch tip will further reduce the tip life. Wear a face shield if any piercing is to be part of the operation.*

6-2. CUTTING PROBLEMS AND RECOMMENDATIONS

1. If sparks come out top of cut or cut is not clean:
   a. The torch is being moved too fast; slow torch travel.
   b. The workpiece being cut is too thick.
   c. Tip or electrode worn; replace tip or electrode (see Torch Owner's Manual).

2. If arc goes out while cutting:
   a. The torch was lifted too far from workpiece; place torch on workpiece if THICKNESS OUTPUT CONTROL is set below 3/8 in. (9.5 mm) or observe proper standoff distance of 1/8 in. (3 mm) if THICKNESS OUTPUT CONTROL is set above 3/8 in. (9.5 mm) while cutting (see Section 4-7).
   b. Work clamp disconnected; connect work clamp to clean, bare metal at workpiece.
   c. Check READY light (see Section 5-2) and TROUBLE LIGHTS (see Section 7-5).

3. If arc goes on/off while cutting:
   a. The torch is being moved too slowly; increase torch travel.
   b. Tip or electrode worn; replace tip or electrode (see Torch Owner's Manual).

4. See Table 7-2. Troubleshooting for additional remedies.

6-3. SHUTTING DOWN

1. Stop cutting.
2. Allow unit to idle for approximately 2 minutes.
3. Place the POWER switch in the OFF position.
4. Turn off gas/air supply at the source.

IMPORTANT: *See Torch Owner's Manual For All Torch Related Information.*

7-1. ROUTINE MAINTENANCE (Table 7-1)

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 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.

A. Fan Motors

This power source 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. Torch Cables And Leads

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

Every three months inspect cables, leads, and torch for breaks in insulation. Repair or replace cables, leads, and torch 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 vacuum dust and dirt from the inside of the power source. Remove the outer enclosure, and use a vacuum suction for the cleaning operation. If dusty or dirty conditions are present, clean the unit once a month.

Table 7-1. Maintenance Schedule

Frequency*	Maintenance
Before cutting or as required.	Check gas/air pressure (see Step 4, Section 6-1). Inspect shield cup, tip, and electrode (see Torch Owner's Manual).
Every week.	Check shield cup detector circuit (see Section 7-5B).
Every month.	Units in heavy service environments: Check labels, cables, leads, and torch; clean internal parts.
Every 3 months.	Check cables, leads, and torch (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.

7-2. TORCH AND WORK CABLE INSPECTION AND CONNECTIONS (Figure 4-3)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down 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.*

If it should become necessary to replace the torch or work cable, proceed as follows:

A. Removal Of Torch And Work Cable

1. Shut down power source.
2. Remove left side panel.
3. Disconnect Torch cable from TORCH output connector.
4. Disconnect Pilot cable from PILOT output connector.
5. Disconnect shield cup detector leads 1 and 2 from terminal strip 1T.

6. Disconnect torch switch leads 3 and 4 from terminal strip 1T, and remove torch cable and leads from unit.
7. Disconnect Work (+) cable from WORK (+) output terminal, and remove cable from unit.

B. Reinstallation Of Torch And Work Cable

1. Route new torch cable and leads through access hole in front panel, and connect torch cable and leads as follows:
   a. Connect Torch cable to TORCH output connector.
   b. Connect Pilot In cable to PILOT output connector.
   c. Connect shield cup detector lead 1 to terminal 1 on 1T.
   d. Connect shield cup detector lead 2 to terminal 2 on 1T.
   e. Connect torch switch lead 3 to terminal 3 on 1T.
   f. Connect torch switch lead 4 to terminal 4 on 1T.
2. Route new Work (+) cable through access hole in front panel, and connect to WORK (+) output terminal.
3. Reinstall and secure left side panel onto unit.

7-3. SPARK GAP (Figure 7-1)

WARNING: ELECTRIC SHOCK can kill.
- *Do not touch live electrical parts.*
- *Shut down 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.*

This unit is provided with a spark gap assembly located behind the right side panel. The spark gap was set at the factory, and readjustment is not recommended. Normal spark gap setting is 0.030 in. (0.762 mm). If it should become necessary to adjust the spark gap, proceed as follows:

1. Shut down power source.
2. Remove right side panel from unit.
3. Loosen screw A.
4. Place feeler gauge of 0.030 in. (0.762 mm) thickness between point C.
5. Apply slight pressure against point B so feeler gauge is held firmly in gap.
6. Tighten screw A.
7. Reinstall right side panel onto unit.
8. Resume operation.

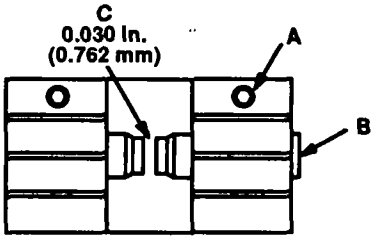


Figure 7-1. Spark Gap Adjustment

7-4. OVERLOAD PROTECTION

WARNING: ELECTRIC SHOCK can kill.
- *Do not touch live electrical parts.*
- *Shut down 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.*

CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.
- *Put on properly grounded wrist strap BEFORE handling circuit boards.*
- *Perform work only at a static safe work area.*

INCORRECT FUSE can damage unit.
- *Use only replacement fuse of same size, type, and rating (see Parts List).*

Main fuse F1 located on the left side of the rear panel protects control transformer T2 from overload. Should F1 open, the power source would be completely inoperative.

Fuses F1 through F5 located on Timer/Control Board PC2 protect the circuitry on PC2 from overload. Should any of these fuses open, the power source would not operate.

To replace main fuse F1 or fuses F1 through F5, correct the problem, and proceed as follows:

1. Shut down power source.
2. Remove left side panel to replace main fuse F1, or remove right side panel to replace fuses F1 through F5.

3. Check fuses, and replace if necessary.
4. Reinstall and secure left and/or right side panels onto unit.
5. Resume operation.

7-5. TROUBLE LIGHTS (Figure 5-1)

A. Gas/Air Trouble Light

To prevent damage to the torch due to insufficient air pressure, the torch is protected by normally open air pressure switch S2. When the power source is energized and the air pressure reaches a preset value, S2 closes. Should air pressure drop below the preset value, S2 would open, and the power source would be completely inoperative. The READY light would turn off, and the GAS/AIR trouble light would come on. Should the GAS/AIR trouble light come on, check gas/air pressure (see Step 4, Section 6-1).

B. Torch Tip Trouble Light

1. Shield Cup Detector Circuit

Should the shield cup be removed or not properly installed on the torch, the power source would be completely inoperative. The READY light would turn off and the TORCH TIP trouble light would come on. Should the TORCH TIP trouble light come on, turn off power source, and check that shield cup is clean and properly installed (see Torch Owner's Manual)..

Once a week check the shield cup detector circuit for proper operation by loosening the shield cup and observing the READY light and TORCH TIP trouble light. If the READY light turns off and the TORCH TIP trouble light comes on, the detector circuit is operating properly. If the READY light remains on or the TORCH TIP trouble light remains off, turn off power source. Check shield cup detector pins for proper operation, and replace if necessary (see Torch Owner's Manual).

2. Tip Leakage Detector Circuit

To prevent injury from electric shock should the tip and electrode come in contact with each other, the power source would be completely inoperative. The READY light would turn off and the TORCH TIP trouble light would come on. Should the TORCH TIP trouble light come on, turn off power source. Check that shield cup is clean and properly installed, and replace the tip and electrode if necessary (see Torch Owner's Manual).

C. Temperature Trouble Light

Main transformer T1 is protected by normally closed thermostat TP1, and main rectifier SR1 is protected by normally closed thermostat TP2. Should TP1 and/or TP2 open, thermal shutdown would occur, and the power source would be completely inoperative. The READY light would turn off, and the TEMPERATURE trouble light would come on. The fan motor FM would continue to run. Should the TEMPERATURE trouble light come on due to a thermal shutdown, a cooling period of approximately ten minutes will be required.

7-6. CIRCUIT BOARD HANDLING PRECAUTIONS

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down 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.*

7-7. TROUBLESHOOTING (Table 7-2)

IMPORTANT: *See Torch Owner's Manual For all torch related information.*

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down 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.*

Troubleshooting to be performed only by qualified persons.

Table 7-2. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Unit completely inoperative; POWER light PL1 off; READY light PL2 off; TROUBLE LIGHTS off; fan motor FM does not run.	Line disconnect switch in the OFF position.	Place line disconnect switch in the ON position.
	Line fuse or circuit breaker open.	Check and replace line fuse or reset circuit breaker.
	Main fuse F1.	Check and replace F1 if necessary (see Section 7-4).
	POWER switch S1.	Check and replace S1 if necessary.
Does not cut; POWER light PL1 on; READY light PL2 on; TROUBLE LIGHTS off; fan motor FM runs.	Work clamp not connected.	Connect work clamp to clean, bare metal at workpiece.
	Torch switch lead connections.	Check, clean, and tighten torch switch lead connections (see Section 7-2).
	Jumper on terminal strip 1T in wrong position.	Place jumper in proper position (see Section 4-4).
	Contactor W.	Check and replace W if necessary.
	Timer/Control Board PC2.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Regulator Board PC1.	See Section 7-6, and contact nearest Factory Authorized Service Station.
Does not cut; POWER light PL1 on; READY light PL2 off; TROUBLE LIGHTS off; fan motor FM runs.	Fuse F1 open on Timer/Control Board PC2.	Check and replace F1 if necessary (see Section 7-4).
	Control relay CR3.	Check and replace CR3 if necessary.
Uncontrolled output.	Jumper on terminal strip 1T in wrong position.	Place jumper in proper position (see Section 4-4).
	THICKNESS OUTPUT CONTROL R1.	Check and replace R1 if necessary.
	Hall Device Board HD1.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Timer/Control Board PC2.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Regulator Board PC1.	See Section 7-6, and contact nearest Factory Authorized Service Station.
No gas/air flow; POWER light PL1 on; READY light PL2 on; TROUBLE LIGHTS off; fan motor FM runs.	Fuse F3 open on Timer/Control Board PC2.	Check and replace F3 if necessary (see Section 7-4).
No gas/air flow; POWER light PL1 on; READY light PL2 off; TROUBLE LIGHTS off; fan motor FM runs.	Fuse F1 open on Timer/Control Board PC2.	Check and replace F1 if necessary (see Section 7-4).
	Fuse F5 open on Timer/Control Board PC2.	Check and replace F5 if necessary (see Section 7-4).
	Air solenoid AS1.	Check and replace AS1 if necessary.

Table 7-2. Troubleshooting (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
No pilot arc (high frequency) or lack of high frequency; difficulty in establishing an arc.	Fuse F1 open on Timer/Control Board PC2.	Check and replace F1 if necessary (see Section 7-4).
	Fuse F4 open on Timer/Control Board PC2.	Check and replace F4 if necessary (see Section 7-4).
	Spark gap G spacing incorrect.	Check and adjust spark gap G (see Section 7-3).
	Leakage of high frequency from torch cable or torch shorted.	Check and replace torch cable and/or torch if necessary (see Section 7-2).
	Control relay CR1.	Check and replace CR1 if necessary.
	Relay Board PC3.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Timer/Control Board PC2.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Regulator Board PC1.	See Section 7-6, and contact nearest Factory Authorized Service Station.
GAS/AIR trouble light on; READY light PL2 off.	TEST/RUN switch S4 in TEST position.	Place S4 in the RUN position.
	Incorrect gas/air pressure adjustment.	Adjust air filter/regulator according to Step 4 of Section 6-1.
	Insufficient gas/air supply (see Table 3-1. Specifications for requirements).	Check gas/air supply pressure.
	Air pressure switch S2.	Check and replace S2 if necessary.
	Dirty air filter/regulator.	Clean air filter/regulator according to manufacturer's instructions (supplied with unit).
TORCH TIP trouble light on; READY light PL2 off.	Shield cup not tight or shield cup contact surface dirty.	Check, clean, and tighten shield cup on torch (see Torch Owner's Manual).
	Electrode touching tip inside torch.	Check and tighten electrode (see Torch Owner's Manual).
	Shield cup detector pins dirty.	Check shield cup detector pins (see Torch Owner's Manual).
	Shield cup detector lead connections.	Check, clean, and tighten shield cup detector lead connections (see Torch Owner's Manual).
	Plug PLG12 or PLG13 loose on Filter Board PC5 or loose connections on terminal strip 1T.	Check and secure PLG12 and PLG13 on PC5, and tighten loose connections on 1T.
	Relay Board PC3.	See Section 7-6, and contact nearest Factory Authorized Service Station.
TEMPERATURE trouble light on; READY light PL2 off.	Thermostat TP1 and/or TP2 open (thermal shutdown).	Allow a cooling period of approximately ten minutes (see Section 7-5).
	Thermostat TP1 and/or TP2.	Check and replace TP1 and/or TP2 if necessary.
	Timer/Control Board PC2.	See Section 7-6, and contact nearest Factory Authorized Service Station.

Table 7-2. Troubleshooting (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
No low gas/air flow (preflow/ postflow air).	Orifice in parallel with gas solenoid GS1 plugged.	Check and clean orifice if necessary.
No high gas/air flow or decreased cutting ability.	Insufficient gas/air pressure (see Table 3-1. Specifications for requirements).	Check gas/air supply.
	Reed switch RS1.	Check and replace RS1 if necessary.
	Gas solenoid GS1.	Check and replace GS1 if necessary.
Fan does not run; POWER light PL1 and READY light PL2 both on.	Fan motor FM.	Replace FM.
TROUBLE LIGHTS not working.	Indicator Board PC4.	See Section 7-6, and contact nearest Factory Authorized Service Station.
	Timer/Control Board PC2.	See Section 7-6, and contact nearest Factory Authorized Service Station.

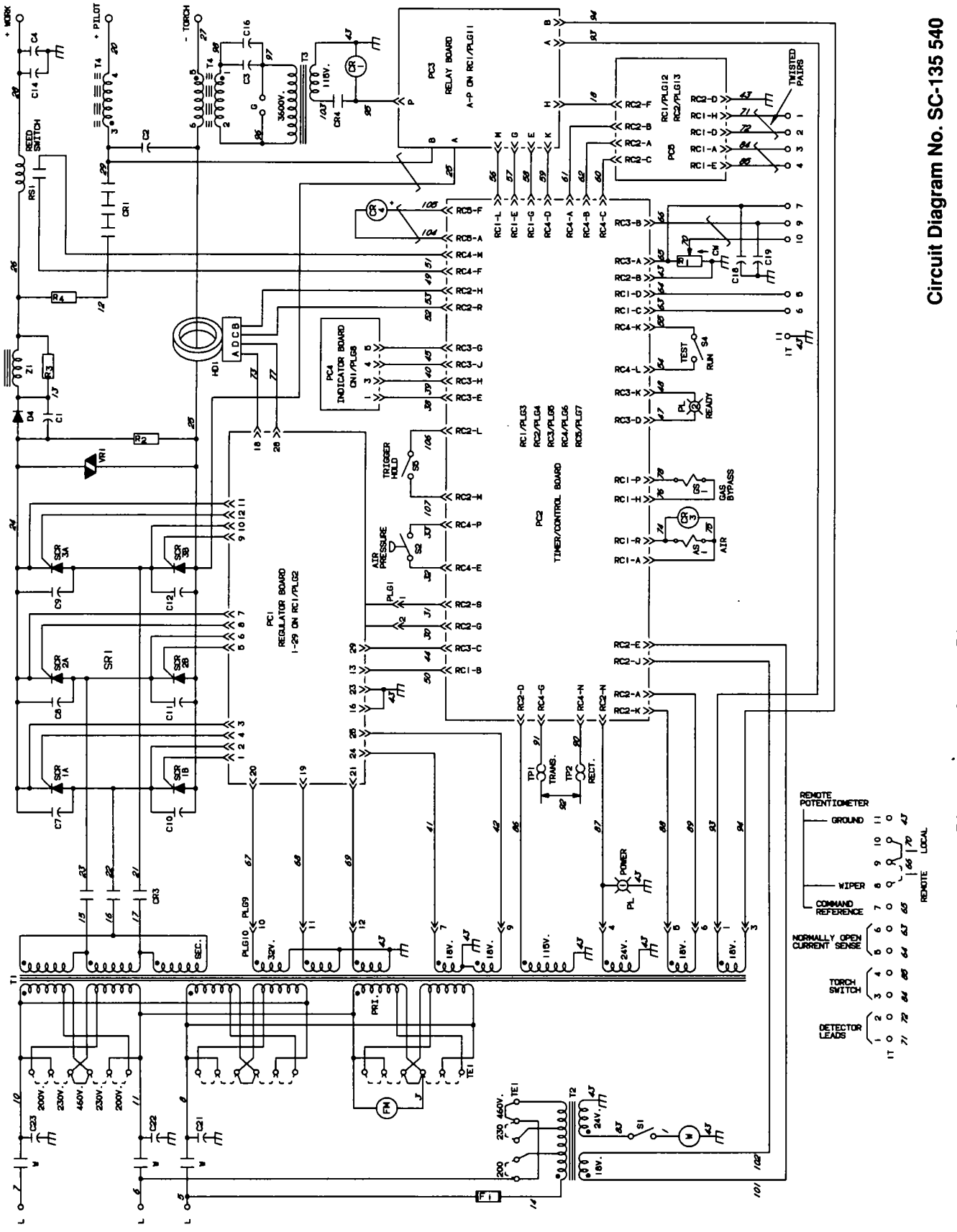
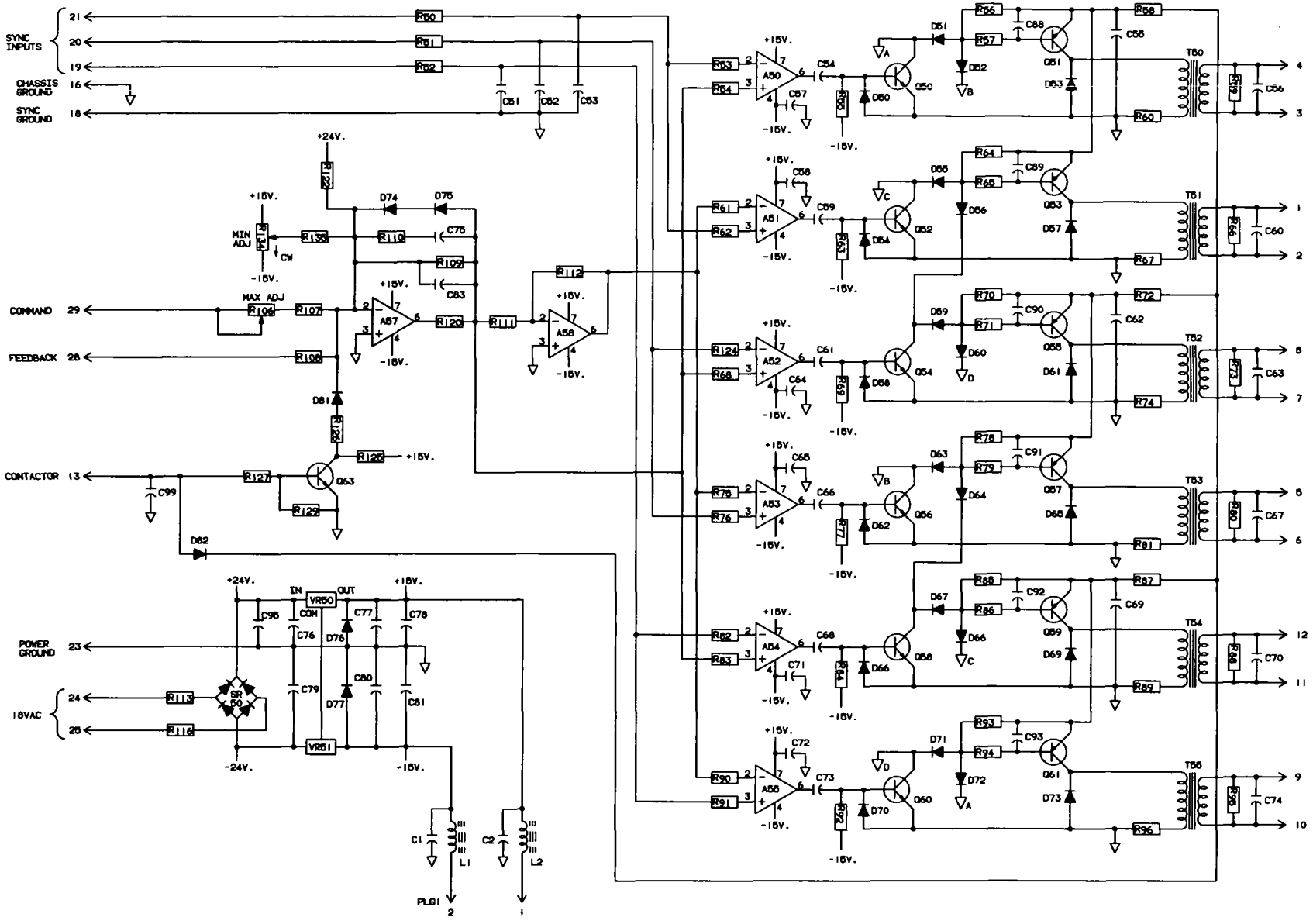


Diagram 8-1. Circuit Diagram For Power Source

Circuit Diagram No. SC-135 540



Circuit Diagram No. SC-126 851-A

Diagram 8-2. Circuit Diagram For Regulator Board PC1

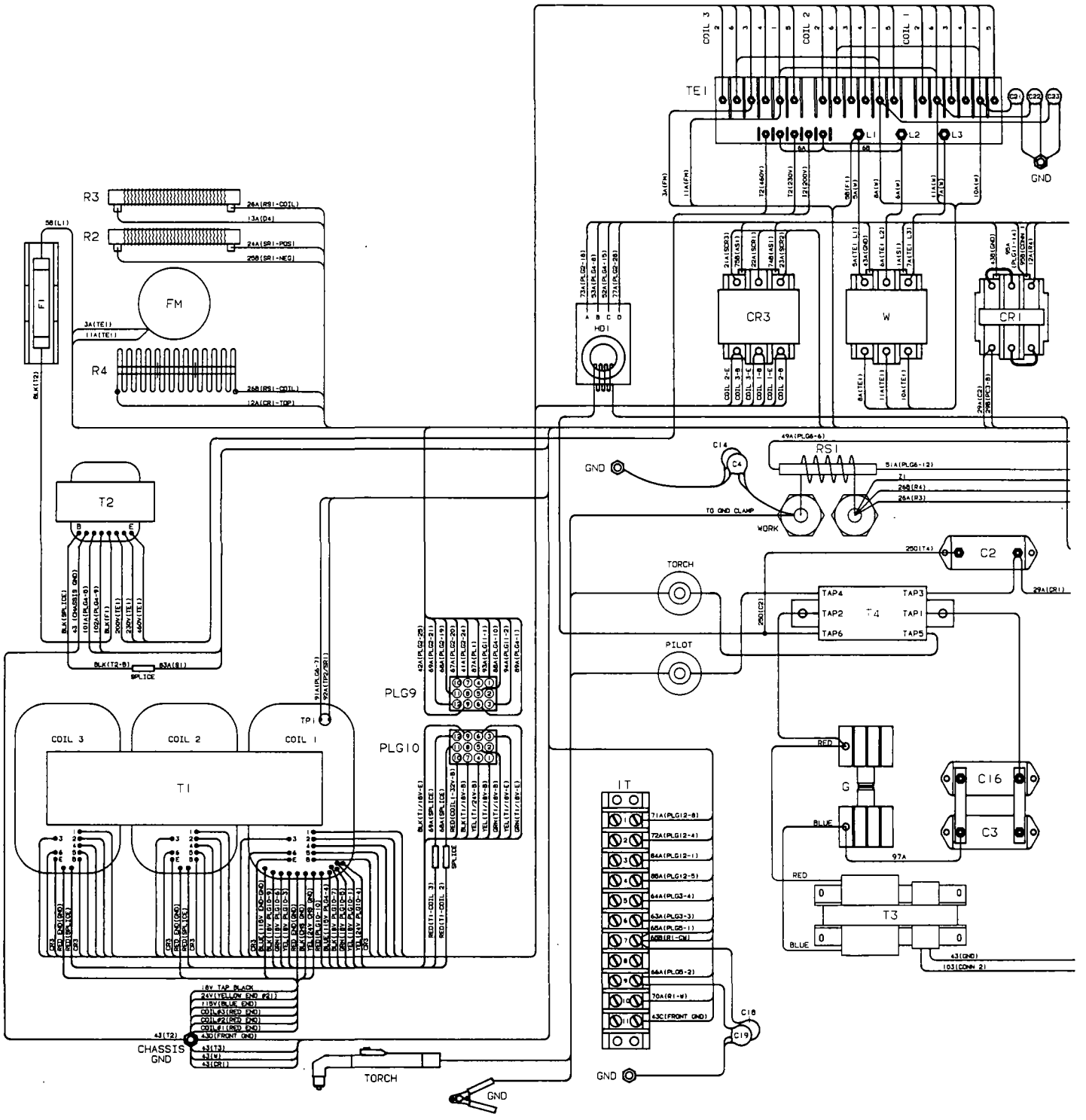
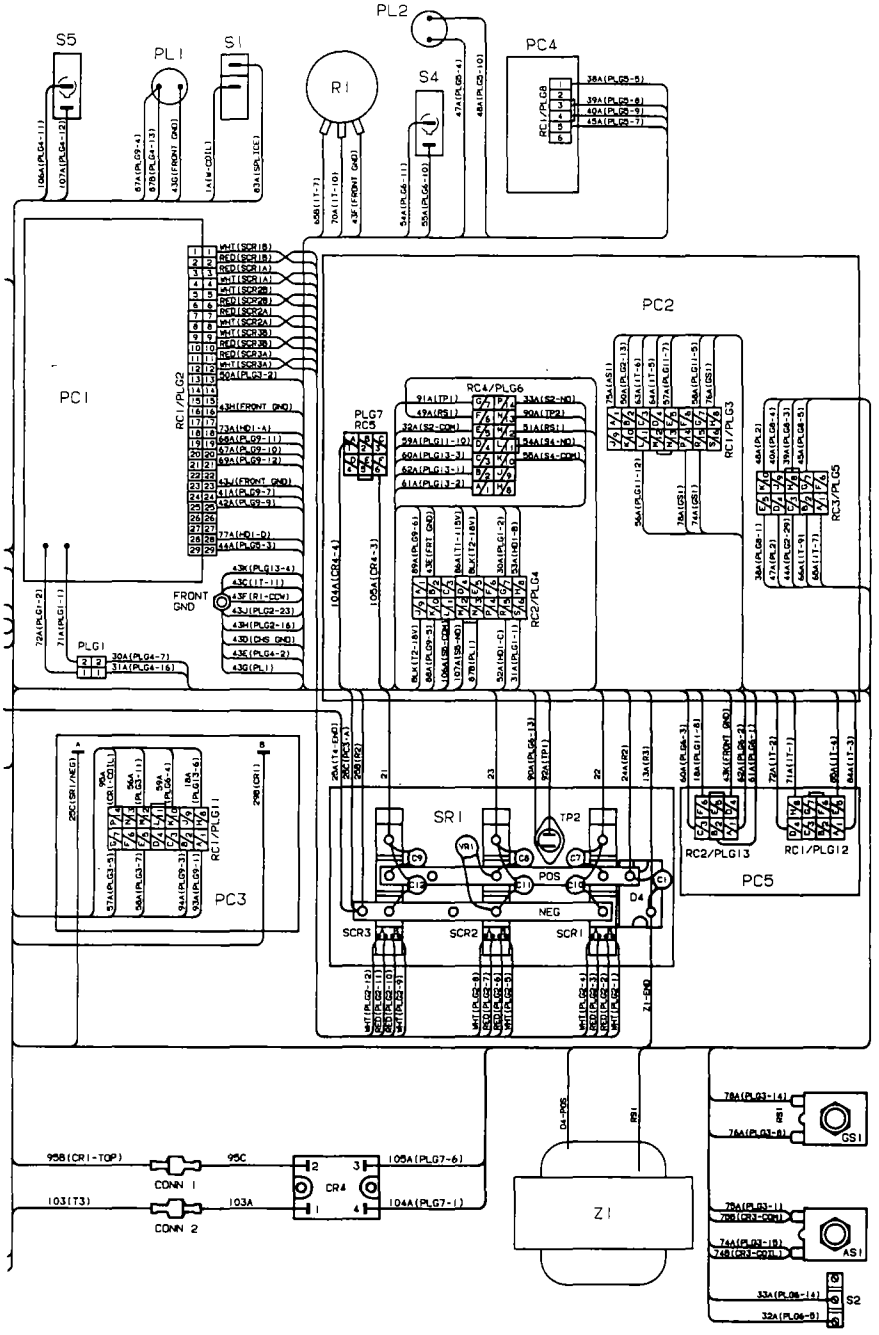


Diagram 8-3. Wiring Diagram For Power Source



Wiring Diagram No. D-135 689

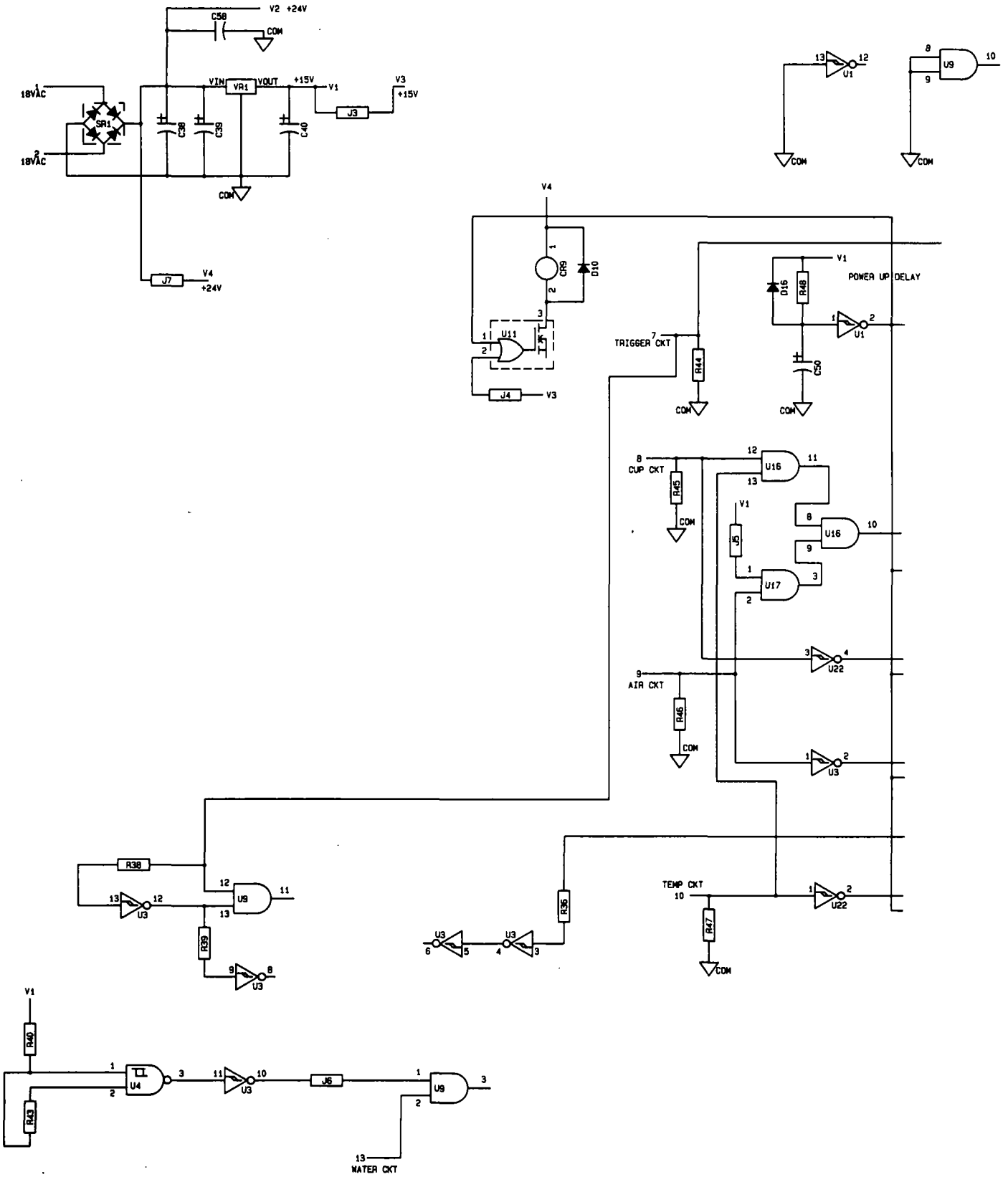
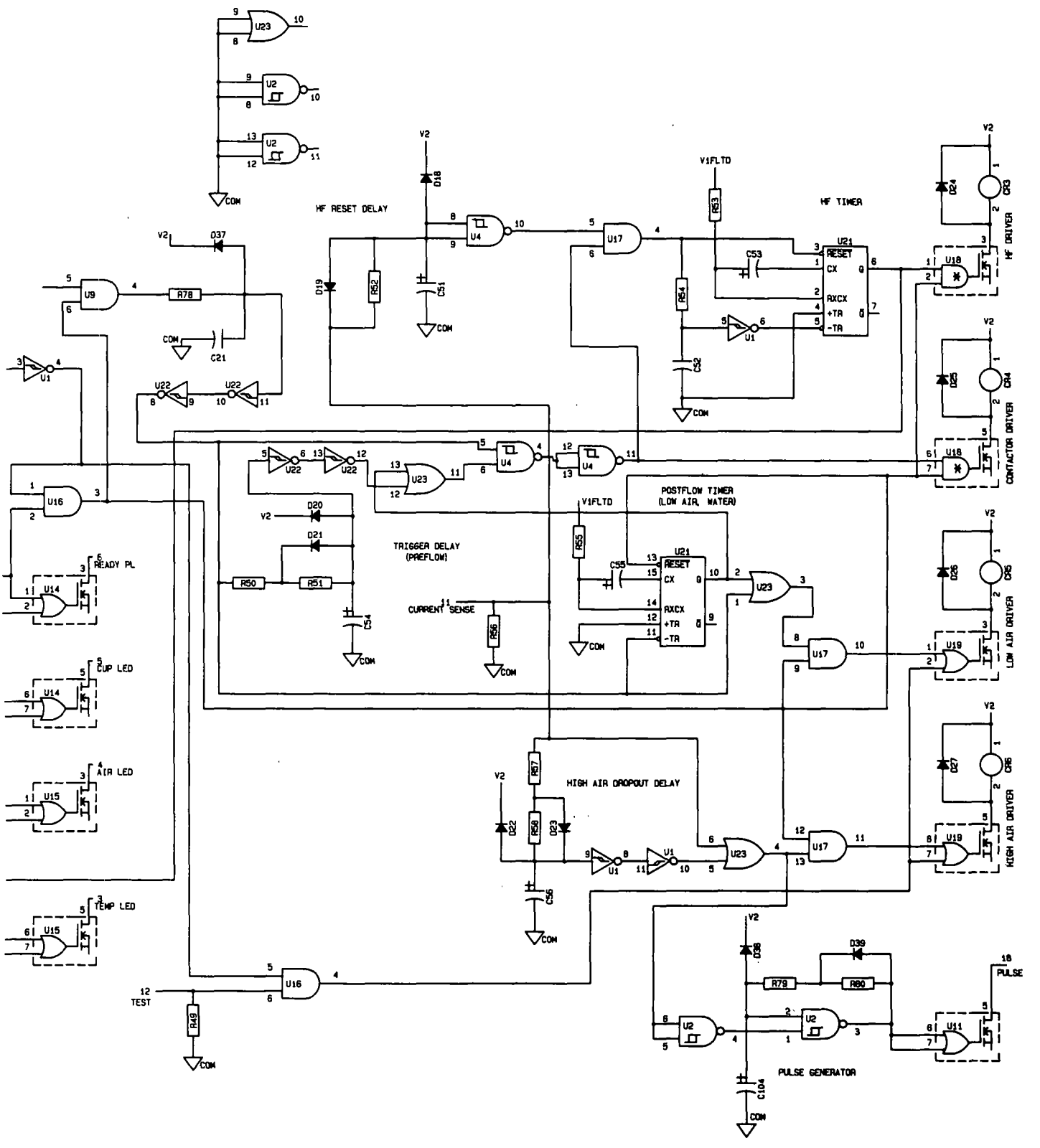


Diagram 8-4A. Circuit Diagram Portion For Timer/Control Board PC2 (1 of 2)



Circuit Diagram No. D-131 748

POWER AND GROUND PINS FOR IC'S							
DEVICE	V1 (+15V)	V1FLTD (+15V)	V3 (+15V)	V3FLTD (+15V)	V6 (+15V)	V7 (-15V)	COM
U1	14						7
U2	14						7
U3	14						7
U4	14						7
U9	14						7
U11			8				4
U14	8						4
U15	8						4
U16	14						7
U17	14						7
U18	8						4
U19	8						4
U21		16					8
U22	14						7
U23	14						7
A1					4	11	

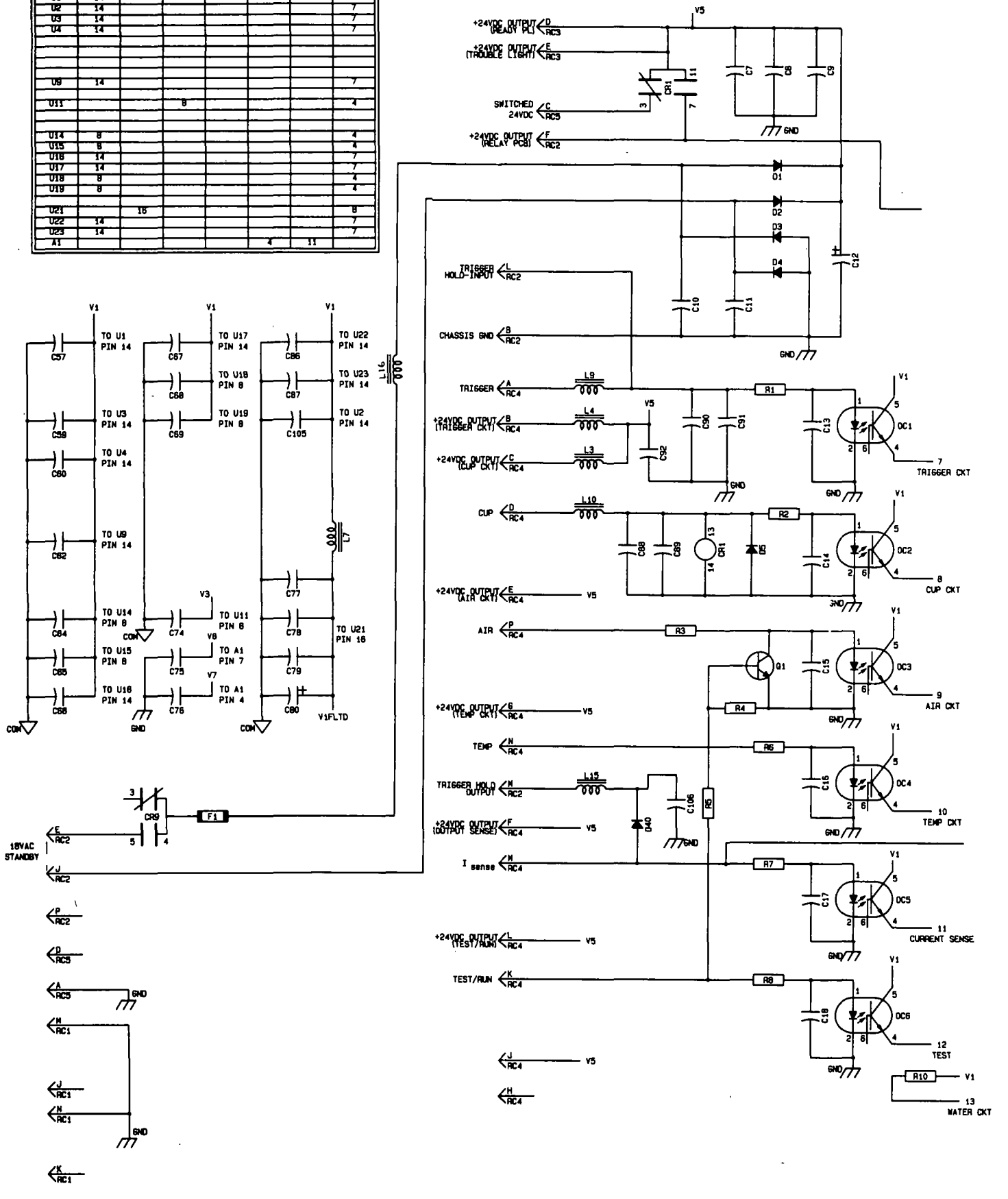
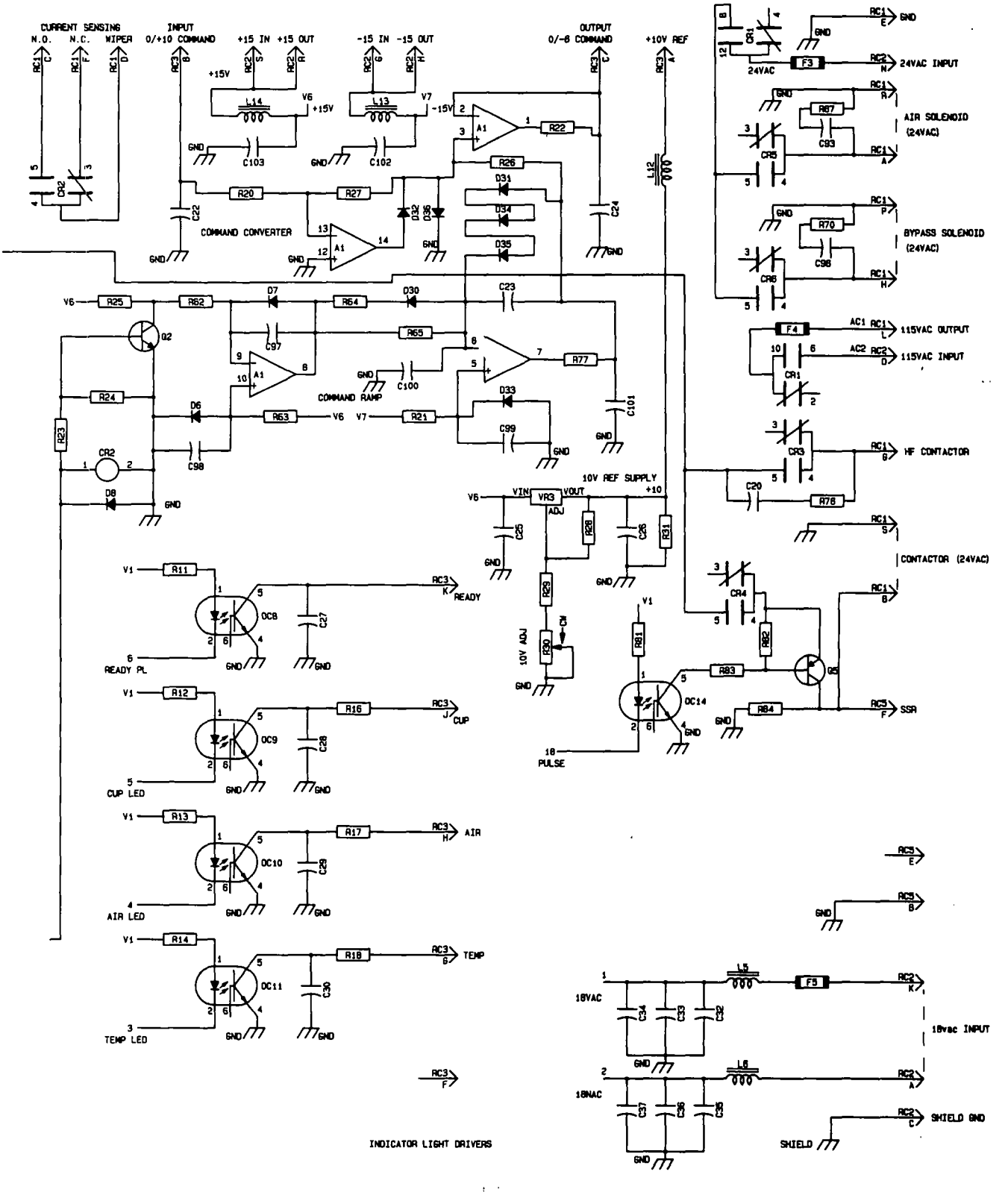
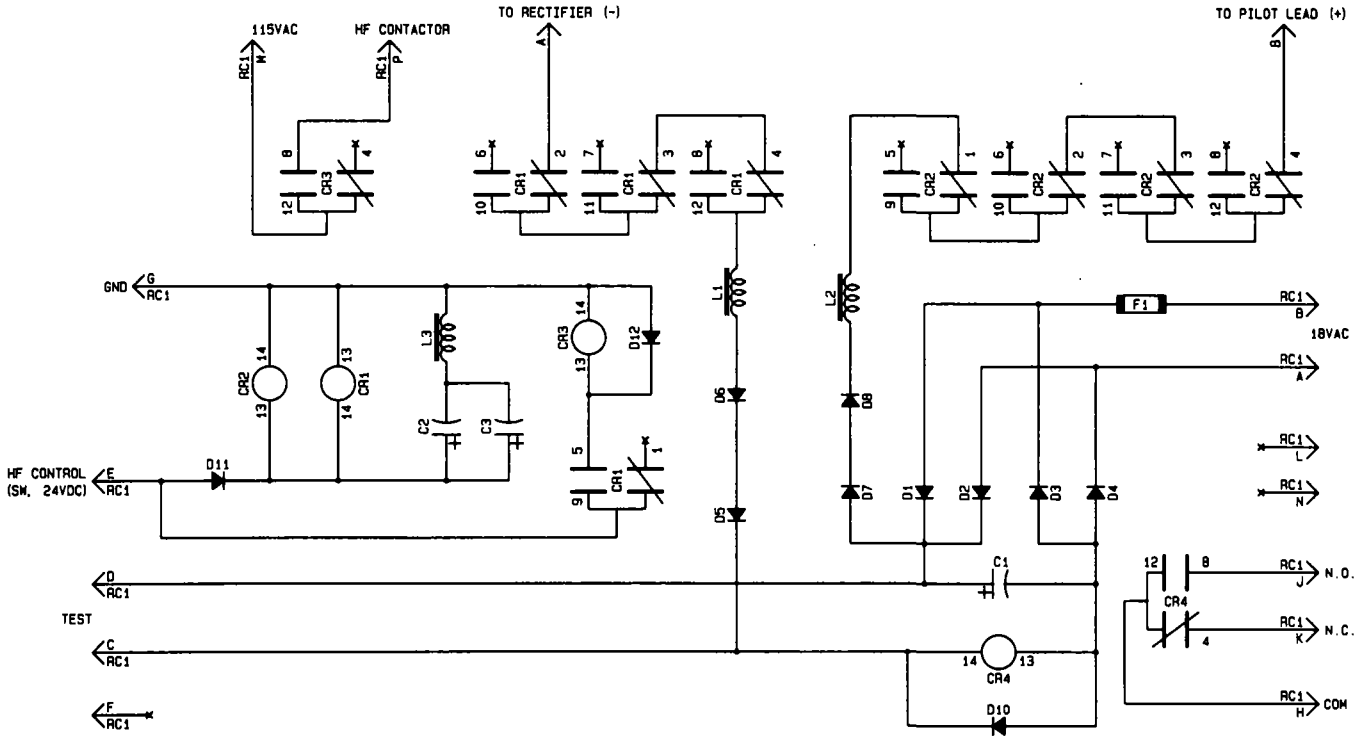


Diagram 8-4B. Circuit Diagram Portion For Timer/Control Board PC2 (2 of 2)

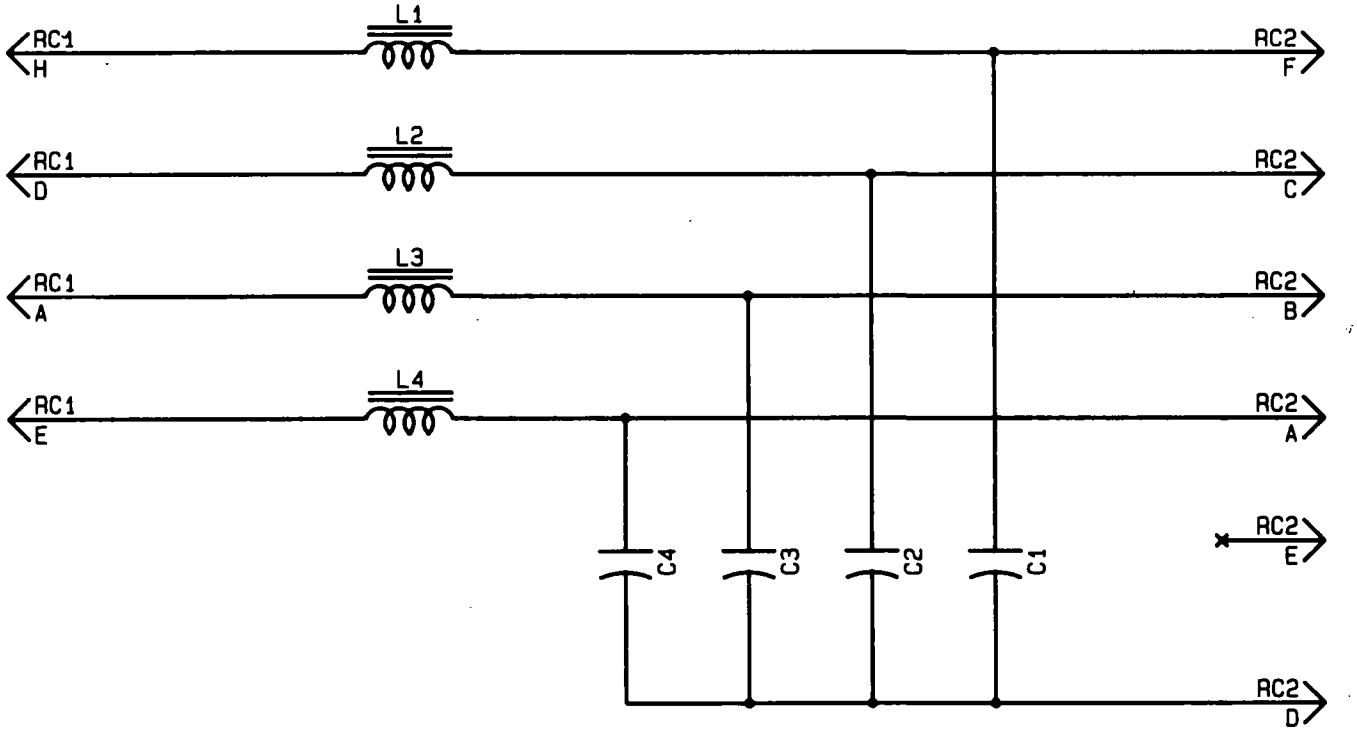


Circuit Diagram No. D-131 748



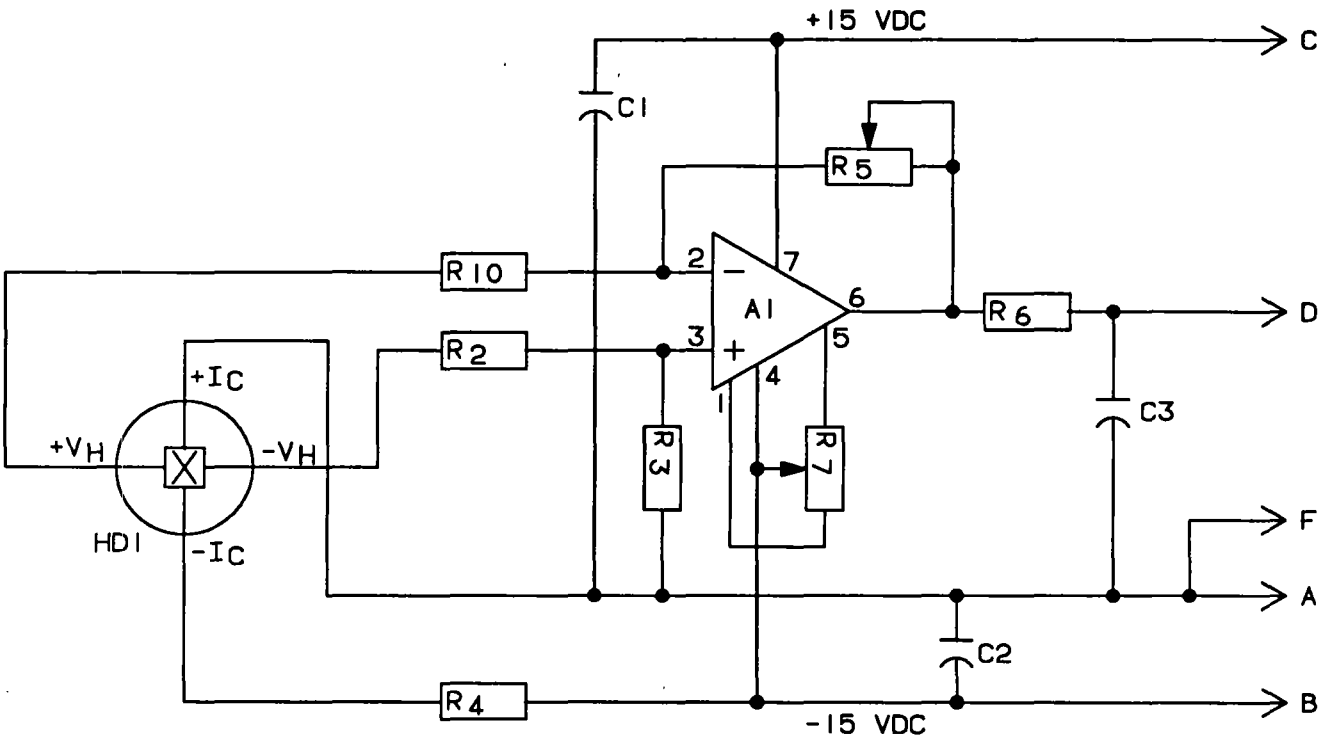
Circuit Diagram No. B-128 923

Diagram 8-5. Circuit Diagram For Relay Board PC3



Circuit Diagram No. A-127 793

Diagram 8-6. Circuit Diagram For Filter Board PC5



Circuit Diagram No. SA-110 758-A

Diagram 8-7. Circuit Diagram For Hall Device HD1

SECTION 9 – PLASMA ARC CUTTING (PAC) INSTALLATION GUIDELINES

9-1. GENERAL

The following information is necessary to make a proper installation of the high-frequency plasma arc cutting (PAC) equipment described in this instruction manual. The importance of a correct installation cannot be overemphasized since case histories of interference due to high-frequency equipment have shown that, in most cases, an inadequate installation was at fault. In the event that interference with authorized FCC services occurs, the user is required to take suitable steps to clear the situation. In such cases, these instructions could serve as a guide in minimizing interference that might be caused by the high-frequency plasma arc cutting (PAC) equipment. The Factory Service Department personnel will assist the user by supplying technical information.

Many processes and applications of processes require open-circuit voltages sufficient to jump from the electrode to the work without making direct contact. The maximum open-circuit voltage (OCV) of a plasma arc cutting (PAC) power source is not sufficient for this. It takes several thousand volts to cause an electrical spark to jump the gap between the torch electrode and the pilot, creating an initial path of ionization, that the arc current can follow without the hazards that would be present at low power frequencies.

In order to provide these higher voltages, it is common practice to superimpose a high open-circuit voltage on the output of a plasma arc cutting (PAC) power source by using high-frequency techniques. The resulting high-frequency voltage can be a source of interference and will be discussed in this section.

9-2. DEFINITIONS

A. High-Frequency Assisted Plasma Arc Cutting (PAC) Power Sources

In the plasma arc cutting (PAC) process, high frequency may be used for initiating the cutting arc and, in the case of an arc outage, reinitiating the cutting arc.

The energy from the high-frequency source must flow to the torch electrode via a good quality, low impedance, and well insulated connecting cable.

B. Cutting Circuit

The circuit consists of all attachments connected to the electrode, pilot arc, and work terminals.

C. Output Terminals

Output terminals are the terminals which provide the cutting current and pilot arc.

D. Electrode Terminal

The electrode terminal is the terminal to which the electrode lead of the cutting torch is connected.

E. Pilot Arc Terminal

The pilot arc terminal is the terminal to which the pilot lead is connected.

F. Work Terminal

The work terminal is the terminal to which the cutting workpiece is connected.

G. Cutting Torch

A device used in the plasma arc cutting (PAC) process to control the position of the electrode, to transfer current to the arc, and to direct the flow of plasma gas.

H. Cutting Zone

The cutting zone is the space within 50 ft. (15 m) in all directions from the midpoint between the power source and the cutting arc (see Figure 9-6).

I. Bonding

Bonding refers to connecting metallic objects together to cause the objects to be at the same potential regardless of any current flow between them (see Figure 9-3 and Figure 9-4).

J. Grounding (Earthing)

Depending on the practices within jurisdictions, one of these terms is commonly used to indicate the connection, or bonding, of parts of the apparatus to the earth.The terms may be used interchangeably.

K. Receiver

A receiver is any device normally used for receiving electromagnetic energy and converting it to useful communications purposes.

L. Conduction

Conduction is the transmission of high-frequency energy via an electrical conductor or conducting medium.

M. High Frequency

High frequency is radio frequency energy, either continuous or pulsed, used to start a plasma arc.

N. High-Frequency Assisted Plasma Arc Cutting (PAC)

High-frequency assisted plasma arc cutting (PAC) refers to any of the plasma arc cutting (PAC) processes requiring high frequency.

O. Interference

Interference is the unwanted and problematic reception of high-frequency energy.

P. Radiation

Radiation is the transmission of high-frequency energy through space.

9-3. HIGH-FREQUENCY RADIATION

Installations using high frequency as an integral part of the power source will produce some high-frequency radiation. Such radiation, if the signal strength is sufficient at the receiving device, can cause an inconvenience or disruption of communications or can cause malfunction in sensitive electronic controls and systems. The four major causes of high-frequency radiation are as follows:

A. Direct Radiation From The Power Source

Direct radiation is that radiation emanating directly from the power source. Radiation from the power line is not considered to be direct radiation from the power source.

B. Direct Radiation From The Cutting Circuit

Any attachment to the output terminals of the power source is capable of acting as an antenna and radiating high-frequency energy. Since direct radiation from the cutting circuit is the major source of radiation, it is important to have only the proper torch attached.

C. Conduction And Radiation From The Power Line

Most power lines are capable of conducting high-frequency energy which may cause interference directly or by reradiation from these power lines. Normally, such radiation is small when compared to that caused by radiation from the torch and work cables or leads.

D. Reradiation

Radiation from the cutting circuit can be picked up by ungrounded metal objects or unshielded wiring in the immediate vicinity, conducted some distance, and reradiated. This can be a troublesome source of interference.

9-4. LOCATION

Locate the power source as close to the cutting process as possible. Also consider the nearness of a suitable ground connection when selecting a site for the installation of the power source. Ideally, the power source should be located in an area where there is a limited amount of miscellaneous wiring (lighting, power, telephone, communications, and other unshielded conductors) located within the cutting zone. Ungrounded, metallic conductors in the cutting zone can act as antennas which will pick up, conduct, or reradiate the high-frequency energy transmitted by the cutting circuit. All miscellaneous wiring in the cutting zone should be enclosed in grounded, rigid metallic conduit, copper braid, or some other material having an equivalent shielding efficiency, and grounded at 50 ft. (15 m) intervals (see Figure 9-1).

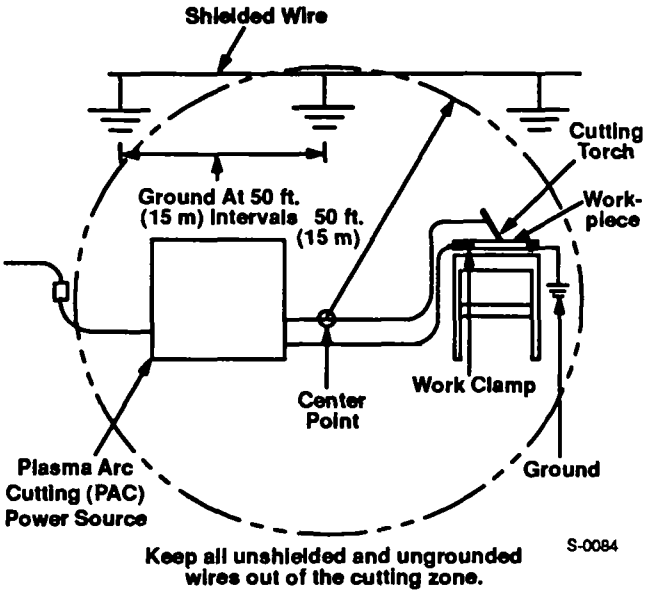


Figure 9-1. Requirements To Minimize Reradiation Pickup In The Vicinity Of The Cutting Zone

9-5. GENERAL INSTALLATION PROCEDURES

A. Torch And Work Cables Or Leads

Position the torch and work cables or leads as close together and as close to the floor or ground plane as possible.

B. High-Frequency Assisted Plasma Arc Cutting (PAC) Power Sources

When the plasma arc cutting (PAC) power source is in operation, all service doors and covers must be closed, securely fastened, and adequately bonded to ensure good contact around the entire perimeter of the opening. Except for changes and adjustments allowed by the manufacturer, the power source should not be modified.

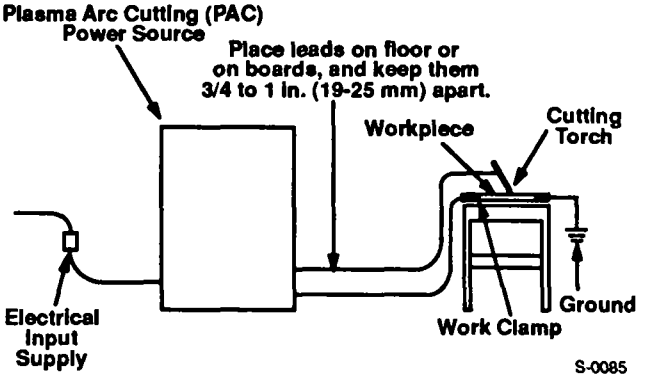


Figure 9-2. General Rules For Torch And Work Cables Or Leads

C. Grounding (Earthing) The Workpiece

It is recommended that the workpiece be firmly grounded. This ground must be made by grounding the workpiece with No. 12 AWG or smaller wire to a driven ground rod or to a water pipe which enters the earth within 10 ft. (3 m) of the workpiece.

D. Metal Buildings

Installation of a plasma arc cutting (PAC) power source within a suitably bonded and grounded (earthed) metal building can be an effective means of reducing high-frequency radiation. Wherever possible, install power sources in such places.

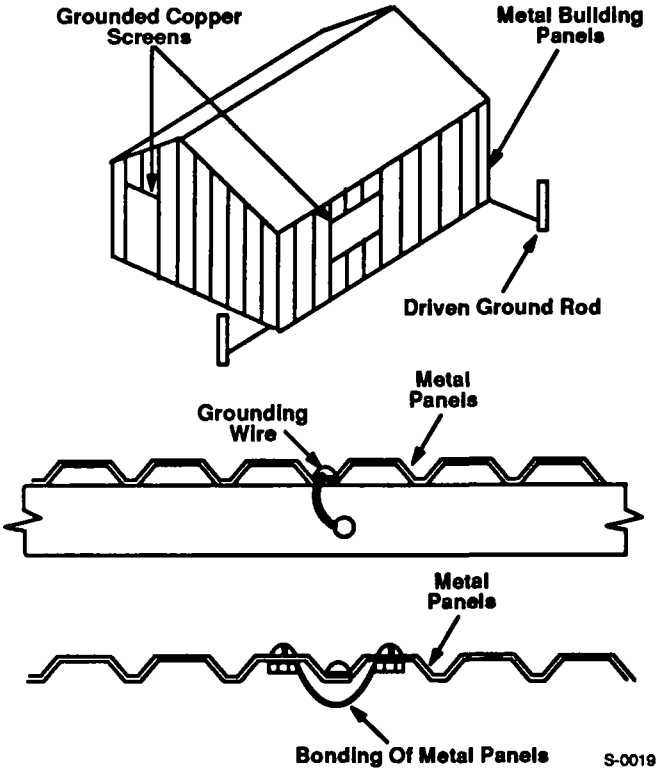


Figure 9-3. Grounding And Bonding Panels Of Metal Building

However, when the power source is installed within a metal building, precautions must be taken to be sure that the building is properly bonded and grounded (earthed). This can be accomplished by placing several good electrical ground rods around the periphery of the building. During the construction of a new building of any type having metal in the structure, be sure that all the reinforcing and structural steel is bonded together (as by welding each piece of metal to all other adjacent pieces). For metal buildings, adjacent metal panels should be bolted or welded together at frequent intervals. All windows and doorways should be covered with grounded copper screen or galvanized hardware cloth of not more than 1/4 in. (6.4 mm) mesh.

E. Shielding Of Miscellaneous Wiring In The Cutting Zone

Ungrounded, metallic conductors in the cutting zone can act as antennas which will pick up, conduct, and/or reradiate the high-frequency energy transmitted by the cutting circuit. This means that all ungrounded water pipes must be grounded, and that all lighting, power, telephone, communications, and other conductors within the cutting zone must be enclosed in grounded, rigid metallic conduit, copper braid, or some other material having an equivalent shielding capability (spirally wound, flexible, metallic conduit is not suitable). Shielding of the miscellaneous wiring in the cutting zone must be grounded at 50 ft. (15 m) intervals. Good low resistance electrical connections must be maintained between conduit sections (see Figure 9-4).

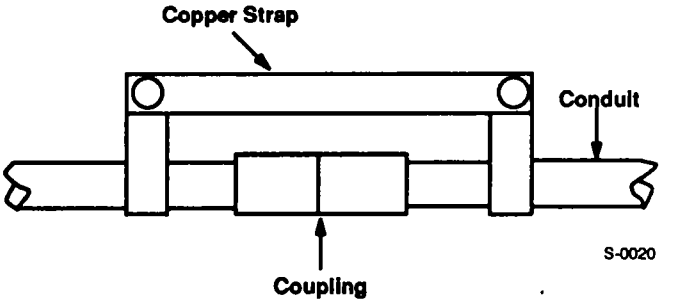


Figure 9-4. Bonding Method For Conduit Sections

F. Power Service

The plasma arc cutting (PAC) power source should be connected to the line input power supply as instructed in this manual. If the unit is equipped with a power cord, the supply conductors serving the power source should be completely enclosed in solid, metallic conduit, or in equivalent shielding, up to the point of connection with the power cord. The solid metallic conduit, or equivalent shielding, should extend the entire distance from the power entrance location in the building to the power source. Shielding should be electrically continuous throughout its length and should be connected so that good electrical contact is provided between the shielding and the power source.

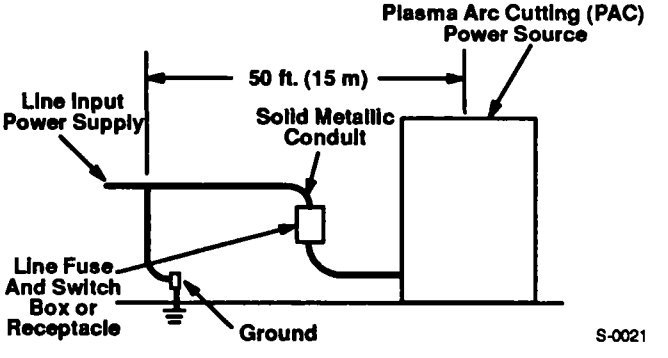


Figure 9-5. Installation Of Plasma Arc Cutting (PAC) Power Source

9-6. GUIDELINES FOR INSTALLATION OF PLASMA ARC CUTTING (PAC) POWER SOURCES

1. Locate the equipment so that the ground lead, when connected to the workpiece, can be kept as short as possible.
2. Shield the line input power leads up to the point of connection of the plasma arc cutting (PAC) power source as specified by the manufacture's requirements (see Section 9-5F).

3. Be sure that the conduit system is continuous to a point at least 50 ft. (15 m) from the power source, and that the conduit system is one complete run within the cutting zone. If rigid, metallic conduit is not used, be sure that the shielding used has equivalent shielding efficiency. Copper sleeving, lead covered cable, or the equivalent, is satisfactory. Spirally wound, flexible metallic conduit is not suitable.

4. Keep torch and work cables or leads as close together and as close to the ground plane as possible.

5. Adjust spark gap setting to the minimum setting given in this manual.

6. Secure all service and access doors before operating.

7. Visualize the cutting zone as a sphere with a 50 ft. (15 m) radius centered on a point between the power source and the cutting torch (see Figure 9-1 and Figure 9-6), and proceed as follows:

   a. Have all unshielded power, lighting, and communication wires within the cutting zone placed in grounded shields or relocated outside the cutting zone.

   b. Ground all large metallic objects, long guy wires, or support wires within the cutting zone.

   c. Be sure that there are no external power or telephone wires within the cutting zone.

8. Use driven ground rods which enter the ground 10 ft. (3 m) or less from the ground connection, or cold water pipes as the ground for the workpiece.

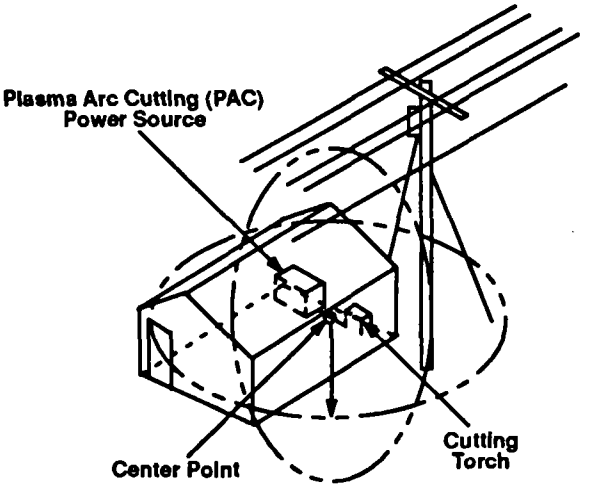


Figure 9-6. Cutting Zone

9. Be sure that all ground connections are clean and tight.

10. If the power source is operated within a metal building, be sure that the building is properly grounded.

9-7. INSTALLATION GUIDELINES CHECKLIST

All items may not be necessary or practical for each installation. Complete the necessary items to eliminate interference with authorized FCC services.

1. Is equipment properly located (see Sections 9-4, 9-5D, 9-5E, and 9-6.1)?
2. Are ac input power connections properly made (see Sections 9-5B, 9-6.2, and 9-6.3)?
3. Are torch and work cables or leads and equipment properly installed (see Sections 9-5A and 9-6.4)?
4. Are ground connections properly made (see Sections 9-5C, 9-6.1, 9-6.4, 9-6.10, and 9-6.11)?
5. Is equipment properly set up and adjusted (see Sections 9-6.5 and 9-6.6)?

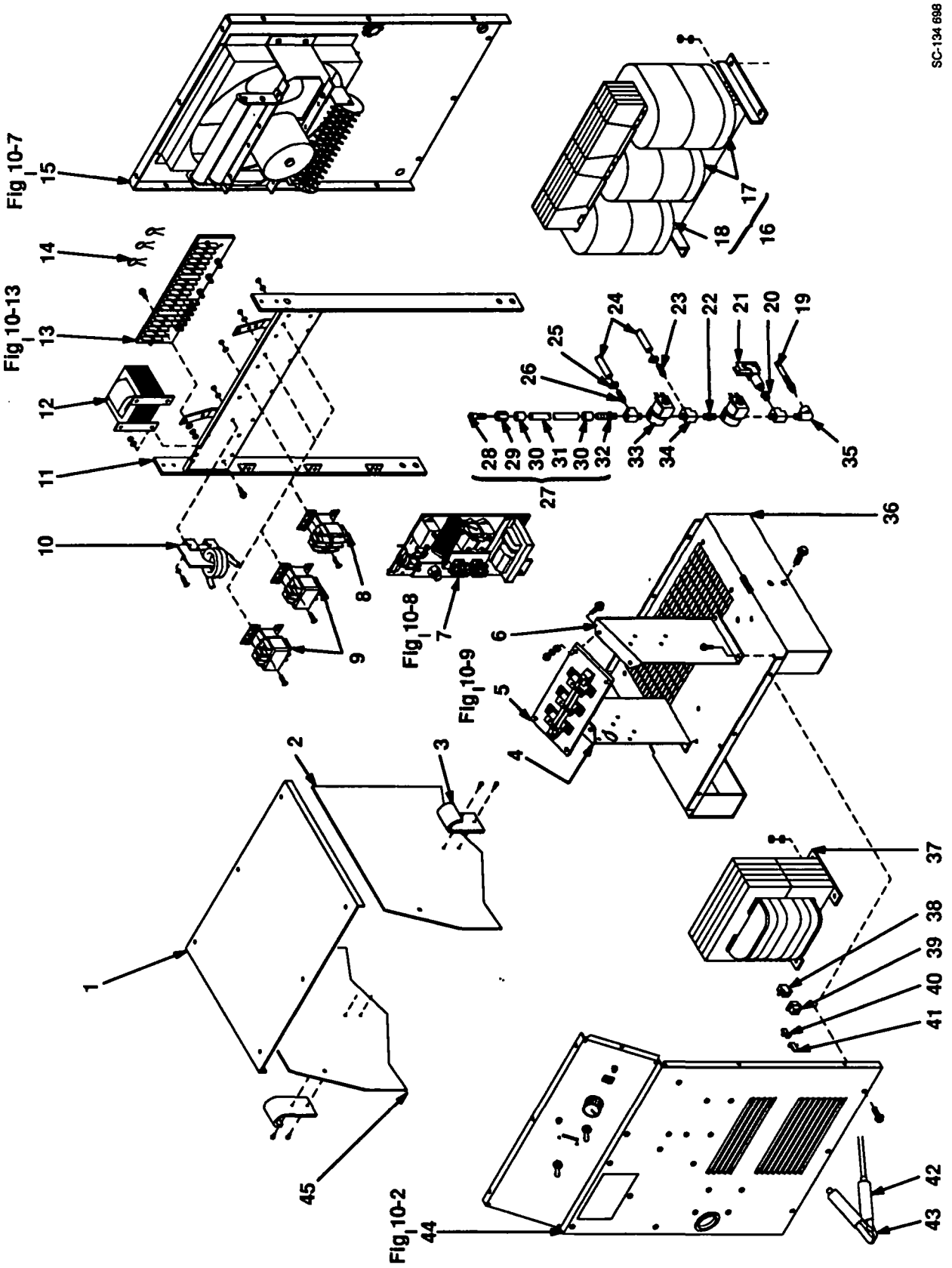
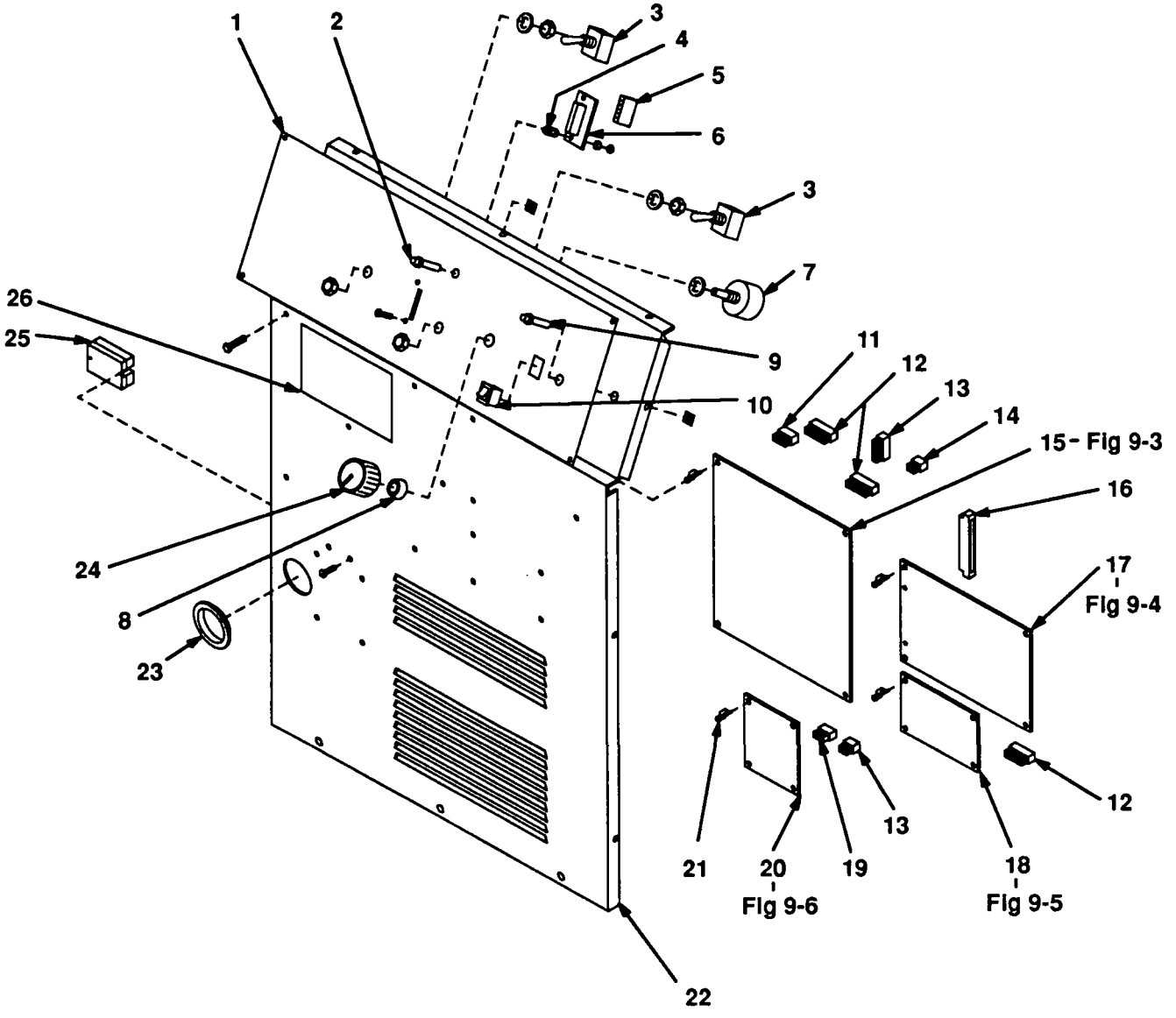


Figure 10-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 10-1. Main Assembly	
1		131 728	COVER, top	1
2		132 941	PANEL, side RH	1
3		015 531	HOOK, lift	2
4		126 700	BRACKET, mtg heatsink LH	1
5	SR1	135 688	RECTIFIER, main (Fig 10-9)	1
		010 021	CLAMP, stl cush .562dia x .343mtg hole	1
6		126 701	BRACKET, mtg heatsink RH	1
7		131 732	HF PANEL, (Fig 10-8)	1
8	CR1	605 855	CONTACTOR, def prp 40A 3P 120V	1
		095 317	LINK, connecting contactor term	2
9	CR3,W	124 886	CONTACTOR, def prp 60A 3P 24V 60 Hz coil	2
10	HD1	134 826	CIRCUIT CARD, hall boost	1
11		132 939	FRAME, center base	1
12	T2	126 982	TRANSFORMER, kVA 1/3 24-18-200/230/460	1
13	TE1	038 126	TERMINAL ASSEMBLY, 3ph 3V (Fig 10-10)	1
14	C21-23	089 634	CAPACITOR, cer disc. .0022uf 3000VAC	3
15		Fig 10-7	PANEL, rear - w/components	1
16	T1	132 879	TRANSFORMER, pwr main 200/230/460 (consisting of)	1
17		131 559	· COIL, pri/sec 200/230/460 center & RH	2
18		131 558	· COIL, pri/sec 200/230/460 LH	1
	TP1	020 520	THERMOSTAT, NC	1
19		127 115	HOSE, air 28 in	1
20		010 869	FITTING, pipe brs bushing 1/4 x 1/8NPT	2
21	S2,3	094 963	SWITCH, pressure air 0-90 lb adjustable	2
		120 561	CONNECTOR, blk 20A 45deg	2
22		010 830	FITTING, piped brs nipple hex 1/4NPT	1
23		073 433	FITTING, brs barbed M 3/16tbg x 1/4NPT	1
24		604 550	HOSE, nprn brd No. 1 x .187 ID (order by ft)	1ft
25		010 323	CLAMP, hose .250-.625clp dia	2
26		124 714	FITTING, brs barbed M 1/4tbg x 1/4NPT	1
27		132 753	HOSE, air (consisting of)	1
28		059 202	· FITTING, hose brs barbed nipple 5/16tbg	1
29		073 841	· FITTING, hose brs nut .625-18RH	1
30		057 173	· FITTING, hose brs ferrule .550 ID x .718L	2
31		110 585	· HOSE, vinyl braided .312 ID x .525 OD (order by ft)	3ft
32		039 599	· FITTING, brs barbed M 5/16tbg x 1/4NPT	1
33	GS1/AS1	109 930	VALVE, 24VAC 2 way 1/4 IPS 1/8orf	2
34		071 270	FITTING, pipe brs tee st 1/4NPT	3
35		010 296	FITTING, hose brs elb M 1/4NPT x .625-18RH	1
36		126 711	BASE	1
37	Z1	132 943	STABILIZER	1
38	PLG10	083 526	HOUSING RECEPTACLE & SOCKETS, (consisting of)	1
		009 418	· RECEPTACLE, female .093 ID 20-14 wire	12
39	PLG9	072 802	HOUSING PLUG & PINS, (consisting of)	1
		009 419	· TERMINAL, male 1 pin .093dia 20-14 wire	12
40		048 280	HOUSING PLUG & PINS, (consisting of)	1
		058 971	· TERMINAL, male	2
41	PLG1	Fig 10-4	Housing is part of PC1 Regulator Circuit Card	
42		026 843	INSULATOR, vinyl blk	2
43		010 368	CLAMP, ground 100A	1
44		Fig 10-2	PANEL, front – w/components	1
45		132 940	PANEL, side LH	1
		132 463	SLEEVE, stop guide	1
		132 657	GUIDE, stand-off	1

**First digit represents page no - digits following dash represent item no.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



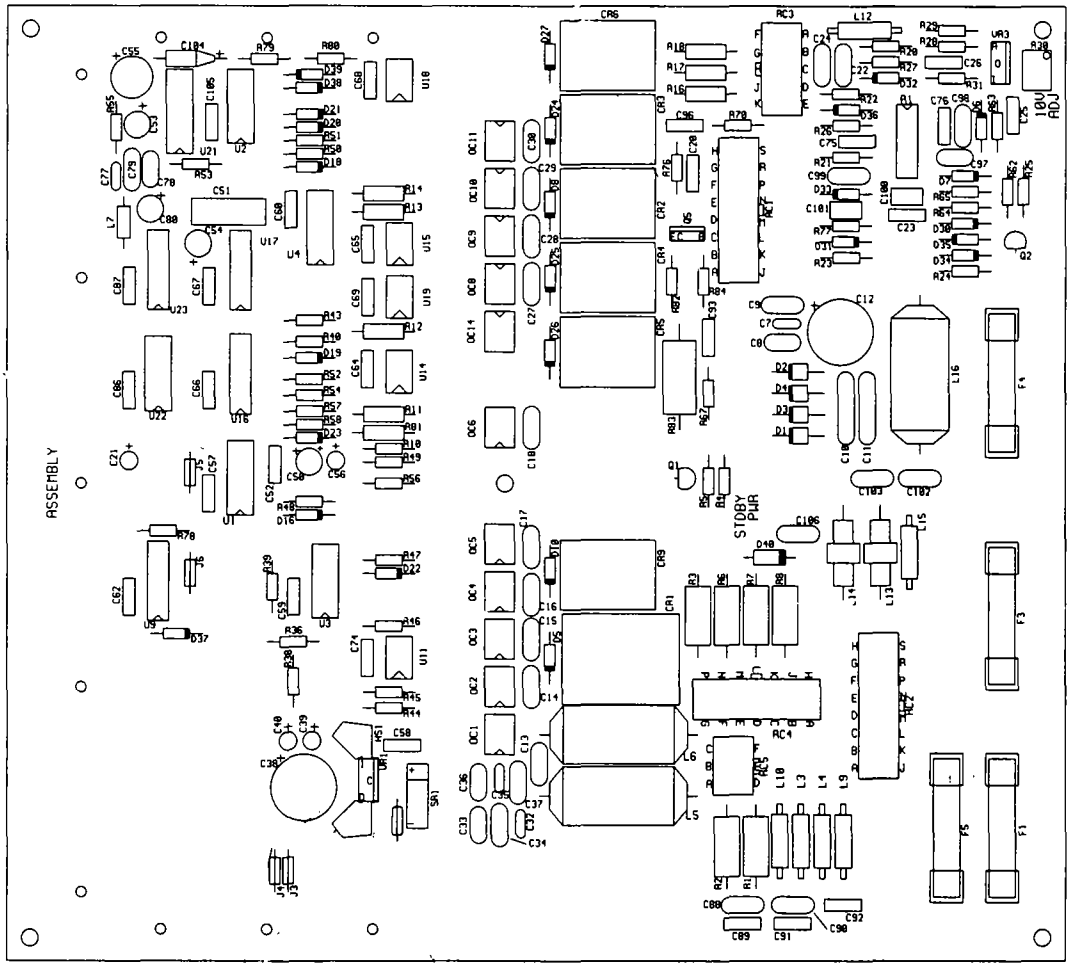
SC-134 705

Figure 10-2. Panel, Front - w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 10-2. Panel, Front w/Components (Fig 10-1 Item 44)	
1			NAMEPLATE, (order by model & serial number)	1
2	PL2	125 521	LIGHT, ind grn lens 28V snap mtg	1
3	S4,5	089 085	SWITCH, tgl SPST 20A 125VAC	4
4		098 691	STAND-OFF, 6-32 x .500 x .250 hex male/female	2
5	PLG8	134 859	HOUSING PLUG & SOCKETS, (consisting of)	1
		125 748	· TERMINAL, contact box shaped 22-18 wire	6
6	PC4	125 057	PRINTED CIRCUIT BOARD, trouble lights	1
7	R1	072 462	POTENTIOMETER, w/shaft lock (consisting of)	1
8		072 590	· LOCK, shaft pot .375-32	1
9	PL1	048 573	LIGHT, ind red lens 28V snap mtg	1
10	S1	111 997	SWITCH, rocker SPST 10A 250VAC	1
11	PLG5	115 091	HOUSING PLUG & SOCKETS, (consisting of)	1
		113 746	· TERMINAL, female 1skt 18-24 wire	10
12	PLG3,4	131 052	HOUSING RECEPTACLE & SOCKETS, (consisting of)	2
		113 746	· TERMINAL, female 1skt 18-24 wire	16
13	PLG6,11	131 056	HOUSING RECEPTACLE & SOCKETS, (consisting of)	2
		113 746	· TERMINAL, female 1skt 18-24 wire	14
14	PLG7,13	115 093	HOUSING PLUG & SOCKETS, (consisting of)	2
		113 746	· TERMINAL, female 1skt 18-24 wire	6
15	PC2	131 745	CIRCUIT CARD, timer/control (Fig 10-3)	1
16	PLG2	035 815	TERMINAL, header 29skt	1
17	PC1	127 184	CIRCUIT CARD, regulator (Fig 10-4)	1
18	PC3	128 920	CIRCUIT CARD, relay (Fig 10-5)	1
19	PLG12	115 092	HOUSING PLUG & SOCKETS, (consisting of)	1
		113 746	· TERMINAL, female 1skt 18-24 wire	8
20	PC5	127 790	CIRCUIT CARD, filter (Fig 10-6)	1
21		110 375	STAND-OFF SUPPORT, pc card No. 6 screw	14
22		126 696	PANEL, front	1
23		004 214	BUSHING, snap-in nyl 1.625 ID x 2.000 mtg hole	1
24		097 924	KNOB, pointer	1
25	CR4	004 960	RELAY, solid state 3-32VDC 10A/240VAC	1
26		124 729	LABEL, precautionary plasma cutting equipment	1

Dia. Mkgs.	Part No.	Description	Quantity
PC2	**131 745**	**Figure 10-3. Circuit Card, Timer/Control (Fig 10-2 Item 15)**	
A1	096 275	IC, linear 324	1
C7,32,35,77	093 697	CAPACITOR, mica 100 pf 300VDC	4
C8,33,36,78,97	053 992	CAPACITOR, cer disc .001uf 1000VDC	5
Note 1	000 340	CAPACITOR, cer disc .01uf 50VDC	23
C10,11	059 122	CAPACITOR, cer disc .01uf 500VDC	2
C12,38	083 973	CAPACITOR, elctlt 1000uf 35VDC	2
C20,23,25,26,52,57-60,62,64-69,74-76,86,87,89,91-93,96,105,	119 197	CAPACITOR, polye film .1uf 100V	27
C21,56	072 130	CAPACITOR, tantlm 1uf 35VDC	2
C39,40	000 348	CAPACITOR, tantlm .47uf 35V	2
C50,53,54,80	091 791	CAPACITOR, tantlm 15uf 35VDC	4
C51	035 522	CAPACITOR, polye film .047uf 100V	1
C55	039 482	CAPACITOR, elctlt 100uf 35VDC	1
C100,101	108 035	CAPACITOR, cer mono .047uf 50VDC	2
C104	005 023	CAPACITOR, tantlm 2.2uf 20V	1
CR1	004 855	RELAY, encl 24VDC 4PDT	1
CR2-6,9	099 018	RELAY, encl 24VDC SPDT	6
D1-5	028 007	DIODE, rect 1A 800V SP	5
D6-8,10,16,18-27,30-39	028 351	DIODE, sig .020A 75V SP	25
D9	092 648	RESISTOR, WW fxd zero ohm	1
D40	026 202	DIODE, rect 1A 400V SP	1
F1	*012 658	FUSE, minat gl slo-blo 2A	1
F3,4	*085 875	FUSE, minat gl slo-blo 5A	2
F5	*012 654	FUSE, minat gl 2A	1
	089 835	CLIP, fuse 15A	8
J3-6	092 648	RESISTOR, WW fxd zero ohm	4
L3,4,9,10,12,15	113 009	CHOKE, RF 100 UH	6
L5,6,16	126 630	CHOKE, filter 95MA 1.6A 500UH	3
L7	095 258	CHOKE, 1000 UH 28MA	1
L13,14	033 942	CHOKE, RF 250MA 3.8 ohm	2
OC1-6,8-11,14	000 041	IC, interface 4N32	11
Q1,2	037 200	TRANSISTOR, NPN 200MA 40V	2
Q5	039 354	TRANSISTOR, PNP4A 40V	1
R1-3,6-8	030 843	RESISTOR, C 1W 680 ohm	6
R4,57	039 331	RESISTOR, CF .25W 4.7K ohm	2
R5,21,24,62,63,84	035 827	RESISTOR, CF .25W 10K ohm	6
R11-14,81	035 820	RESISTOR, CF .50W 470 ohm	5
R16-18	030 940	RESISTOR, C .5W 2K ohm	3
R20,80	035 884	RESISTOR, CF .25W 100K ohm	2
R22,67,70,76,82	035 823	RESISTOR, CF .25W 100 ohm	5
R23,54	039 332	RESISTOR, CF .25W 15K ohm	2
R25	035 887	RESISTOR, CF .25W 3.3K ohm	1
R26,44-47,49,56,64	035 825	RESISTOR, CF .25W 1K ohm	8
R27	000 007	RESISTOR, MF .25W 62K ohm	1
R28	035 824	RESISTOR, CF .25W 270 ohm	1
R29	039 328	RESISTOR, CF .25W 1.5K ohm	1
R30	052 150	POTENTIOMETER, cermet trmr 25/T .5W 1K ohm	1
R31	044 635	RESISTOR, MF .25W 681 ohm	1
R36,38-40,43	092 648	RESISTOR, WW fxd zero ohm	5
R48,51	093 041	RESISTOR, MF .25W 150K ohm	2
R50	039 330	RESISTOR, CF .25W 3.9K ohm	1
R52	038 584	RESISTOR, CF .25W 470K ohm	1
R53	094 447	RESISTOR, MF .25W 681K ohm	1
R55	052 146	RESISTOR, MF .25W 619K ohm	1
R58	035 885	RESISTOR, CF .25W 68K ohm	1
R77	099 297	RESISTOR, MF .25W 47.5 ohm	1
R78	039 335	RESISTOR, CF .25W 47K ohm	1
R79	072 677	RESISTOR, MF .25W 33.2K ohm	1

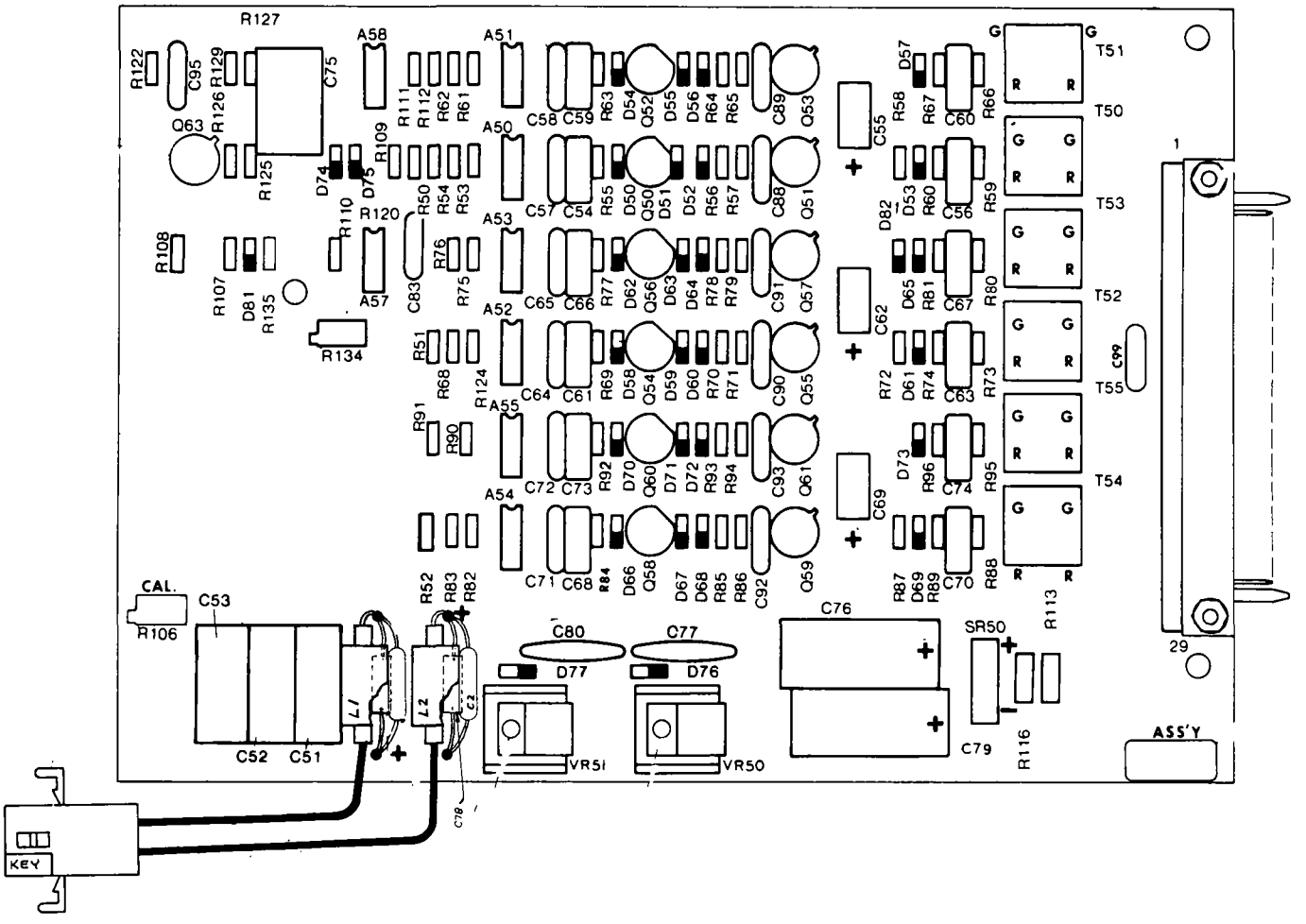
Dia. Mkgs.	Part No.	Description	Quantity
PC2	**131 745**	**Figure 10-3. Circuit Card, Timer/Control (Fig 10-2 Item 15) (Continued)**	
R83	030 819	RESISTOR, C 2W 270 ohm	1
RC1,2	114 425	TERMINAL, header 16 pin	2
RC3	113 747	TERMINAL, header 10 pin	1
RC4	117 864	TERMINAL, header 14 pin	1
RC5	114 654	TERMINAL, header 6 pin	1
SR1	035 841	RECTIFIER, integ 1.5A 200V	1
U1,3,22	113 461	IC, digital 40106	3
U2,4	090 597	IC, digital 4093	2
U9,16,17	093 069	IC, digital 4081	3
U11,14,15,19	097 767	IC, interface 3634	4
U18	113 482	IC, linear 3632	1
U21	094 594	IC, digital 4098	1
U23	093 068	IC, digital 4071	1
VR1	083 772	IC, linear 7815	1
VR3	095 269	IC, linear 317T	1



C-131 747-A

Figure 10-3. Circuit Card, Timer/Control PC2

Note 1: C9,13-18,22,24,27-30,34,37,79,88,90,98,99,102,103,106
*Recommended Spare Parts.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



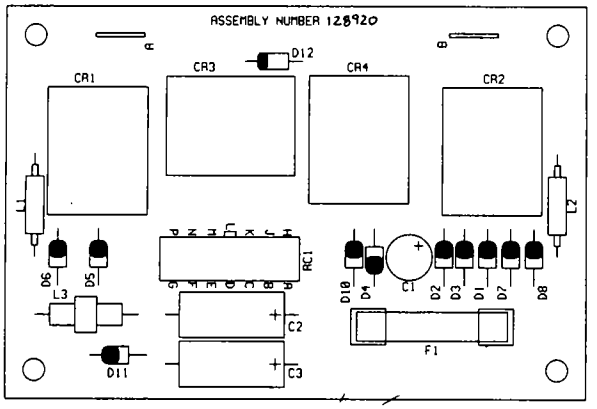
C-126 963-B

Figure 10-4. Circuit Card, Regulator PC1

Dia. Mkgs.	Part No.	Description	Quantity
PC1	**127 184**	**Figure 10-4. Circuit Card, Regulator (Fig 10-2 Item 17)**	
A50-55, 57,58	035 845	IC, linear 307	8
C1,2	006 034	CAPACITOR, cer disc .003uf 3000VDC	2
C51-53	035 834	CAPACITOR, polye met film 1.5uf 100V	3
C54,56,59-61,63, 66-68,70,73,74	035 833	CAPACITOR, polye film .033uf 100VDC	12
C55,62,69	035 835	CAPACITOR, elctlt 4.7uf 35V	3
C57,58,64,65,71,72,77,80	053 991	CAPACITOR, cer disc .05uf 500VDC	8
C75	038 585	CAPACITOR, polye film .22uf 50V	1
C76,79	000 859	CAPACITOR, elctlt 220uf 35VDC	2
C78,81	031 630	CAPACITOR, elctlt 22uf 50VDC	2
C83,88-93,95,99	059 122	CAPACITOR, cer disc .01uf 500VDC	9
D50-52,54-56,58-60,62-64, 66-68,70-72,74,75,81	028 351	DIODE, sig .020A 75V SP	21
D53,57,61,65,69, 73,76,77,82	026 202	DIODE, rect 1A 400V SP	9
L1,2	126 630	CHOKE, filter 95MA 1.6A 500 UH	2
PLG1	058 969	HOUSING, term header 2skt	1
Q50,52,54,56,58,60	037 277	TRANSISTOR, NPN 200MA 30V	6
Q51,53,55,57,59,61	035 842	TRANSISTOR, PNP .6A 40V	6
Q63	000 088	TRANSISTOR, NPN 800MA 40V	1
R50-52,111,112	000 885	RESISTOR, CF .25W 10K ohm	5
R53,54,61,62,68,75,76, 82,83,90,91,109,124	035 884	RESISTOR, CF .25W 100K ohm	13
R55,63,69,77,84,92,126	035 826	RESISTOR, CF .25W 6.8K ohm	7
R56,64,70,78,85,93,107,129	035 827	RESISTOR, CF .25W 10K ohm	8
R57,65,71,79,86,94	035 825	RESISTOR, CF .25W 1K ohm	6
R58,72,87	035 823	RESISTOR, CF .25W 100 ohm	3
R59,66,73,80,88,95	035 257	RESISTOR, C .25W 270 ohm	6
R60,67,74,81,89,96	605 919	RESISTOR, C .25W 47 ohm	6
R106	039 360	POTENTIOMETER, cermet trmr 20/T .5W 25K ohm	1
R108	084 205	RESISTOR, CF .25W 3.3K ohm	1
R110	053 225	RESISTOR, CF .25W 39K ohm	1
R113,116	030 089	RESISTOR, C .5W 2.7 ohm	2
R120	039 106	RESISTOR, CF .25W 470 ohm	1
R122	076 712	RESISTOR, C .25W 220K ohm	1
R125	035 887	RESISTOR, CF .25W 3.3K ohm	1
R127	039 329	RESISTOR, CF .25W 2.7K ohm	1
R134	035 848	POTENTIOMETER, cermet trmr 25/T .5W 10K ohm	1
R135	052 138	RESISTOR, CF .25W 20K ohm	1
RC1	035 849	TERMINAL, header 29 pin	1
SR50	035 841	RECTIFIER, integ 1.5A 200V	1
T50-55	035 846	TRANSFORMER, pulse	6
VR50	081 832	IC, linear 78M15	1
VR51	046 932	IC, linear 7915	1

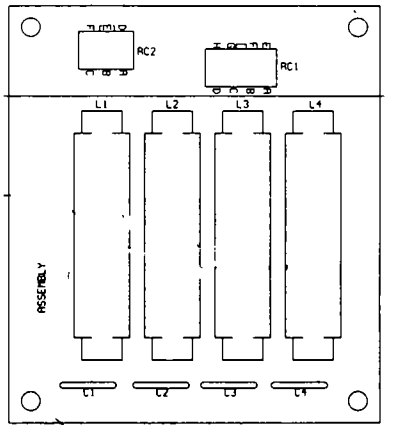
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Dia. Mkgs.	Part No.	Description	Quantity
PC3	**128 920**	**Figure 10-5. Circuit Card, Relay (Fig 10-2 Item 18)**	
C1	039 482	CAPACITOR, elctlt 100uf 35VDC	1
C2,3	000 859	CAPACITOR, elctlt 220uf 35VDC	2
CR1-4	004 855	RELAY, encl 24VDC 4PDT	4
D1-8,10	028 007	DIODE, rect 1A 800V SP	9
D11,12	026 202	DIODE, rect 1A 400V SP	2
F1	*012 633	FUSE, minat gl 1A	1
L1,2	113 009	CHOKE, RF 100 UH	2
L3	033 942	CHOKE, RF 250MA 3.8 ohm	1
RC1	117 864	TERMINAL, header 14 pin	1



A-128 922

Figure 10-5. Circuit Card, Relay PC3



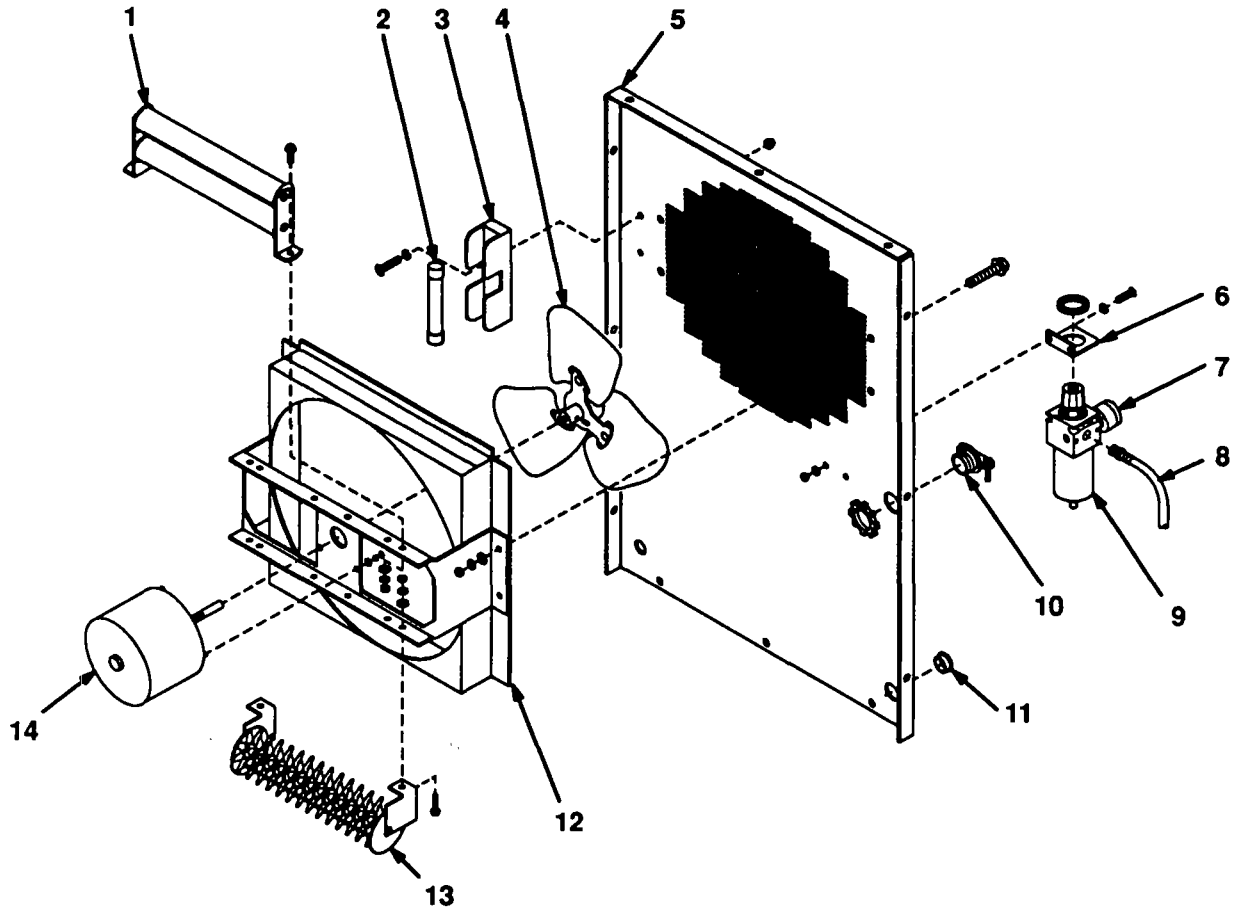
A-127 791

Figure 10-6. Circuit Card, Filter PC5

Dia. Mkgs.	Part No.	Description	Quantity
PC5	**127 790**	**Figure 10-6. Circuit Card, Filter (Fig 10-2 Item 20)**	
C1-4	006 034	CAPACITOR, cer disc .003uf 3000VDC	4
L1-4	127 804	CHOKE	4
RC1	113 749	TERMINAL, header 8 pin	1
RC2	114 654	TERMINAL, header 6 pin	1

*Recommended Spare Parts.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 10-7. Panel, Rear - w/Components (Fig 10-1 Item 15)	
1	R2,3	126 736	RESISTOR, WW fxd 375W 20-161 ohm dual	1
2	F1	*604 259	FUSE, crtg 3A 600V one time	1
3		070 404	HOLDER, fuse crtg 30A 600V 1P	1
4		032 611	BLADE, fan 14 in 3 wg 23 deg	1
5		126 695	PANEL, rear	1
6		125 044	BRACKET, mtg air filter/regulator	1
7		125 145	GAUGE, air 0-160 psi	1
8		127 115	HOSE, air (consisting of)	1
		059 202	· FITTING, hose brs barbed nipple 5/16TBG	1
		010 606	· FITTING, hose brs nut .625-18 RH	1
		057 173	· FITTING, hose brs ferrule .550 ID x .718 L	1
		039 599	· FITTING, brs barbed M 5/16TBG x 1/4NPT	1
		110 585	· HOSE, vinyl braided .312 ID x .525 OD (order by ft)	3ft
9		125 042	REGULATOR/FILTER, 150 PSIG in 0-125 PSIG out 1/4NPT	1
10		044 426	CONNECTOR, clamp cable .690/1.070	1
11		030 170	BUSHING, snap-in nyl .750 ID x 1.000 mtg hole	1
12		131 361	CHAMBER, plenum 14 in	1
13	R4	126 841	RESISTOR, WW fxd 2625W 4.09 ohm	1
14	FM	116 190	MOTOR, 1/12hp 230V 1550 RPM 50/60 Hz	1

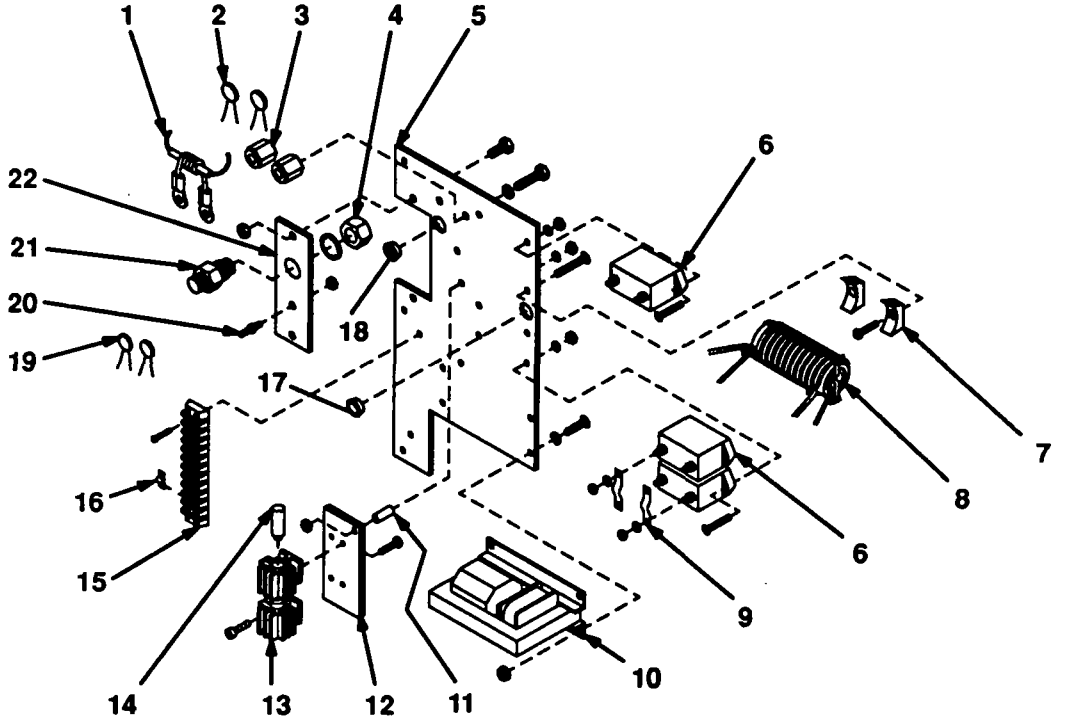


SC-135 352

Figure 10-7. Panel, Rear - w/Components

*Recommended Spare Parts.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		131 732	**Figure 10-8. HF Panel (Fig 10-1 Item 7)**	
1	RS1	125 508	RELAY, reed	1
2		128 256	CAPACITOR ASSEMBLY, (consisting of)	1
	C4,14	089 634	· CAPACITOR, cer disc .0022uf 3000VAC	2
3	WORK	026 947	STAND-OFF, insul .250-20 x 1.000 lg x .312 thd	2
4		605 884	NUT, stl hex half .750-16	1
		038 328	STUD, brs .250-20 x 1.250	1
		601 836	NUT, brs hex jam hvy .250-20	2
5		131 733	PANEL, mtg HF	1
6	C2,3,16	096 761	CAPACITOR, mica .002uf 10000V	3
7		113 146	CABLE TIE MOUNT, for lashing	2
8	T4	128 833	COIL, HF coupling	1
9		010 886	STRIP, conductor	2
10	T3	074 398	TRANSFORMER, high voltage 115V pri 3600V sec 30MA	1
11		103 947	TUBING, stl .312 OD x 17ga wall x .937	2
12		113 000	STRIP, mtg spark gap	2
13		020 622	HOLDER, points	2
14	G	*020 603	POINT, spark gap	2
15	1T	♦073 586	BLOCK, term 20A 11P screw term	1
16		♦601 219	LINK, jumper term blk 20A	1
17		010 493	BUSHING, snap-in nyl .625 ID x .875 mtg hole	1
18		025 338	BUSHING, nyl univ 23/32 hd dia .625 mtg	1
19		♦126 450	CAPACITOR ASSEMBLY, (consisting of)	1
	C18,19	087 209	· CAPACITOR, cer disc .003uf 2000VAC	2
20		038 888	STUD, pri board brs .250-20 x 1.500	1
21		125 689	FITTING, pipe brs adapter bhd .562-18 x .750-16 w/.125	1
22		131 734	STRIP, mtg torch	1



SB-135 353

Figure 10-8. HF Panel

*Recommended Spare Parts.

♦Item is not part of HF Panel.

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
	SR1	**135 688**	**Figure 10-9. Rectifier, Main (Fig 10-1 Item 5)**	
1	SCR1-3A,B	126 283	POWER BLOCK, thyristor 40A	3
2		112 250	FOIL, interface heat transfer	3
3		126 282	HEAT SINK	1
4	TP2	129 552	THERMOSTAT, NC	1
5	D4	126 213	DIODE BLOCK, rect 85A 1000V	1
6		126 710	TUBING, cop hd drn .500 OD	1
7		126 495	BUS BAR	2
8	C1,7-12	080 894	CAPACITOR, cer disc .01uf 1000VDC	7
9	VR1	004 113	VARISTOR, 40 joule 390VDC	1

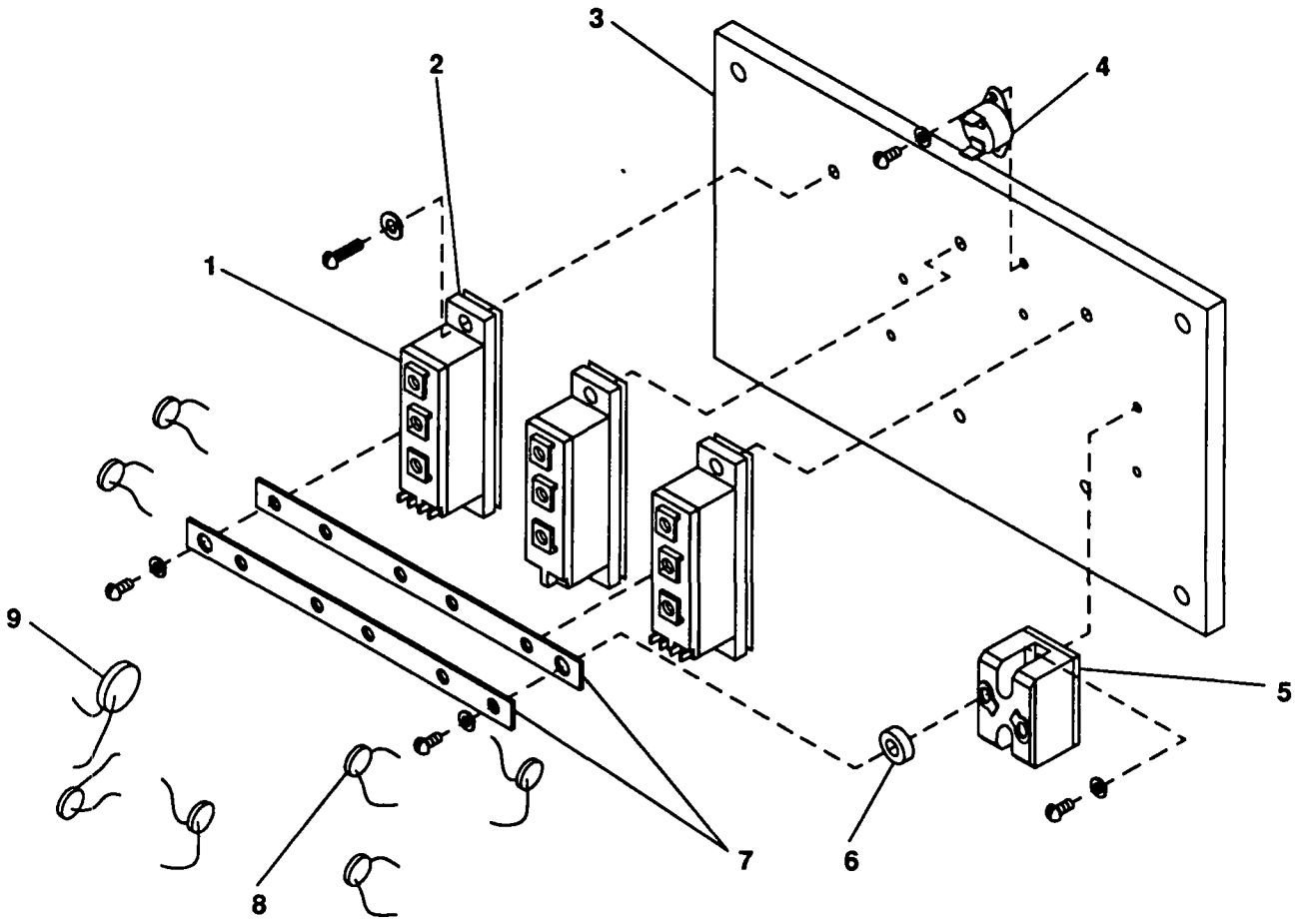
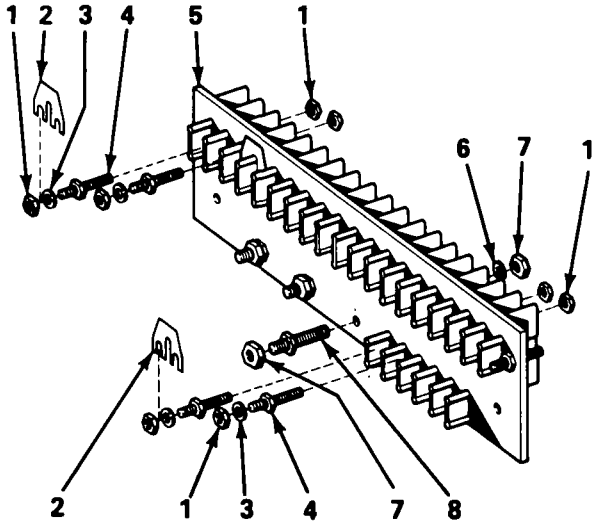


Figure 10-9. Rectifier, Main

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

Item No.	Part No.	Description	Quantity
	038 126	**Figure 10-10. Terminal Assembly, Pri 3Ph 3V (Fig 10-1 Item 13)**	
1	601 835	NUT, brs hex 10-32 reg	46
2	038 618	LINK, jumper term bd pri	7
3	010 913	WASHER, flat brs .187 ID	23
4	038 887	STUD, primary board brs 10-32	23
5	038 058	TERMINAL BOARD, pri	1
6	010 915	WASHER, flat brs .250 ID	6
7	601 836	NUT, brs hex .250-20 jam hvy	6
8	038 888	STUD, primary board brs .250-20	3



TC-038 125-A

Figure 10-10. Terminal Assembly, Pri 3Ph 3V

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